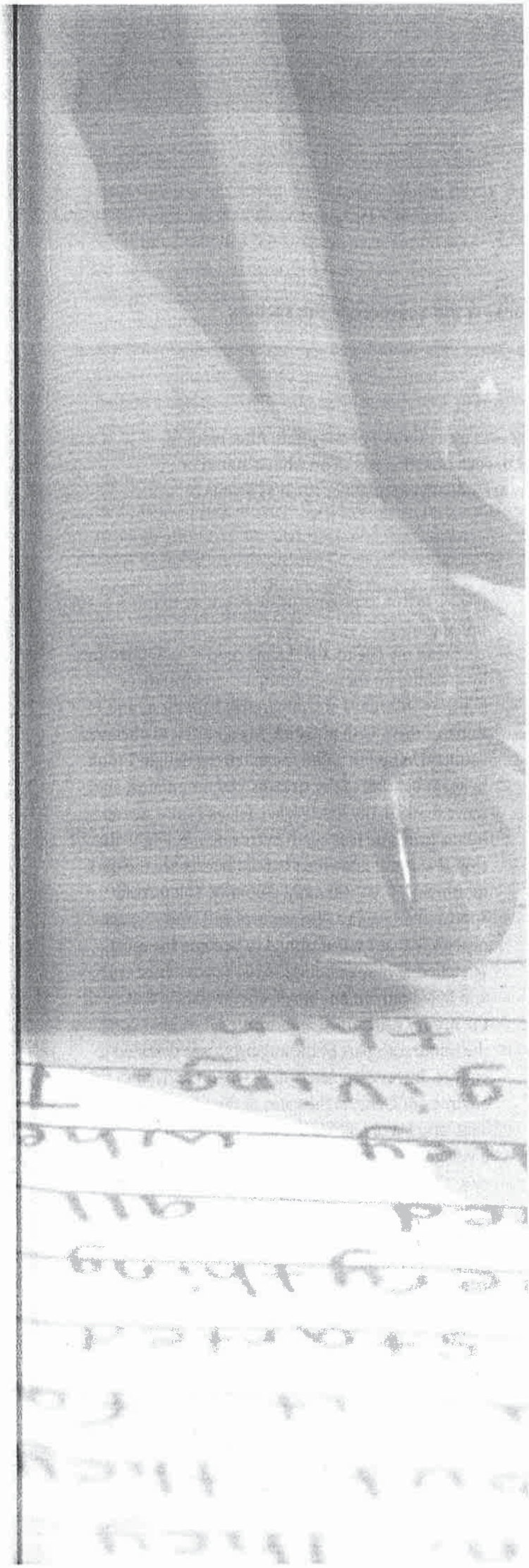


Chapter 3
Practice Test 1

Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

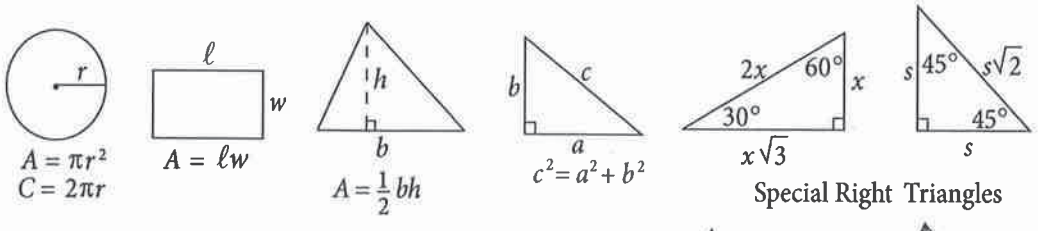
DIRECTIONS

For questions **1-15**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **16-20**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

$A = \frac{1}{2}bh$

$c^2 = a^2 + b^2$

Special Right Triangles

$V = \ell wh$

$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

During a certain week, Jan worked j hours each day for 3 days, and Noah worked n hours each day for 5 days. Which of the following represents the total combined number of hours worked that week by Jan and Noah?

A) $3j + 5n$

B) $5j + 3n$

C) $8jn$

D) $15jn$

2

If $\frac{y+2}{5} = c$ and $c = 4$, what is the value of y?

A) 16

B) 18

C) 20

D) 22

3

For $i = \sqrt{-1}$, what is the sum $(10 - 4i) + (3 + 6i)$?

A) $13 - 10i$

B) $13 + 2i$

C) $7 - 10i$

D) $7 + 2i$

4

$$(ab^2 + 4a^2 + 6a^2b^2) - (-ab^2 + 2a^2b^2 + 4a^2)$$

Which of the following is equivalent to the expression above?

A) $-2a^2b^2$

B) $-2a^2b^2 + 8a^2$

C) $2ab^2 - 2a^2b^2 + 8a^2$

D) $2ab^2 + 4a^2b^2$

CONTINUE

5

$$w = 3{,}150 + 450l$$

A marine biologist uses the equation above to estimate the weight, w, of a mature great white shark, in pounds, in terms of the shark's fork length, l, in feet. Based on the equation, what is the estimated weight increase, in pounds, for each foot of growth in fork length in a great white shark?

A) 3,150

B) 2,700

C) 1,350

D) 450

6

Juan is a book editor who is given a book to edit. The number of pages that he has left to edit at the end of each hour is estimated by the equation $P = 326 - 12h$, where h represents the number of hours spent editing the book. What is the meaning of the value 326 in this equation?

A) Juan edits pages at a rate of 326 per day.

B) Juan edits pages at a rate of 326 per hour.

C) Juan is given a total of 326 pages to edit.

D) Juan will finish editing the book in 326 hours.

7

If $\frac{x}{y} = 3$, what is the value of $\frac{12y}{x}$?

A) 4

B) 6

C) 8

D) 12

8

$$2y + x = -17$$

$$5x - 4y = -15$$

What is the solution (x, y) to the system of equations shown above?

A) $(-7, -5)$

B) $(-4, -1)$

C) $(-3, 0)$

D) $(5, -11)$

CONTINUE

9

$$c = \frac{\frac{r}{1,200}}{1-\left(1+\frac{r}{1,200}\right)^{-N}} M$$

In order to buy a house, a couple takes on a mortgage of M dollars at an annual rate of r percent to be paid off over N months. If the equation above is used to determine the monthly payment, c, that the couple needs to make to pay off the loan, which of the following expressions gives the value of M, in terms of c, r, and N?

A) $M = \left(\frac{r}{1,200}\right)c$

B) $M = \left(\frac{1,200}{r}\right)c$

C) $M = \frac{1-\left(1+\frac{r}{1,200}\right)^{-N}}{\frac{r}{1,200}}c$

D) $M = \frac{\frac{r}{1,200}}{1-\left(1+\frac{r}{1,200}\right)^{-N}}c$

10

A line in the xy-plane has a slope of $\frac{2}{3}$ and passes through the origin. Which of the following points lies on the line?

A) $\left(0, \frac{2}{3}\right)$

B) (2, 3)

C) (6, 4)

D) (9, 4)

11

$$f(x) = cx^2 + 30$$

For the function f defined above, c is a constant and $f(3) = 12$. What is the value of $f(-3)$?

A) −12

B) −2

C) 0

D) 12

CONTINUE

12

$$A = 240 - 20w$$

$$B = 320 - 30w$$

In the equations above, A and B represent the price per night for a room in Hotel A and Hotel B, respectively, w weeks after September 1 last autumn. What was the price per night in Hotel A when it was equal to the price per night in Hotel B?

A) \$80

B) \$160

C) \$180

D) \$220

13

If $a - 4b = 18$, what is the value of $\frac{3^a}{81^b}$?

A) 81^2

B) 9^6

C) 3^{18}

D) The value cannot be determined from the information given.

14

If $(ax + 3)(bx + 5) = 35x^2 + kx + 15$ for all values of x, and $a + b = 12$, what are the two possible values for k?

A) 46 and 50

B) 15 and 35

C) 21 and 25

D) 5 and 7

15

If $y > 5$, which of the following is equivalent to

$$\frac{1}{\frac{1}{y-4} + \frac{1}{y-3}}?$$

A) $2y - 7$

B) $y^2 - 7y + 12$

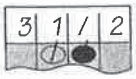
C) $\frac{y^2 - 7y + 12}{2y - 7}$

D) $\frac{2y - 7}{y^2 - 7y + 12}$

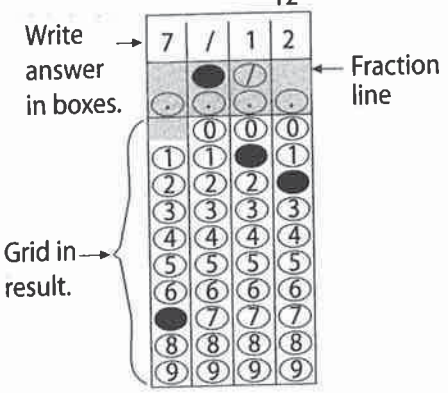
CONTINUE

DIRECTIONS

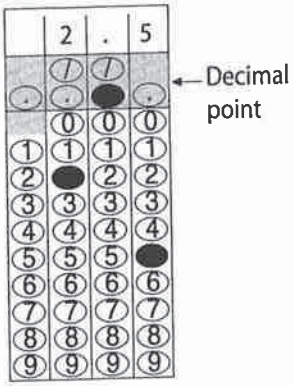
For questions 16-20, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

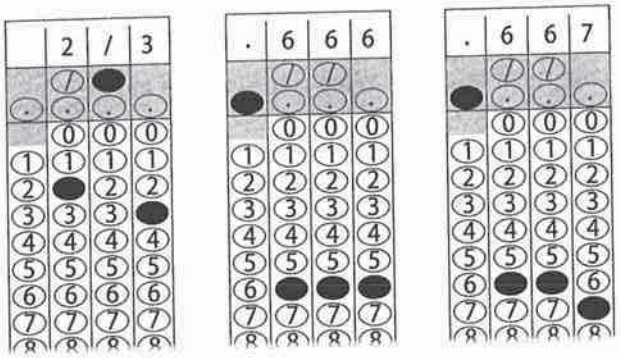
Answer: $\frac{7}{12}$



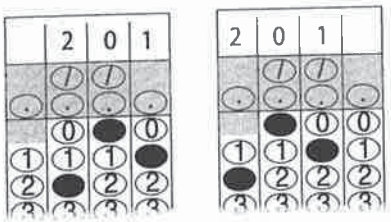
Answer: 2.5



Acceptable ways to grid $\frac{2}{3}$ are:



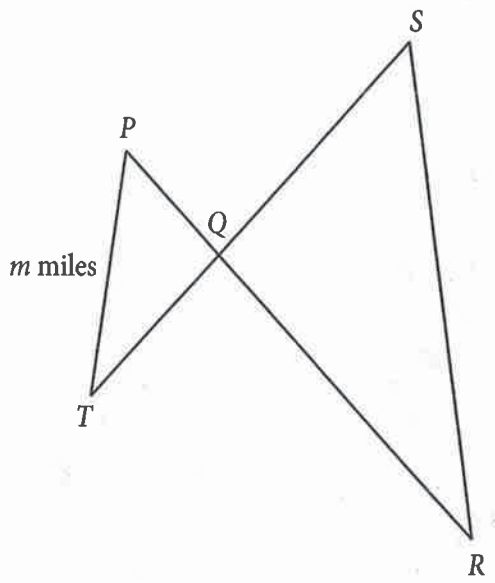
Answer: 201 – either position is correct



NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

16



In a certain park, the layout of the six bicycle paths is shown in the figure above. The lengths of $\overline{PQ}$, $\overline{QT}$, $\overline{QS}$, and $\overline{SR}$ are 3 miles, 4 miles, 8 miles, and 10 miles, respectively. Paths $\overline{PR}$ and $\overline{ST}$ intersect at point Q, and $\angle TPQ$ is congruent to $\angle QRS$. What is the value of m ?

17

If $y > 0$ and $y^2 - 36 = 0$, what is the value of y ?

18

In a right triangle, one angle measures $d°$, where $\cos d° = \frac{5}{13}$. What is $\sin (90° - d°)$?

CONTINUE

19

If $c = 3\sqrt{5}$ and $5c = \sqrt{5z}$, what is the value of z?

20

$$a + b = -10$$

$$2a + b = -33$$

What is the value of b in the system of equations shown above?

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section in the test.

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

DIRECTIONS

For questions **1-30**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **31-38**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

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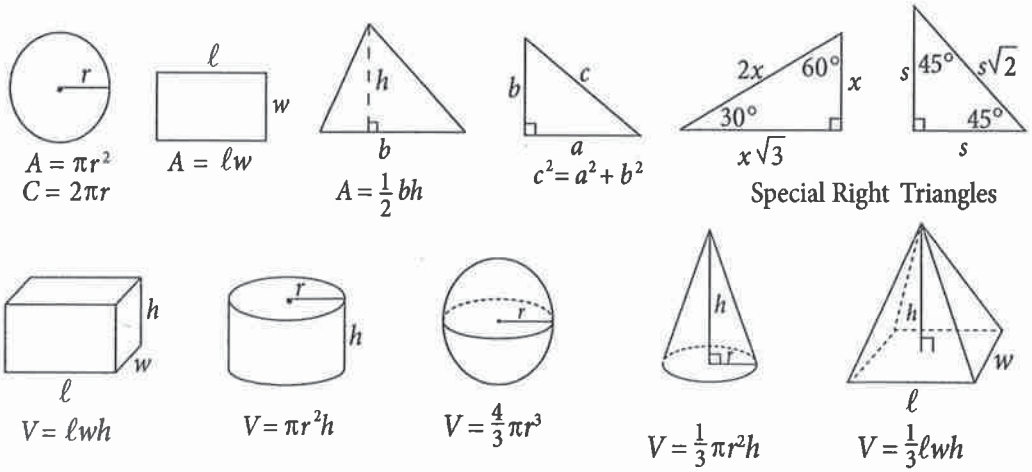
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

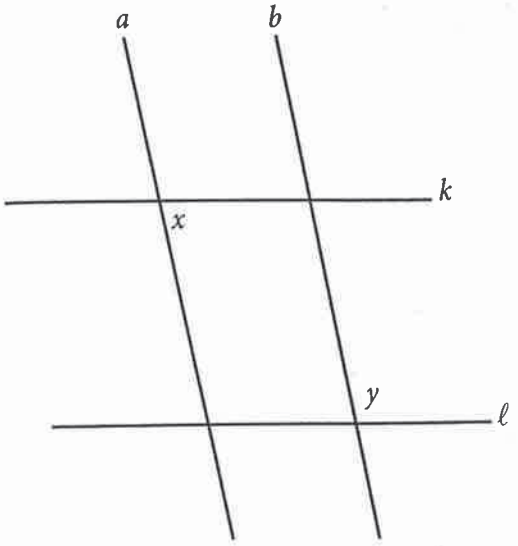
REFERENCE



The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1



In the figure shown above, lines a and b are parallel and lines k and ℓ are parallel. If the measure of $\angle x$ is 75°, what is the measure of $\angle y$?

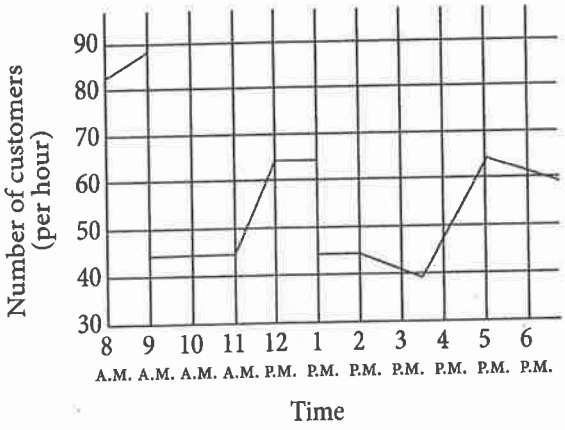
A) 15°

B) 75°

C) 105°

D) 165°

2



The graph above shows the number of customers per hour at a coffee shop. Over which of the following intervals is the number of customers strictly decreasing then strictly increasing?

A) From 9 A.M. to 12 P.M.

B) From 12 P.M. to 2 P.M.

C) From 2 P.M. to 5 P.M.

D) From 3:30 P.M. to 6:30 P.M.

3

If $y = \frac{x}{k}$, where k is a constant, and $y = 5$ when $x = 30$, what is the value of y when $x = 42$?

A) 6

B) 7

C) 10

D) 17

CONTINUE

4

1 kilogram = 1,000 grams
10 decigrams = 1 gram

A pharmacy sells a certain type of medication in 1-decigram doses. Based on the information shown in the box above, three kilograms of medication contain how many 1-decigram doses?

A) 300,000
B) 30,000
C) 3,000
D) 300

5

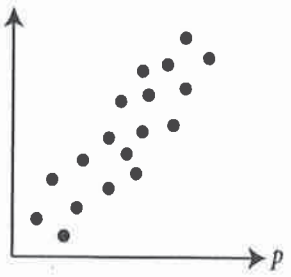
If $6x - 4$ is 11 less than 25, what is the value of $9x$?

A) 3
B) 8
C) 18
D) 27

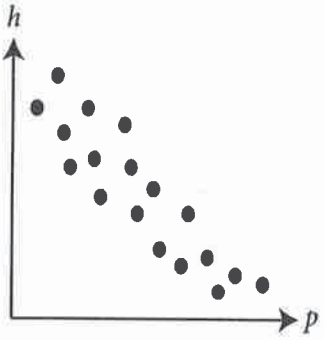
6

Which of the graphs below best illustrates a strong positive correlation between h and p?

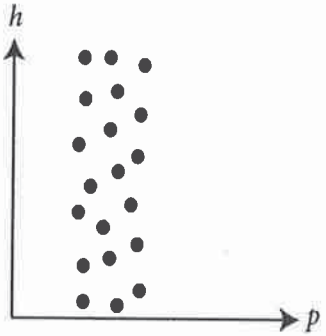
A)



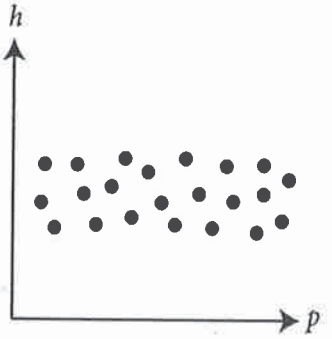
B)



C)



D)



CONTINUE

Questions 7 and 8 refer to the following information.

$$p = 101 + 10.094d$$

The total pressure on an object submerged in the ocean depends on the depth of the object beneath the surface. The formula above shows the relationship between p, pressure, in kilopascals, and d, depth, in meters.

7

At which of the following depths will the total pressure be closest to 200 kilopascals?

A) 8 meters

B) 9 meters

C) 10 meters

D) 11 meters

8

Which of the following formulas expresses depth in terms of pressure?

A) $d = \frac{p}{10.094} - 101$

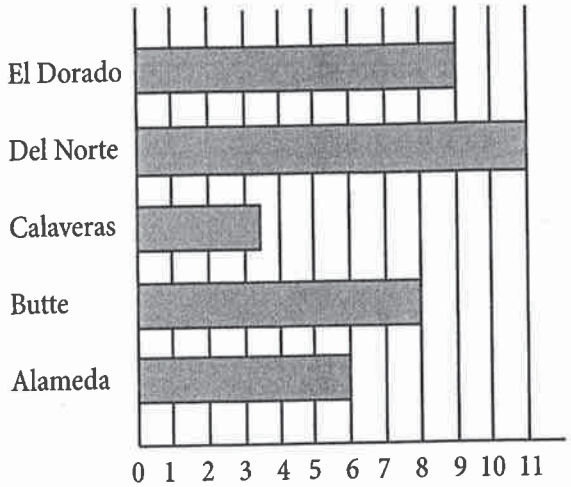
B) $d = \frac{10.094}{101 - p}$

C) $d = \frac{p + 101}{10.094}$

D) $d = \frac{p - 101}{10.094}$

9

Wind Turbine Operation in Five Counties



The number of wind turbines in use in five counties is shown in the graph above. If there are a total of 3,750 wind turbines operating in these five counties, which of the following is an appropriate label for the horizontal axis of the graph?

A) Number of wind turbines (in tens)

B) Number of wind turbines (in hundreds)

C) Number of wind turbines (in thousands)

D) Number of wind turbines (in tens of thousands)

CONTINUE

10

For how many values of k is it true that $|k - 3| + 2$ is equal to one?

A) None

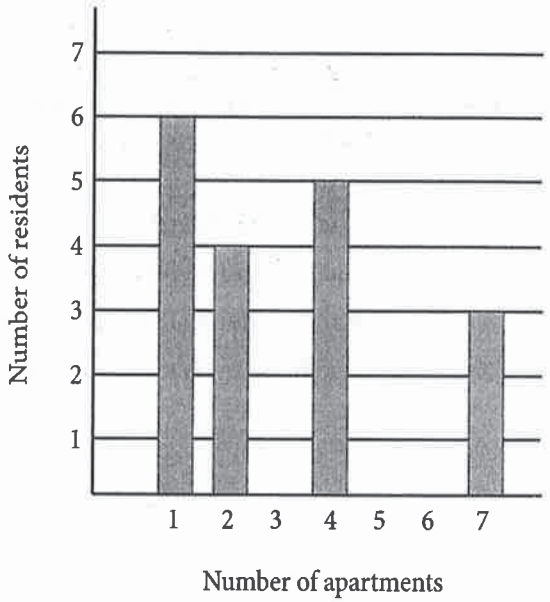
B) One

C) Two

D) More than two

11

Number of Residents in Each of 14 Apartments



According to the histogram shown above, which of the following is closest to the average (arithmetic mean) number of residents per apartment?

A) 3

B) 3.25

C) 3.5

D) 4

12

Which of the following integers CANNOT be a solution to the inequality $6x - 4 \leq 7x - 3$?

A) 1

B) 0

C) –1

D) –2

13

Weights of potatoes (in ounces)								
2	3	3	4	4	4	5	5	6
6	7	7	7	7	8	8	9	9

An agriculture class harvested 18 potatoes from the school garden and compiled the weights of the potatoes in the table above. If the 2-ounce measurement is removed from the data, which of the following statistical measures of the values listed will change the least?

A) The mean

B) The median

C) The range

D) The total

CONTINUE

14

$$p + x > y$$

$$r - x < -y$$

In the xy-plane, (2, 2) is a solution to the system of inequalities shown above. Which of the following must be true about p and r?

A) $p < r$

B) $r < p$

C) $p + r = 0$

D) $|p| = |r|$

15

	Political Party			
	Liberal	Conservative	Independent	Total
Men	59	74	62	195
Women	82	63	55	200
Total	141	137	117	395

A group of voters in country X responded to a poll that asked which political party they planned to vote for. The table above shows the results of the polling data. Which of the categories below accounts for approximately 15 percent of all poll respondents?

A) Men voting Liberal

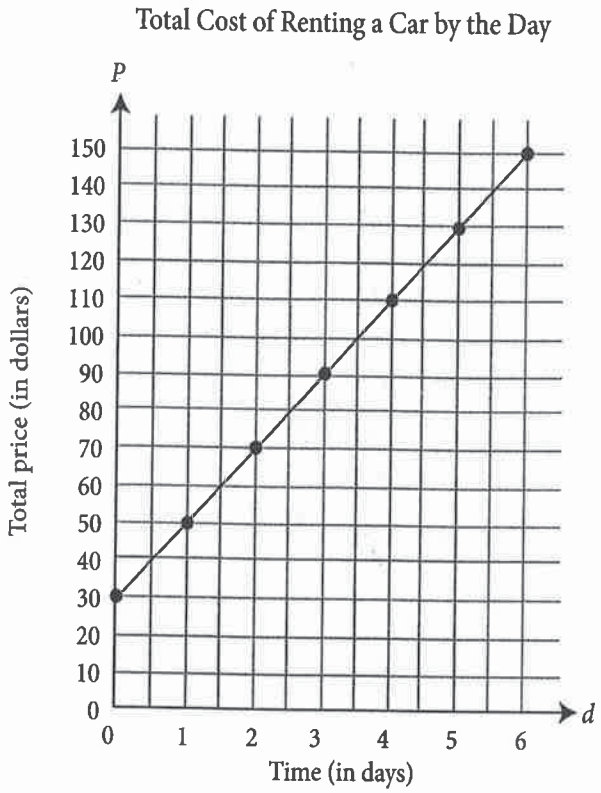
B) Men voting Independent

C) Women voting Conservative

D) Women voting Liberal

CONTINUE

Questions 16 and 17 refer to the following information.



The graph above shows the total price P, in dollars, to rent a car for d days.

16

What does the slope of the graph represent?

A) The total number of cars rented

B) The initial cost of renting a car

C) The average increase in price to rent a car for each additional day

D) The total number of days for which a car is rented

17

Which of the equations below shows the relationship between d and P?

A) $P = 25d$

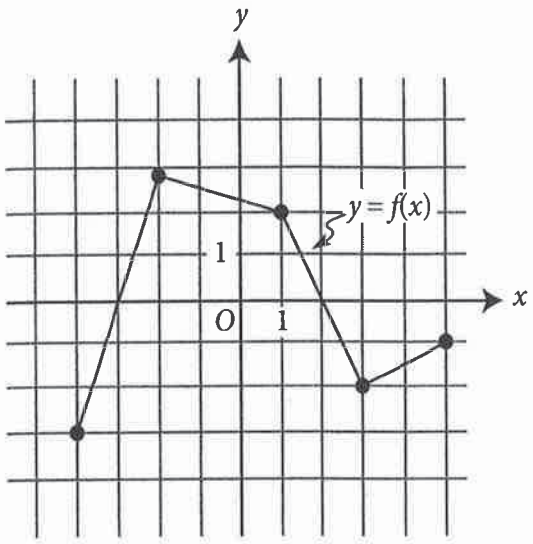
B) $P = d + 30$

C) $P = 10d + 30$

D) $P = 20d + 30$

CONTINUE

18



The figure above shows the complete graph of the function f in the xy-plane. For which of the following values of x is $f(x)$ at its maximum?

A) -4

B) -3

C) -2

D) 3

19

The price of a train ticket purchased in the train station or from a conductor is 15 percent less during off-peak hours than it is during peak hours. If a ticket is purchased from the conductor, an 11 percent surcharge is added to the price. Alec purchased a ticket from the conductor during off-peak hours and paid a total of t dollars. Which of the following, in terms of t, represents the price he would have paid if he had purchased the ticket in the train station during peak hours?

A) $\frac{t}{0.96}$

B) $0.96t$

C) $\frac{t}{(0.85)(1.11)}$

D) $(0.85)(1.11)t$

20

Number of Exercise Sessions per Week

	0–2	3–5	More than 5	Total
Group 1	13	22	15	50
Group 2	11	18	21	50
Total	24	40	36	100

The table above was compiled by a nutrition researcher studying how often people exercise when asked to keep a log of their exercise sessions. Group 1 was comprised of people who regularly eat snacks, and Group 2 was comprised of people who rarely eat snacks. If one person is randomly chosen from among those who exercise fewer than six times per week, what is the probability that this person belonged to Group 1 ?

A) $\frac{35}{64}$

B) $\frac{50}{64}$

C) $\frac{29}{100}$

D) $\frac{35}{100}$

21

A service station sells gasoline for \$3.25 per gallon and diesel fuel for \$3.00 per gallon. On Monday, the service station's revenue from selling a total of 131 gallons of gasoline and diesel fuel was \$404.25. How many gallons of diesel fuel did the service station sell on Monday?

A) 35

B) 55

C) 76

D) 86

CONTINUE

Questions 22 and 23 refer to the following information.

Total Budget Spending in One U.S. State by Category, 2010–2014

Year	K-12 education	Higher education	Public assistance	Medicaid	Corrections	Transportation
2014	3,635,265	3,099,112	29,450	2,990,415	930,525	1, 556,244
2013	3,677,428	2,734,615	45,873	3,005,188	820,855	1,873,618
2012	3,715,853	2,550,665	55,645	3,020,012	773,420	1,721,682
2011	3,747,921	2,309,789	54,321	2,984,375	694,011	1,388,904
2010	3,785,200	2,104,214	55,787	3,001,650	632,350	1,434,006

The table above summarizes annual spending, in thousands of dollars, for six categories of spending in one U.S. state, 2010-2014.

22

Of the following, which category's ratio of its 2010 spending to its 2014 spending is nearest to the higher education category's ratio of its 2010 spending to its 2014 spending?

A) K-12 education

B) Medicaid

C) Corrections

D) Transportation

23

Which of the following is the best approximation of the average rate of change in spending on public assistance from 2012 to 2014 ?

A) $6,000,000

B) $10,000,000

C) $13,000,000

D) $26,000,000

CONTINUE

24

A fish leaps vertically upward from the surface of a lake at an initial speed of 9 meters per second. The height h, in meters, of the fish above the surface of the water s seconds after it leaps is given by the equation $h = 9s - 4.9s^2$. Approximately how many seconds after the fish leaps will it hit the surface of the lake?

A) 2.0

B) 2.5

C) 3.0

D) 3.5

25

A circle in the xy-plane is centered at (3, 0) and has a radius with endpoint $\left(1, \frac{8}{3}\right)$. Which of the following is an equation of the circle?

A) $(x-3)^2 + y^2 = \frac{10}{3}$

B) $(x+3)^2 + y^2 = \frac{10}{3}$

C) $(x-3)^2 + y^2 = \frac{100}{9}$

D) $(x+3)^2 + y^2 = \frac{100}{9}$

26

A square lawn has a length of 8 feet and a width of 8 feet. Eight researchers each examine a randomly chosen region of the field; all regions are square with length and width of one foot. The researchers count the number of seedlings in each region that have reached a height of at least 2 inches. The table below shows the resulting data.

Region	1	2	3	4
Number of seedlings	82	87	95	99
Region	5	6	7	8
Number of seedlings	102	106	111	115

Which of the following best approximates the number of seedlings that are at least 2 inches high in the entire lawn?

A) 80

B) 640

C) 800

D) 6,400

27

A zoologist is studying the reproduction rates of two different breeds of chinchillas in country Y. He discovered that the Eastern chinchillas in his study produced 30 percent more offspring than the Western chinchillas did. Based on the zoologist's observation, if the Eastern chinchillas in his study produced 143 offspring, how many offspring did the Western chinchillas produce?

A) 100

B) 103

C) 110

D) 186

CONTINUE

28

When polynomial $g(x)$ is divided by $x - 4$, the remainder is 3. Which of the following statements about $g(x)$ must be true?

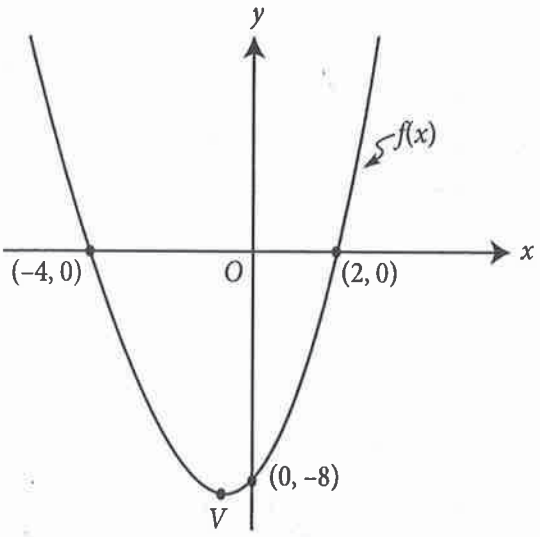
A) $g(-4) = 3$

B) $g(4) = 3$

C) $x - 4$ is a factor of $g(x)$.

D) $x + 3$ is a factor of $g(x)$.

29



The figure above shows the graph in the xy-plane of the function $f(x) = x^2 + 2x - 8$. Which of the following is an equivalent form of the function f that includes the coordinates of vertex V as constants in the function?

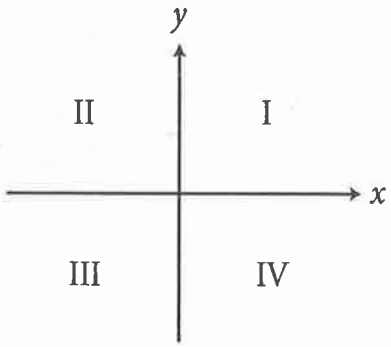
A) $f(x) = (x + 1)^2 - 9$

B) $f(x) = x(x + 2) - 8$

C) $f(x) = (x - 2)(x + 4)$

D) $f(x) = (x + 2)(x - 4)$

30



If the system of inequalities $y \geq x + 2$ and $y \geq \frac{1}{3}x - 1$ is graphed in the xy-plane shown above, how many quadrants will contain solutions to the system?

A) 4

B) 3

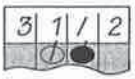
C) 2

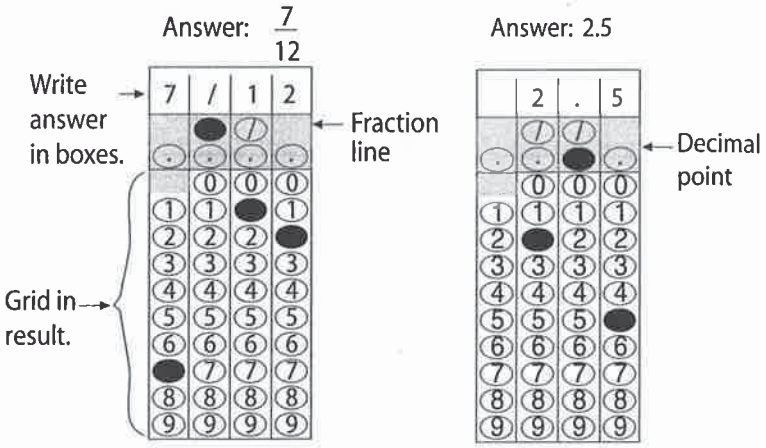
D) 1

CONTINUE

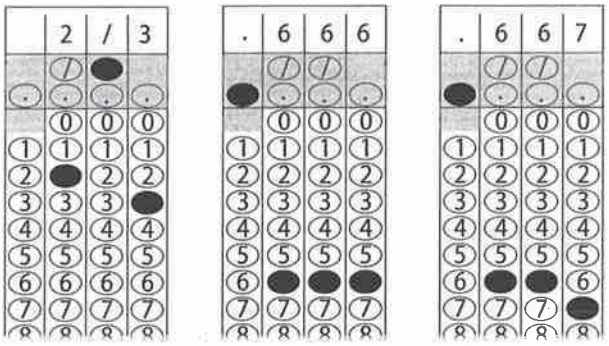
DIRECTIONS

For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

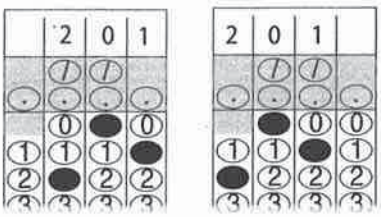
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.



Acceptable ways to grid $\frac{2}{3}$ are:



Answer: 201 – either position is correct

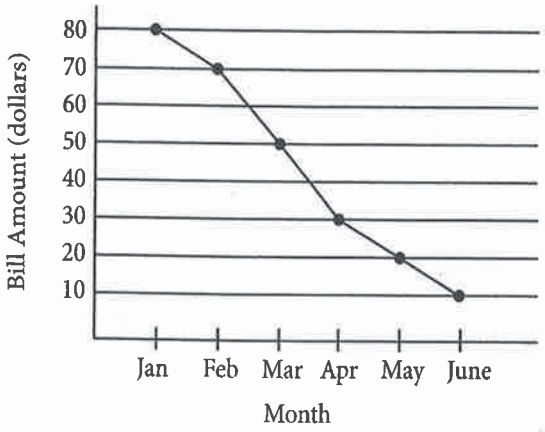


NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

31

Amount of Greg's Heating Bill Each Month from January to June



The line chart above shows the amount of Greg's monthly heating bill from January to June. The amount of his bill in April was what fraction of the amount of his bill in February?

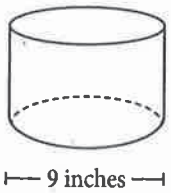
32

A worker at a shoe factory is required to box at least 8 pairs of shoes per minute, but is not allowed to box more than 12 pairs of shoes per minute. According to this information, what is a possible amount of time, in minutes, that it could take the worker to box 168 pairs of shoes?

33

Safety regulations in a certain building require that the elevator not carry more than 1,600 pounds. A delivery driver will enter the elevator with a pallet containing a certain number of identical cartons that weigh 45 pounds each. If the combined weight of the delivery driver and the empty pallet is 250 pounds, what is the maximum number of cartons that will be allowed by the building's safety regulations?

34



An aluminum can in the shape of a right circular cylinder has a diameter of 9 inches and a volume of 81π cubic inches. What is the height of the can, in inches?

CONTINUE

35

For what value of x is the expression

$$\frac{2}{(x-6)^2 + 4(x-7) + 8}$$ undefined?

36

A train passes through the Appleton train station every 20 minutes. The first train each day passes through at 6:00 A.M., and the last train passes through at 10:40 P.M. How many trains pass through the Appleton station in one day?

Questions 37 and 38 refer to the following information.

Helene purchased a \$50 savings bond, issued by city *A*, which earns interest that is compounded annually. She uses the expression $\$50(1.03)^t$ to find the value of the savings bond after t years.

37

What is the annual interest rate, expressed as a percentage, earned by the savings bond? (Disregard the percent sign when gridding in your answer.)

38

Helene's sister Carolyn purchased a \$50 savings bond issued by city *B*. Carolyn's bond has an interest rate, compounded annually, that is 1 percent greater than the interest rate earned by Helene's bond. After 12 years, the value of Carolyn's bond will be how much greater than the value of Helene's bond? (Round your answer to the nearest cent and disregard the dollar sign when gridding in your answer.)

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section in the test.

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Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

1.
YOUR NAME: (Print) _____ (Last) (First) (M.I.)
SIGNATURE: _____ DATE: / /
HOME ADDRESS: (Print) _____ (Number and Street)
(City) (State) (Zip Code)
PHONE NO.: (Print)

5. YOUR NAME
First 4 letters of last name | FIRST INIT | MID INIT

A	A	A	A		A	A
B	B	B	B		B	B
C	C	C	C		C	C
D	D	D	D		D	D
E	E	E	E		E	E
F	F	F	F		F	F
G	G	G	G		G	G
H	H	H	H		H	H
I	I	I	I		I	I
J	J	J	J		J	J
K	K	K	K		K	K
L	L	L	L		L	L
M	M	M	M		M	M
N	N	N	N		N	N
O	O	O	O		O	O
P	P	P	P		P	P
Q	Q	Q	Q		Q	Q
R	R	R	R		R	R
S	S	S	S		S	S
T	T	T	T		T	T
U	U	U	U		U	U
V	V	V	V		V	V
W	W	W	W		W	W
X	X	X	X		X	X
Y	Y	Y	Y		Y	Y
Z	Z	Z	Z		Z	Z

IMPORTANT: Please fill in these boxes exactly as shown on the back cover of your test book.

2. TEST FORM

3. TEST CODE

0	A
1	B
2	C
3	D
4	E
5	F
6	G
7	H
8	I
9	
	J
	K
	L
	M
	N
	O
	P
	Q
	R
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9

4. REGISTRATION NUMBER

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

6. DATE OF BIRTH

Month	Day		Year	
JAN				
FEB	0	0	0	0
MAR	1	1	1	1
APR	2	2	2	2
MAY	3	3	3	3
JUN		4	4	4
JUL		5	5	5
AUG		6	6	6
SEP		7	7	7
OCT		8	8	8
NOV		9	9	9
DEC				

7. SEX
MALE
FEMALE

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Test 1 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 1—Reading

1.	A	B	C	D	27.	A	B	C	D
2.	A	B	C	D	28.	A	B	C	D
3.	A	B	C	D	29.	A	B	C	D
4.	A	B	C	D	30.	A	B	C	D
5.	A	B	C	D	31.	A	B	C	D
6.	A	B	C	D	32.	A	B	C	D
7.	A	B	C	D	33.	A	B	C	D
8.	A	B	C	D	34.	A	B	C	D
9.	A	B	C	D	35.	A	B	C	D
10.	A	B	C	D	36.	A	B	C	D
11.	A	B	C	D	37.	A	B	C	D
12.	A	B	C	D	38.	A	B	C	D
13.	A	B	C	D	39.	A	B	C	D
14.	A	B	C	D	40.	A	B	C	D
15.	A	B	C	D	41.	A	B	C	D
16.	A	B	C	D	42.	A	B	C	D
17.	A	B	C	D	43.	A	B	C	D
18.	A	B	C	D	44.	A	B	C	D
19.	A	B	C	D	45.	A	B	C	D
20.	A	B	C	D	46.	A	B	C	D
21.	A	B	C	D	47.	A	B	C	D
22.	A	B	C	D	48.	A	B	C	D
23.	A	B	C	D	49.	A	B	C	D
24.	A	B	C	D	50.	A	B	C	D
25.	A	B	C	D	51.	A	B	C	D
26.	A	B	C	D	52.	A	B	C	D

Section 2—Writing and Language Skills

1.	A	B	C	D	23.	A	B	C	D
2.	A	B	C	D	24.	A	B	C	D
3.	A	B	C	D	25.	A	B	C	D
4.	A	B	C	D	26.	A	B	C	D
5.	A	B	C	D	27.	A	B	C	D
6.	A	B	C	D	28.	A	B	C	D
7.	A	B	C	D	29.	A	B	C	D
8.	A	B	C	D	30.	A	B	C	D
9.	A	B	C	D	31.	A	B	C	D
10.	A	B	C	D	32.	A	B	C	D
11.	A	B	C	D	33.	A	B	C	D
12.	A	B	C	D	34.	A	B	C	D
13.	A	B	C	D	35.	A	B	C	D
14.	A	B	C	D	36.	A	B	C	D
15.	A	B	C	D	37.	A	B	C	D
16.	A	B	C	D	38.	A	B	C	D
17.	A	B	C	D	39.	A	B	C	D
18.	A	B	C	D	40.	A	B	C	D
19.	A	B	C	D	41.	A	B	C	D
20.	A	B	C	D	42.	A	B	C	D
21.	A	B	C	D	43.	A	B	C	D
22.	A	B	C	D	44.	A	B	C	D

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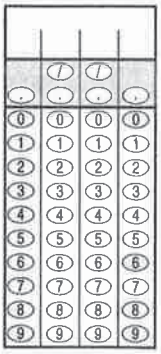
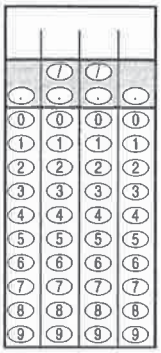
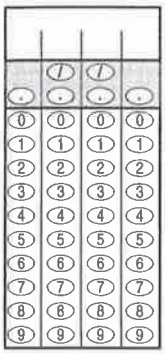
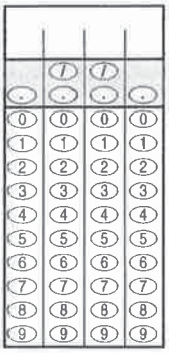
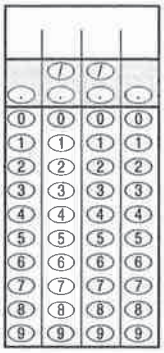
Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

Test 1 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 3—Mathematics: No Calculator

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ
6. Ⓐ Ⓑ Ⓒ Ⓓ
7. Ⓐ Ⓑ Ⓒ Ⓓ
8. Ⓐ Ⓑ Ⓒ Ⓓ
9. Ⓐ Ⓑ Ⓒ Ⓓ
10. Ⓐ Ⓑ Ⓒ Ⓓ
11. Ⓐ Ⓑ Ⓒ Ⓓ
12. Ⓐ Ⓑ Ⓒ Ⓓ
13. Ⓐ Ⓑ Ⓒ Ⓓ
14. Ⓐ Ⓑ Ⓒ Ⓓ
15. Ⓐ Ⓑ Ⓒ Ⓓ

16. 
17. 
18. 
19. 
20. 

Section 4—Mathematics: Calculator

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ
6. Ⓐ Ⓑ Ⓒ Ⓓ
7. Ⓐ Ⓑ Ⓒ Ⓓ
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17. Ⓐ Ⓑ Ⓒ Ⓓ
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21. Ⓐ Ⓑ Ⓒ Ⓓ
22. Ⓐ Ⓑ Ⓒ Ⓓ
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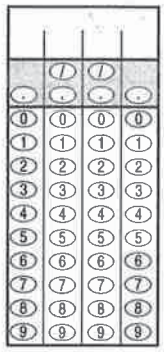
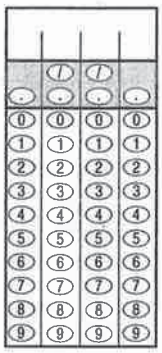
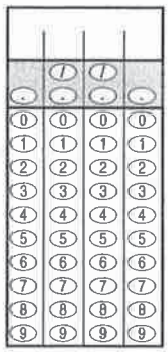
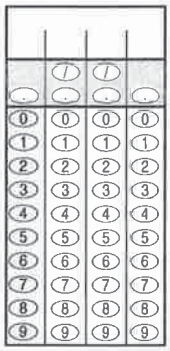
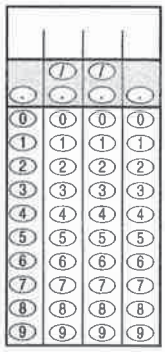
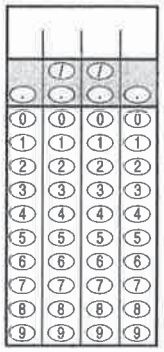
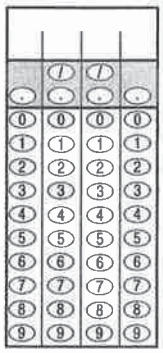
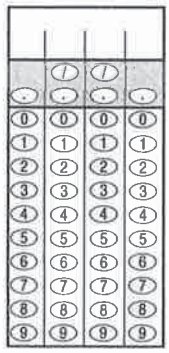
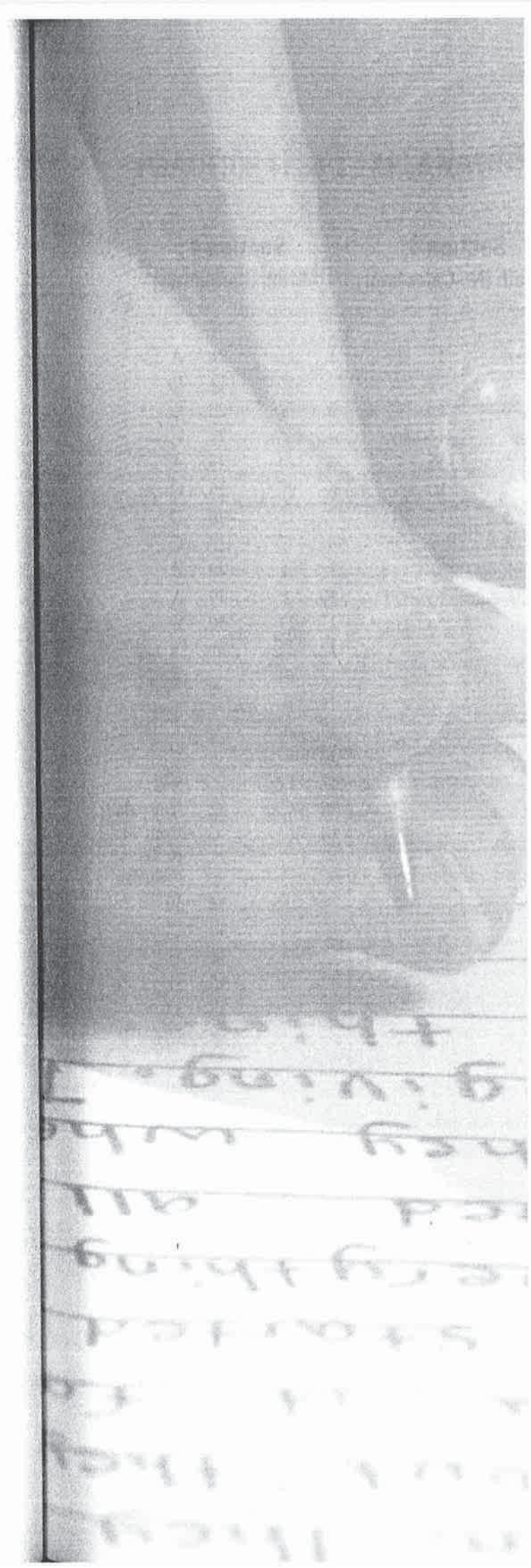
24. Ⓐ Ⓑ Ⓒ Ⓓ
25. Ⓐ Ⓑ Ⓒ Ⓓ
26. Ⓐ Ⓑ Ⓒ Ⓓ
27. Ⓐ Ⓑ Ⓒ Ⓓ
28. Ⓐ Ⓑ Ⓒ Ⓓ
29. Ⓐ Ⓑ Ⓒ Ⓓ
30. Ⓐ Ⓑ Ⓒ Ⓓ

31. 
32. 
33. 
34. 
35. 
36. 
37. 
38. 



Chapter 4
Practice Test 1: Answers and Explanations

Section 3: Math (No Calculator)

1.	A	11.	D
2.	B	12.	A
3.	B	13.	C
4.	D	14.	A
5.	D	15.	C
6.	C	16.	5
7.	A	17.	6
8.	A	18.	$\frac{5}{13}$
9.	C	19.	225
10.	C	20.	13

Section 4: Math (Calculator)

1.	C	20.	A
2.	C	21.	D
3.	B	22.	C
4.	B	23.	C
5.	D	24.	A
6.	A	25.	C
7.	C	26.	D
8.	D	27.	C
9.	B	28.	B
10.	A	29.	A
11.	D	30.	B
12.	D	31.	$\frac{3}{7}, \frac{6}{14}$, .428 or .429
13.	B		
14.	B		
15.	A		
16.	C		
17.	D		
18.	C	32.	Any value from 14 to 21, inclusive
19.	C	33.	30
		34.	4
		35.	4
		36.	51
		37.	3
		38.	8.76

les, please turn to page 565.

Section 3: Math (No Calculator)

1. **A** Write an expression for the number of hours each of the two people has worked. Jan worked j hours a day for 3 days, so she worked a total of $3j$ hours. Noah worked n hours a day for 5 days, so he worked a total of $5n$ hours. Therefore, the total hours worked by Jan and Noah combined is the sum of these two, which is $3j + 5n$. These are not like terms, so they cannot be combined or simplified further. The correct answer is (A).

2. **B** Plug $c = 4$ into the right side of the equation to get $\frac{y+2}{5} = 4$. Multiply both sides of the equation by 5 to get $y + 2 = 20$. Subtract 2 from both sides to get $y = 18$, which is (B).

3. **B** Even though this looks complicated, start by combining like terms. Add the real terms, 10 and 3, to get 13. Then, add the imaginary terms, $-4i$ and $6i$, to get $2i$. Add these two to get $13 + 2i$, which is (B).

4. **D** Simplify this expression by combining like terms in bite-sized pieces. Start with the ab^2 terms. The $-ab^2$ term from the second polynomial is subtracted from the ab^2 in the first. $ab^2 - (-ab^2) = ab^2 + ab^2 = 2ab^2$. Eliminate any choice that does not include $2ab^2$: (A) and (B). Now look at the a^2 terms. The $4a^2$ term from the second polynomial is subtracted from the $4a^2$ term in the first. $4a^2 - 4a^2 = 0$. Therefore, the correct answer cannot have an a^2 term. Eliminate the remaining choice that does, which is (C). The correct answer is (D).

5. **D** The weight of a mature great white shark is estimated by $w = 3{,}150 + 450l$, where l is the fork length in feet. The question asks for the estimated weight increase in pounds for each foot of growth. To determine this, plug in values for l that show a one foot increase. First, plug in $l = 2$. If $l = 2$, then $w = 3{,}150 + 450(2) = 4{,}050$. Then plug in $l = 3$. If $l = 3$, then $w = 3{,}150 + 450(3) = 4{,}500$. The increase is $4{,}500 - 4{,}050 = 450$. Therefore, the correct answer is (D).

6. **C** The number of pages Juan has left to edit is represented by the equation $P = 326 - 12h$, where h represents the number of hours worked. The question asks for what 326 represents in this equation. Since P is a number of pages, 326 must also be a number of pages, so eliminate (D). Choices (A) and (B) each deal with a rate. In order to turn a rate into an amount, the rate must be multiplied by time. Since h represents time, the coefficient on time, 12, must represent the rate rather than 326. Therefore, eliminate (A) and (B). Only (C) remains, so it must be correct. To understand why it is correct, plug in $h = 0$. If $h = 0$, then $P = 326 - 12(0) = 326$.

Therefore, after working for 0 hours at the start of the project, he has 326 pages left to edit. Therefore, the correct answer is (C).

7. **A** The question says that $\frac{x}{y} = 3$. Plug in values of x and y that satisfy this equation. Let $x = 6$ and $y = 2$. Plug these values into the expression $\frac{12y}{x}$ to get $\frac{12(2)}{6} = \frac{24}{6} = 4$. Therefore, the correct answer is (A).

8. **A** To solve this problem, plug in the answers. Test the points in the answer choices by plugging them into the two equations. In order to be the solution of the system of equations, a point must satisfy both equations. Start with (A): (–7, –5). Plug these values into the first equation to get $2(-5) + (-7) = -17$. This is true, so plug the values into the second equation to get $5(-7) - 4(-5) = -15$. Since this is also true, the correct answer is (A).

9. **C** The equation includes a very complicated fraction. However, the equation asks for the value of M, which is not part of the fraction but rather the value that is being multiplied by the fraction. In order to isolate a variable that is multiplied by a fraction, multiply both sides by the reciprocal. On the right side of the equation, the fractions cancel, isolating M. On the left side, the reciprocal is multiplied by c to get $\frac{1-\left(1+\frac{r}{1,200}\right)^{-N}}{\frac{r}{1,200}}c$. Therefore, the correct answer is (C).

10. **C** The question asks about a line in the xy-plane. Any such line can be defined by the equation $y = mx + b$, in which m is the slope and b is the y-intercept. The question says that the slope is $\frac{2}{3}$, so $m = \frac{2}{3}$. The question also says that the line passes through the origin, which is the point (0, 0). Since the y-intercept is the point at which the x-coordinate is 0, the origin must be the y-intercept, so $b = 0$. Thus the equation of the line is $y = \frac{2}{3}x + 0$, or $y = \frac{2}{3}x$. Plug the points in the answer choices into this equation. Start with (A). Plug in the values from (A) to get $\frac{2}{3} = \frac{2}{3}(0)$. Since this is false, eliminate (A). Try (B). Plug in the values from (B) to get $3 = \frac{2}{3}(2)$. Since this is false, eliminate (B). Try (C). Plug in the values from (C) to get $4 = \frac{2}{3}(6)$. Since this is true, select (C).

11. **D** Since $f(3) = 12$, plug this into the function equation to get $f(3) = c(3)^2 + 30 = 12$. Therefore, $9c + 30 = 12$. Subtract 30 from both sides to get $9c = -18$. Divide both sides by 9 to get $c = -2$.

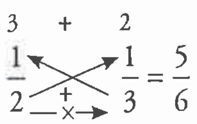
Plug this into the original equation to get $f(x) = -2x^2 + 30$. The question asks for $f(-3)$, so plug in $x = -3$ to get $f(-3) = -2(-3)^2 + 30 = -2(9) + 30 = -18 + 30 = 12$. The correct answer is (D).

12. **A** The question asks for the price per night when it is the same for both hotels. Since the two equations given are for the price per night in the two hotels, set the two expressions for the prices equal: $240 - 20w = 320 - 30w$. Add $30w$ to both sides to get $240 + 10w = 320$. Subtract 240 from both sides to get $10w = 80$. Divide both sides by 10 to get $w = 8$. This represents the number of weeks, but the question asks for the price per night. Plug this value of w into the equation for A. $A = 240 - 20(8) = 240 - 160 = 80$, which is (A).

13. **C** The question asks for the value of $\frac{3^a}{81^b}$. To divide numbers with exponents, the bases must be the same. Convert the denominator to a base of 3: since $81 = 3^4$, $81^b = (3^4)^b$. When raising a number with an exponent to an exponent, multiply the exponents, so $81^b = (3^4)^b = 3^{4b}$. Therefore, $\frac{3^a}{81^b} = \frac{3^a}{3^{4b}}$. When dividing numbers with exponents and the same base, subtract the exponents, so $\frac{3^a}{81^b} = \frac{3^a}{3^{4b}} = 3^{a-4b}$. The question also says that $a - 4b = 18$, so $\frac{3^a}{81^b} = \frac{3^a}{3^{4b}} = 3^{a-4b}$ $= 3^{18}$. Therefore, the correct answer is (C).

14. **A** The question gives a quadratic in both factored and expanded form. Get them in the same form by expanding the factored quadratic on the left side. Use FOIL on $(ax + 3)(bx + 5)$. Multiply first terms to get $(ax)(bx) = abx^2$. Compare this to the x^2 term on the right side, $35x^2$. Therefore, $ab = 35$. Since $ab = 35$, consider the factors of 35. There are two pairs of factors: 1, 35 and 5, 7. Since the question says that $a + b = 12$, a and b must be 5 and 7, but there is no way to determine the order. Therefore, consider both $a = 5$, $b = 7$ and $a = 7$, $b = 5$. If $a = 5$ and $b = 7$, the equation becomes $(5x + 3)(7x + 5) = 35x^2 + kx + 15$. To get the value of k, determine the coefficient on the x-term of the quadratic expression on the left. To do this, find the product of the outer terms and the product of the inner terms, which are $25x$ and $21x$, respectively. Add these products to get $25x + 21x = 46x$, so, in this case, $k = 46$. Eliminate any choice that does not include 46: (B), (C), and (D). Therefore, the correct answer is (A). (To determine the other possible value, plug in $a = 7$ and $b = 5$ to get $(7x + 3)(5x + 5)$. Multiply outer terms to get $35x$. Multiply inner terms to get $15x$. Add the products to get $50x$, so $k = 50$.)

15. **C** Rather than dealing with complicated fractions, simplify the fractions by plugging in. The question says that $y > 5$, so plug in $y = 6$ to get $\frac{1}{\frac{1}{6-4} + \frac{1}{6-3}}$. The fraction simplifies to $\frac{1}{\frac{1}{2} + \frac{1}{3}}$. Now, add the fractions in the denominator, using the bowtie method.



Therefore, the original fraction is equivalent to $\frac{1}{\frac{5}{6}}$. When dividing by a fraction, flip the bottom fraction and multiply. Therefore, $\frac{1}{\frac{5}{6}} = \frac{\frac{1}{1}}{\frac{5}{6}} = \frac{1}{1} \times \frac{6}{5} = \frac{6}{5}$, so $\frac{6}{5}$ is the target number. Plug $y = 6$ into the answer choices and eliminate any choice that is not equal to $\frac{6}{5}$. Since (A) and (B) are not fractions, eliminate them immediately. Try (C). $\frac{y^2 - 7y + 12}{2y - 7} = \frac{6^2 - 7(6) + 12}{2(6) - 7} = \frac{36 - 42 + 12}{12 - 7} = \frac{6}{5}$, so keep (C). Try (D). $\frac{2y - 7}{y^2 - 7y + 12} = \frac{2(6) - 7}{6^2 - 7(6) + 12} = \frac{5}{6} \neq \frac{6}{5}$, so eliminate (D). The correct answer is (C).

16. **5** First label the figure. Label $\overline{PQ}$ with length 3, $\overline{QT}$ with length 4, $\overline{QS}$ with length 8 and $\overline{SR}$ with length 10. When a question involves two triangles, determine whether they are similar. Similar triangles, by definition, have three pairs of congruent corresponding angles. However, since the measures of the angles in all triangles have a sum of 180°, it is only necessary to show that two pairs of corresponding angles are congruent. The question says that $\angle TPQ$ is congruent to $\angle QRS$. Also, $\angle PQT$ and $\angle SQR$ are vertical angles, so they are also congruent. Thus, the two triangles are similar. Similar triangles have a consistent proportion between corresponding sides (sides that are opposite congruent angles). The question asks for the value of m, or the length of $\overline{PT}$, which corresponds with $\overline{SR}$. Use the lengths of another pair of corresponding sides, $\overline{QT}$ and $\overline{QS}$, to set up a proportion: $\frac{m}{10} = \frac{4}{8}$. Cross-multiply to get $8m = 40$. Divide by 8 to get $m = 5$. Therefore, the correct response is 5.

17. **6** To solve the equation $y^2 - 36 = 0$, add 36 to both sides to get $y^2 = 36$. Take the square root of both sides to get $y = \pm 6$. However, the question specifies that $y > 0$, so $y = 6$.

18. $\frac{5}{13}$ Draw the right triangle. Label one of the non-right angles with measure $d°$. Since cos = $\frac{adj}{hyp}$ and cos $d° = \frac{5}{13}$, label the side adjacent to d as 5 and the hypotenuse 13. Using the Pythagorean Theorem (or the 5-12-13 Pythagorean triple), the missing side has length 12. Since the

angles in a triangle have a sum of 180, label the missing angle x and set up the equation $d + x + 90 = 180$. Subtract 90 from both sides to get $d + x = 90$, and subtract d from both sides to get $x = 90 - d$. The question asks for the sine of this angle. Since $\sin = \frac{opp}{hyp}$, find the side opposite this angle, which is 5, and the hypotenuse, which is 13, to get $\sin(90° - d°) = \frac{5}{13}$. Alternatively, note that the angle of measure $(90° - d°)$ is the complement of the angle of measure $d°$. The sine of an angle is equal to the cosine of its complement. Therefore, $\sin(90° - d°) = \cos d° = \frac{5}{13}$. Either way, the answer is $\frac{5}{13}$.

19. **225** The question asks for the value of z. The second equation, $5c = \sqrt{5z}$, is in terms of c and z, so plug in the value of c to get $5\left(3\sqrt{5}\right) = \sqrt{5z}$. Simplify the left side to get $15\sqrt{5} = \sqrt{5z}$. Since the equation involves square roots, square both sides to get $\left(15\sqrt{5}\right)^2 = \left(\sqrt{5z}\right)^2$. Square each factor to get $(15)^2\left(\sqrt{5}\right)^2 = \left(\sqrt{5z}\right)^2$ and $(225)(5) = 5z$. Divide both sides by 5 to get $225 = z$. The answer is 225.

20. **13** To determine the value of b, stack the equations and cancel the a terms. To do this, make sure that the a term coefficients are opposites. Multiply the first equation by –2 to get $-2a - 2b = 20$. Stack this below the second equation, $2a + b = -33$, and add the two equations.

$$\begin{array}{r} 2a + b = -33 \\ \underline{-2a - 2b = 20} \\ 0a - b = -13 \end{array}$$

Therefore, the new equation is $0 - b = -13$ or $b = 13$. Thus, the correct response is 13.

Section 4: Math (Calculator)

1. **C** When two parallel lines are intersected by a third line, or by two or more parallel lines, remember this simple rule: All the small angles are the same; all the big angles are the same; and any small angle + any big angle = 180°. "Small" angles are less than 90°, and "big" angles are greater than 90°. In this question, x is a small angle, and y is a big angle, so $x + y = 180°$. Substitute the given value: $75° + y = 180°$. Subtract 75° from both sides to get $y = 105°$. The answer is (C).

2. **C** Work through the answer choices one at a time. For (A), the number of customers stays the same from 9:00 A.M.–11:00 A.M., then increases from 11:00 A.M.–12:00 P.M., so eliminate (A). For (B), the number of customers stays the same from 12:00 P.M.–1:00 P.M., drops suddenly, then stays the same from 1:00 P.M.–2:00 P.M., so eliminate (B). Choice (C) looks good; the

number of customers decreases from 2:00 P.M.–3:30 P.M., then increases from 3:30 P.M.–5:00 P.M. Finally, in (D), the number of customers increases from 3:30 P.M.–5:00 P.M., then decreases from 5:00 P.M.–6:30 P.M. This is a trap answer that does the opposite of what the question asks for, so eliminate (D). The correct answer is (C).

3. **B** Start by plugging in the values given for x and y, then solve for k. If $5 = \frac{30}{k}$, then $5k = 30$ and $k = 6$. It is given that k is a constant, which means that its value doesn't change (whereas x and y are variables, so their values do change). Now plug in the values for the second scenario: $y = \frac{42}{6}$, so $y = 7$, which is (B).

4. **B** Set up a proportion. First convert the 3 kilograms into grams: $\frac{1\text{kg}}{1{,}000\text{g}} = \frac{3\text{kg}}{x\text{g}}$, so $x = 3(1{,}000) = 3{,}000$ grams. Next, convert the 3,000 grams into decigrams: $\frac{1\text{g}}{10\text{dg}} = \frac{3{,}000\text{g}}{x\text{dg}}$, so $x = 10(3{,}000) = 30{,}000$ decigrams, which is (B).

5. **D** The simplest way to solve this problem is to translate it into an equation and solve for x. The statement *6x – 4 is 11 less than 25* can be translated as $6x - 4 = 25 - 11$. Simplify the right side: $6x - 4 = 14$. Add 4 to both sides: $6x = 18$. Divide by 6: $x = 3$. Be careful not to fall for (A); read the full question! The question asks for the value of $9x$, and $(9)(3) = 27$, so the answer is (D).

6. **A** When a question contains a scatterplot, draw a line of best fit through the dots, so that roughly half the dots are above the line, and half are below. If the line of best fit has a positive slope, it means that h and p have a *positive correlation* (the question might say "association" rather than "correlation"). If the line has a negative slope, it means that the two quantities have a *negative correlation*, as in (B). If there is no clear relationship between the variables, there is *no* correlation. If the dots in the scatterplot are packed relatively closely, the correlation is *strong*; if they are far apart, the correlation is *weak*. Fortunately, there's no need to choose between strong and weak here. The answer is (A).

7. **C** Plug in 200 for p and solve for d: $200 = 101 + 10.094d$. Subtract 101 from both sides: $99 = 10.094d$. Divide both sides by 10.094 to get $d = 9.808$. The question asks for the closest answer, so round to the closest integer, which is 10. The correct answer is (C).

8. **D** The fastest way to solve this question is to use algebra. Start by isolating the term that contains d by subtracting 101 from both sides: $p - 101 = 10.094d$. Divide by 10.094: $\frac{p - 101}{10.094} = d$. Now simply write the expression in reverse so that d is on the left side: $d = \frac{p - 101}{10.094}$. This matches (D), so that's the correct answer. As an alternative, plug in to solve the problem.

Plug in 2 for d and solve for p: $101 + (10.094)(2) = 121.188 = p$. Now plug these values into the answers and pick the one that works. Only (D) matches.

9. **B** Add up the number of wind turbines shown on the graph: $9 + 11 + 3.5 + 8 + 6 = 37.5$. Now try the answer choices. Start with (B) or (C), then move higher or lower if the first choice doesn't work. Try (C): $37.5 \times 1{,}000 = 37{,}500$, which is too big. Try (B): $37.5 \times 100 = 3{,}750$, which is correct.

10. **A** When the SAT mixes math symbols and words, try translating the words into a math equation. In this question, the phrase $|k - 3| + 2$ *is equal to one* translates to $|k - 3| + 2 = 1$. To isolate the absolute value expression, subtract 2 from both sides to get $|k + 3| = -1$. Here's the tricky part of the question: An absolute value expression can never be negative, so no values of k would make this expression true. Therefore, the answer is (A).

11. **D** Read carefully! There are 14 apartments: 1 apartment with 6 residents, 2 with 4 residents, 4 with 5 residents, and 7 with 3 residents. Add up all the residents: $6 + 4 + 4 + 5 + 5 + 5 + 5 + 3 + 3 + 3 + 3 + 3 + 3 + 3 = 55$. Divide by the number of apartments: $\frac{55}{14} = 3.929$. This is closest to 4, so the answer is (D).

12. **D** There are two ways to tackle this problem: solve algebraically or plug in the answers. To solve algebraically, subtract $6x$ from both sides to get $-4 \leq x - 3$. Then add 3 to both sides to get $-1 \leq x$ or $x \geq -1$. Since x must be -1 or greater, -2 cannot be a solution, so the answer is (D). To plug in the answers, start with (B) or (C). Here, it makes more sense to start with (B), because 0 is a very easy number to plug in. Plugging in 0 gives $-4 \leq -3$, which is true, so eliminate (B). Now try (C): $-10 \leq -10$, which is true, so eliminate (C). Finally, try (D): $-16 \leq -17$, which is false, so the answer is (D).

13. **B** To calculate (or estimate) mean, median, or range, it's best to save mean for last, since it's usually the most time-consuming to calculate. Start with the easiest part: the total. If 2 is removed, the total will change by 2. The range is the difference between the largest and smallest term. The range now is $9 - 2 = 7$, but if 2 is removed, the smallest term will be 3, so the range will be $9 - 3 = 6$, and the range changes by 1. To find the median in a set with an even number of terms, take the average of the two middle terms. Here, the two middle terms are both 6, so 6 is the median. If 2 is removed, there will be 17 terms, so the 9th term will be the median. Since the new 9th term will be 6, the median will not change at all. This makes it unnecessary to calculate the average. The average is the total divided by the number of things, so if 2 is removed from the total and 1 from the number of things, the average will change. Therefore, the answer is (B).

14. **B** Plug (2, 2) in for x and y, and solve for p and r. In the first inequality, $p + 2 > 2$, so $p > 0$. In the second inequality, $r - 2 < -2$, so $r < 0$. Since r is negative and p is positive, r must be less than p, so the answer is (B).

15. **A** When a question says approximately, go ahead and approximate. The total, 395, is close to 400, so 15% of 400 = $\frac{15}{100} \times 400 = 60$. Often this would be enough to find the correct answer, but in this case there are two answers, 59 and 62, that are very close, so try them both. $\frac{59}{395} \times 100 = 14.94\%$. That looks good, but try (B), just to be safe: $\frac{62}{395} \times 100 = 15.7\%$, which rounds to 16%, which is not correct. The correct answer is (A).

16. **C** Slope is rise divided by run, or vertical change divided by horizontal change. For each additional day, the price increases by \$20, so the slope, $\frac{20}{1}$, is equivalent to the average daily price increase. The correct answer is (C).

17. **D** When the SAT asks for the relationship between two variables, they are asking for an equation. In this case, it's the equation of a line, and all the answer choices are in slope-intercept form. The slope is 20 (as calculated for the previous question). Notice on the graph that when $d = 0$, $P = 30$, so the y-intercept is 30. The equation of a line in slope-intercept form is $y = mx + b$, where m is the slope and b is the y-intercept. In this question, $m = 20$ and $b = 30$, so the equation is $y = 20d + 30$, and the answer is (D). Plugging in values from the graph can also determine the correct equation.

18. **C** Remember that $f(x) = y$. The maximum y-value on this line graph is 3, and when $y = 3$, $x = -2$, so the answer is (C). In this type of question, if they ask for an x-value, the corresponding y-value is likely to be a trap answer (in this case (D) is the trap).

19. **C** When there are variables in the answers, plug in. Start from the simplest price, which is a peak ticket bought in the station. Let's say that price is \$100. Then an off-peak ticket purchased in the station will be 15% off, or \$85. For an off-peak ticket purchased from the conductor, there is an 11% surcharge, so $\frac{11}{100} \times 85 = 9.35$, and \$85 + \$9.35 = \$94.35. This is the value of t, and the question is asking for the value of a peak ticket bought in the station, which is \$100. Now plug t = \$94.35 into the answer choices, and choose the one that equals \$100; the correct answer is (C).

20. **A** In most SAT questions, all the information matters. But, once in a while, there will be unnecessary information designed to create confusion. In this question, it is not necessary to know the total number of people, nor whether they eat snacks or not. A person is being randomly chosen from *among those who exercise fewer than six times per week*, so only the first two columns in the table matter. There are a total of 24 + 40 people who exercise fewer than 6 times per week and, of those people,

13 + 22 = 35 of them are in group 1. Use the probability formula: $probability = \frac{want}{total} = \frac{35}{64}$. The correct answer is (A).

21. **D** This question can be solved two ways: as a system of equations, or by plugging in the answers.

To solve with equations, start by assigning variables. Make g the number of gallons of gasoline and d the number of diesel. Now write two equations: $3.25g + 3d = 404.25$ and $g + d = 131$. To get the value for d, try to make the g values disappear. Multiply the 2nd equation by -3.25 to get $-3.25g - 3.25d = -425.75$. Stack and add the two equations to get

$$\begin{aligned} 3.25g + \quad 3d &= \quad 404.25 \\ \underline{-3.25g - 3.25d} &= \underline{-425.75} \\ -0.25d &= -21.5 \end{aligned}$$

Divide by -0.25 to find that $d = 86$, so the correct answer is (D).

A safer method is to plug in the answers. Start with (C). If the station sold 76 gallons of diesel, then the station sold 131 – 76 = 55 gallons of gasoline. The revenue from diesel would be 76 × \$3 = \$228, and the revenue from gasoline would be 55 × \$3.25 = \$178.75, for a total of \$228 + \$178.75 = \$406.75, which doesn't match the total sales of \$404.25 given by the problem. Since the total was too high, move to (D), where more of the cheaper diesel fuel was sold: If the station sold 86 gallons of diesel, then the station sold 131 – 86 = 45 gallons of gasoline. The revenue from diesel would be 86 × \$3 = \$258, and the revenue from gasoline would be 45 × \$3.25 = \$146.25, for a total of \$258 + \$146.25 = \$404.25, which matches the total sales given by the problem. The correct answer is (D).

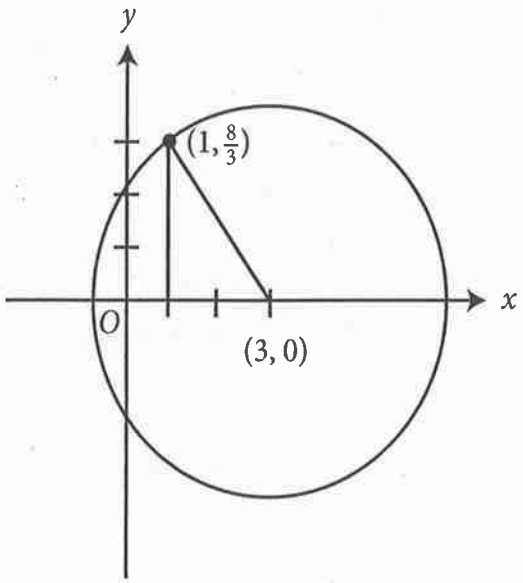
22. **C** With the ugly numbers in the chart, approximation is helpful here. The ratio of 2010 higher education spending to 2014 higher education spending can be estimated as 2.1 million to 3.1 million, or even more approximately as 2:3. The only other column that is close is corrections, which can be estimated as 630,000 to 930,000, also fairly close to 2:3. The correct answer is (C).

23. **C** When questions ask for an approximate value, round the numbers to avoid unnecessary math. Round public assistance spending in 2012 to \$56,000 and round 2014 spending to \$30,000. Subtract to get an approximate difference of \$26,000. Divide by two to get an average of \$13,000. Read carefully: The chart values are in *thousands of dollars*, so multiply by 1,000 to get the actual rate of change of \$13,000,000, which is (C).

24. **A** When the fish hits the surface of the lake, the height will be 0, so plug 0 into the equation: $0 = 9s - 4.9s^2$. From here, the easiest thing to do is plug in the answer choices. Start with (C): $(9)(3) - (4.9)(3^2) = 27 - 44.1 = -17.1$. This negative value means that the fish has gone 17 meters below the surface. Choice (C) is too big, so try (B). It's also too big, so the answer must be

(A). Double check to be sure: $9(2) - (4.9)(2^2) = 18 - 19.6 = -1.6$. The question is asking for an approximate answer, and (A) is closest, so that's the correct answer. The problem can also be solved by factoring $h = 9s - 4.9s^2$ into $h = s(9 - 4.9s)$. The solutions for s in this equation are $s = 0$ (the time when the fish began the leap) and $9 - 4.9s = 0$ (the time when the fish hit the water). Solve the latter for s: $9 = 4.9s$, so $s = \frac{9}{4.9} = 1.84$ seconds, which is closest to (A).

25. **C** The equation of a circle centered at (h, k) is $(x - h)^2 + (y - k)^2 = r^2$. Therefore, the left side of the equation must be $(x - 3)^2 + y^2$. Eliminate (B) and (D). To narrow it down further, find the radius by drawing a triangle and finding the legs to plug into the Pythagorean Theorem (this is safer than trying to remember the distance formula).



The base is 2 and the height is $\frac{8}{3}$, so use the Pythagorean Theorem to find the radius. $2^2 + \left(\frac{8}{3}\right)^2 = r^2$, so $4 + \frac{64}{9} = r^2$, or $\frac{36}{9} + \frac{64}{9} = \frac{100}{9} = r^2$. It's not necessary to take the square root, because the only piece missing from the circle formula is r^2. The correct equation is $(x - 3)^2 + y^2 = \frac{100}{9}$, which is (C).

26. **D** When dealing with area questions, always calculate the areas—don't make assumptions. The area of the lawn is $8 \times 8 = 64$ square feet. There are 8 samples, and each sample is $1 \times 1 = 1$ square foot, so the total area sampled is $\frac{8}{64} = \frac{1}{8}$ of the total area. Next, since the question asks for approximation, approximate the total number of seedlings. Notice that the middle values are very close to 100, and

the highest and lowest values are almost equidistant from 100, so the average number of seedlings in a sample is about 100. Therefore, the total number of seedlings in all the samples is approximately $100 \times 8 = 800$, and the total number of seedlings in the lawn is approximately $800 \times 8 = 6{,}400$. The correct answer is (D).

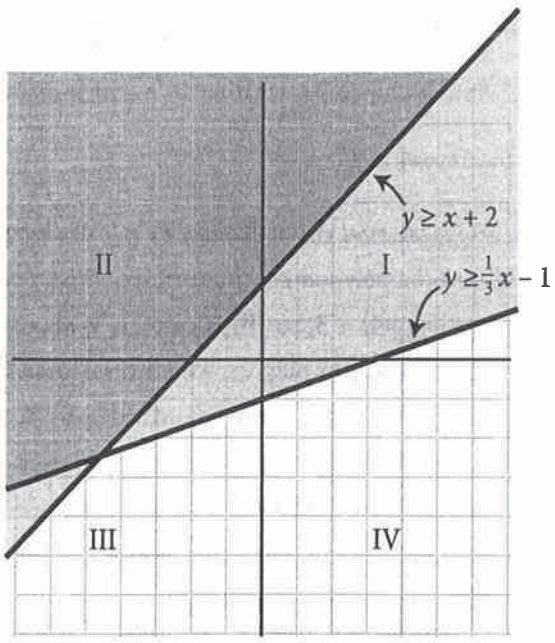
27. **C** The easiest way to solve this question is to plug in the answers. Start with (B). If there were 103 Western chinchilla offspring, then the Eastern chinchilla produced $103 \times \frac{30}{100} = 30.9$ more offspring than the Western chinchilla, totaling 133.9. Since 133.9 does not match the 143 offspring specified by the problem, eliminate (B) and move to a larger number. Try (C): If there were 110 Western chinchilla offspring, then the Eastern chinchilla produced $110 \times \frac{30}{100} = 33$ more offspring than the Western chinchilla, totaling 143, which matches the number specified in the problem. Therefore, the answer is (C).

28. **B** The opening sentence, *when polynomial $g(x)$ is divided by $x - 4$, the remainder is 3,* means that if an x-value of 4 is plugged into the polynomial, the corresponding y-value will be 3. This fact can be represented with the equation $g(4) = 3$, so (B) is correct. Without knowing this, the question is pretty tough. However, it is possible to plug in, with a little knowledge about how remainders work. Consider an easier question: When a number is divided by 5, the remainder is 3. What is one value for the number? It's fairly easy to come up with an answer to this question, such as the number 13. A simple way to find a quotient with a certain remainder is to double (or triple, etc.) the number, and add the remainder. So, double 5 and add 3, and the result is 13. The same thing can be done in this more difficult question. The divisor is $x - 4$, so double it and add 3: $2(x - 4) + 3 = 2x - 5$. This polynomial meets the requirements of the question and can be used to test the answers. For (A), plug $x = -4$ into the polynomial: $2(-4) + 5 = -3$, so (A) is false. For (B), $2(4) - 5 = 3$, so (B) looks good, but be sure to check all four answers. For (C), remember that if $x - 4$ is a factor of $g(x)$, then 4 is a solution, and plugging 4 into the equation should yield zero. But working through (B) already demonstrated that $2(4) - 5 = 3$, so (C) is false. For (D), plug –3 into the equation: $2(-3) - 5 = -11$, so (D) is false, and the answer is (B).

29. **A** The question gives an equation in *standard* form, which is $y = ax^2 + bx + c$, and asks for the equation in *vertex* form. The vertex form of a parabola is $y = a(x - h)^2 + k$. It's called vertex form because the vertex of the parabola is at (h, k). The x-coordinate of the vertex will always be the average of the x-coordinates of any two points that have the same y-value. The graph gives two points on the y-axis (these are the *solutions* or *zeros* of the equation), so find the average of the x-coordinates:

$\frac{-4+2}{2} = -1$, so $h = -1$. From the graph, it also looks like the y-coordinate of the vertex is –9, so $k = -9$, making the vertex (–1, –9). Now look at the answers. Choice (A) is in vertex form, and the vertex it shows is (–1, –9), so the correct answer is (A).

30. **B** To answer this question, use the provided quadrant drawing to make a quick sketch with both equations drawn. It is not necessary to make a perfectly accurate graph; just get the general idea. For this system of inequalities, any solutions must be above *both* lines (because the solutions must be greater than both $y \geq x + 2$ and $y \geq \frac{1}{3}x - 1$), so shade in this area as shown below:



As the sketch shows, there are solutions in Quadrants I, II, and III, but not in IV. Therefore, the answer is (B).

31. **$\frac{3}{7}$, $\frac{6}{14}$, .428 or .429**

Locate the values for April and February, and write them as a fraction: $\frac{30}{70}$. This fraction won't fit into the grid-in box, so either reduce it or convert it into a decimal.

32. **Any value from 14 to 21, inclusive**

If the worker boxes 8 pairs of shoes per minute, it will take $\frac{168}{8} = 21$ minutes to box all the shoes. If the worker boxes 12 pairs per minute, the same task will take $\frac{168}{12} = 14$ minutes. Therefore, any answer from 14 to 21 is valid. An easy way to solve a question like this is to just plug in a value within the given range. Suppose the worker boxes 10 pairs per minute. Then it will

take $\frac{168}{10} = 16.8$ minutes to complete the task. This is a valid answer, and it is faster than finding the boundaries of the range.

33. **30** Begin by subtracting the weight of the driver and the pallet: 1,600 – 250 = 1,350. Now divide by the weight of the boxes: $\frac{1,350}{45} = 30$. Therefore, 30 is the maximum number of boxes that can be safely loaded into the elevator.

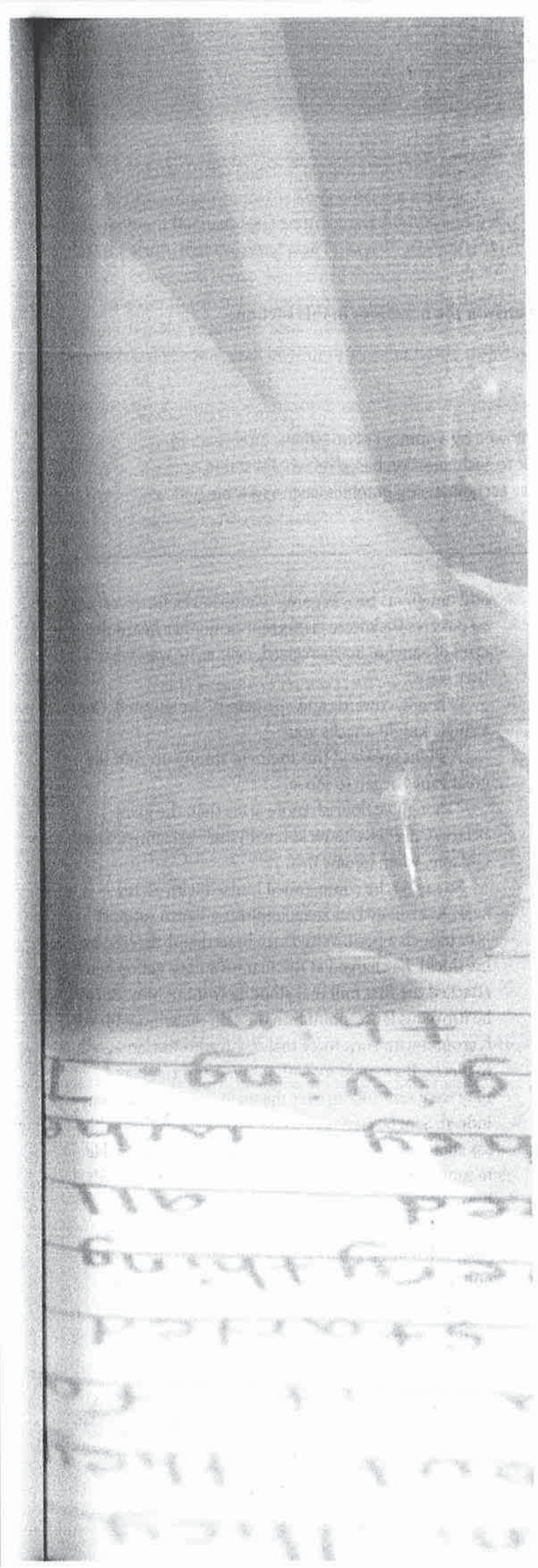
34. **4** The formula for the volume of a cylinder is $V = \pi r^2 h$, so plug the given information into the formula. The radius is $\frac{9}{2}$, so $81\pi = \pi\left(\frac{9}{2}\right)^2 h$. Divide both sides by π and square the fraction on the right: $81 = \frac{81}{4}h$. Divide both sides by $\frac{81}{4}$ to get the correct answer, which is 4.

35. **4** A fraction is undefined if the denominator is zero, so set the denominator equal to zero: $(x-6)^2 + 4(x-7) + 8 = 0$. Now solve for x by using FOIL and distributing where necessary: $x^2 - 12x + 36 + 4x - 28 + 8 = 0$. Combine like terms: $x^2 - 8x + 16 = 0$. Factor the equation: $(x-4)^2 = 0$. Take the square root of both sides: $x - 4 = 0$. Add 4 to both sides: $x = 4$. The correct answer is 4.

36. **51** The trains arrive at 6, 6:20, 6:40, then 7, 7:20, 7:40, then 8, 8:20, 8:40, and so on. There are three trains per hour, so count the number of hours—using a pencil to keep track if necessary. There are 17 hours, and 17 × 3 = 51, so the correct answer is 51.

37. **3** For this question, it helps to know the compound interest formula, which is $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where A is the total amount, P is the principal or initial amount, r is the interest rate (expressed as a decimal), n is how many times per year the rate is compounded, and t is the number of years. That may seem complicated, but usually the interest is compounded once a year, so $n = 1$, and the formula can be simplified to $A = P(1 + r)^t$. Therefore, the interest rate expressed as a decimal is 0.03. Multiply by 100 to express the interest rate as a percentage: (0.03)(100) = 3, which is the correct answer.

38. **8.76** It helps to solve question 37, the easier question of the pair, before solving this one. Helene's interest rate, from the answer to question 37, is 3%, so to find her total after 12 years, use the formula above: $A = 50(1.03)^{12} = 71.29$. Carolyn earns 1% more, so her total is $A = 50(1.04)^{12} = 80.05$. Subtract the first total from the second to get 8.76, which is the correct answer.



Chapter 5
Practice Test 2

Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

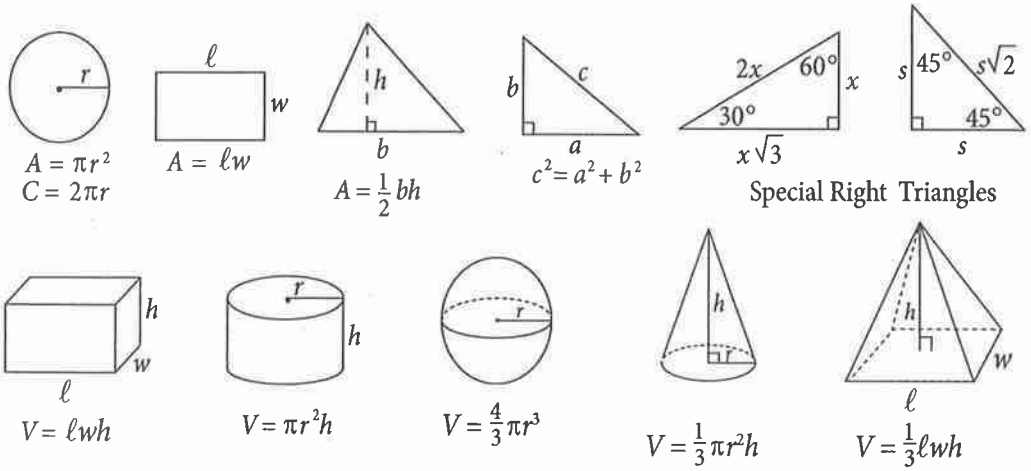
DIRECTIONS

For questions **1-15**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **16-20**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

The cost C, in dollars, that a catering company charges to cater a wedding is given by the function $C = 20wt + 300$, where w represents the number of workers catering the wedding and t represents the total time, in hours, it will take to cater the wedding using w workers. Which of the following is the best explanation of the number 20 in the function?

A) A minimum of 20 workers will cater the wedding.

B) The cost of every wedding will increase by $20 per hour.

C) The catering company charges $20 per hour for each worker.

D) There will be 20 guests at the wedding.

2

If $12x + 4 = 20$, what is the value of $6x + 5$?

A) 4

B) 6

C) 10

D) 13

3

$$5x - 4y = 36$$

$$-x - y = 0$$

Which of the ordered pairs (x, y) below is a solution to the system of equations shown above?

A) $(-5, 4)$

B) $(-4, 4)$

C) $(4, -4)$

D) $(5, -4)$

4

In the equation $y - \sqrt{4x^2 + 28} = 0$, $x > 0$ and $y = 8$. What is the value of x ?

A) 3

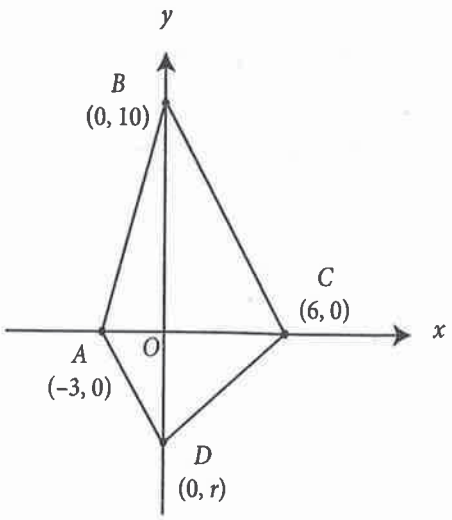
B) 4

C) 5

D) 6

CONTINUE

5



The figure above shows quadrilateral $ABCD$ in the xy-plane. If $\overline{BC}$ is parallel to $\overline{AD}$, what is the value of r?

A) −6

B) −5

C) −3

D) −2

6

Which of the following expressions is equivalent to $16x^6 - 24x^3y^3 + 9y^6$?

A) $(16x^2 - 9y^2)^3$

B) $(16x^3 - 9y^3)^2$

C) $(4x^3 - 3y^3)^2$

D) $(4x - 3y)^6$

7

$$S = 180(n - 2)$$

The measure S, in degrees, of the sum of the angles in a polygon is related to the number of sides, n, of the polygon by the formula above for all $n > 2$. If the sum of the angles of a polygon is greater than 2,000°, then what is the least number of sides it can have?

A) 11

B) 12

C) 13

D) 14

8

The graph of line k in the xy-plane has a y-intercept of −8 and contains the point (4, 4). The graph of line m contains the points (1, 5) and (5, −3). If lines k and m intersect at the point (s, t), what is the value of $s - t$?

A) 2

B) 3

C) 4

D) 5

CONTINUE

9

$$\left(k^{x^2+xy}\right)\left(k^{y^2+xy}\right)=k^{25}$$

In the equation above, $k > 1$ and $x = 3$. What is the positive value of y?

A) 1

B) 2

C) 4

D) 5

10

$$F=\frac{D}{E-D}$$

A factory tracks quality control by using the formula above to determine a fault rating, F, based on the number of defective parts, D, and the number of acceptable parts, E. Which of the following expresses D in terms of F and E?

A) $D=\frac{E}{1-F}$

B) $D=\frac{E}{1+F}$

C) $D=\frac{FE}{1-F}$

D) $D=\frac{FE}{1+F}$

11

The graph in the xy-plane of the function g has the property that y is always greater than or equal to -2. Which of the following could be g?

A) $g(x)=x^2-3$

B) $g(x)=(x-3)^2$

C) $g(x)=|x|-3$

D) $g(x)=(x-3)^3$

12

Which of the following complex numbers is equivalent to $\frac{1+10i}{6-3i}$? (Note: $i=\sqrt{-1}$)

A) $\frac{1}{6}+\frac{10i}{3}$

B) $-\frac{1}{6}+\frac{10i}{3}$

C) $\frac{8}{15}+\frac{7i}{5}$

D) $-\frac{8}{15}+\frac{7i}{5}$

CONTINUE

13

The estimated value of a truck declines at an annual rate of 7 percent. If the original value of the truck was \$35,000, which of the functions v best models the value of the truck, in dollars, t years later?

A) $v(t) = 0.07(35{,}000)^t$

B) $v(t) = 0.93(35{,}000)^t$

C) $v(t) = 35{,}000(0.07)^t$

D) $v(t) = 35{,}000(0.93)^t$

14

$$\frac{6x - 1}{x + 4}$$

Which of the following is equivalent to the expression above?

A) $6 - \frac{25}{x + 4}$

B) $6 - \frac{1}{x + 4}$

C) $6 - \frac{1}{4}$

D) $\frac{6 - 1}{4}$

15

$$3k^2 - 18k + 12 = 0$$

What is the product of all values of k that satisfy the equation above?

A) 3

B) 4

C) $3\sqrt{5}$

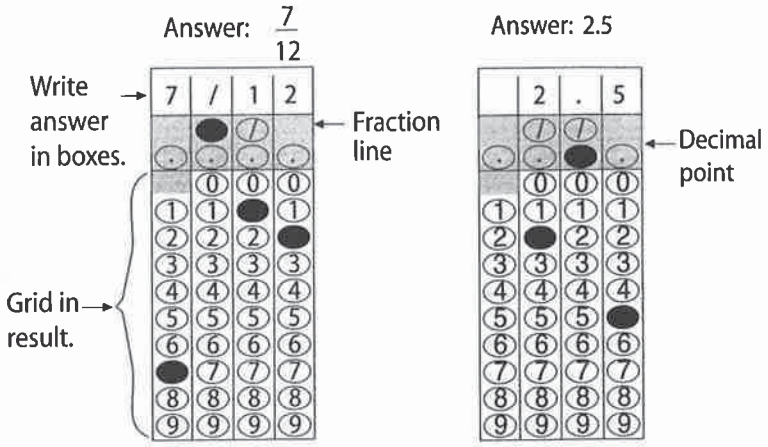
D) $6\sqrt{5}$

CONTINUE

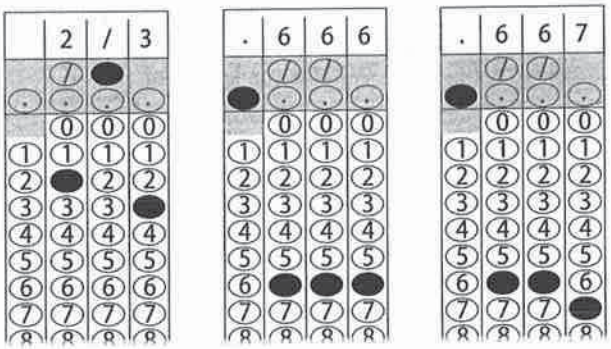
DIRECTIONS

For questions 16-20, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

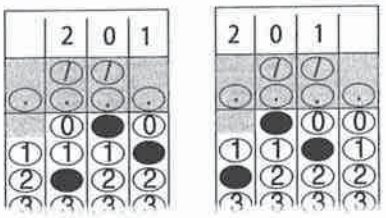
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.



Acceptable ways to grid $\frac{2}{3}$ are:



Answer: 201 – either position is correct



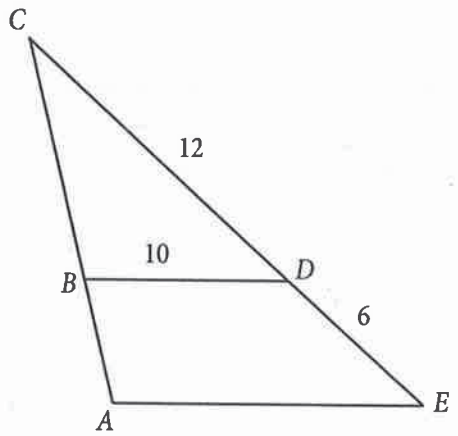
NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

16

In the equation $3(x - 5)^2 + 7 = ax^2 + bx + c$, a, b, and c are constants. If the equation is true for all values of x, what is the value of c?

17



In the figure above, $\overline{BD} \parallel \overline{AE}$. What is the length of $\overline{AE}$?

18

At the end of a card game, Eve has a pile of red and blue chips that is worth \$120. If red chips are worth \$5 and blue chips are worth \$20, and Eve has at least one red chip and at least one blue chip, what is one possible number of red chips Eve has?

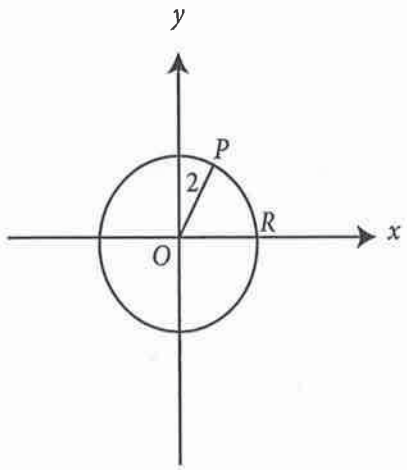
19

$$\frac{1}{2}x + ay = 16$$
$$bx + 4y = 48$$

In the system of equations shown above, a and b are constants. If there are infinitely many solutions for this system, what is the value of $a + b$?

CONTINUE

20



The xy-plane above shows the circle with center O and radius 2. If the measure of $\angle POR$ is $\frac{\pi}{3}$ radians, what is the x-coordinate of point P?

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section in the test.

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

DIRECTIONS

For questions **1-30**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **31-38**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

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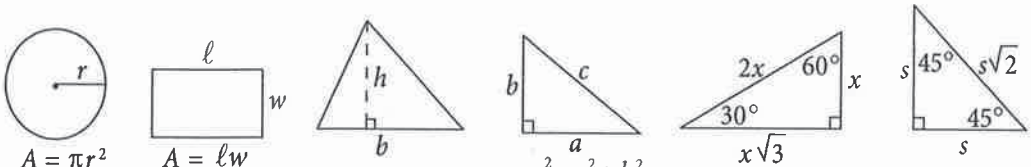
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



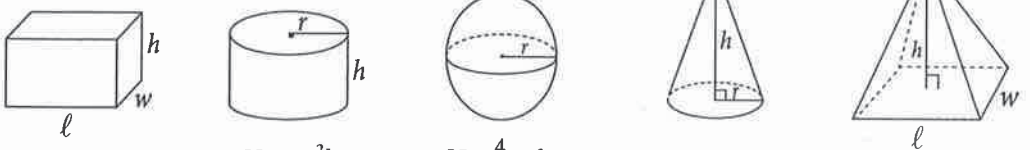
$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

$A = \frac{1}{2}bh$

$c^2 = a^2 + b^2$

Special Right Triangles



$V = \ell wh$

$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

A contractor creates a mosaic floor pattern in which there are 9 blue tiles for every 80 tiles in total. At this rate, how many blue tiles will there be in a floor pattern of 4,800 tiles?

A) 700

B) 620

C) 540

D) 480

2

$$c = 120 + 75d$$

A couple rents a car for their vacation. When a particular car is rented for d days, the total cost will be c dollars as shown in the equation above. What is the value of d when c is 345 ?

A) 25,995

B) 354

C) 75

D) 3

3

An artist creates prints of her latest painting to sell. The artist earns \$50 for each large print she sells and \$35 for each small print she sells. Which of the following expressions represents the amount, in dollars, that the artist earns for selling l large prints and s small prints?

A) $50l + 35s$

B) $50l - 35s$

C) $35l + 50s$

D) $35l - 50s$

4

When 6 times a number y is subtracted from 15, the result is 33. What number results when 3 times y is added to 19 ?

A) –3

B) 7

C) 10

D) 28

CONTINUE

Questions 5 and 6 refer to the following information.

A television store's revenue is directly proportional to the number of televisions it sells. The store earns $1,440 in a day in which it sells 6 televisions.

5

The store pays the factory 39% of the money earned from the sale of each television. The rest of the money earned is the store's profit. What is the profit the store makes on a day in which it sells 6 televisions?

A) $390.00

B) $561.60

C) $690.00

D) $878.40

6

How much revenue will the store earn on a day in which it sells 9 televisions?

A) $960

B) $2,160

C) $8,640

D) $12,960

7

A record collector is looking to buy records that cost either $20 or $35 each. Let a be the number of $20 records and b be the number of $35 records. The collector can buy a maximum of 25 records and can spend up to $750. Which of the following systems of inequalities accurately describes this relationship?

A) $\begin{cases} a + b \leq 750 \\ 20a + 35b \leq 25 \end{cases}$

B) $\begin{cases} 20a + 35b \leq 750 \\ a + b \leq 750 \end{cases}$

C) $\begin{cases} \frac{a}{20} + \frac{b}{35} \leq 750 \\ a + b \leq 25 \end{cases}$

D) $\begin{cases} 20a + 35b \leq 750 \\ a + b \leq 25 \end{cases}$

8

$$y = x^2 - 12x + 35$$

The equation above is a quadratic equation. Which of the following equivalent forms of the equation displays the x-intercepts of the parabola in the xy-plane as constants or coefficients?

A) $y + 1 = (x - 6)^2$

B) $y - 35 = x^2 - 12x$

C) $y = (x - 5)(x - 7)$

D) $y = x(x - 12) + 35$

CONTINUE

9

In a certain quiz game, each player begins with p points, loses 3 points for every question answered incorrectly, and cannot increase his or her score. If a player who answers 15 questions incorrectly has a score of 165, which of the following is the value of p ?

A) 210

B) 180

C) 140

D) 0

10

Number of hours per day Albert expects to devote to typing the document	4
Number of units in the document	21
Number of words Albert types per minute	85
Number of sections in the document	145
Number of pages in the document	725
Number of words in the document	181,235

Albert needs to type a long, prewritten document. The table above shows information about the document, Albert's typing speed, and the number of hours he expects to devote to typing the document each day. If Albert types at the rates provided in the table, which of the following is closest to the number of days Albert would expect to take in order to type the entire document?

A) 9

B) 36

C) 148

D) 2,132

11

At 9:00 A.M. Monday, a trash can with a capacity of 20 cubic feet contains 8 cubic feet of garbage. Each day after Monday, 3 cubic feet of garbage are added to the trash can. If no garbage is removed and d represents the number of days after Monday, which of the following inequalities describes the set of days for which the trash can is full or overflowing?

A) $12 \geq 3d$

B) $8 + 3d \geq 20$

C) $20 - 3 \leq d$

D) $20 \leq 3d$

12

In function m, $m(4) = 6$ and $m(6) = 10$. In function n, $n(6) = 4$ and $n(10) = 2$. What is the value of $m(n(6))$?

A) 2

B) 4

C) 6

D) 10

CONTINUE

13

The circumference of Earth's equator is approximately 40,000 kilometers. Earth rotates completely around its axis in one day. Which of the following is the closest approximation of the average speed, in kilometers per minute, of a point on Earth's equator, as the Earth rotates about its axis?

A) 18

B) 20

C) 28

D) 56

14

A theater owner wanted to determine whether local residents were more interested in seeing operas or symphonies. The theater owner asked 85 people who were in a shopping mall on a Sunday and 5 people declined to respond. Which of the following factors is the greatest flaw in the theater owner's methodology in reaching a reliable conclusion about the local residents' performance-viewing preferences?

A) The size of the sample

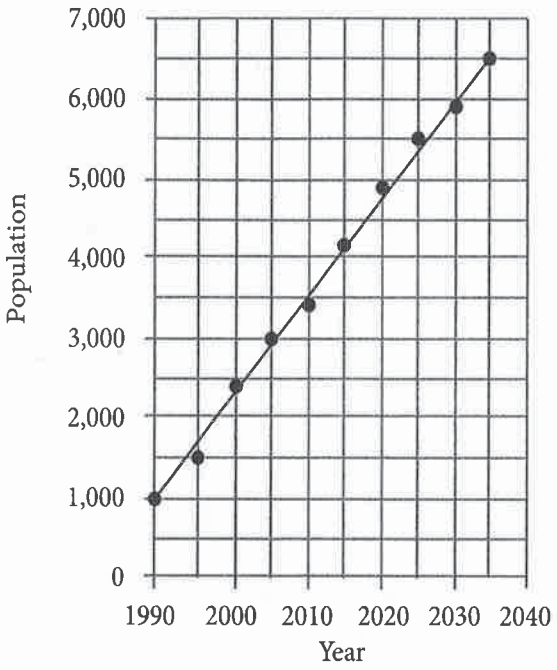
B) The location in which the survey was given

C) The population of the area

D) The residents who declined to respond

15

Population of Town T from 1990 projected through 2035



According to the line of best fit in the scatterplot above, which of following best approximates the year in which the population of Town T is projected to reach 5,000 ?

A) 2017

B) 2022

C) 2028

D) 2033

16

The half-life of an unknown isotope is approximately 25% less than that of carbon-14. The half-life of carbon-14 is 5,730 years. Which of the following best approximately the half-life, in years, of the unknown isotope?

A) 1,400

B) 4,300

C) 5,705

D) 7,200

CONTINUE

17

A company's accounting department took a survey of its employees' salaries and found that the mean salary was $80,000 and that the median salary was $45,000. Which of the following could explain the difference between the mean and the median salary in the company?

A) Many of the employees' salaries are between $45,000 and $80,000.

B) The employees have salaries that are close to each other.

C) There are a few employees with salaries that are much lower than the rest.

D) There are a few employees with salaries that are much higher than the rest.

18

Results of Interview for Applicants to College C

	Accepted by College C	Rejected by College C
Completed interview	15,700	34,300
Did not complete interview	9,300	40,700

The table above summarizes the results of the 100,000 applicants to College C. If an accepted student is randomly chosen, what is the probability that the student did not complete an interview?

A) $\frac{93}{1{,}000}$

B) $\frac{1}{4}$

C) $\frac{93}{250}$

D) $\frac{157}{250}$

19

Mathias saves an average of d dollars per month, where $d > 300$. The actual amount he saves per month varies, but is always within $20 of the average amount. If this month Mathias saved k dollars, which of the following inequalities expresses the relationship between k, the amount he saved this month, and d, the average amount he saves per month?

A) $d - k < 20$

B) $d + k < 20$

C) $-20 < d - k < 20$

D) $-20 < d + k < 20$

CONTINUE

Questions 20 and 21 refer to the following information.

The class president chose 200 students at random from each of the junior and senior classes at her high school. Each student was asked how many hours of homework he or she completed in an average school night. The results are shown in the table below.

Number of hours	Junior class	Senior class
1	25	30
2	80	70
3	50	60
4	35	35
5	10	5

There are a total of 600 students in the junior class and 400 students in the senior class.

20

What is the median number of hours of homework in an average night for all the students surveyed?

A) 2

B) 3

C) 4

D) 5

21

Based on the survey data, which of the following statements accurately compares the expected total number of members of each class who complete four hours of homework?

A) The total number of students who complete four hours of homework in the junior class is 35 more than in the senior class.

B) The total number of students who complete four hours of homework in the senior class is 35 more than in the junior class.

C) The total number of students who complete four hours of homework in the junior class is 200 more than in the senior class.

D) The total number of students who complete four hours of homework is expected to be the same in both classes.

22

The equation of circle P in the xy-plane can be represented as $x^2 + y^2 - 6x + 8y = -9$. What is the radius of circle P?

A) 2

B) 4

C) 8

D) 16

CONTINUE

Questions 23 and 24 refer to the following information.

$$G = \frac{ab}{d^2}$$

The gravitational force, G, between an object of mass a and an object of mass b is given by the formula above, where d represents the distance between the two objects.

23

Which of the following expressions represents the square of the distance between the two objects in terms of the masses of the objects and the gravitational force between them?

A) $d^2 = \frac{Gb}{a}$

B) $d^2 = \frac{Ga}{b}$

C) $d^2 = \frac{G}{ab}$

D) $d^2 = \frac{ab}{G}$

24

Objects k and m have the same masses, respectively, as do objects a and b. If the gravitational force between k and m is 9 times the gravitational force between a and b, then the distance between k and m is what fraction of the distance between a and b ?

A) $\frac{1}{243}$

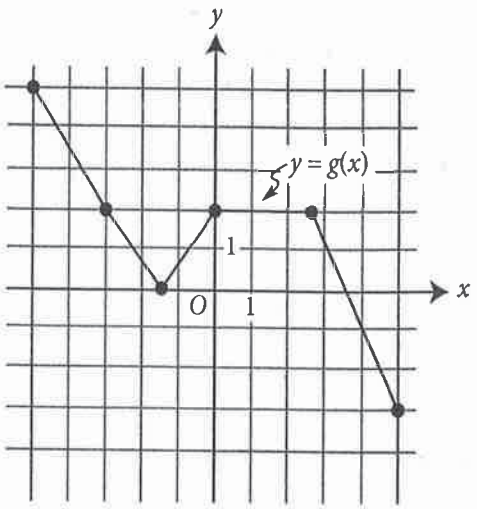
B) $\frac{1}{81}$

C) $\frac{1}{9}$

D) $\frac{1}{3}$

CONTINUE

25



The figure above shows the complete graph of the function g in the xy-plane. Which of the following must be true?

I. $g(-3) = 2$

II. $g(2) = -3$

III. $g\left(\frac{1}{2}\right) = g(2)$

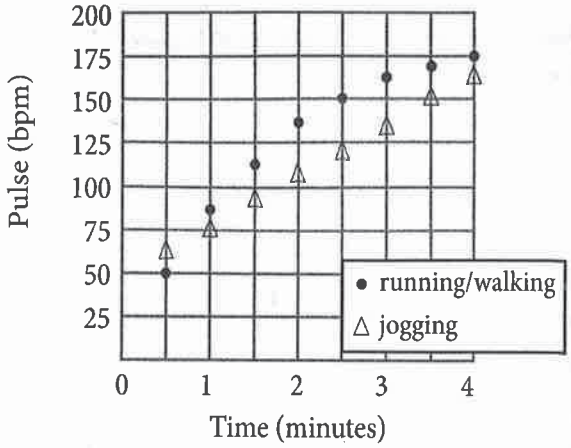
A) III only

B) I and II only

C) I and III only

D) I, II, and III

26



Two athletes have their pulses, in beats per minute (bpm), monitored while they exercise. One athlete alternates brisk running with walking, while the other athlete jogs at a constant pace. The graph above shows the athletes' heart rates at 30-second intervals. Which of the following statements accurately compares the average rates at which the pulses of the two athletes change?

A) In the interval from 1 to 2 minutes, the rate of change of pulse for the athlete who alternates running and walking is of lesser magnitude than the rate of change of pulse for the athlete who jogs only, whereas in the interval from 3 to 4 minutes, the rate of change of pulse for the athlete who jogs only is of lesser magnitude.

B) In the interval from 1 to 2 minutes, the rate of change of pulse for the athlete who jogs only is of lesser magnitude than the rate of change of pulse for the athlete who alternates running and walking, whereas in the interval from 3 to 4 minutes, the rate of change of pulse for the athlete who alternates running and walking is of lesser magnitude.

C) In every 30-second interval, the rate of change of pulse for the athlete who alternates running and walking is of lesser magnitude than it is for the athlete who jogs only.

D) In every 30-second interval, the rate of change of pulse for the athlete who jogs only is of lesser magnitude than it is for the athlete who alternates running and walking.

CONTINUE

27

The graph in the xy-plane of linear function g has an x-intercept at $(s, 0)$ and a y-intercept at $(0, t)$. If $t - s = 0$, $t \neq 0$, and $s \neq 0$, which of the following must be true about the graph of g?

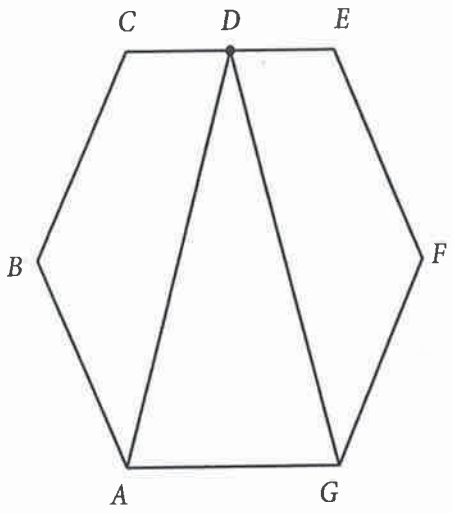
A) It has a positive slope.

B) It has a negative slope.

C) It has a slope of zero.

D) It has no slope.

28



In the figure above, $ABCEFG$ is a regular hexagon and D is the midpoint of $\overline{CE}$. If the area of the hexagon is $864\sqrt{3}$ square feet, what is the area, in square feet, of triangle ADG?

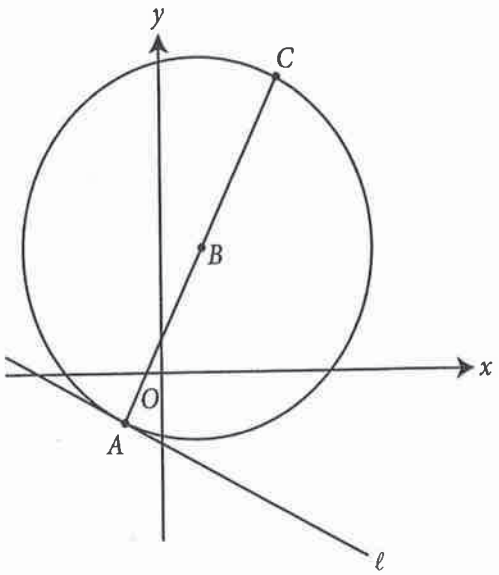
A) 144

B) 432

C) $288\sqrt{3}$

D) $432\sqrt{3}$

29



In the xy-plane above, $\overline{AC}$ is the diameter of the circle centered at B, and the coordinates of points A and C are $(-1, -1)$ and $(3, 7)$, respectively. If line ℓ is tangent to the circle at point A, which of the following is an equation of line ℓ?

A) $y = -\frac{1}{2}(x + 3)$

B) $y = -\frac{1}{2}x + 3$

C) $y = -2x + 1$

D) $y = -2x - 3$

CONTINUE

30

$$y = rx^2 + s$$

$$y = -2$$

In the system of equations above, r and s are constants. For which of the following values of r and s does the system have exactly two real solutions?

A) $r = -2, s = -1$

B) $r = -1, s = -2$

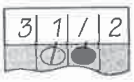
C) $r = 2, s = -2$

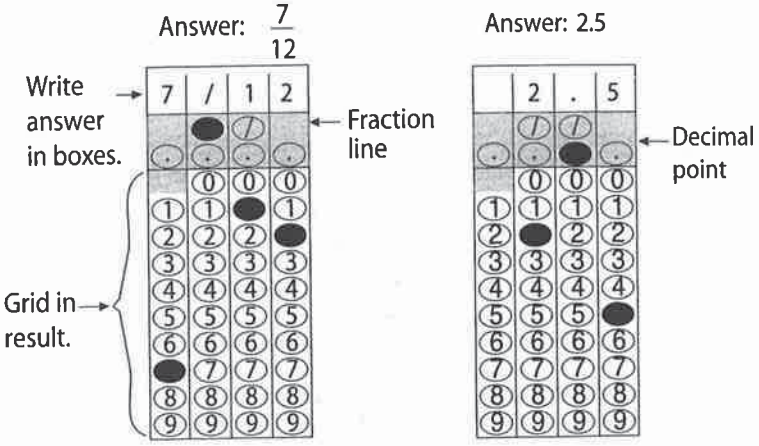
D) $r = 3, s = 1$

CONTINUE

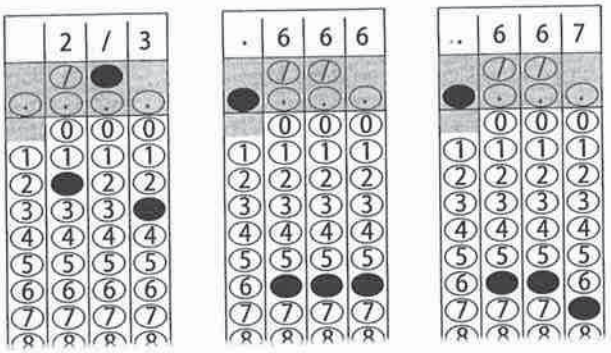
DIRECTIONS

For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

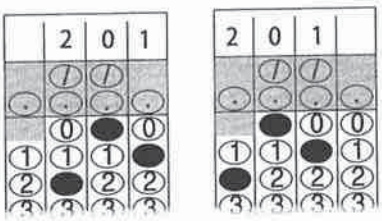
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.



Acceptable ways to grid $\frac{2}{3}$ are:



Answer: 201 – either position is correct



NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

31

If 560 minutes is equal to z hours and 20 minutes, what is the value of z ?

32

A climate scientist estimates that a certain state's average snowfall is decreasing by 0.4 inches per year. If the scientist's estimate is accurate, how many years will it take for the average annual snowfall to be 6 inches less than it is now?

33

Dave was charged a fine for returning a number of overdue books to the library. Each week after he incurred the fine, he paid the library a fixed amount until the fine was paid off. The equation $C = 12 - 1.5w$, where $C \geq 0$, models the amount C, in dollars, that Dave owes w weeks after he incurred the fine. According to this model, how much money, in dollars, did Dave initially owe the library? (Disregard the $ sign when gridding in your answer.)

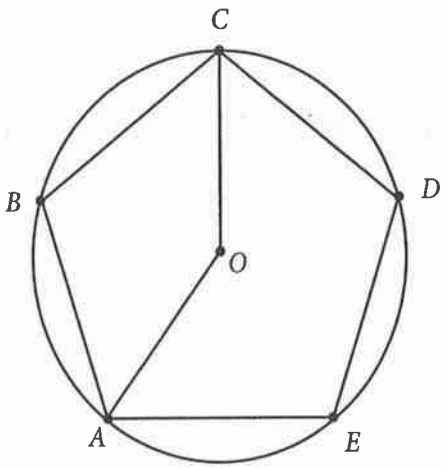
34

$$g(x) = 2x^2 - kx + 14$$

In the xy-plane, the graph of the function above contains the point $(4, -2)$. What is the value of k ?

CONTINUE

35



In the figure above, the circle is centered at point O, $ABCDE$ is a regular pentagon, and $ABCO$ is a quadrilateral. If the length of arc $\overset{\frown}{ABC}$ is 24, what is the circumference of circle O?

36

Satya ate a breakfast sandwich and an order of fried potatoes and consumed a total of 910 calories. If the breakfast sandwich contained 240 more calories than the fried potatoes, how many calories did the breakfast sandwich contain?

Questions 37 and 38 refer to the following information.

$$P_{t+1} = P_t + 0.3(P_t)\left(1 - \frac{P_t}{C}\right)$$

A certain species of deer on an isolated island has a current population of 4,200. The estimated population of deer next year, P_{t+1}, is related to the population this year, P_t, by the formula above. In this formula, the constant C represents the maximum number of deer the island is capable of supporting.

37

Suppose that environmental conditions on the island changed suddenly, and there was a resultant decrease in the maximum number of deer the island is capable of supporting. If the number of deer increases from 4,200 this year to 4,704 next year, what would be the maximum number of deer the island is capable of supporting?

38

If $C = 10{,}500$, and the given formula is accurate, what will the population of deer be 2 years from now? (Round your answer to the nearest whole number.)

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section in the test.

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Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

1.

YOUR NAME: (Print) _____ (Last) _____ (First) _____ (M.I.)

SIGNATURE: _____ DATE: ___/___/___

HOME ADDRESS: (Print) _____ (Number and Street)

_____ (City) _____ (State) _____ (Zip Code)

PHONE NO.: (Print) _____

IMPORTANT: Please fill in these boxes exactly as shown on the back cover of your test book.

2. TEST FORM

3. TEST CODE

0	A	J	0	0
1	B	K	1	1
2	C	L	2	2
3	D	M	3	3
4	E	N	4	4
5	F	O	5	5
6	G	P	6	6
7	H	Q	7	7
8	I	R	8	8
9			9	9

4. REGISTRATION NUMBER

0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

5. YOUR NAME

First 4 letters of last name					FIRST INIT	MID INIT
A	A	A	A		A	A
B	B	B	B		B	B
C	C	C	C		C	C
D	D	D	D		D	D
E	E	E	E		E	E
F	F	F	F		F	F
G	G	G	G		G	G
H	H	H	H		H	H
I	I	I	I		I	I
J	J	J	J		J	J
K	K	K	K		K	K
L	L	L	L		L	L
M	M	M	M		M	M
N	N	N	N		N	N
O	O	O	O		O	O
P	P	P	P		P	P
Q	Q	Q	Q		Q	Q
R	R	R	R		R	R
S	S	S	S		S	S
T	T	T	T		T	T
U	U	U	U		U	U
V	V	V	V		V	V
W	W	W	W		W	W
X	X	X	X		X	X
Y	Y	Y	Y		Y	Y
Z	Z	Z	Z		Z	Z

6. DATE OF BIRTH

Month	Day		Year	
JAN				
FEB	0	0	0	0
MAR	1	1	1	1
APR	2	2	2	2
MAY	3	3	3	3
JUN		4	4	4
JUL		5	5	5
AUG		6	6	6
SEP		7	7	7
OCT		8	8	8
NOV		9	9	9
DEC				

7. SEX

MALE

FEMALE

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Test 2 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 1—Reading

1.	A	B	C	D	27.	A	B	C	D
2.	A	B	C	D	28.	A	B	C	D
3.	A	B	C	D	29.	A	B	C	D
4.	A	B	C	D	30.	A	B	C	D
5.	A	B	C	D	31.	A	B	C	D
6.	A	B	C	D	32.	A	B	C	D
7.	A	B	C	D	33.	A	B	C	D
8.	A	B	C	D	34.	A	B	C	D
9.	A	B	C	D	35.	A	B	C	D
10.	A	B	C	D	36.	A	B	C	D
11.	A	B	C	D	37.	A	B	C	D
12.	A	B	C	D	38.	A	B	C	D
13.	A	B	C	D	39.	A	B	C	D
14.	A	B	C	D	40.	A	B	C	D
15.	A	B	C	D	41.	A	B	C	D
16.	A	B	C	D	42.	A	B	C	D
17.	A	B	C	D	43.	A	B	C	D
18.	A	B	C	D	44.	A	B	C	D
19.	A	B	C	D	45.	A	B	C	D
20.	A	B	C	D	46.	A	B	C	D
21.	A	B	C	D	47.	A	B	C	D
22.	A	B	C	D	48.	A	B	C	D
23.	A	B	C	D	49.	A	B	C	D
24.	A	B	C	D	50.	A	B	C	D
25.	A	B	C	D	51.	A	B	C	D
26.	A	B	C	D	52.	A	B	C	D

Section 2—Writing and Language Skills

1.	A	B	C	D	23.	A	B	C	D
2.	A	B	C	D	24.	A	B	C	D
3.	A	B	C	D	25.	A	B	C	D
4.	A	B	C	D	26.	A	B	C	D
5.	A	B	C	D	27.	A	B	C	D
6.	A	B	C	D	28.	A	B	C	D
7.	A	B	C	D	29.	A	B	C	D
8.	A	B	C	D	30.	A	B	C	D
9.	A	B	C	D	31.	A	B	C	D
10.	A	B	C	D	32.	A	B	C	D
11.	A	B	C	D	33.	A	B	C	D
12.	A	B	C	D	34.	A	B	C	D
13.	A	B	C	D	35.	A	B	C	D
14.	A	B	C	D	36.	A	B	C	D
15.	A	B	C	D	37.	A	B	C	D
16.	A	B	C	D	38.	A	B	C	D
17.	A	B	C	D	39.	A	B	C	D
18.	A	B	C	D	40.	A	B	C	D
19.	A	B	C	D	41.	A	B	C	D
20.	A	B	C	D	42.	A	B	C	D
21.	A	B	C	D	43.	A	B	C	D
22.	A	B	C	D	44.	A	B	C	D

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Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

Test 2 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 3—Mathematics: No Calculator

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
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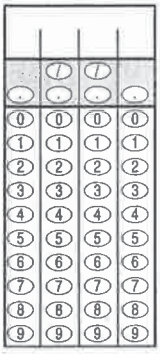
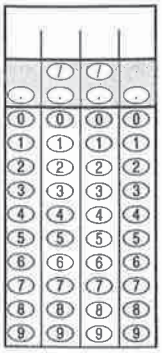
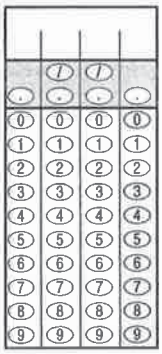
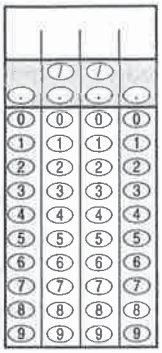
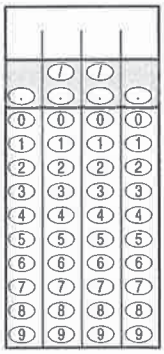
16. 
17. 
18. 
19. 
20. 

Section 4—Mathematics: Calculator

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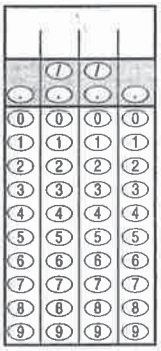
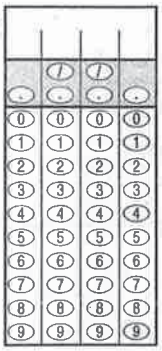
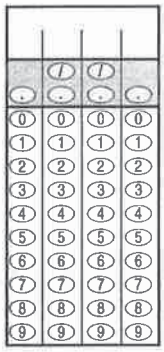
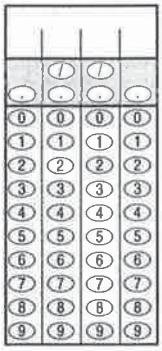
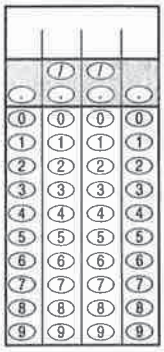
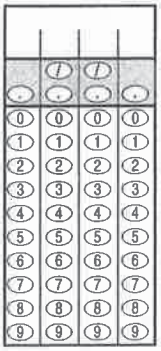
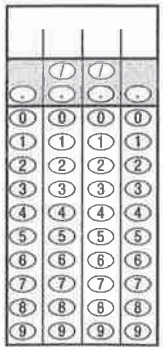
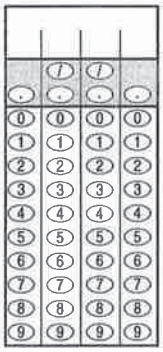
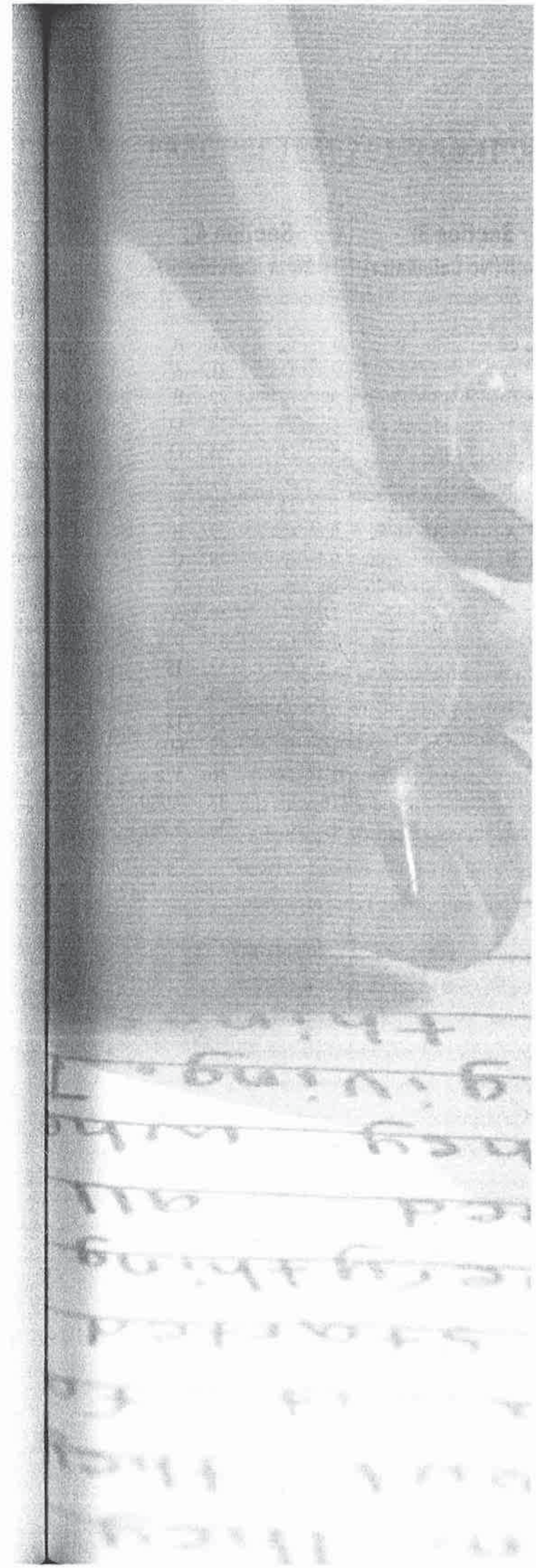
31. 
32. 
33. 
34. 
35. 
36. 
37. 
38. 



Chapter 6 Practice Test 2: Answers and Explanations

Section 3: Math (No Calculator)

1.	C	11.	B
2.	D	12.	D
3.	C	13.	D
4.	A	14.	A
5.	B	15.	B
6.	C	16.	82
7.	D	17.	15
8.	A	18.	4, 8, 12, 16, or 20
9.	B	19.	$\frac{17}{6}$ or 2.83
10.	D	20.	1

Section 4: Math (Calculator)

1.	C	20.	A
2.	D	21.	A
3.	A	22.	B
4.	C	23.	D
5.	D	24.	D
6.	B	25.	C
7.	D	26.	B
8.	C	27.	B
9.	A	28.	C
10.	A	29.	A
11.	B	30.	A
12.	C	31.	9
13.	C	32.	15
14.	B	33.	12
15.	B	34.	12
16.	B	35.	60
17.	D	36.	575
18.	C	37.	7,000
19.	C	38.	5,741

les, please turn to page 565.

Section 3: Math (No Calculator)

1. **C** Use Process of Elimination. The w represents the number of workers, and t represents the total time in hours. Therefore, the 20 must have something to do with the cost of the workers' hourly wage. Eliminate (A) because nothing is mentioned about a minimum number of workers. Eliminate (B) because it is unrelated to the workers. Choice (C) relates to the hourly wage, so keep it, but check (D) just in case. Choice (D) can be eliminated because the number of wedding guests is unrelated to the cost and unrelated to the workers and their time. Choice (C) is correct.

2. **D** Subtract 4 from both sides of the equation to get $12x = 16$. Divide the entire equation by 2 to get $6x = 8$. Therefore, $6x + 5 = 8 + 5 = 13$, which is (D).

3. **C** Plug in the answers, starting with (B). In (B), $x = -4$ and $y = 4$. Plug those values into the first equation to get $5(-4) - 4(4) = 36$. Solve the left side of the equation to get $-20 - 16 = 36$, and $-36 = 36$. Since the values do not work in the first equation, eliminate (B). Next try (C). In (C), $x = 4$, and $y = -4$. Plug those values in the first equation to get $5(4) - 4(-4) = 36$. Solve the left side of the equation to get $20 - (-16) = 36$, and $36 = 36$. Next, try the same numbers in the second equation: $-4 - (-4) = 0$. Solve the left side of the equation to get $-4 + 4 = 0$, and $0 = 0$. The coordinate pair works in both equations, therefore, the correct answer is (C).

4. **A** Plug $y = 8$ into the equation to get $8 - \sqrt{4x^2 + 28} = 0$. Therefore, $\sqrt{4x^2 + 28} = 8$. Plug in the answers to see which value of x works. In (B), $x = 4$, making the square root $\sqrt{4(4)^2 + 28} = \sqrt{4(16) + 28} = \sqrt{92}$, which is not equal to 8. A smaller number is needed, so eliminate (B), (C), and (D). The answer is therefore (A).

5. **B** Parallel lines have the same slope. Since the question asks for the y-coordinate of a point on $\overline{AD}$, which is parallel to $\overline{BC}$, start by finding the slope of $\overline{BC}$. Use the slope formula $\frac{y_2 - y_1}{x_2 - x_1}$ to get $\frac{10 - 0}{0 - 6} = \frac{10}{-6} = \frac{5}{-3}$. Now use this slope to find the value of r: $\frac{5}{-3} = \frac{0 - r}{-3 - 0}$ or $\frac{5}{-3} = \frac{-r}{-3}$. Therefore, $5 = -r$, so $r = -5$, and the answer is (B).

6. **C** Use bite-sized pieces and Process of Elimination. Focus on just the first term in the expression given, which is $16x^6$. In (A), the first term in the expanded version of the expression would be $(16x^2)^3 = 4{,}096x^6$. Eliminate (A). In (B), the first term in the expanded version of the expression would be $(16x^3)^2 = 256x^6$. Eliminate (B). In (C), the first term of the expanded expression would be $(4x^3)^2 = 16x^6$. This is correct, so either expand out the rest of (C) or check the first term on the expression in (D) to be sure. The second option is easier: $(4x)^6 = 4{,}096x^6$, so (C) is correct.

7. **D** When a question asks for the least possible value, plug in the answers, starting with the smallest answer choice. Plug in $n = 11$ from (A) and see if $S > 2{,}000$ as stated in the question. The equation becomes $S = 180(11 - 2) = 1{,}620$. This is not greater than 2,000, so eliminate (A). A larger value for n is needed to make the sum of the angles greater than 2,000. Try (C) to get $S = 180(13 - 2) = 1{,}980$. This is still too small, so (D) must be the correct answer.

8. **A** First, define the equations for both of the lines. The slope-intercept form of a line is $y = mx + b$, where x and y are the coordinates of a point on the line, m is the slope, and b is the y-intercept. Plug in the point (4, 4) and a y-intercept of -8 into the slope-intercept equation to get $4 = (m)(4) - 8$. Solve for m to get $12 = 4m$ and $m = 3$. Therefore,

the equation for line k is $y = 3x - 8$. Next, find the equation of line m. Given two points, use the point-slope formula to find the line: $y - y_1 = m(x - x_1)$. To find the slope, m, use the slope formula $\frac{y_2 - y_1}{x_2 - x_1}$. For line m, the slope is $\frac{-3-5}{5-1} = \frac{-8}{4} = -2$. Therefore, plugging the point (1, 5) into the point-slope formula results in $y - 5 = -2(x - 1)$. Distribute the –2 to get $y - 5 = -2x + 2$. Solve for y to get $y = -2x + 7$. Set the two line equations equal to each other to get $3x - 8 = -2x + 7$. Solve for x to get $5x = 15$, and $x = 3$. Plug $x = 3$ into the equation for line k to get $y = 3(3) - 8 = 1$. Therefore, the point of intersection (s, t) is (3, 1) and $s - t = 3 - 1 = 2$, and the answer is (A).

9. **B** When multiplying variables with the same base and different exponents, add the exponents. The equation becomes $k^{x^2+xy+y^2+xy} = k^{25}$. Combine like terms to get $k^{x^2+2xy+y^2} = k^{25}$. Therefore, $x^2 + 2xy + y^2 = 25$. Factor the quadratic to get $(x + y)^2 = 25$. Take the square root of both sides to get $x + y = \pm 5$. Substitute 3 for x to get $3 + y = \pm 5$. Since the question asks for the positive value of y, the equation to use is $3 + y = 5$, so $y = 2$, and the correct answer is (B).

10. **D** Plug in. Let $D = 2$ and $E = 5$, so the equation becomes $F = \frac{2}{5-2} = \frac{2}{3}$. Plug these values for D, E, and F into the answer choices to see which answer works. Choice (A) becomes $2 = \frac{5}{1 - \frac{2}{3}}$. Solve the right side of the equation to get $2 = \frac{5}{\frac{1}{3}}$, and 2 = 15. Eliminate (A). Choice (B) becomes $2 = \frac{5}{1 + \frac{2}{3}}$. Solve the right side of the equation to get $2 = \frac{5}{\frac{5}{3}}$, and 2 = 3. Eliminate (B). Choice (C) becomes $2 = \frac{\frac{2}{3}(5)}{1 - \frac{2}{3}}$. Solve the right side of the equation to get $2 = \frac{\frac{10}{3}}{\frac{1}{3}}$, and 2 = 10. Eliminate (C). The answer must be (D). And indeed, plugging in the values gives $2 = \frac{\frac{2}{3}(5)}{1 + \frac{2}{3}}$. Solving the right side of the equation results in $2 = \frac{\frac{10}{3}}{\frac{5}{3}}$, and 2 = 2.

11. **B** Since calculator use is not allowed on this section, graphing and checking each function is not an option. Plug in instead. Usually, zero is a number to avoid, since it messes things up, but the goal here is to find what must be true, so messing things up helps. If $x = 0$, (A) becomes $0^2 - 3 = -3$. This is not greater than or equal to –2, so eliminate (A). Choice (B) becomes $(0 - 3)^2 = 9$, which is greater than –2, so keep it for now. Choice (C) becomes $|0| - 3 = -3$, and (D) becomes $(0 - 3)^3 = -27$. Neither of these values is greater than –2, so eliminate them and choose (B).

12. **D** When a fraction has imaginary numbers in the denominator, multiply the fraction by the complex conjugate of the denominator. The complex conjugate of $(6 - 3i)$ is $(6 + 3i)$. The original expression becomes $\frac{(1 + 10i)(6 + 3i)}{(6 - 3i)(6 + 3i)}$. Use FOIL to multiply it out to get $\frac{6 + 3i + 60i + 30i^2}{36 + 18i - 18i - 9i^2}$. Combine like terms to get $\frac{6 + 63i + 30i^2}{36 - 9i^2}$. Since $i = \sqrt{-1}$, $i^2 = -1$. Plug this into the expression, which becomes $\frac{6 + 63i + 30(-1)}{36 - 9(-1)} = \frac{6 + 63i - 30}{36 + 9} = \frac{-24 + 63i}{45}$. Split this into two fractions, as seen in the answer choices, to get $\frac{-24}{45} + \frac{63i}{45} = \frac{-8}{15} + \frac{7i}{5}$, which is (D).

13. **D** The decay formula states that *decay* = *original*$(1 - r)^t$, where r is the rate of decay and t is time. Therefore, the value of the truck after t years is $35{,}000(0.93)^t$, which is (D).

14. **A** Rather than trying to do some messy algebraic manipulation, plug in a simple number like $x = 2$. The expression becomes $\frac{6(2) - 1}{2 + 4} = \frac{11}{6}$. Now plug $x = 2$ into the answer choices to see which one equals $\frac{11}{6}$. Choice (A) becomes $6 - \frac{25}{2 + 4} = 6 - \frac{25}{6} = \frac{36}{6} - \frac{25}{6} = \frac{11}{6}$. That matches, but check the other answer choices to be sure. None of them equals $\frac{11}{6}$ when $x = 2$, so the answer is (A).

15. **B** The product of the roots of a quadratic $ax^2 + bx + c = 0$ is $\frac{c}{a}$. In the given quadratic, $c = 12$ and $a = 3$, so $\frac{12}{3} = 4$. Without this handy trick, another way to solve this is to use the quadratic formula to find the roots, then multiply them together. Either way, the answer is (B).

16. **82** Expand the left side of the equation to get $3(x - 5)(x - 5) + 7$. FOIL the quadratic to get $3(x^2 - 10x + 25) + 7$. Distribute the 3 to get $3x^2 - 30x + 75 + 7 = 3x^2 - 30x + 82$. Therefore, $c = 82$.

17. **15** Because BD and AE are parallel, triangles ACE and BCD are similar triangles (all of their corresponding angles are equal to each other). Therefore, the lengths of their sides are proportional. To solve for the length of $\overline{AE}$, set up the following proportion: $\frac{10}{12} = \frac{\overline{AE}}{18}$. Cross-multiply to get $12\overline{AE} = 180$. Solve for $\overline{AE}$ to get $\overline{AE} = 15$.

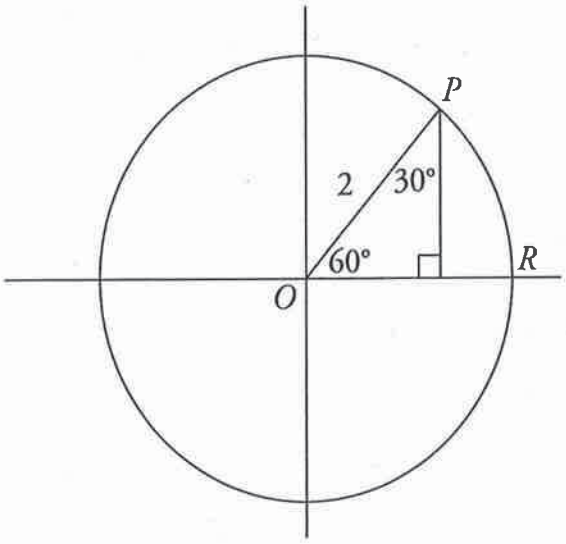
18. **4, 8, 12, 16,** or **20**

Plug in. Start by testing whether a single red chip could work. If Eve has one red chip, then she has \$120 – \$5 = \$115 worth of blue chips, which does not divide by 20 for an integer number of blue chips. If Eve had 2 red chips, she would have 110 worth of blue chips, which still won't work. If Eve had \$20 worth of red chips, though, she would have \$100 left for exactly 5 blue chips. She would need 4 red chips to equal \$20, so 4 is one possible answer. Any number of red chips that gave Eve a multiple of \$20 would also work, so 8, 12, 16, and 20 are also acceptable answers.

19. $\frac{17}{6}$ or **2.83**

If the system of equations has infinitely many solutions, it means that the two equations are the same line. Therefore, seek to make the two equations look the same. Multiply the top equation by 3 to get $\frac{3}{2}x + 3(ay) = 48$. To make the bottom equation the same, it must be true that $b = \frac{3}{2}$, and $3a = 4$. Solve for a to get $a = \frac{4}{3}$. Therefore, $a + b = \frac{4}{3} + \frac{3}{2} = \frac{17}{6}$.

20. **1** Convert $\frac{\pi}{3}$ radians to degrees by multiplying by $\frac{180}{\pi}$. $\frac{\pi}{3}\left(\frac{180}{\pi}\right) = 60$. Therefore, the angle $POR = 60°$. Next, draw a straight line from P to the x-axis, and mark the angles as follows:



Remember that the sides of a 30-60-90 triangle are in a ratio of $1 : \sqrt{3} : 2$. Given that 2 is opposite the 90° angle, the length opposite the 30° angle is 1, and the x-value of P is therefore also 1.

Section 4: Math (Calculator)

1. **C** There are 9 blue tiles for every 80 tiles. The question says *at this rate*, so set up a proportion. Make sure to have like units on the top and like units on the bottom:

$\frac{9 \text{ blue}}{80 \text{ total}} = \frac{b \text{ blue}}{4{,}800 \text{ total}}$. Cross-multiply to get $80b = 43{,}200$. Divide both sides by 80 to get $b = 540$. The correct answer is (C).

2. **D** The question asks for the value of d when $c = 345$. Plug this value of c into the equation, $c = 120 + 75d$, to get $345 = 120 + 75d$. Subtract 120 from both sides to get $225 = 75d$. Divide both sides by 75 to get $d = 3$. The correct answer is (D).

3. **A** The question states that the artist makes \$50 for each large print. Since the artist sells l large prints, she earns a total of $50l$ for all the large prints. The artist also earns \$35 for each small print. Since the artist sells s small prints, she earns a total of $35s$ for all of the small prints. The question asks for the amount she earns for both the l large prints and the s small prints. This is equal to the sum of the two amounts, which is $50l + 35s$. The correct answer is (A).

4. **C** Translate the first sentence into an equation. The expression *6 times a number y* translates to $6y$. This term *subtracted from 15* translates to $15 - 6y$. The term *the result is 33* translates to $= 33$, so the whole sentence translates to $15 - 6y = 33$. Solve for y. Subtract 15 from both sides to get $-6y = 18$. Divide both sides by -6 to get $y = -3$. The question asks, *What number results when 3 times y is added to 19?* The term *what number* translates to a variable. Use x. The term *results* translates to $=$. The term *3 times y* translates to $3y$. The term *is added to* translates to $+$. Therefore, the question translates to $x = 3y + 19$. Since $y = -3$, plug this into the equation to get $x = 3(-3) + 19 = -9 + 19 = 10$. The correct answer is (C).

5. **D** The question asks for the profit the store makes when it sells 6 televisions. It also defines profit as the amount of money left after paying 39 percent of the money earned. According to the information given, the total revenues from selling 6 televisions is \$1,440. To determine how much the store paid the factory, take 39% of this by entering $\frac{39}{100} \times 1{,}440$ on a calculator to get \$561.60. To find the profit, subtract this amount from the revenue: \$1,440.00 – \$561.60 = \$878.40. The correct answer is (D).

6. **B** The information given for this set of questions uses the term *directly proportional*, so set up a proportion in the form $\frac{x_1}{y_1} = \frac{x_2}{y_2}$. The question asks for the revenue when the store sells 9 televisions, and the information above the question says the store makes a profit of \$1,440 when the store sells 6 televisions. Set up the proportion: $\frac{\$1{,}440}{6 \text{ televisions}} = \frac{x}{9 \text{ televisions}}$. Be sure to put like units in the numerators and like units in the denominators. Cross-multiply to get $6x = \$12{,}960$. Divide both sides by 6 to get $x = \$2{,}160$. The correct answer is (B).

7. **D** The question asks for a pair of equations. Use bite-sized pieces to determine each equation. The question says the collector can buy a maximum of 25 records, so the total number of records must be less than or equal to 25. Come up with an expression to determine the total number of records. The number of \$20 records is a and the number of \$35 records is b, so

the total number of records must be $a + b$. Therefore, the correct choice must include the inequality $a + b \leq 25$. Eliminate any choice that does not include this: (A) and (B). The other equation in both remaining answers involves an expression set less than or equal to 750. Find 750 in the problem. The question states that the collector can spend up to $750, so come up with an expression for what the collector spends. To find the cost of the $20 records, multiply the number of these records, a, by 20 to get $20a$. Similarly, to find the total cost of the $35 records multiply b by 35 to get $35b$. Therefore, the total cost of all the records is this sum: $20a + 35b$. This sum must be less than or equal to $750, so the answer must include the inequality $20a + 35b \leq 750$. Eliminate the remaining choice that doesn't include this inequality: (C). Therefore, the correct answer is (D).

8. **C** The x-intercepts, by definition, are the x-coordinates of the points at which $y = 0$, so set $y = 0$ in the equation above to get $0 = x^2 - 12x + 35$. Factor the right side of the equation by finding a pair of numbers with a product of 35 and a sum of –12. This pair is –5 and –7. The factored form of the equation, therefore, is $0 = (x - 5)(x - 7)$. Set both factors equal to 0 to get $x - 5 = 0$ and $x - 7 = 0$. Solve each equation to get $x = 5$ and $x = 7$. Select the answer that includes both the numbers 5 and 7, which is (C). Alternatively, know that the x-intercepts are the same as the solutions. To find the solutions, put in the equation in factored form, which is (C).

9. **A** A player loses 3 points for every question answered incorrectly. If a player answers 15 questions incorrectly, he or she loses $15 \times 3 = 45$ points. If this player has 165 points remaining, he or she must have started with $165 + 45 = 210$ points. Since the player started with k points, k must equal 210. Therefore, the correct answer is (A).

10. **A** Not all the information in the table is relevant. The question asks for the number of days it would take Albert to type the entire document. The table provides the number of pages, sections, and units in the document. However, it does not provide any way to determine the amount of time it would take to type a page, section, or unit, so ignore this information. The table does, however, provide the number of words in the document and the number of words Albert can type per minute. Use the formula: *Amount* = *Rate* × *Time*. The amount is 181,235 words, and the rate is 85 words per minute. Set up the equation $181{,}235 = 85t$. Divide both sides by 85 on a calculator to get approximately 2,132 minutes (it's okay to round a bit, since the question asks for the *closest* answer). However, the question asks for days. Each day, Albert expects to devote four hours to typing the document. 2,132 minutes is equal to

$\frac{2{,}132}{60}$ = 35.533 hours. At 4 hours per day, 35.533 hours of typing can be completed in $\frac{35.533}{4}$ = 8.88 days. Select the closest choice, which is (A).

11. **B** The capacity of the trash can is 20 cubic feet, and the question asks when the trash can will be full or overflowing. In other words, it asks when the amount of garbage in the trash can is at or above capacity. First, come up with an expression for the amount of garbage in the trash can. Each day 3 cubic feet is added. Therefore, after d days, $3d$ cubic feet has been added. This amount is added to the original amount, which is 8, so the amount of garbage in the trash can after d days is $8 + 3d$. The question asks for when this amount is at or above capacity, which is 20. Therefore, the inequality is $8 + 3d \geq 20$, which is (B).

12. **C** The question asks for the value of $m(n(6))$. For compound functions, start on the inside and work to the outside. The inside is $n(6)$. According to the information in the question, $n(6) = 4$. Therefore $m(n(6)) = m(4)$. According to the information in the question, $m(4) = 6$. Therefore, $m(n(6)) = m(4) = 6$, so the correct answer is (C).

13. **C** The question asks for the average speed in kilometers per minute, so determine distance and time in kilometers and minutes, respectively. The circumference of Earth's equator is about 40,000, so this is the distance. Earth completes a rotation in one day, which is 24 hours. However, the question asks for minutes, so convert hours to minutes with the proportion $\frac{1 \text{ hour}}{60 \text{ min}} = \frac{24 \text{ hours}}{x \text{ min}}$. Cross-multiply to get x = 1,440. To determine speed, divide distance by time to get $\frac{40{,}000 \text{ km}}{1{,}440 \text{ min}} \approx 28$. The correct answer is (C).

14. **B** The theater owner is trying to determine whether local residents would prefer to see operas or symphonies by surveying people at a mall on a Sunday. Go through each choice and determine which one describes the cause of a flaw in the theater owner's methodology. Choice (A) is the size of the sample. While it's possible that this sample size is too small, there is no information about the area's population to determine whether this is a sufficiently or insufficiently large sample. Eliminate (A). Choice (B) is the location in which the survey was given. The location causes a flaw, because it creates a bias toward people who are likely to visit a shopping mall. Keep (B). Choice (C) is the population of the area. There is no information about the population of the area, so it is impossible to determine whether this creates a problem. Eliminate (C). Choice (D) is the residents who declined to respond. There is no reason to think that this significantly hurts sample size or creates a bias. Eliminate (D). The correct answer is (B).

15. **B** The question asks for the year the population is projected to reach 5,000. Population is expressed by the vertical axis, so find 5,000 on that axis. Trace the line across the graph until reaching the line of best fit. Then, follow downward until reaching the horizontal axis somewhere between 2020 and 2025. The only choice between these two is (B).

16. **B** The half-life of the unknown element is approximately 25% less than that of carbon-14. Take 25% of the half-life of carbon-14, which is $\frac{25}{100} \times 5{,}730 = 1{,}432.50$. Since it's 25% *less*, subtract this number from 5,730 to get 5,730 – 1432.50 = 4,297.50, which is closest to (B).

17. **D** The question states that the mean salary of the employees is $80,000 and the median salary is $45,000. The mean refers to the average (the sum of the salaries divided by the number of employees), and the median refers to the middle salary when listed in order. If the median is $45,000, there must be an equal number of employees with salaries greater than $45,000 and less than $45,000. If the average is greater than the median, it must mean that the salaries at the top half have a greater effect on the average and the ones at the bottom half, which would happen if a few employees had significantly higher salaries. This is (D). Alternatively, come up with a simple example that describes the situation. For example, there could be three employees with salaries $20,000, $45,000, and $175,000. The median is $45,000 and the mean is $80,000. Go through the choices and eliminate any choice that doesn't describe this situation. Choice (A) says that many employees' salaries are between $45,000 and $80,000. In this case, there are no salaries between $45,000 and $80,000. Eliminate (A). Choice (B) says the employees' salaries are close to each other. In this case, the salaries are far apart from each other. Eliminate (B). Choices (C) and (D) are opposites. Choice (C) says a few salaries are much lower than the rest and (D) says a few salaries are much higher than the rest. In this example, the low salary is much closer to the median than the high salary, so eliminate (C) and pick (D).

18. **C** The question asks for probability, which is $\frac{want}{total}$. The question says *an accepted student* is chosen, so the *total* is the number of accepted students, which is 15,700 + 9,300 = 25,000. The question asks for the probability that *the student did not complete an interview*, so this number represents the *want*. Make sure to only count the students who did not complete an interview and were accepted, which is 9,300. Therefore, the probability is $\frac{want}{total} = \frac{9{,}300}{25{,}000} = \frac{93}{250}$, which is (C).

19. **C** Plug In. Let $d = 400$ and $k = 390$. Plug these values into the answer choices to see which answer works. Choice (A) becomes $400 - 390 < 20$, which is true. Keep (A). Choice (B) becomes $400 + 390 < 20$. This isn't true, so eliminate (B). Choice (C) becomes $-20 < 400 - 390 < 20$. This is also true, so keep (C). Choice (D) becomes $-20 < 400 + 390 < 20$. Eliminate (D). Now plug in some different numbers to try to eliminate (A) or (C). Try $d = 390$ and $k = 400$. Choice (A) becomes $390 - 400 < 20$, and (C) becomes $-20 < 390 - 400 < 20$. Both of these are still true. When that happens, try plugging in some numbers that *don't* work—the correct answer will prove false and an incorrect answer may still be true. Try $d = 400$ and $k = 450$, which don't work because they are more than $20 apart. Choice (A) becomes $400 - 450 < 20$, which is still true, so eliminate it. Choice (C) is false for the numbers that don't work, so it is correct.

20. **A** The median is the middle number when all the numbers are listed in order. However, in this case, there are too many numbers to list them in order. Instead, think in terms of what the middle number would be. Half the numbers should be greater than the median and the other half of the numbers should be less than the median. Since the president polled 200 students each from the junior and senior classes, a total of 400 students were polled. Therefore, in this case, there should be 200 greater than and 200 less the median. Therefore, the median is the average of the 200th and 201st numbers. Find the 200th and 201st numbers in the ordered list. Start with the smallest numbers. In the combined junior and senior classes, there are 25 + 30 = 55 students who complete one hour of homework a night. The median must be greater than this. In the combined junior and senior classes, there are 80 + 70 = 150 students who complete two hours of homework. Therefore, there must be a total of 55 + 150 = 205 students with 1 or 2 hours. Since the tally is greater than 201, the 200th and 201st students must be part of the group of students who complete two hours of homework. Therefore, the average of the 200th and 201st (the median) must be 2. The correct answer is (A).

21. **A** The question asks how to compare the number of students who complete four hours of homework in the two classes. The number in the table for both classes is 35, which would seem to point to (D). However, these numbers do not represent the entirety of the two classes but rather a random sample of 200 from each class. Use proportions to determine the actual expected amounts. Since there are 600 students in the junior class, set up the proportion $\frac{35}{200} = \frac{x}{600}$. Cross-multiply to get $200x = 21{,}000$. Divide both sides by 200 to get $x = 105$ students in the junior class who complete four hours of homework per night. Since there are 400 students in the senior class, set up the proportion $\frac{35}{200} = \frac{x}{400}$. Cross-multiply to get $200x = 14{,}000$. Divide both sides by 200 to get $x = 70$ students in the senior class who complete four hours of homework per night. Therefore, the junior class has 105 – 70 = 35 more students who complete four hours of homework than does the senior class. The correct answer is (A).

22. **B** The equation of a circle is $(x - h)^2 + (y - k)^2 = r^2$, where r stands for radius. Start by reordering the equation to get $x^2 - 6x + y^2 + 8y = -9$. To solve for the radius, it is necessary to complete the squares. Remember what gets added to one side of the equation must be added to the other: $(x^2 - 6x + 9) + (y^2 + 8y + 16) = -9 + 9 + 16$. Therefore, $r^2 = -9 + 9 + 16 = 16$, and $r = 4$, which is (B).

23. **D** Solve the equation for d^2. First multiply both sides of the equation by d^2 to get $Gd^2 = ab$. Then divide by G to get $d^2 = \frac{ab}{G}$. Therefore, (D) is correct.

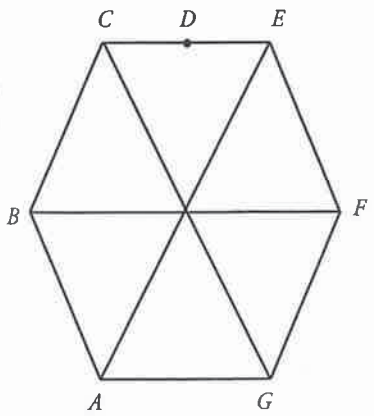
24. **D** Start by plugging in the same mass for k, m, a, and b. Let $k = m = a = b = 2$. The gravitational force between k and m is 9 times the force between a and b, so plug in $G_{km} = 81$ and $G_{ab} = 9$. Square numbers will work well here, since the distance is squared in the formula. Use these values in the formula to find the distance between the given objects. The gravitational force for k and m becomes $81 = \frac{(2)(2)}{(d_{km})^2}$, so $81(d_{km})^2 = 4$, and $(d_{km})^2 = \frac{4}{81}$. Take the square root of both sides to get $d_{km} = \frac{2}{9}$. Follow the same steps to find the gravitational force for a and b: $9 = \frac{(2)(2)}{(d_{ab})^2}$, then $9(d_{ab})^2 = 4$, so $(d_{ab})^2 = \frac{4}{9}$, and $d_{ab} = \frac{2}{3}$. Now make the fraction: $\frac{d_{km}}{d_{ab}} = \frac{\frac{2}{9}}{\frac{2}{3}} = \frac{2}{9} \times \frac{3}{2} = \frac{1}{3}$, which is (D).

25. **C** Remember that $f(x)$ or $g(x) = y$. The graph shows that when the x-value is –3, the y-value is 2. Therefore, Statement (I) is true. Eliminate (A). The graph shows that when the x-value is 2, the y-value is 2. Therefore, Statement (II) is false. Eliminate (B) and (D). The correct answer is therefore (C).

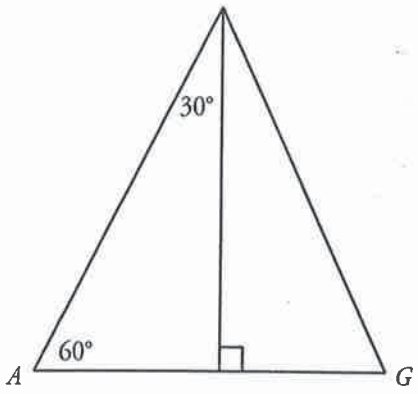
26. **B** Use Process of Elimination. The graph of the athlete who only jogs is linear, which is to say the rate of change is consistent throughout time, while the rate of change for the athlete who alternates running/walking is represented by a curve—it flattens out during minutes 3 and 4. Based on this, eliminate (C) and (D) since the rate of change is not consistent for the running/walking athlete. Eliminate (A) because the rate of change is greater for the athlete who jogs during minutes 3 and 4. The correct answer is therefore (B).

27. **B** Plug in values for s and t that make the statement $t - s = 0$ true, such as $t = 5$ and $s = 5$. Therefore, the points (0, 5) and (5, 0) are on the line. The answers all refer to the slope of the line, so plug these points into the slope formula: $\frac{y_2 - y_1}{x_2 - x_1}$. This becomes $\frac{0-5}{5-0} = \frac{-5}{5} = -1$, making (B) the correct answer.

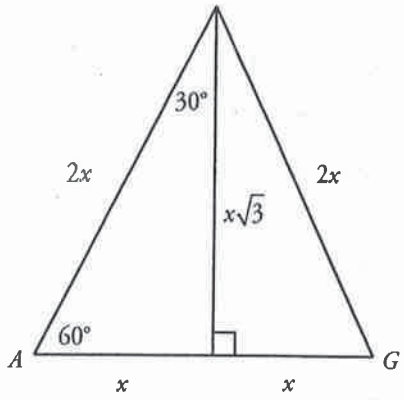
28. **C** Rather than trying to remember the formula for the area of a hexagon, ignore triangle ADG for now and divide the hexagon up into triangles, like this:



Because the hexagon is a regular one, each of these six triangles is the same. The area of each triangle is $\frac{1}{6}$ of the hexagon, or $144\sqrt{3}$. Each internal angle in a regular hexagon is 120°, so each triangle is equilateral. Use this information to find the length of a side of the hexagon. Isolate one triangle to work with, and divide it in half to form two 30°-60°-90° triangles.

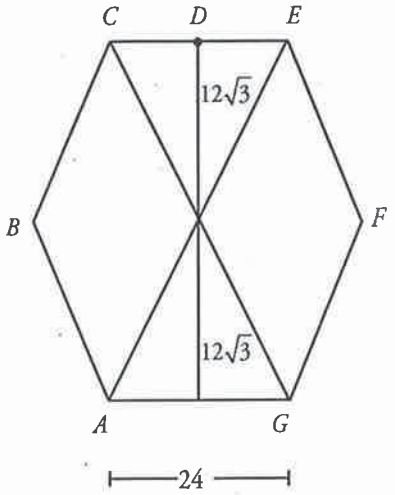


To more easily use the relationships of the 30°-60°-90° triangle's sides, label $\overline{AG}$ as $2x$, so the height of the equilateral triangle is $x\sqrt{3}$.



The area of a triangle is $A = \frac{1}{2}bh$, so plug the information into the formula to get $144\sqrt{3} = \frac{1}{2}(2x)\left(x\sqrt{3}\right)$. Simplify the right side to get $144\sqrt{3} = x^2\sqrt{3}$, then divide both sides by $\sqrt{3}$ to get $144 = x^2$. This means that $x = 12$, and $\overline{AG} = 2x = 24$. This is the base of triangle ADG. To find the height, go back to the hexagon divided into equilateral triangles. The height of each equilateral triangle is $x\sqrt{3}$ or $12\sqrt{3}$, and the height of triangle ADG is equal to 2 of these heights, or $24\sqrt{3}$.

3



Plug these values into the area formula to get $A = \frac{1}{2}(24)\left(24\sqrt{3}\right) = 288\sqrt{3}$, which is (C). Another way to approach this question is to ballpark—the area of triangle ADG is about one-third of the area of the hexagon. Dividing $864\sqrt{3}$ by 3 results in $288\sqrt{3}$, which is—not just approximately—(C).

29. **A** Start by using Process of Elimination. The diagram shows that line l has a negative slope and a negative y-intercept. All the answers have lines with negative slopes, but only (A) and (D) have negative y-intercepts. Eliminate (B) and (C). Since line l is tangent to the circle at point A, line l is perpendicular to the line containing $\overline{AC}$. Perpendicular lines have slopes that are opposite reciprocals, so find the slope of $\overline{AC}$. The slope formula is $\frac{y_2 - y_1}{x_2 - x_1}$, which becomes $\frac{7-(-1)}{3-(-1)} = \frac{8}{4} = 2$ for $\overline{AC}$. Therefore, the slope of line l is $-\frac{1}{2}$, so (A) is the answer.

30. **A** The solutions to a system of equations are the points the equations share. The line $y = -2$ is the straightforward equation, so y must be -2 in the other equation. Plug the values given in each answer choice for r and s, along with -2 for y, into the first equation, and solve for x. The answer that yields two real solutions for x will be the correct answer. Choice (A) becomes $-2 = -2x^2 - 1$. Add 1 to both sides to get $-1 = -2x^2$. Divide both sides by -2 to get $\frac{1}{2} = x^2$. Take the square root of both sides of the equation to get $\pm\sqrt{\frac{1}{2}} = x$. Therefore, (A) has two real solutions: $\left(-\sqrt{\frac{1}{2}}, -2\right)$ and $\left(\sqrt{\frac{1}{2}}, -2\right)$, so (A) is the correct answer.

31. **9** There are 60 minutes in an hour. To convert minutes into hours, divide the number of minutes by 60. $\frac{560}{60} = 9.\overline{3}$ or nine and one-third hours. Therefore, 560 minutes is equal to 9 hours and 20 minutes, and $z = 9$.

32. **15** The rate of decrease is 0.4 inches per year. Set up a proportion: $\frac{0.4 \text{ inches}}{1 \text{ year}} = \frac{6 \text{ inches}}{x}$. Cross-multiply to get $6 = 0.4x$, then divide by 0.4 to get $x = 15$ years. Therefore, it will take 15 years for the average annual snowfall to be 6 inches less than it is now.

33. **12** Dave incurred the initial fine at week 0. Plug 0 for w into the equation to get $C = 12 - 1.5(0)$. Solve for C to get $C = 12 - 0 = 12$.

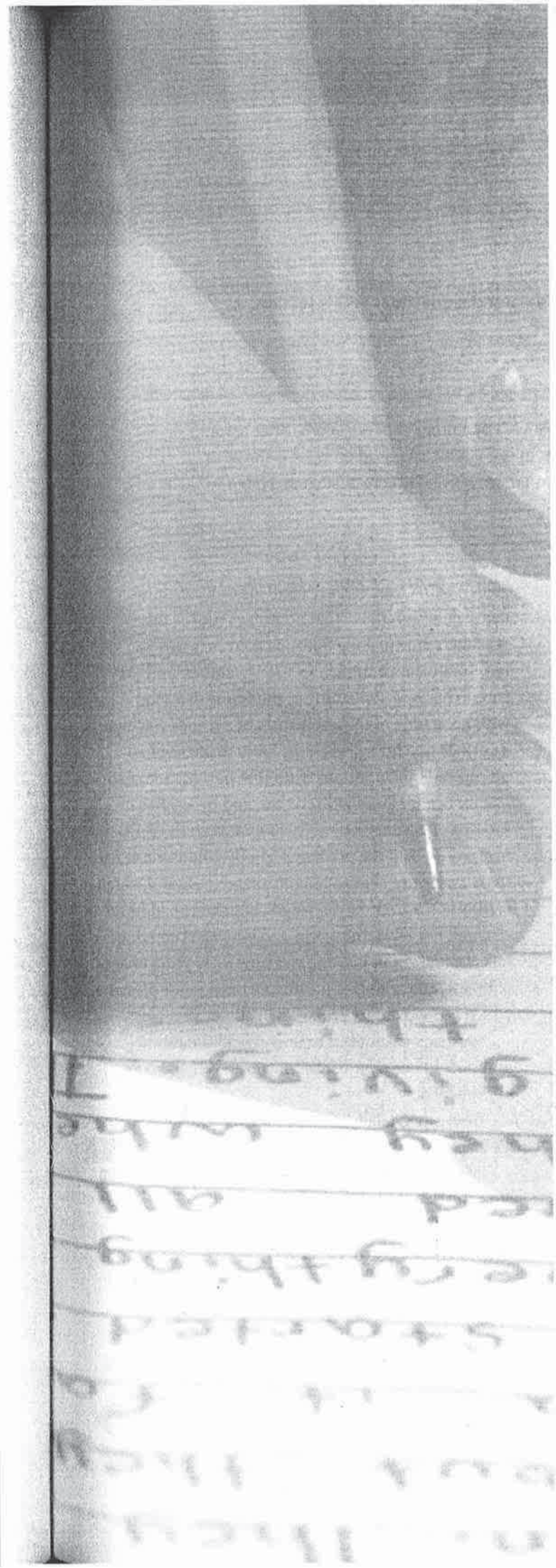
34. **12** Plug (4, –2) into the function to get $-2 = 2(4)^2 - k(4) + 14$. Simplify the equation to get $-2 = 32 - 4k + 14$, and $-2 = 46 - 4k$. Solve for k to get $-48 = -4k$, and $k = 12$.

35. **60** Because the angle COA faces two of the five sides of the pentagon, angle COA is $\frac{2}{5}$ of the circle. The length of the arc made by this angle is 24, so set up an equation: $24 = \frac{2}{5} \times circumference$. Multiply both sides by $\frac{5}{2}$ to get $circumference = 60$.

36. **575** Let b represent the number of calories in the breakfast sandwich and f represent the number of calories in the fried potatoes. The information in the question can then be translated into the following equations: $b + f = 910$ and $b = f + 240$. Solve the second equation for f to get $f = b - 240$. Plug this value for f into the first equation to get $b + b - 240 = 910$. Solve for b to get $2b - 240 = 910$, $2b = 1{,}150$, and $b = 575$.

37. **7,000** According to the question, $P_t = 4{,}200$ and $P_{t+1} = 4{,}704$. Plug these values into the equation to get $4{,}704 = 4{,}200 + 0.3(4{,}200)\left(1 - \frac{4{,}200}{C}\right)$. Simplify the right side of the equation to get $4{,}704 = 4{,}200 + 1{,}260\left(1 - \frac{4{,}200}{C}\right)$. Subtract 4,200 from both sides of the equation to get $504 = 1{,}260\left(1 - \frac{4{,}200}{C}\right)$. Divide the equation by 1,260 to get $0.4 = 1 - \frac{4{,}200}{C}$. Solve for C to get $-0.6 = -\frac{4{,}200}{C}$, $-0.6C = -4{,}200$, and $C = 7{,}000$.

38. **5,741** According to the question, $C = 10{,}500$ and $P_t = 4{,}200$. Therefore, $P_{t+1} = 4{,}200 + 0.3(4{,}200)\left(1 - \frac{4{,}200}{10{,}500}\right)$. Solve the equation to get $P_{t+1} = 4{,}200 + 1{,}260(1 - 0.4) = 4{,}200 + 756 = 4{,}956$. That's the deer population after one year, but the question asks for the population after two years, so do it again. Plug 4,956 into the equation as the new P_t to get the deer population two years from now: $P_{t+1} = 4{,}956 + 0.3(4{,}956)\left(1 - \frac{4{,}956}{10{,}500}\right)$. Solve the equation to get $P_{t+1} = 4{,}956 + 1{,}486.8(1 - 0.472) = 4{,}956 + 785.03 \approx 5{,}741$. Only round at the last step to make sure the answer is as accurate as possible.



Chapter 7
Practice Test 3

Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

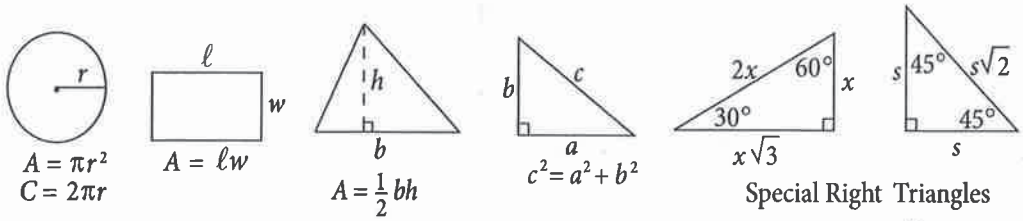
DIRECTIONS

For questions **1-15**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **16-20**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



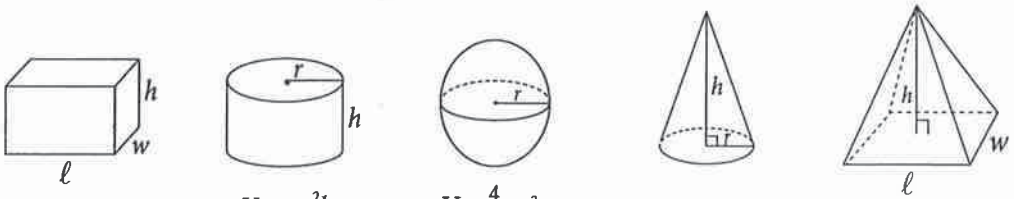
$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

$A = \frac{1}{2}bh$

$c^2 = a^2 + b^2$

Special Right Triangles



$V = \ell wh$

$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

If $4s = 28$, what is the value of $8s + 13$?

A) 7

B) 56

C) 69

D) 84

2

Which of the following is equal to $b^{\frac{3}{4}}$, for all values of b ?

A) $\sqrt[4]{b^3}$

B) $\sqrt[4]{b^{\frac{1}{3}}}$

C) $\sqrt[4]{b^{\frac{1}{4}}}$

D) $\sqrt[4]{b^4}$

3

A landscaper will sod p plots of land with the same dimensions with a particular type of grass. The landscaper charges based on the equation $Cost = pGlw$, where p is the number of plots, G is a constant in dollars per square meter, l is the length of a plot in meters, and w is the width of a plot in meters. If the customers asks the landscaper to use a cheaper type of grass for sodding, the value of which of the following would change?

A) p

B) G

C) l

D) w

4

$$3x + 2y = -21$$

$$5x + 6y = -35$$

If (x, y) is a solution to the system of equations above, what is $x + y$?

A) −14

B) −7

C) 14

D) 56

CONTINUE

5

The number of countries that were members of the European Union in 2008 was three times the number of countries in the European Union in 1974. If the European Union had 27 members in 2008 and m members in 1974, which of the following equations is true?

A) $m + 27 = 3$

B) $\frac{m}{3} = 27$

C) $3m = 27$

D) $27m = 3$

6

If $\frac{7}{y} = \frac{17}{y + 30}$, what is the value of $\frac{y}{7}$?

A) $\frac{1}{3}$

B) 3

C) 7

D) 21

7

$$cx - 6y = 8$$

$$3x - 7y = 5$$

In the system of equations shown above, c is a constant and x and y are variables. For what value of c will the system of equations have no solution?

A) $\frac{24}{5}$

B) $\frac{18}{7}$

C) $-\frac{18}{7}$

D) $-\frac{24}{5}$

8

x	$g(x)$
0	2
1	5
3	−1
7	0

The function g is defined by a polynomial. Some of the values of x and $g(x)$ are shown in the table above. Which of the following must be a factor of $g(x)$?

A) $x - 1$

B) $x - 2$

C) $x - 3$

D) $x - 7$

CONTINUE

9

The line $y = cx + 6$, where c is constant, is graphed in the xy-plane. If the point (r, s) lies on the line, where $r \neq 0$ and $s \neq 0$, which is the slope of the line in terms of r and s?

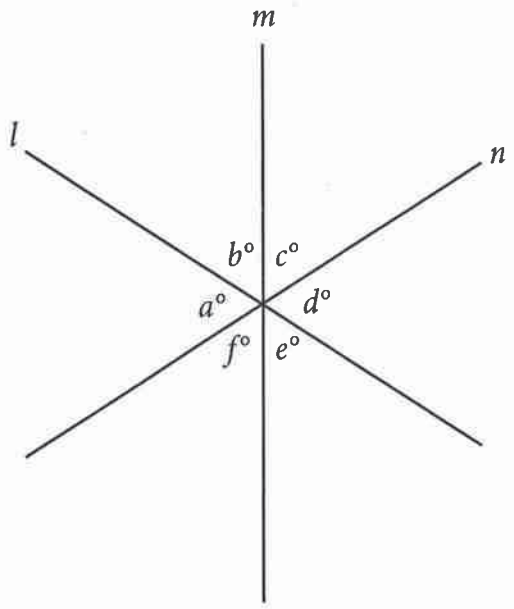
A) $\frac{r-6}{s}$

B) $\frac{6-s}{r}$

C) $\frac{6-r}{s}$

D) $\frac{s-6}{r}$

10



Note: Figure not drawn to scale.

In the figure above, lines l, m, and n intersect at a single point. If $a + b = c + d$, which of the following must be true?

I. $b = c$

II. $e = f$

III. $a = e$

A) I and II only

B) II and III only

C) I and III only

D) I, II, and III

CONTINUE

11

$$y = k(x - 4)(x + 12)$$

In the quadratic equation above, k is a constant such that $k \neq 0$. When the equation is graphed in the xy-plane, the graph is a parabola with vertex (m, n). Which of the following is equal to n ?

A) $-24k$

B) $-36k$

C) $-48k$

D) $-64k$

12

In the xy-plane, a parabola defined by the equation $y = (x - 8)^2$ intersects the line defined by the equation $y = 36$ at two points, P and Q. What is the length of $\overline{PQ}$?

A) 8

B) 10

C) 12

D) 14

13

$$F(C) = \frac{9}{5}C + 32$$

The function above describes the relationship between temperatures measured in degrees Fahrenheit, F, and in degrees Celsius, C. Based on the function, which of the following must be true?

I. A temperature decrease of 1.8 degrees Celsius is equivalent to a temperature decrease of 1 degree Fahrenheit.

II. A temperature decrease of 1 degree Celsius is equivalent to a temperature decrease of $\frac{9}{5}$ degrees Fahrenheit.

III. A temperature decrease of $\frac{5}{9}$ degrees Fahrenheit is equivalent to a temperature decrease of 1 degree Celsius.

A) I only

B) II only

C) II and III only

D) I, II, and III

CONTINUE

14

$$\frac{80x^2 + 84x - 13}{kx - 4} = -16x - 4 - \frac{29}{kx - 4}$$

The equation above is true for all $x \neq \frac{4}{k}$, where k is a constant. What is the value of k ?

A) -5

B) -2

C) 2

D) 5

15

What are the solutions to $5x^2 + 30x + 15 = 0$?

A) $x = -2 \pm 2\sqrt{6}$

B) $x = -2 \pm \sqrt{6}$

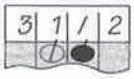
C) $x = -3 \pm \frac{\sqrt{60}}{10}$

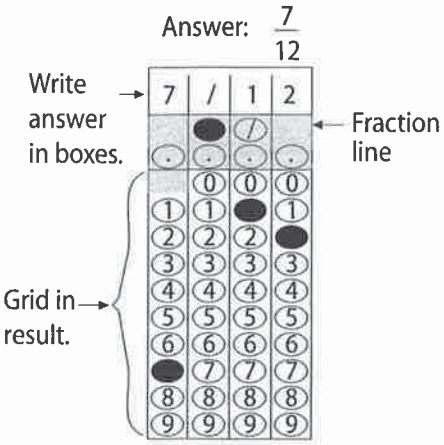
D) $x = -3 \pm \sqrt{6}$

CONTINUE

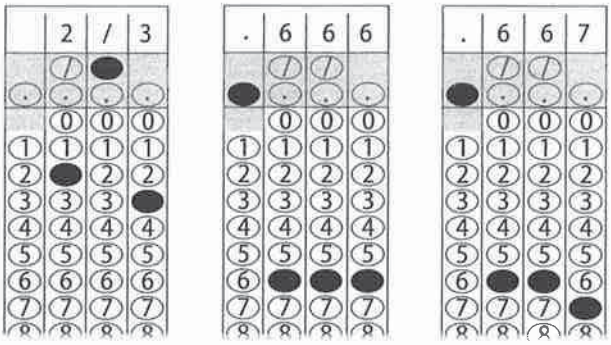
DIRECTIONS

For questions 16-20, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

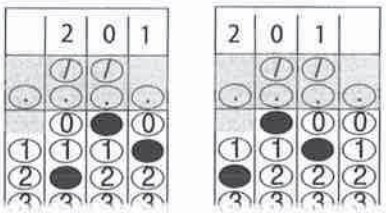
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.



Acceptable ways to grid $\frac{2}{3}$ are:



Answer: 201 – either position is correct



NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

16

If $\frac{21}{25}z - \frac{16}{25}z = \frac{1}{2} + \frac{3}{10}$, what is the value of z?

17

$$y^3(y^2 - 10) = -9y$$

If $y > 0$, what is one possible solution to the equation above?

18

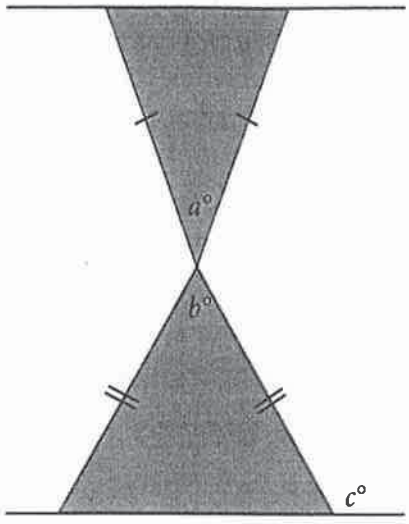
At a music school, each long session lasts twenty minutes longer than each short session. If 3 long sessions and 4 short sessions last a total of 270 minutes, how many minutes does a long session last?

19

In triangle UVW, the measure of $\angle U$ is 90°, $WV = 39$, and $UV = 36$. Triangle XYZ is similar to triangle UVW, where $\angle X$, $\angle Y$, and $\angle Z$ correspond to $\angle U$, $\angle V$, and $\angle W$, respectively. If each side of triangle XYZ is $\frac{3}{5}$ the length of its corresponding side of triangle UVW, what is the value of $\cos Z$?

CONTINUE

20



Note: Figure not drawn to scale.

Two isosceles triangles are shown above. If $b = 180 - 4a$ and $a = 35$, what is the value of c?

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section in the test.

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

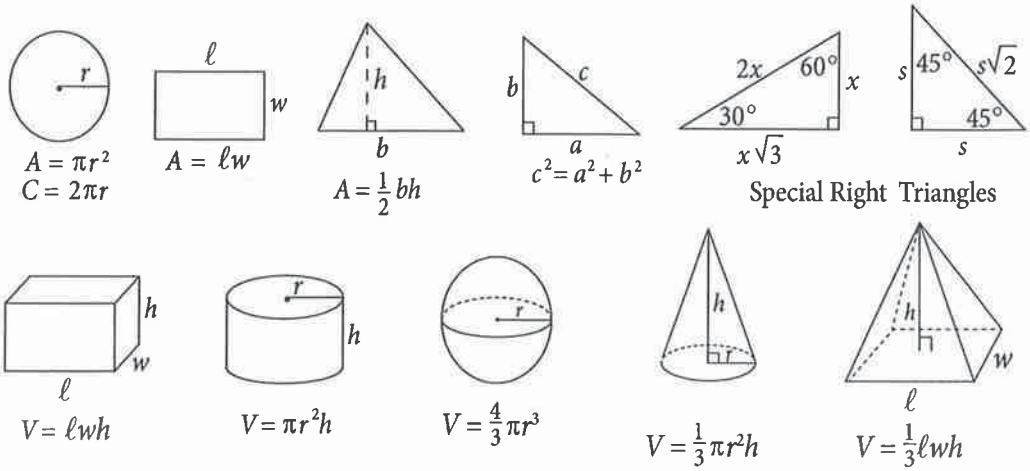
DIRECTIONS

For questions **1-30**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **31-38**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

Species	Eye color		Total
	Yellow	Brown	
Grey wolf	16	2	18
Coyote	7	5	12
Total	23	7	30

The table above shows the distribution by species and eye color for the 30 canids living in a nature conservancy. If one canid is selected at random, what is the probability that it will be either a grey wolf with yellow eyes or a coyote with brown eyes?

A) $\frac{11}{30}$

B) $\frac{17}{30}$

C) $\frac{21}{30}$

D) $\frac{23}{30}$

2

The graph below shows U.S. military spending, in billions of dollars, each year from 1992 through 2006.

Based on the graph, which of the following best describes the overall trend in U.S. military spending from 1992 through 2006 ?

A) Spending generally decreased in every year since 1992.

B) Spending generally increased in every year since 1992.

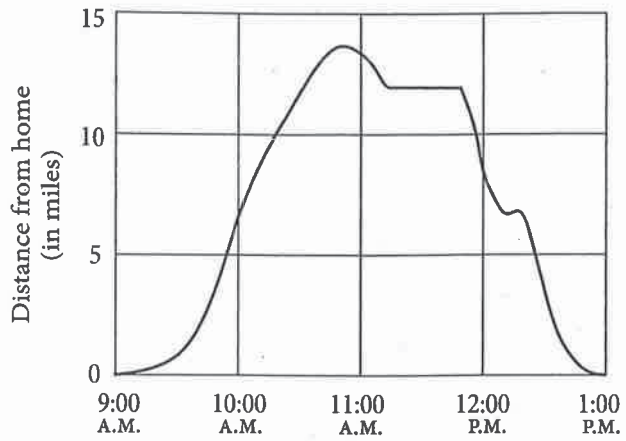
C) Spending generally remained constant in every year from 1992 through 2006.

D) Spending decreased until 1996 and increased after 2001.

CONTINUE

3

Eddie's Bike Ride



The graph above represents Eddie's distance from home during a 4-hour bike ride. He stopped for 40 minutes during his bike ride to repair a flat tire. According to the graph, which of the following is nearest to the time he finished repairing his flat tire and continued on his ride?

A) 11:10 A.M.

B) 11:50 A.M.

C) 12:10 P.M.

D) 12:50 P.M.

4

At the Acme automobile factory, approximately 4 percent of male employees and 6 percent of female employees received performance bonuses last month. If there were 648 male employees and 519 female employees at the Acme automobile factory last month, which of the following is closest to the total number of male and female employees at the Acme automobile factory who received performance bonuses last month?

A) 26

B) 31

C) 57

D) 113

5

What is the sum of the polynomials $4x^2 + 3x - 2$ and $2x^2 - 8x + 9$?

A) $6x^2 - 5x - 7$

B) $6x^2 - 5x + 7$

C) $6x^4 - 5x - 7$

D) $6x^4 - 5x + 7$

CONTINUE

6

k	1	2	3	4	5
$g(k)$	−3	1	5	9	13

The table above shows selected values of the linear function g. Which of the following best defines g?

A) $g(k) = k - 1$

B) $g(k) = 2k - 4$

C) $g(k) = 3k - 5$

D) $g(k) = 4k - 7$

7

The total annual rainfall, in inches, in Brown County from 2005 to 2015 can be modeled by the equation $y = -0.14x + 7.8$, where x is the number of years since 2005 and y is the total annual rainfall. Which of the following best describes the meaning of the number −0.14 in the equation?

A) The total annual rainfall in 2005

B) The total annual rainfall in 2015

C) The estimated difference between the total rainfall in 2005 and the total rainfall in 2015

D) The estimated decrease in the average rainfall per year from 2005 to 2015

8

An insect crawls 30 inches in 16.3 minutes. If the insect continues to crawl at the same rate, approximately how many inches will it crawl in 6 hours?

A) 200

B) 300

C) 650

D) 960

CONTINUE

9

$$\frac{8}{5}v = \frac{7}{4}$$

In the equation above, what is the value of v?

A) $\frac{56}{20}$

B) $\frac{35}{32}$

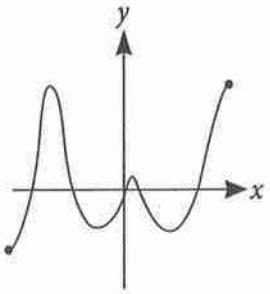
C) $\frac{32}{35}$

D) $\frac{20}{56}$

10

The function g has four distinct zeros. Which of the following could be the complete graph of g in the xy-plane?

A)



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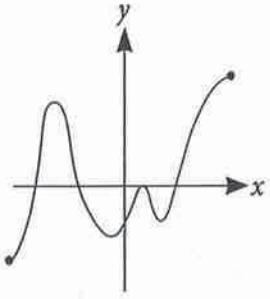

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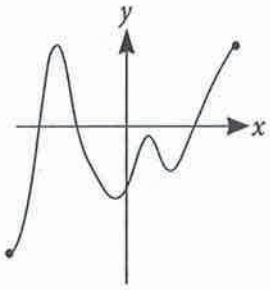

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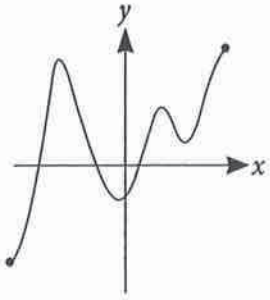


CONTINUE

Questions 11 and 12 refer to the following information.

Substance	Specific heat capacity $\left(\frac{J}{g}\right)$
Aluminum	0.90
Copper	0.39
Glass	0.67
Gold	0.13
Olive oil	1.79
Porcelain	1.08
Rubber	1.25
Water	4.18

The chart above gives approximations for the specific heat capacity, in joules per gram $\left(\frac{J}{g}\right)$, for eight common substances. The heat energy required to raise the temperature of a substance by 1° Celsius can be represented by the expression $Q = mC$, where Q is heat energy measured in joules (J), m is the mass of the substance measured in grams (g), and C is the specific heat capacity measured in $\frac{J}{g}$.

11

A piece of copper has a mass of 75 grams. How much heat energy, in joules, is needed to raise the temperature of the piece of copper by 1° Celsius?

A) 29.25

B) 50.25

C) 111.95

D) 192.30

12

A piece of porcelain requires 80 joules of heat energy to raise its temperature by 1° Celsius. If a piece of another substance with the same mass requires approximately 67 joules of heat energy to raise its temperature by 1° Celsius, the piece could be composed of which substance?

A) Aluminum

B) Glass

C) Olive oil

D) Rubber

CONTINUE

13

A medical study was conducted in order to determine whether product K could help people with hearing loss improve their hearing. The administrators of the study selected 200 subjects at random from a large group of people who had severe hearing loss. Half of the subjects were randomly assigned to be given product K and half were not. The resulting data demonstrated that subjects who were given product K had significantly improved hearing compared to those who were not given product K. Based on this study, which of the following conclusions is most appropriate?

A) Product K will enable all people who take it to significantly improve their hearing.

B) Product K is more effective than all other hearing-improvement products.

C) Product K will help people significantly improve their hearing.

D) Product K is likely to help people with severe hearing loss improve their hearing.

14

A car accelerates for t seconds at a constant rate of a meters per second squared $\left(\frac{\text{m}}{\text{s}^2}\right)$ until it reaches a velocity of v meters per second. The distance in meters the car travels is given by $d = vt - \frac{1}{2}at^2$. Which of the following gives a in terms of v, d, and t?

A) $a = 2\left(v - \frac{d}{t}\right)$

B) $a = 2\left(v + \frac{d}{t}\right)$

C) $a = 2\left(\frac{v}{t} - \frac{d}{t^2}\right)$

D) $a = 2\left(\frac{v}{t} + \frac{d}{t^2}\right)$

15

A certain type of ribbon costs \$0.15 per inch. Which of the equations below gives the total price, p, in dollars, for y yards of ribbon? (1 yard = 36 inches)

A) $p = 0.15y + 36$

B) $p = 0.15(36y)$

C) $p = \frac{0.15y}{36}$

D) $p = \frac{36y}{0.15}$

CONTINUE

Questions 16 and 17 refer to the following information.

$$C(q) = 60q + 300$$

$$R(q) = 75q$$

The cost of producing a product and the revenue earned from selling a product are functions of the number of units sold. The functions shown above are the estimated cost and revenue functions for a certain product. The function $C(q)$ gives the total cost, in dollars, of producing a quantity of q units of the product, and the function $R(q)$ gives the total revenue, in dollars, earned from selling a quantity of q units of the product.

16

How will the total cost of producing q units change if the quantity is decreased by 20 units?

A) The total cost will decrease by $1,200.

B) The total cost will decrease by $320.

C) The total cost will decrease by $20.

D) The total cost will increase by $1,200.

17

At what quantity will the cost of producing q units equal the revenue earned from selling q units?

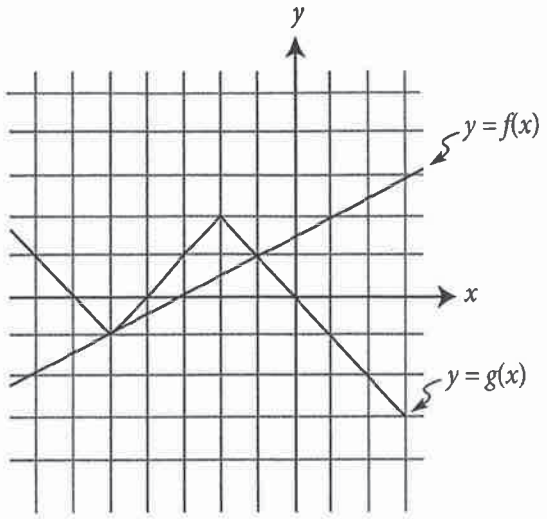
A) 2

B) 15

C) 20

D) 45

18



The figure above shows the graphs of the functions f and g in the xy-plane. For which of the following values of x is it true that $f(x) + g(x) = 1$?

A) −5

B) −4

C) −3

D) −2

19

Of the four types of depreciation shown below, which one would yield exponential decay in the value of an item?

A) The item loses 5% of its initial value in each successive year.

B) The item loses 6% of its current value in each successive year.

C) The value of the item decreases by $50 in each successive year.

D) The value of the item decreases by $60 in each successive year.

CONTINUE

20

A recipe for making lemonade states that one ounce of sugar is sufficient to make 30 imperial pints of lemonade. If an imperial pint is equivalent to $1\frac{1}{4}$ U.S. pints, approximately how many U.S. pints of lemonade can be made with 17 ounces of sugar?

A) 515

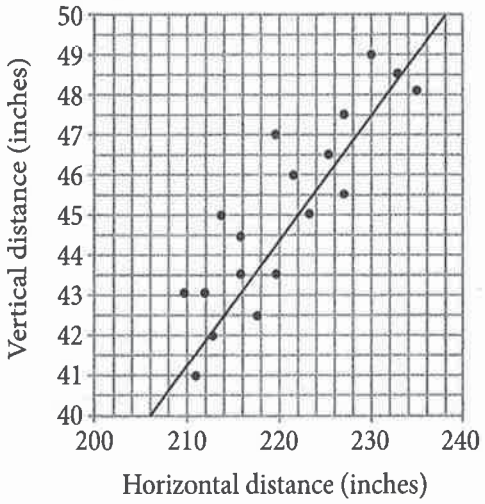
B) 640

C) 1,015

D) 1,280

21

Horizontal Distance versus Vertical Distance



For a physics experiment, Hussain made 18 long jumps, and his classmates recorded the results. The scatterplot above shows both the vertical and horizontal distance of each jump. A line of best fit for the data is also shown. For the jump with a horizontal distance of 230 inches, the vertical distance was approximately how many inches more than the distance predicted by the line of best fit?

A) 1.5

B) 3

C) 4.5

D) 6

CONTINUE

22

Mrs. Warren has b boxes of Girl Scout cookies that she wants to distribute to the members of her troop. If she gives each girl 4 boxes, she will have 11 boxes left over. If she wanted to give each student 5 boxes, she would need an additional 12 boxes. How many girls are in Mrs. Warren's Girl Scout troop?

A) 12

B) 23

C) 27

D) 32

23

When three numbers are added together, the result is 665. The largest number is one-third more than the sum of the other two numbers. What is the value of the largest number?

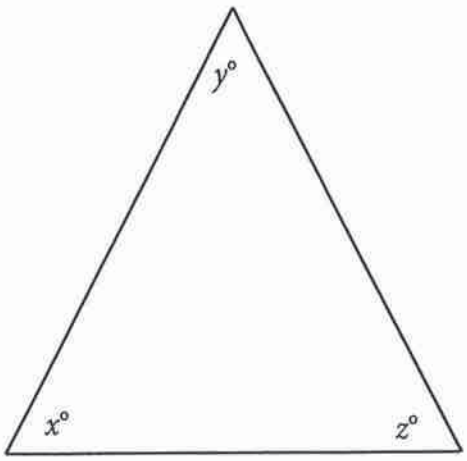
A) 95

B) 245

C) 350

D) 380

24



Note: Figure not drawn to scale.

In the triangle shown above, $\cos(x°) = \sin(z°)$. If $x = 3j - 19$ and $z = 5j - 15$, what is the value of j?

A) 8.5

B) 15.5

C) 34.5

D) 51.5

25

The length of a rectangle is decreased by 25 percent, and the width of the rectangle is increased by k percent. If the area of the rectangle increases by 5 percent, what is the value of k?

A) 25

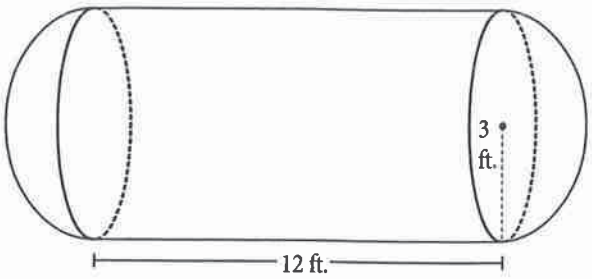
B) 30

C) 35

D) 40

CONTINUE

26



A space capsule is built from a right circular cylinder and two halves of a sphere with internal measurements as shown in the figure above. Which of the following is closest to the volume, in cubic feet, of the capsule?

A) 339.9

B) 396.3

C) 452.4

D) 565.6

27

The graph of line ℓ in the xy-plane passes through the origin and the points $(p, 4)$ and $(9, p)$. Which of the following is a possible value for p ?

A) -6

B) -3

C) 0

D) 12

28

	Decaffeinated	Caffeinated
Tea		
Coffee		
Total	28	116

The partially completed table above shows all the drinks that were sold on one day at a coffee shop. The shop sold 3 times as many cups of caffeinated tea as it did decaffeinated tea, and it sold 5 times as many cups of caffeinated coffee as it did decaffeinated coffee. If 28 cups of decaffeinated beverages and 116 cups of caffeinated beverages were sold, and one cup is selected at random out of all the caffeinated beverages that were sold, which of the following is closest to the probability that this cup contains coffee?

A) 0.508

B) 0.583

C) 0.672

D) 0.690

CONTINUE

29

$$4x + j = 7x - 9$$
$$4y + k = 7y - 9$$

In the system of equations shown above, j and k are constants, and j is k plus $\frac{3}{2}$. Which of the following must be true?

A) x is y minus $\frac{1}{2}$

B) x is y plus $\frac{1}{2}$

C) x is y minus $\frac{3}{2}$

D) x is y plus $\frac{9}{2}$

30

Banerji currently owns 6,500 baseball cards. He is gradually selling his collection and estimates that the number of cards he owns will decrease by 20 percent every 6 months. Which of the following expressions best models Banerji's estimate of the number of baseball cards he will own m months from now?

A) $6{,}500(0.2)^{\frac{m}{6}}$

B) $6{,}500(0.2)^{6m}$

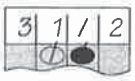
C) $6{,}500(0.8)^{\frac{m}{6}}$

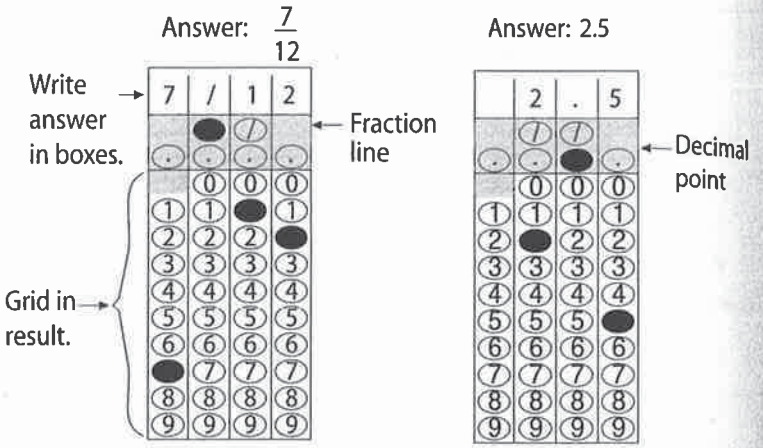
D) $6{,}500(0.8)^{6m}$

CONTINUE

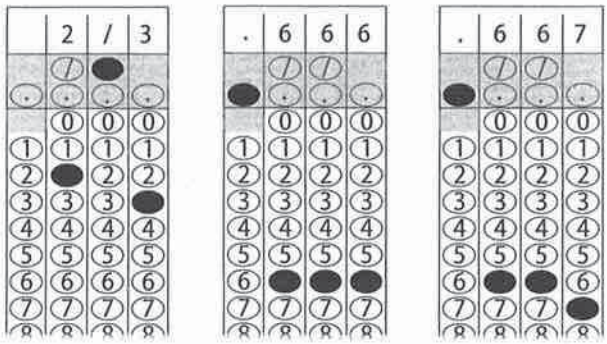
DIRECTIONS

For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

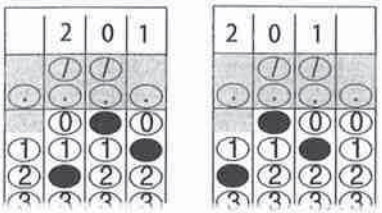
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.



Acceptable ways to grid $\frac{2}{3}$ are:



Answer: 201 – either position is correct



NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

31

If the expression $(6x^2 - 7x + 5) - 3(x^2 - 5x + 4)$ is written in the form $ax^2 + bx + c$, what is the value of a?

32

At a grocery store, potatoes are \$0.30 each, and onions are \$0.50 each. If Emeril plans to spend at least \$2.00 but no more than \$2.50 on p potatoes and 1 onion, what is one possible value for p?

33

Height of 12 infants in Mrs. Graham's daycare program

Student	Height	Student	Height
Angela	25	Letitia	22
Benjamin	22	Moishe	26
Charles	23	Nancy	30
Denise	27	Sasha	21
Elaine	24	Tormund	27
Johanna	30	Walter	25

The table above shows the heights, in inches, of 12 infants between the ages of 3 months and 6 months. According to the table, what is the mean height, in inches, of these infants? (Round your answer to the nearest tenth.)

34

In a certain course, students take 8 exams that are graded on a scale from 0 to 100, inclusive. Jacob received an average score of 65 on his first 4 exams. What is the lowest score he can receive on his 5th exam and still be able to score an average of 75 for all 8 exams?

CONTINUE

35

$$y \leq 20x + 3{,}500$$

$$y \leq -8x$$

The graph in the xy-plane of the solution set of the system of inequalities above contains the point (j, k). What is the greatest possible value of k?

36

In the circle centered at P, the measure of central angle QPR is $\frac{7\pi}{6}$ radians. The length of the arc defined by central angle QPR is what fraction of the circumference of the circle?

Questions 37 and 38 refer to the following information.

According to a well-known statistics theorem, if patients enter a medical clinic at a rate of m patients per minute and each stays at the clinic an average of W minutes, the average number of patients, L, in the clinic at any point in time is given by $L = mW$.

The manager of the Kind Care clinic estimates that when the clinic is open, an average of 4 patients per minute enter the clinic and that on average, each of them stays 45 minutes. The manager uses the above theorem to estimate that at any point in time, there are 180 patients in the clinic.

37

A rival clinic, the Speedy Care clinic, recently opened across the street. The manager of this clinic estimates that, when the clinic is open, an average of 324 patients per hour enter the clinic and that, on average, each of them stays 40 minutes. The average number of patients in the Speedy Care clinic at any point in time is what percent greater than the average number of patients in the Kind Care clinic at any point in time? (Note: Disregard the percent sign when gridding in your answer. For example, if your answer is 38.4%, enter 38.4)

CONTINUE

38

The theorem above may be applied to any part of the clinic, such as the waiting room or a particular office. The manager observes that, when the clinic is open, approximately 36 patients per hour are being treated by a doctor, and that each of these patients spends an average of 15 minutes with his or her doctor. At any time when the clinic is open, approximately how many patients, on average, are being treated by a doctor at the Kind Care clinic?

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section in the test.

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Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

1.
YOUR NAME: _____ (Print) Last First M.I.
SIGNATURE: _____ DATE: / /
HOME ADDRESS: _____ (Print) Number and Street
City State Zip Code
PHONE NO.: _____ (Print)

IMPORTANT: Please fill in these boxes exactly as shown on the back cover of your test book.

2. TEST FORM

3. TEST CODE

4. REGISTRATION NUMBER

6. DATE OF BIRTH

Month	Day		Year	
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○ FEB	0	0	0	0
○ MAR	1	1	1	1
○ APR	2	2	2	2
○ MAY	3	3	3	3
○ JUN		4	4	4
○ JUL		5	5	5
○ AUG		6	6	6
○ SEP		7	7	7
○ OCT		8	8	8
○ NOV		9	9	9
○ DEC				

7. SEX
○ MALE
○ FEMALE

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5. YOUR NAME
First 4 letters of last name | FIRST INIT | MID INIT

Test 3 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 1—Reading

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Section 2—Writing and Language Skills

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The Princeton Review

Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

Test 3 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 3—Mathematics: No Calculator

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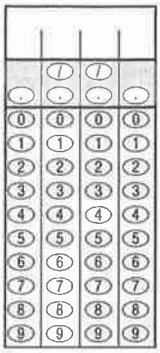
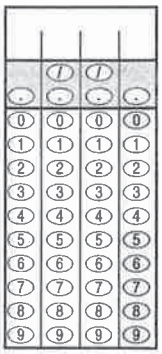
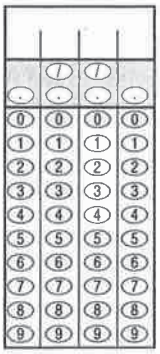
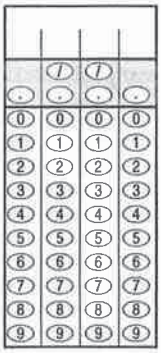
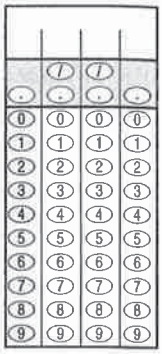
16. 
17. 
18. 
19. 
20. 

Section 4—Mathematics: Calculator

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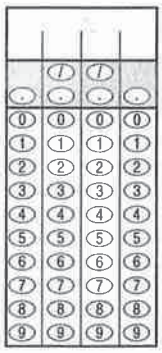
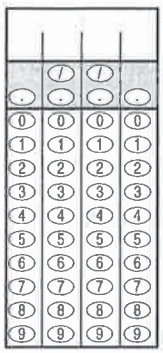
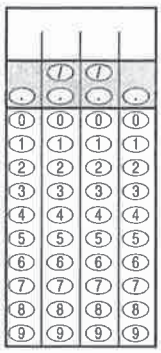
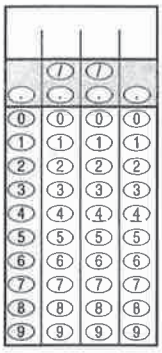
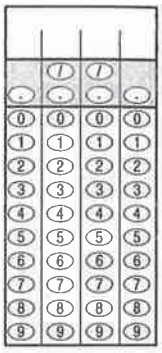
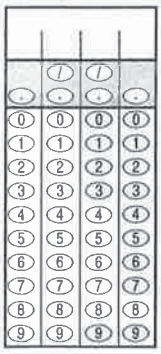
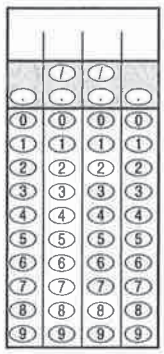
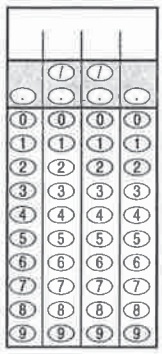
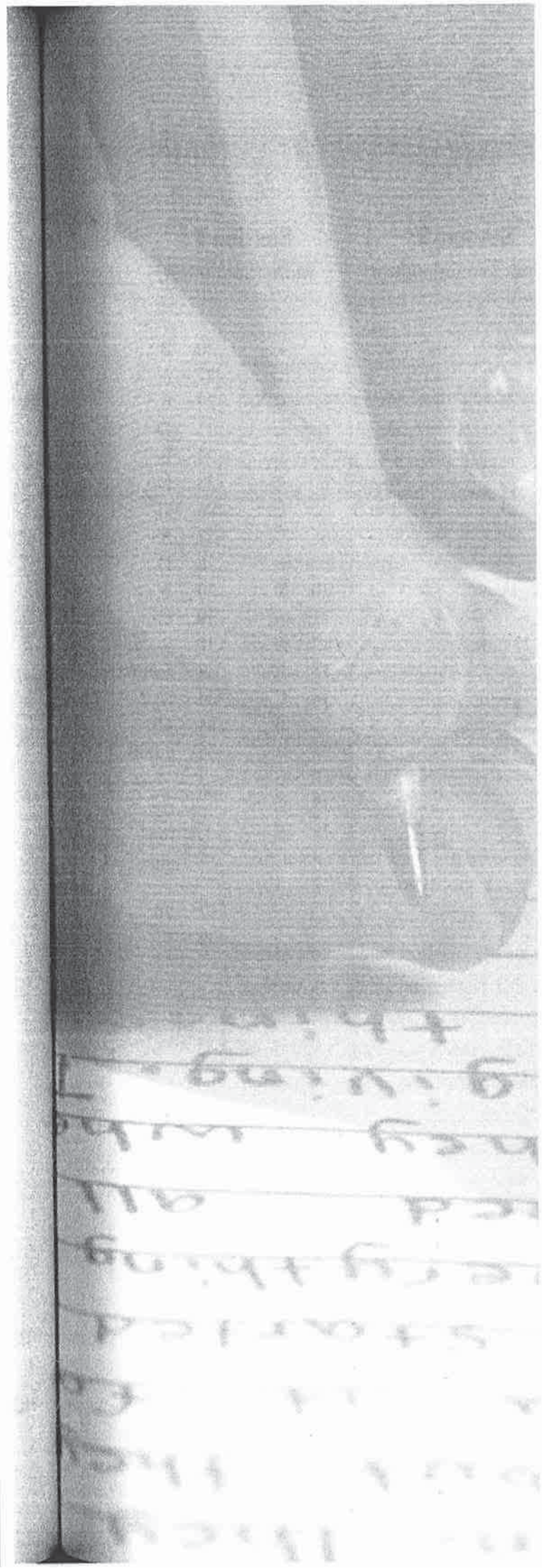
31. 
32. 
33. 
34. 
35. 
36. 
37. 
38. 



Chapter 8 Practice Test 3: Answers and Explanations

Section 3: Math (No Calculator)

1. C
2. A
3. B
4. B
5. C
6. B
7. B
8. D
9. D
10. A
11. D
12. C
13. B
14. A
15. D
16. 4
17. 1 or 3
18. 50
19. $\frac{5}{13}$
20. 110

Section 4: Math (Calculator)

1. C
2. D
3. B
4. C
5. B
6. D
7. D
8. C
9. B
10. B
11. A
12. A
13. D
14. C
15. B
16. A
17. C
18. C
19. B
20. B
21. A
22. B
23. D
24. B
25. D
26. C
27. A
28. D
29. B
30. C
31. 3
32. 5 or 6
33. 25.2
34. 40
35. 1,000
36. $\frac{7}{12}$ or .583
37. 20
38. 9

bles, please turn to page 565.

Section 3: Math (No Calculator)

1. **C** The question asks for the value of $8s + 13$, so determine the value of s. Since $4s = 28$, divide both sides by 4 to get $s = 7$. Therefore, $8s + 13 = 8(7) + 13 = 56 + 13 = 69$. Alternatively, since $4s = 28$, $8s = 2(4s) = 2(28) = 56$. Therefore, $8s + 13 = 56 + 13 = 69$. Using either method, the answer is (C).

2. **A** The question asks which choice is equal to $b^{\frac{3}{4}}$. By rule, fractional exponents express roots. Let the denominator of the fraction equal the root taken. Since the denominator is 4, take the 4th root. The numerator of the fraction remains as the exponent. Therefore, $b^{\frac{3}{4}} = \sqrt[4]{b^3}$, which is (A).

3. **B** The question asks for the value that will change if a cheaper type of grass is used. The only thing that has changed is that the customer has asked for a cheaper type of grass. A cheaper type of grass does not change the number of plots, the length of a plot, or the width of any plot, so the values p, l, and w do not change. Eliminate (A), (C), and (D). Only (B) remains. Alternatively, note that it is only the price that changes and the only value whose units involve dollars is G, so this must be the value that changes. The answer is (B).

4. **B** When there is a system of equations, stack and add or subtract the two equations to get an equation. The goal is to find an equation in which the coefficients on x and y are the same as in the expression the question asks for the value of. In this case, since the question asks for $x + y$, the coefficients on x and y should be equal. Stack and add the two equations to get $8x + 8y = -56$. Divide both sides by 8 to get $x + y = -7$. The answer is (B).

5. **C** The question says that the number of countries in the European Union in 2008 was three times the number of countries in 1974. Translate this into an equation. Since the question says that the European Union had 27 members in 2008, translate *the number of countries in the European Union in 2008* to 27. Translate *was* to =. Translate *three times* to 3( ), leaving room between the parentheses for whatever follows in the sentence. What follows is *the number of countries in the European Union in 1974*, which the question later says is m. Therefore the sentence translates to $27 = 3(m)$, or $3m = 27$, which is (C).

6. **B** The question asks for $\frac{y}{7}$, so solve for y. Since $\frac{7}{y} = \frac{17}{y + 30}$, cross-multiply to get $7(y + 30) = 17y$. Distribute the 7 to get $7y + 210 = 17y$. Subtract $7y$ from both sides to get $210 = 10y$. Divide both sides by 10 to get $21 = y$. Therefore, $\frac{y}{7} = \frac{21}{7} = 3$, which is (B).

7. **B** Since there are no exponents on x or y in either equation, the equations are linear. A system of linear equations has no solution if the two lines represented by the equations are parallel. Two lines are parallel when they have the same slope. To determine the slope of the lines, get each line in slope-intercept form: $y = mx + b$. Start with the second equation, $3x - 7y = 5$. Subtract

$3x$ from both sides to get $-7y = -3x + 5$. Divide both sides by -7 to get $y = \frac{3}{7}x - \frac{5}{7}$. In slope-intercept form, the slope is equal to m, so the slope of this line is $\frac{3}{7}$. Now get the slope of the other line, $cx - 6y = 8$. Subtract cx from both sides to get $-6y = -cx + 8$. Divide both sides by -6 to get $y = \frac{c}{6}x - \frac{8}{6}$, so the slope of this line is $\frac{c}{6}$. Since these two slopes have to be equal, set $\frac{3}{7} = \frac{c}{6}$. Cross-multiply to get $7c = 18$. Divide both sides by 7 to get $c = \frac{18}{7}$. The answer is (B).

8. **D** A factor of a polynomial is used to find a solution, or a value of x for which the corresponding value of the function is 0. When a function in factored form is set equal to 0, each factor can be set equal to 0 to get each solution. Since, according to the table, $g(7) = 0$, $x = 7$ is one solution of g. Therefore, it must also be the solution to an equation made by setting one of the factors equal to 0. To find this factor, get the equation $x = 7$ into the form of an equation with one side equal to 0. Subtract 7 from both sides to get $x - 7 = 0$. Therefore, $x - 7$ is one of the factors of g, and the answer is (D).

9. **D** A line whose equation is in the form $y = mx + b$ has slope m and y-intercept b. In the equation $y = cx + 6$, the slope is c. Plug the point (r, s) into the equation to get $s = cr + 6$. To find the slope, solve for c. First, subtract 6 from both sides to get $s - 6 = cr$. Now, divide both sides by r to get $c = \frac{s - 6}{r}$. The correct answer is (D).

10. **A** The question asks for pairs of congruent angles. Start with the vertical angles. Vertical angles are non-adjacent angles formed by intersecting lines. The pairs of vertical angles in this figure are $a°$ and $d°$, $b°$ and $e°$, and $c°$ and $f°$. Since vertical angles are always congruent, $a = d$, $b = e$, and $c = f$. The question also states that $a + b = c + d$. Since $a = d$, it must also be the case that $b = c$. This shows that Statement (I) is true, so (B) can be eliminated. Since $b = c$, $b = e$, and $c = f$, then e must also equal f. Statement (II) is true, so eliminate (C). Statement (III) says that $a = e$. It has been determined that $b = c = e = f$ and that $a = d$, but so far nothing has shown that $a = e$. To be sure, plug in for e. Let $e = 30$. If $e = 30$, then $b = c = f = 30$, so $b + c + e + f = 30 + 30 + 30 + 30 = 120$. Since $a + b + c + d + e + f = 360$, then $a + d + 120 = 360$ and $a + d = 240$. Since $a = d$, then a and d are both equal to 120. Therefore, $a \neq e$. Cross off (III) and eliminate (D). The answer is (A).

11. **D** The graph asks for the y-coordinate of the vertex, which is the point of the parabola on the axis of symmetry. Therefore, the axis of symmetry is the line $x = m$. To determine the value of m, find a pair of points with the same y-coordinate, and get the midpoint of the segment between them. To make this easy, let $y = 0$ to get $0 = k(x - 4)(x + 12)$. Set each factor equal to 0 to get $k = 0$, $x - 4 = 0$, and $x + 12 = 0$. Since the question says $k \neq 0$, reject the first equation. Solve

the second equation, $x - 4 = 0$, by adding 4 to both sides to get $x = 4$. Solve the third equation, $x + 12 = 0$, by subtracting 12 from both sides to get $x = -12$. Therefore, the points (4, 0) and (–12, 0) are on the parabola. The midpoint of (4, 0) and (–12, 0) is $\left(\frac{4 + (-12)}{2}, 0\right) = \left(\frac{-8}{2}, 0\right) =$ (–4, 0). Therefore, $m = -4$. Since (m, n) is a point on the parabola, $n = k(m - 4)(m + 12)$. To find n, plug in $m = -4$ to get $n = k(-4 - 4)(-4 + 12) = k(-8)(8) = -64k$. Another option would be to plug in for k to get a quadratic, then complete the square on the x-terms to get the equation into the vertex form. Either way, the correct answer is (D).

12. **C** The question asks about points of intersection. Points of intersection are solutions to both equations. Since $y = (x - 8)^2$ and $y = 36$, set $(x - 8)^2 = 36$. To solve, take the square root of both sides to get $x - 8 = \pm 6$. Always remember to use ± when taking the square root of both sides of an equation. Consider both possible equations. If $x - 8 = 6$, add 8 to both sides to get $x = 14$. If $x - 8 = -6$, add 8 to both sides to get $x = 2$. Therefore, points P and Q are at coordinates (2, 36) and (14, 36). Since the endpoints of PQ share y-coordinates, the length of the segment is the difference in the x-coordinates of the endpoints. Therefore, $\overline{PQ} = 14 - 2 = 12$. The correct answer is (C).

13. **B** The question statements refer to equivalent decreases in Celsius and Fahrenheit. Test each of these statements by plugging in an example. Statement (I) refers to a decrease of 1.8 degrees Celsius. Use a simple example of such a decrease. Try $C = 1.8$ and $C = 0$. Since the formula includes fractions, convert 1.8 into a fraction in order to do the arithmetic. $\frac{1.8}{1.0} = \frac{18}{10} = \frac{9}{5}$, so $1.8 = \frac{9}{5}$. If $C = \frac{9}{5}$, then $F\left(\frac{9}{5}\right) = \frac{9}{5}\left(\frac{9}{5}\right) + 32 = \frac{81}{25} + 32 = 3\frac{6}{25} + 32 = 35\frac{6}{25}$. If $C = 0$, then $F(0) = \frac{9}{5}(0) + 32 = 32$. Since this is a decrease of more than 1, cross out (I) and eliminate any choice that includes (I): (A) and (D). Now look at the remaining choices. Since both remaining choices include (II), (II) must be true, so test (III) only. Statement (III) refers to a decrease of $\frac{5}{9}$ degrees Fahrenheit. Pick two easy values for F with a difference of $\frac{5}{9}$. $F = \frac{5}{9}$ and $F = 0$ might appear easy, but the first step to solving will be to subtract 32, which is not convenient with $F = \frac{5}{9}$. Instead, use $F = 32\frac{5}{9}$ and $F = 32$. If $F = 32\frac{5}{9}$, then $32\frac{5}{9} = \frac{9}{5}C + 32$. Subtract

32 from both sides to get $\frac{5}{9} = \frac{9}{5}C$. Multiply both sides by $\frac{5}{9}$ to get $\frac{25}{81} = C$. If $F = 32$, then $32 = \frac{9}{5}C + 32$. Subtract 32 from both sides to get $0 = \frac{9}{5}C$. Multiply both sides by $\frac{5}{9}$ to get $0 = C$. Since this a decrease of less than 1, cross off (III) and eliminate (C). The answer is (B).

14. **A** This is a complicated algebra question, so look for a way to plug in. Since no calculator is allowed on this section, it is especially important to plug in an easy number. Try $x = 1$. If $x = 1$, then $\frac{80(1)^2 + 84(1) - 13}{k(1) - 4} = -16(1) - 4 - \frac{29}{k(1) - 4}$. Simplify to get $\frac{80 + 84 - 13}{k - 4} = -16 - 4 - \frac{29}{k - 4}$ and $\frac{151}{k - 4} = -20 - \frac{29}{k - 4}$. Add $\frac{29}{k - 4}$ to both sides to get $\frac{151}{k - 4} + \frac{29}{k - 4} = -20$. Since the fractions on the right have the same denominator, add both the numerators to get $\frac{180}{k - 4} = -20$. Multiply both sides by $(k - 4)$ to get $180 = -20(k - 4)$. Distribute on the right side to get $180 = -20k + 80$. Subtract 80 from both sides to get $100 = -20k$. Divide both sides by –20 to get $k = -5$, which is (A).

15. **D** To find the solutions to a quadratic equation, the first option is to factor. First, since 5 is a factor of each term, factor 5 to get $5(x^2 + 6x + 3) = 0$. Divide both sides by 5 to get $x^2 + 6x + 3 = 0$. However, as the answer choices hint, factoring this equation further will be difficult, so use the quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. The standard form of a quadratic equation is $ax^2 + bx + c = 0$, so $a = 1$, $b = 6$, and $c = 3$. Therefore, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-6 \pm \sqrt{6^2 - 4(1)(3)}}{2(1)} = \frac{-6 \pm \sqrt{36 - 12}}{2} = \frac{-6 \pm \sqrt{24}}{2}$. Simplify the square root by finding a perfect square factor. Since $24 = 4 \times 6$, $\sqrt{24} = \sqrt{4} \times \sqrt{6} = 2\sqrt{6}$, so $x = \frac{-6 \pm 2\sqrt{6}}{2}$. Simplify the fraction by dividing both terms in the numerator by 2 to get $x = -3 \pm \sqrt{6}$. The correct answer is (D).

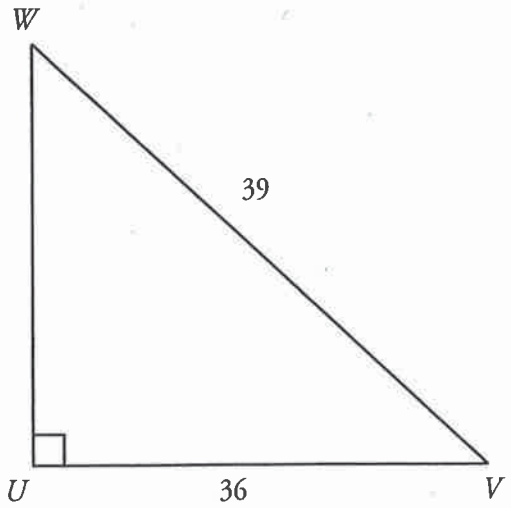
16. **4** To solve this equation, start by simplifying like terms on the left side. Since the denominators are the same, subtract the numerators to get $\frac{5}{25}z = \frac{1}{2} + \frac{3}{10}$. Simplify the fraction on the left

side of the equation to get $\frac{1}{5}z = \frac{1}{2} + \frac{3}{10}$. Now eliminate the fractions by multiplying both sides by a common multiple of all three denominators, such as 10. The result is $2z = 5 + 3$. Simplify the right side to get $2z = 8$. Divide both sides by 2 to get $z = 4$. The answer is 4.

17. **1 or 3** To solve a polynomial, get one side of the equation equal to 0. To do that in this case, add $9y$ to both sides to get $y^3(y^2 - 10) + 9y = 0$. Distribute y^3 to get $y^5 - 10y^3 + 9y = 0$. Since each term on the left includes y, factor y to get $y(y^4 - 10y^2 + 9) = 0$. Now factor $(y^4 - 10y^2 + 9)$. Notice that this resembles a quadratic of the form $ax^2 + bx + c$ but with the exponents doubled. It can be factored the same way. The quadratic $(y^2 - 10y + 9)$ factors to $(y - 9)(y - 1)$, so $(y^4 - 10y^2 + 9)$ factors to $(y^2 - 9)(y^2 - 1)$. Notice that each of these factors is a difference of squares, so $(y^2 - 9) = (y - 3)(y + 3)$ and $(y^2 - 1) = (y - 1)(y + 1)$. Therefore, the equation $y(y^4 - 10y^2 + 9) = 0$ factors to $y(y - 3)(y + 3)(y - 1)(y + 1) = 0$. Set each of these factors equal to 0 to get $y = 0$, $y - 3 = 0$, $y + 3 = 0$, $y - 1 = 0$, and $y + 1 = 0$. Solve these equations to get $y = 0$, $y = 3$, $y = -3$, $y = 1$, and $y = -1$, respectively. Since the question specifies that $y > 0$, the only remaining possible solutions are $y = 3$ and $y = 1$. Grid in either of these two answers.

18. **50** To solve this problem, translate each statement into an equation. Let L represent the length of a long session and S represent the length of a short session. Each long session lasts 20 minutes longer than each short session. *Each long session* translates to L. The word *lasts* is the main verb of the sentence, so it translates to =. The phrase *20 minutes longer* translates to ___ + 20, leaving room on the left for whatever follows. What follows is *each short session*, which translates to S. Therefore, the first sentence translates to $L = S + 20$. Now translate the second sentence. The term *3 long sessions* translates to $3L$. The word *and* translates to +. The term *4 short sessions* translates to $4S$. The term *last a total of* translates to =. Therefore, the second sentence translates to $3L + 4S = 270$. To solve this system of equations, substitute $L = S + 20$ into the second equation to get $3(S + 20) + 4S = 270$. Distribute 3 to get $3S + 60 + 4S = 270$. Combine like terms to get $7S + 60 = 270$. Subtract 60 from both sides to get $7S = 210$. Divide both sides by 7 to get $S = 30$. This is not the answer. Don't forget to read the question, which asks for the length of a *long* session. Since $L = S + 20$, $L = 30 + 20 = 50$. The answer is 50.

19. $\frac{5}{13}$ The question asks for the value of cos Z. By definition, corresponding angles in similar triangles are congruent. Since $\angle Z$ corresponds to $\angle W$ in a similar triangle, $\angle Z$ is congruent to $\angle W$. Since congruent angles have equal cosines, cos Z = cos W. Therefore, this question can be answered by ignoring triangle XYZ and working exclusively in triangle UVW to determine the value of cos W, and thus the value of cos Z. Draw triangle UVW, filling in $WV = 39$ and $UV = 36$.



By definition, $\cos W = \frac{adj}{hyp}$. The hypotenuse is 39, but the adjacent side isn't given. The adjacent side can be solved for using the Pythagorean Theorem, but this is difficult with numbers this large and no calculator. Instead, look for a Pythagorean triple. The ratio 36:39, can be reduced by a factor of 3 to 12:13, so this is a 5:12:13 right triangle. Therefore the missing side, $\overline{UW}$, must have a length of $3 \times 5 = 15$. Thus, the adjacent side is 15, and $\cos W = \frac{adj}{hyp} = \frac{15}{39} = \frac{5}{13}$. The answer is $\frac{5}{13}$.

20. **110** Start with the equation $b = 180 - 4a$. Since $a = 35$, $b = 180 - 4(35) = 180 - 140 = 40$. Therefore, the two base angles of the lower triangle have a sum of $180° - 40° = 140°$. Since the two base angles are opposite equal sides, they must be equal, so each is 70°. The angle with measure c combines with the base angle on the right to form a straight angle. Therefore, $70° + c° = 180°$, and $c = 110$. The answer is 110.

Section 4: Math (Calculator)

1. **C** The probability of selecting a grey wolf with yellow eyes is $\frac{16}{30}$, and the probability of selecting coyote with brown eyes is $\frac{5}{30}$. Therefore, the probability of selecting one or the other is $\frac{16}{30} + \frac{5}{30} = \frac{21}{30}$, so (C) is correct.

2. **D** Use Process of Elimination. From 1992 to 1996 the graph shows a downward slope, which indicates a decrease in military spending. Therefore, eliminate (B) and (C). In 2001 the graph shows an upward slope, which indicates an increase in military spending. Eliminate (A). Choice (D) is correct.

3. **B** During the 40 minutes that Eddie stops to repair his bike, his distance does not change. On the graph, this time period would be shown as a flat horizontal line. The only flat horizontal portion of the graph occurs between about 11:10 A.M., just before noon. So, he finished repairing his bike just before noon, and (B) is correct.

4. **C** Use bite-sized pieces to carefully tackle this one step at a time. Translate "4 percent" of the 648 male employees into math and calculate: $\frac{4}{100}(648) = 25.92$ male employees who received bonuses. Do the same for the female employees: $\frac{6}{100}(519) = 31.14$ female employees who received bonuses. Add these together to get 25.92 + 31.14 = 57.06. This is closest to (C), so (C) is correct.

5. **B** Use bite-sized pieces. Start by adding the x^2 terms: $4x^2 + 2x^2 = 6x^2$. Eliminate (C) and (D). Next, since the x terms are the same in the remaining answers, add the constants: $-2 + 9 = 7$. Eliminate (A). Therefore, the correct answer is (B).

6. **D** Plug in. According to the table, when $k = 1$, $g(k) = -3$. Plug in 1 for k in the answers and eliminate any answers that do not return a value of –3. Choice (A) becomes $1 - 1 = 0$. Eliminate (A). Choice (B) becomes $2(1) - 4 = -2$. Eliminate (B). Choice (C) becomes $3(1) - 5 = -2$. Eliminate (C). Choice (D) becomes $4(1) - 7 = -3$. Therefore, the correct answer is (D).

7. **D** Use Process of Elimination. Since x represents the number of years since 2005, the –0.14 must somehow be related to the number of years. Eliminate (A) and (B) since the question states that y represents the rainfall in any given year. Choice (C) would be represented by the y value for 2005 minus the y value for 2015, so eliminate (C). The correct answer is (D).

8. **C** There are 60(6) = 360 minutes in 6 hours. To calculate the distance the insect crawls, set up the following proportion: $\frac{30 \text{ inches}}{16.3 \text{ min}} = \frac{x}{360 \text{ min}}$. Cross-multiply: $16.3x = 30(360)$. Solve for x, resulting in $16.3x = 10{,}800$ and $x = 662.577$. The question asks for an *approximate* answer, so choose the closest answer, which is (C).

9. **B** To isolate v, multiply both sides of the equation by $\frac{5}{8}$, resulting in $v = \frac{7}{4} \times \frac{5}{8} = \frac{35}{32}$. Choice (B) is correct.

10. **B** The term *zero* means an x-intercept (a point where the curve crosses the x-axis. The only graph showing a curve that crosses the x-axis 4 times is (B), so (B) is correct.

11. **A** According the information given, $Q = mC$ where $C = \frac{\text{J}}{\text{g}}$. The chart shows that the heat capacity $\left(\frac{\text{J}}{\text{g}}\right)$ for copper is 0.39, and the mass is 75. Therefore, $Q = 75(0.39) = 29.25$, which matches (A).

12. **A** According to the information given, $Q = mC$. The table indicates that for porcelain, $C = 1.08$. Find the mass of the porcelain by plugging in 80 for Q and 1.08 for C, resulting in $80 = m(1.08)$. Solve for m to get $m \approx 74$. To find the unknown substance, plug in 67 for Q and 74 for m, resulting in $67 = 74C$. Solve for C to get $C \approx 0.9054$. This approximates the value given for aluminum in the chart. Choice (A) is correct.

13. **D** Use Process of Elimination. The study was done on 200 people with severe hearing loss. Eliminate (A) because the study population doesn't deal with all people; it only deals with people who have severe hearing loss. Because no other hearing-improvement products were mentioned in the question, eliminate (B). In comparing (C) and (D), (C) is too broad, because it applies to people generally, rather than just to the people with severe hearing loss who were studied. Therefore, eliminate (C) and choose (D).

14. **C** Since the problem asks for an expression for a, rearrange the formula so that a is alone on one side. First, subtract vt from both sides, resulting in $d - vt = -\frac{1}{2}at^2$. Next, multiply both sides by –2, resulting in $-2(d - vt) = at^2$, then divide both sides by t^2, resulting in $\frac{-2(d - vt)}{t^2} = a$. To make the equation look like the answer choices, flip it around so the a is on the left and apply the t^2 in the denominator to each part of the binomial in the parentheses. The equation becomes $a = -2\left(\frac{d}{t^2} - \frac{vt}{t^2}\right)$, and the second fraction can be reduced, resulting in $a = -2\left(\frac{d}{t^2} - \frac{v}{t}\right)$. Finally, apply the negative sign in front of the 2 to the terms in the parentheses and switch their order: $a = 2\left(\frac{v}{t} - \frac{d}{t^2}\right)$, which matches (C).

15. **B** The ribbon costs 0.15(36) = \$5.40 per yard. There are variables in the answer choices, so plug in. If $y = 2$, then $p = 2(5.40) = 10.80$. Plug 2 in for y in the answers to see which answer returns a value of 10.80. Choice (A) becomes 0.15(2) + 36 = 36.30. Eliminate (A). Choice (B) becomes 0.15(36)(2) = 10.8. Keep (B), but check (C) and (D) just in case. Choice (C) becomes $\frac{0.15(2)}{36} \approx 0.008$. Eliminate (C). Choice (D) becomes $\frac{36(2)}{0.15} = 480$. Eliminate (D). Choice (B) is correct.

16. **A** There are variables in the answer choices, so plug in. If $q = 40$, then $C = 60(40) + 300 = 2{,}700$. Now decrease q by 20 units: if $q = 20$, then $C = 60(20) + 300 = 1{,}500$. 2,700 – 1,500 = 1,200. Choice (A) is correct.

17. **C** To find the quantity at which revenues will equal costs, set the equations equal to each other: $60q + 300 = 75q$. Subtract $60q$ from each side to get $300 = 15q$, and $q = 20$, which matches (C).

18. **C** Look up the values for $f(x)$ and $g(x)$ for each of the x-values in the answer choices and see which pair adds up to 1. For (A), $f(-5) = -1$ and $g(-5) = -1$, and the sum of these values is -2. Eliminate (A). For (B), $f(-4)$ is a small negative number and $g(-4) = 0$, and the sum of these values is negative, so eliminate (B). For (C), $f(-3) = 0$ and $g(-3) = 1$, and the sum of these values is 1. Therefore, (C) is correct.

19. **B** Exponential decay provides increasingly greater or smaller changes in values as time progresses. Plug in to see what would happen in each situation. Let the initial value of the item equal \$100. For (A), the item would lose $100 \times 0.05 = \$5$ every year. Eliminate (A), because the amount of value the item loses would be the same every year. For (B), the item would lose $100 \times 0.06 = \$6$ the first year. Therefore, the new item value would be $100 - 6 = \$94$. The second year, the item would lose $94 \times 0.06 = \$5.64$, and the new item value would be $94 - 5.64 = \$88.36$. Each successive year, the loss would be less than the loss the year before. This is an exponential decay; therefore, the correct answer is (B).

20. **B** First, calculate the number of imperial pints that can be made with 17 ounces of sugar. Set up the following proportion: $\frac{1 \text{ ounce}}{30 \text{ I. pints}} = \frac{17 \text{ ounces}}{x}$. Cross-multiply to get $x = 510$ imperial pints.

Next, calculate the number of U.S. pints that are equivalent to 510 imperial pints by setting up the following proportion: $\frac{1 \text{ I. pint}}{1\frac{1}{4} \text{ U.S. pints}} = \frac{510 \text{ I. pints}}{x}$. Simplify the left side of the equation to $\frac{1}{\frac{5}{4}} = \frac{510}{x}$, or $\frac{4}{5} = \frac{510}{x}$. Cross-multiply, resulting in $4x = 2{,}550$. Solve for x to get $x = 637.5$. The closest approximation for 637.5 is 640. Choice (B) is correct.

21. **A** The actual plotted point at 230 inches is 49 yards. However, the line of best fit at 230 inches equals 47.5 inches. $49 - 47.5 = 1.5$. Therefore, (A) is correct.

22. **B** The question asks for a specific amount, so plug in the answers. Start with (B). If there are 23 girls in the troop, then Mrs. Warren currently has $23(4) + 11 = 103$ boxes. If she were to give 5 boxes to each girl, she would need $23(5) = 115$. Therefore, she is $115 - 103 = 12$ boxes short. Since this matches the information given in the problem, the correct answer is (B).

23. **D** Let l = the largest number and s = the sum of the other two numbers. According to the question, $l = \frac{4}{3}s$. Divide both sides by $\frac{4}{3}$ to get $\frac{3}{4}l = s$. Plug in the answers, starting with (B). If the largest number is 245, the sum of the other two numbers is $\frac{3}{4}(245) = 183.75$. The sum of all three numbers would be $245 + 183.75 = 428.75$. Eliminate both (A) and (B) because these values

are too small. Try (C). If the largest number is 350, then the sum of the other two numbers is $\frac{3}{4}(350) = 262.5$, and the sum of all three numbers is 350 + 262.5 = 612.5. Eliminate (C). Since only (D) remains, it must be the correct answer.

24. **B** When the question asks for a specific value, plug in the answers. Start with (B) and make $j = 15.5$. The value of x would then be $3(15.5) - 19 = 27.5$, and the value of z would be $5(15.5) - 15 = 62.5$. Now use a calculator to check to if cos (27.5°) = sin (62.5°). Both equal 0.887, so (B) is correct.

25. **D** First, plug in a length and a width for the rectangle. Let, $l = 12$ and $w = 10$. The area of this rectangle can be calculated as $A = lw = (12)(10) = 120$. In the new rectangle, the length is reduced by 25% or $\frac{1}{4}$, making the new length $12 - \left(\frac{1}{4}\right)(12) = 9$. The area of 120 is increased by 5%, so the new area is $120 + \left(\frac{5}{100}\right)(120) = 120 + 6 = 126$. Plug these new numbers into the area formula to get $126 = 9w$, then divide both sides by 9 to get $w = 14$. The width increased from 10 to 14, but the question asks for the percent increase, which is calculated as $\frac{difference}{original} \times 100$. In this case, that value is $\frac{14-10}{10}(100) = \frac{4}{10}(100) = 40$, so $k = 40\%$, and the correct answer is (D).

26. **C** The formula for the volume of a cylinder is $V = \pi r^2 h$. For the figure shown, $r = 3$ and $h = 12$. The volume of the cylinder portion of the capsule is $V = \pi(3^2)(12) = 108\pi$. The two ends of the capsule make up one complete sphere. The formula for the volume of a sphere is $V = \frac{4}{3}\pi r^3$. Again, $r = 3$. Therefore, the volume of spherical portion of the capsule is $V = \frac{4}{3}\pi(3)^3 = 36\pi$. The volume of the entire figure is $108\pi + 36\pi = 144\pi \approx 452.4$. The correct answer is (C).

27. **A** Given two points on a line, the slope is calculated as $\frac{y_2 - y_1}{x_2 - x_1}$. Use the points (0, 0) and (p, 4) to find the slope of the line: $\frac{4-0}{p-0} = \frac{4}{p}$. Next, use the points (0, 0) and (9, p) to find the slope of the line: $\frac{p-0}{9-0} = \frac{p}{9}$. Set the two expressions equal to each other to get $\frac{4}{p} = \frac{p}{9}$. Cross-multiply to get $p^2 = 36$. Solve for p to get $p = \pm 6$. Only the –6 value appears in the answers, therefore (A) is correct.

28. **D** To fill in the table, write a system of equations using the information given. Call the number of decaffeinated teas x, so the number of caffeinated teas is $3x$. Call the number to decaffeinated coffees y, so the number of caffeinated coffees is $5y$. The two equations that can be written from this information and the table are $x + y = 28$ and $3x + 5y = 116$. When dealing with systems of equations, look for a way to stack and add the equations to eliminate one variable and solve for another.

To do this, multiply the first equation, $x + y = 28$, by -3 to get $-3x - 3y = -84$. Now stack and add the equations:

$$\begin{aligned} 3x + 5y &= 116 \\ \underline{-3x - 3y} &\underline{= -84} \\ 2y &= 32 \end{aligned}$$

Divide by 2 to get $y = 16$. This means that $x = 28 - y = 28 - 16 = 12$. Use these values to fill in the chart.

	Decaffeinated	Caffeinated
Tea	$x = 12$	$3x = 36$
Coffee	$y = 16$	$5y = 80$
Total	28	116

Now find the probability that a caffeinated beverage chosen at random is a coffee. Divide the number of caffeinated coffees, 80, by the total number of caffeinated beverages, 116, to get a probability of 0.69. Choice (D) is correct.

29. **B** Start by consolidating like terms. The top equation becomes $j = 3x - 9$, and the bottom equation becomes $k = 3y - 9$. In the first equation, replace j with $k + 1.5$ to get $k + 1.5 = 3x - 9$. Solve this equation for k to get $k = 3x - 10.5$. Set the two equations equal to each other to get $3y - 9 = 3x - 10.5$. Add 10.5 to both sides to get $3y + 1.5 = 3x$. Divide the entire equation by 3 to get $y + 0.5 = x$. Choice (B) is correct. Another approach would be to plug in numbers for j and k then solve for x and y.

30. **C** The fastest way to solve this is to use the decay formula: *final amount* = *original amount* $(1 - r)^t$. In this case, the *original amount* = 6,500 and the $r = 0.2$. The *final amount* = $6{,}500(1 - 0.2)^t = 6{,}500(0.8)^t$. Eliminate (A) and (B). Next, plug in a value for m. If $m = 12$, then because the value of the baseball cards decreases every 6 months, $t = \frac{12}{6} = 2$. This matches (C). Of course, this question can also be solved without the formula, though not as quickly. Pick a value for m that will make the number of baseball cards easy to calculate, such as $m = 6$. Banerji starts with 6,500 cards, and he will sell off 20% of them in those 6 months. Calculate 20% of 6,500, which is 1,300, then subtract that from 6,500 to get 5,200 cards. This is the target value. Plug in $m = 6$ in each of the answer choices to see which one equals 5,200. Only (C) matches this target value.

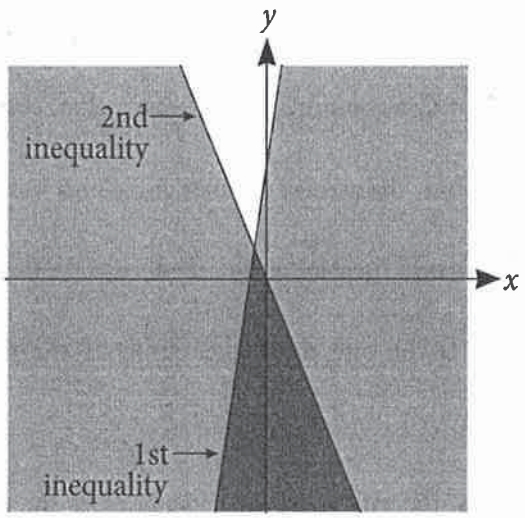
31. **3** Start by distributing the negative three to get $6x^2 - 7x + 5 - 3x^2 + 15x - 12$. Combine like terms to get $3x^2 + 8x - 7$. Therefore, $a = 3$.

32. **5 or 6** One onion costs \$0.50. Subtract that from the total amounts that Emeril might spend to find that he can spend between \$1.50 and \$2 on potatoes. If he spends \$1.50 on potatoes that cost \$0.30 each, he can buy 5 potatoes. If he spends closer to \$2.00 on potatoes, he can get 6 for \$1.80. He can't get 7 potatoes, as that would put him over his \$2 potato budget, so Emeril can get 5 or 6 potatoes.

33. **25.2** The mean of a list is the total divided by the number of items in the list. Here, the total of all the heights is 302, and there are 12 infants in the program. $\frac{302}{12} = 25.1\overline{6}$. Rounded to the nearest tenth, this becomes 25.2.

34. **40** For an average score of 75 on all 8 exams, Jacob needs to score a total of $75 \times 8 = 600$ points. Over the first 4 exams, he has already scored $65 \times 4 = 260$ points. To find the minimum score allowable for the 5th exam, maximize the scores on all of the other remaining exams. The most he can score on an exam is 100. If he got 100 on the 6th, 7th, and 8th exams that would be a total of 300 points. Add this to his current points: $300 + 260 = 560$ points, which means that on the 5th test, he would need to score a minimum of $600 - 560 = 40$.

35. **1,000** Draw a rough sketch of the graph of this system of inequalities to figure out what is going on here. It would look something like this:



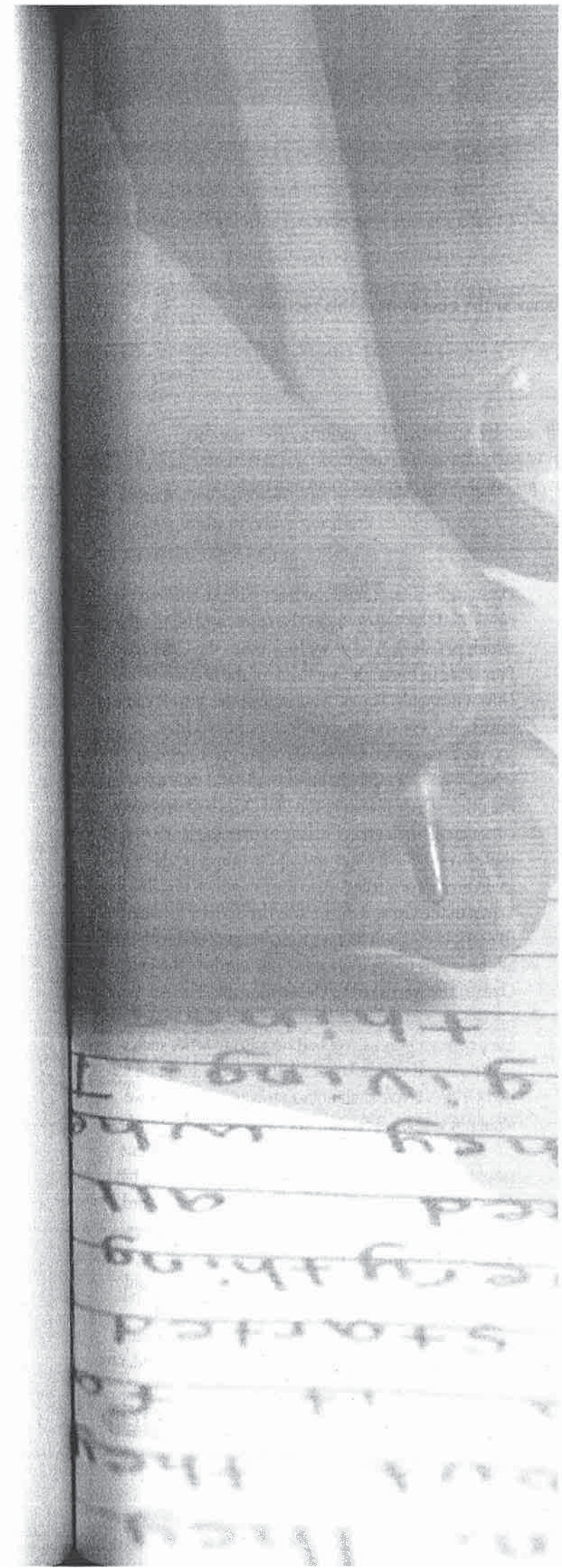
The area included in both inequalities represents the solution to the system. The question asks for the greatest value of k, which is the y-coordinate, so it would happen as close to the top of the graph as possible. For the area of overlap representing the solution, this happens at the point of intersection of the two lines. Find this point of intersection by setting the two equations $y = 20x + 3{,}500$ and $y = -8x$ equal to each other to get $20x + 3{,}500 = -8x$. Add $8x$ to both sides to get $28x + 3{,}500 = 0$, then subtract 3,500 from both sides to get $28x = -3{,}500$. Dividing both sides by 28 results in $x = -125$. This is the value for j, and it can be plugged back into either equation to get the value of k, the y-coordinate at that point. Use the easier equation, $y = -8x$ to get $k = -8(-125) = 1{,}000$.

36. $\frac{7}{12}$ or **.583**

There is a proportional relationship between the arc length, degree measure, and area of a section of a circle formed by two radii. For this question, the important aspects of the circle are the given angle measure of $\frac{7\pi}{6}$ radians and the arc the question asks about. Set up a proportion: $\frac{\text{arc}}{\text{circumference}} = \frac{\text{angle measure}}{\text{total radians}}$. This fractional part of the circumference in the first part of the proportion is what the question is asking for, so focus on the second part. The angle measure is given, and the total number of radians in a circle is 2π. Fill in the second fraction to get $\frac{\text{arc}}{\text{circumference}} = \frac{\frac{7\pi}{6}}{2\pi}$. Dividing by a number is the same as multiplying by the reciprocal of the number, so the second fraction becomes $\frac{7\pi}{6} \times \frac{1}{2\pi} = \frac{7}{12}$.

37. **20** Start by calculating the average number of patients in the Kind Care clinic. According to the information provided, $m = 4$ and $W = 45$. Therefore, Kind Care has an average of $4(45) = 180$ patients in their clinic. Speedy Care sees 324 patients "per hour," so set up a proportion: $\frac{324 \text{ patients}}{60 \text{ minutes}} = \frac{m \text{ patients}}{1 \text{ minute}}$. Cross-multiply to get $60m = 324$, then divide by 60 to get $m = 5.4$ patients per minute. Therefore, the average number of patients in their clinic can be calculated as $L = 5.4(40) = 216$. To calculate a "percent greater than," use the following formula percent change formula: $\frac{\textit{difference}}{\textit{original}} \times 100$. In this case, the smaller number is the original, so the percent change is $\frac{216 - 180}{180} \times 100 = 20$.

38. **9** According to the question, the rate at which patients enter the clinic is defined as m patients per minute. This question gives the rate of 36 patients "per hour," so set up a proportion: $\frac{36 \text{ patients}}{60 \text{ minutes}} = \frac{m \text{ patients}}{1 \text{ minute}}$. Cross-multiply to get $60m = 36$, then divide by 60 to get $m = 0.6$ patients per minute. Each stays with the doctor an average of 15 minutes, so to find the average number of patients being treated, L, use the formula to get $L = (0.6)(15) = 9$.



Chapter 9
Practice Test 4

Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

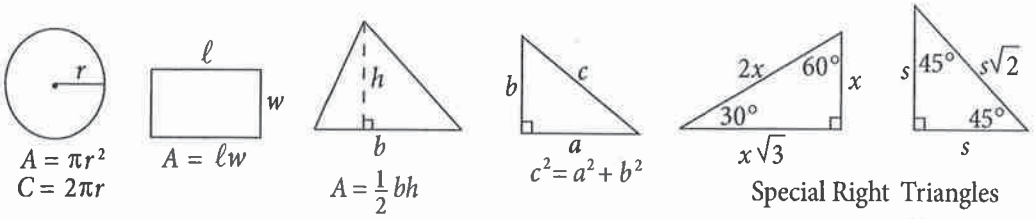
DIRECTIONS

For questions **1-15**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **16-20**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



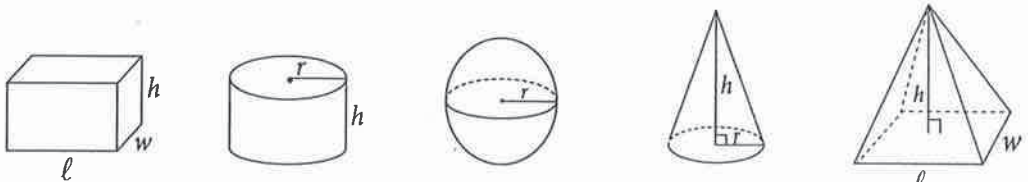
$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

$A = \frac{1}{2}bh$

$c^2 = a^2 + b^2$

Special Right Triangles



$V = \ell wh$

$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

In the function $g(x) = \frac{5}{3}x + k$, k is a constant. If $g(9) = 12$, what is the value of $g(-3)$?

A) -12

B) -8

C) -3

D) 2

2

$$3(k + 2) = h$$

$$\frac{h}{k} = 5$$

If the solution set to the system of equations shown above is (h, k), what is the value of k?

A) 1

B) 3

C) 6

D) 15

3

Which of the following expressions is equal to 1 for some value of y?

A) $|2 - y| + 2$

B) $|y - 2| + 2$

C) $|y + 2| + 2$

D) $|2 - y| - 2$

4

If $\frac{x + y}{x}$ is equal to $\frac{6}{5}$, which of the following is true?

A) $\frac{y}{x} = \frac{1}{5}$

B) $\frac{y}{x} = \frac{11}{5}$

C) $\frac{x + y}{x} = \frac{1}{5}$

D) $\frac{x - 2y}{x} = -\frac{1}{5}$

CONTINUE

5

$g(x) = -4x - 7$

The function g is shown above. Which of the following is equal to $g(-2x)$?

A) $8x - 7$

B) $8x + 7$

C) $8x^2 - 21x$

D) $-8x - 7$

6

Which of the following expressions is equivalent to $4(3x - 2)(5x - 2)$?

A) $12x$

B) $7x^2 + 15x$

C) $60x^2 + 16x$

D) $60x^2 - 64x + 16$

7

If $k = 1$, which of the following is the solution set for $x - 7 = \sqrt{x - k}$?

A) {1}

B) {5}

C) {10}

D) {5, 10}

8

While preparing for a weightlifting competition, Alexei plans a training program in which his heaviest lift of each day increases by a constant amount. If Alexei's training program requires that his heaviest lift on day 6 is 180 pounds and his heaviest lift on day 24 is 225 pounds, which of the following most accurately describes how the amount Alexei lifts changes from day 6 to day 24 in his training program?

A) Alexei increases the weight of his heaviest lift by 2 pounds every 5 days.

B) Alexei increases the weight of his heaviest lift by 2 pounds per day.

C) Alexei increases the weight of his heaviest lift by 2.5 pounds per day.

D) Alexei increases the weight of his heaviest lift by 5 pounds per day.

CONTINUE

9

$$y = -4x - 6$$

Which of the following is the equation of a line that is parallel to the line with the equation shown above?

A) $4x - y = 9$

B) $4x + 2y = 8$

C) $6x + 3y = 12$

D) $12x + 3y = 10$

10

$$y = (x - 7)(3x + 4)$$

$$x = 3y - 1$$

The solution set for the system of equations shown above contains how many ordered pairs?

A) Infinitely many

B) 2

C) 1

D) 0

11

Peggie and Joan each purchased a bouquet of flowers from a florist. The price of Peggie's bouquet was d dollars, and the price of Joan's bouquet was \$4 less than the price of Peggie's bouquet. If Peggie and Joan split the cost of the bouquets equally, and each paid 15% sales tax on her share, which of the following expressions gives the amount, in dollars, that each of them paid?

A) $1.15d - 2.3$

B) $2d - 1.15$

C) $2.15d - 2$

D) $2.3d - 4.6$

12

$$\frac{z - 3}{z + 3} = 8$$

What is the value of z in the equation above?

A) $-\frac{27}{7}$

B) $-\frac{7}{2}$

C) -3

D) $-\frac{21}{9}$

CONTINUE

13

In the quadratic equation $x^2 - 3t = \frac{v}{3}x$, t and v are constants. What are the solutions for x?

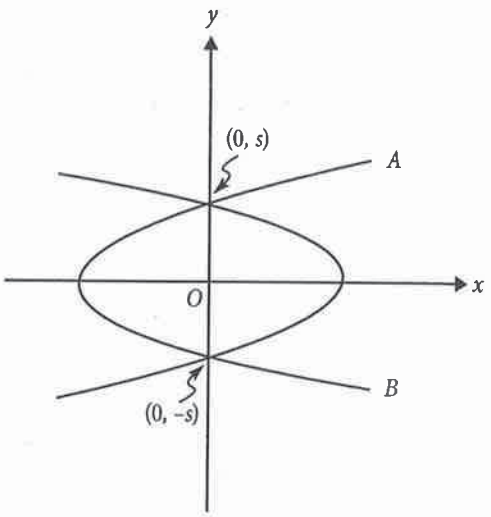
A) $x = \frac{v}{3} \pm \frac{\sqrt{v^2 + 4t}}{3}$

B) $x = \frac{v}{3} \pm \frac{\sqrt{v^2 + 36t}}{6}$

C) $x = \frac{v}{6} \pm \frac{\sqrt{v^2 + 108t}}{6}$

D) $x = \frac{v}{6} \pm \frac{\sqrt{v^2 + 4t}}{6}$

14



Two equations A and B, defined by $x = 18y^2 - 2$ and $x = -18y^2 + 2$ respectively, are graphed in the xy-plane above. The graphs of A and B intersect at the points $(0, s)$ and $(0, -s)$. What is the value of s?

A) 3

B) 1

C) $\frac{1}{3}$

D) $\frac{1}{9}$

CONTINUE

15

In the equation $\frac{18+i}{4+3i} = a + bi$, where a and b are real numbers, what is the value of a?

(Note: $i = \sqrt{-1}$)

A) 2

B) 3

C) $\frac{18}{4}$

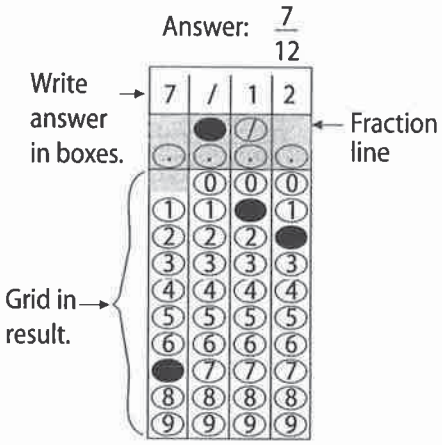
D) $\frac{11}{2}$

CONTINUE

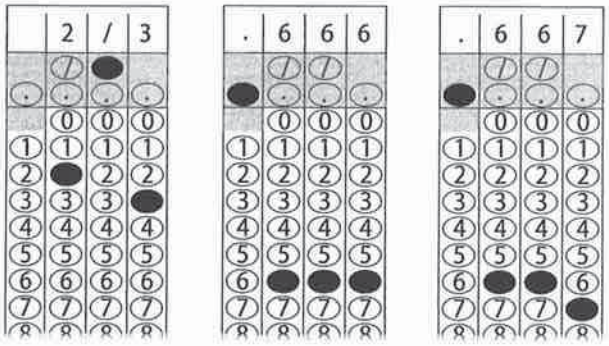
DIRECTIONS

For questions 16-20, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

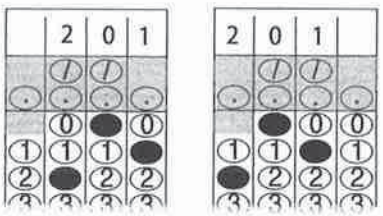
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.



Acceptable ways to grid $\frac{2}{3}$ are:



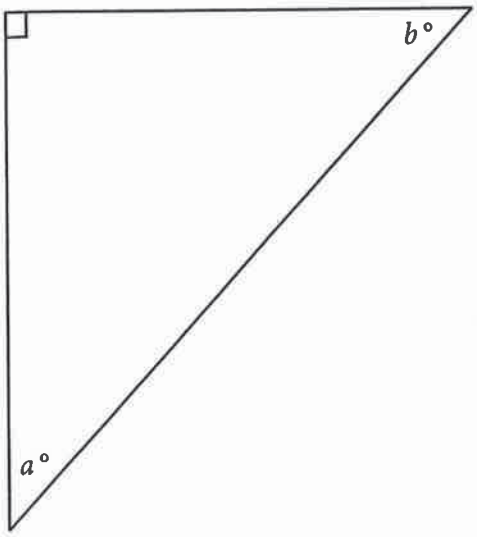
Answer: 201 – either position is correct



NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

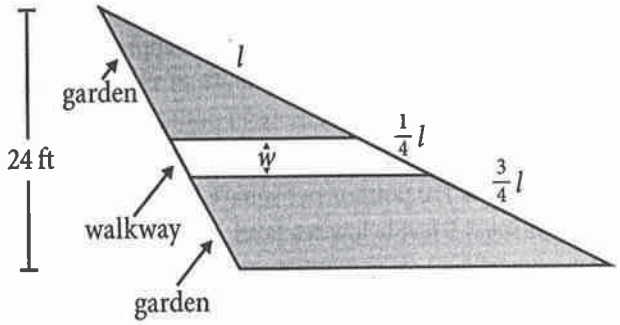
CONTINUE

16



In the triangle above, the cosine of $a°$ is 0.625. What is the sine of $b°$?

17



Bridget owns a triangular patch of land. She decides to convert it into a garden with a paved walkway, as shown above. The long sides of the walkway are parallel to each other and to the base of the triangular patch of land. What is the width, w, in feet, of the walkway?

18

$$8x - 5y = 27$$

$$5x + 10y = 30$$

The solution set of the system of equations above is (x, y). What is the value of y ?

CONTINUE

19

The epipelagic zone is the oceanic zone that extends from the surface down to a depth of approximately 650 feet below sea level. At a depth of 170 feet below sea level, the total pressure is 90 pounds per square inch. At a depth 215 feet below sea level, the total pressure is 110 pounds per square inch. For every additional 5 feet below sea level, the total pressure increases by p pounds per square inch, where p is a constant. What is the value of p ?

20

If $x^3 - 4x^2 + 3x - 12 = 0$, what real value is a solution for x ?

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section in the test.

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

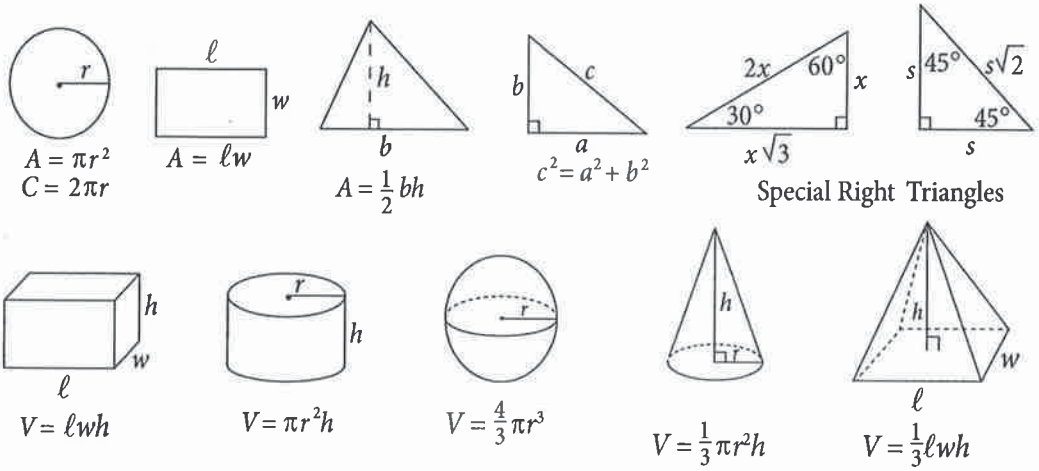
DIRECTIONS

For questions **1-30**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **31-38**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

4

1

To make the high school football team, Walter must be able to run a 40-yard dash in under 6 seconds. Walter currently runs the 40-yard dash in 7.2 seconds, and believes that with training he can reduce his time by 0.2 seconds per week. Which of the following represents the number of seconds in which Walter believes he will be able to run the 40-yard dash w weeks from now?

A) $0.2 - 7.2w$

B) $6.0 - 0.2w$

C) $7.2 + 0.2w$

D) $7.2 - 0.2w$

2

A piece of yarn 4 yards long is cut in half, and each half is cut into fourths. What is the length, in inches, of each of the pieces of yarn? (1 yard = 36 inches)

A) 8

B) 18

C) 24

D) 36

3

A ride-sharing service charges a base fee of $2.40 per ride. The cost of gas is included in the base fee, but there is an additional charge of $0.30 per mile. For one ride, Edward paid $3.60. How many miles long was Edward's ride?

A) 2

B) 3

C) 4

D) 5

4

Yesterday Tiki cycled 13 fewer miles than Irina. If the two of them cycled a total of 51 miles yesterday, how many miles did Irina cycle?

A) 19

B) 32

C) 38

D) 64

CONTINUE

5

The resistance of a circuit is equal to the voltage applied to the circuit divided by the number of amps flowing through the circuit. How many amps are flowing through a circuit with a resistance of 9 ohms if 54 volts are applied to the circuit?

A) 486

B) 45

C) 6

D) 0.167

6

Florence interviewed a random sample of her first-year classmates in medical school to determine the statistical distribution of blood types among the students. Of the 75 students she interviewed, 38.7% had O-positive blood type. Based on this result, about how many of the 265 students in Florence's first-year class would be expected to have O-positive blood type?

A) 40

B) 80

C) 100

D) 110

CONTINUE

Number of Viewers by Favorite Television Network

	Age (years)					
Network	18-24	25-34	35-44	45-64	65 and older	Total
A	3,729	11,471	12,758	4,164	3,284	35,406
B	5,731	19,879	23,480	7,999	5,466	62,555
C	3,798	12,360	15,252	4,643	3,685	39,738
D	2,984	8,975	12,084	3,676	3,053	30,772
Total	16,242	52,685	63,574	20,482	15,488	168,471

A survey asked television viewers to name their one favorite network *A*, *B*, *C*, or *D*. The table above displays the number of surveyed viewers, categorized by age group and favorite network. According to the table, if a viewer who was 35 to 64 years old at the time of the survey is chosen at random, which of the following is nearest to the probability that the viewer preferred network *D*?

A) 0.20

B) 0.35

C) 0.50

D) 0.75

CONTINUE

8

Custom Furniture Made in 2015

Wood species	Furniture type				
	Beds	Chairs	Desks	Tables	Total
Cherry	9	7	0	15	31
Maple	12	6	9	0	27
Walnut	3	1	11	2	17
Total	24	14	20	17	75

The table above shows the 75 pieces of furniture that a custom furniture maker made in 2015, categorized by furniture type and wood species. What proportion of the furniture pieces are desks made of maple?

A) $\frac{2}{25}$

B) $\frac{3}{25}$

C) $\frac{4}{15}$

D) $\frac{9}{25}$

9

The graph of line m in the xy-plane passes through Quadrants I, II, and III, but not Quadrant IV. Which of the following must be true about the slope of line m?

A) It is positive.

B) It is negative.

C) It is undefined.

D) It is zero.

10

The graph of the function g in the xy-plane has x-intercepts at -2, 2, and 5. Which of the following could be the function g?

A) $g(x) = (x - 2)^2(x - 5)$

B) $g(x) = (x - 2)(x + 2)(x + 5)$

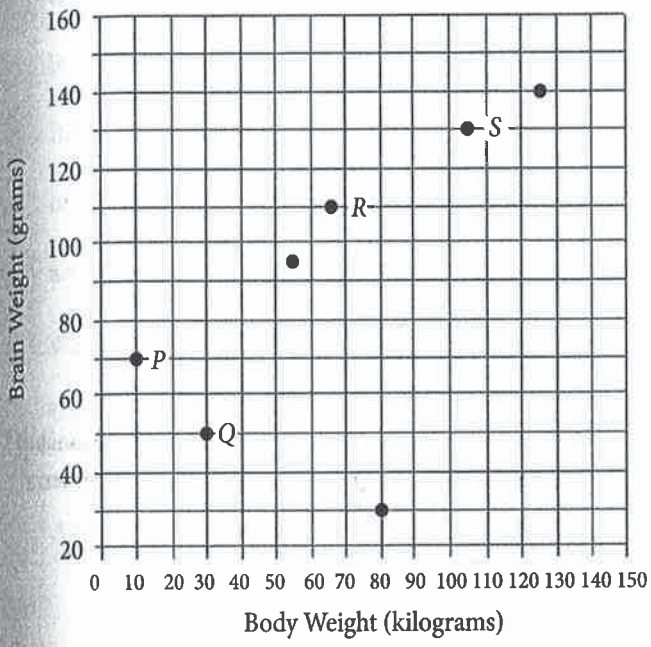
C) $g(x) = (x + 2)^2(x + 5)$

D) $g(x) = (x - 5)(x - 2)(x + 2)$

CONTINUE

Questions 11 and 12 refer to the following information.

Body weight versus brain weight



A researcher at a university made the scatterplot above to illustrate the relationship between the body weight and brain weight of 9 species of animals.

11

What is the brain weight, in grams, of the animal that has the greatest body weight?

A) 70

B) 125

C) 140

D) 160

12

Of the points labeled *P*, *Q*, *R*, and *S*, which point represents the species whose ratio of brain weight to body weight is the least?

A) *P*

B) *Q*

C) *R*

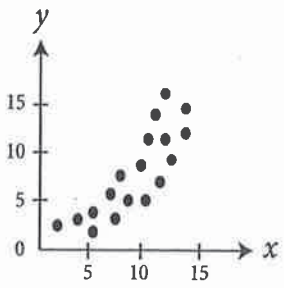
D) *S*

CONTINUE

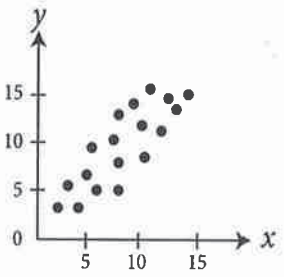
13

Which of the scatterplots below illustrates a relationship that is best modeled by the function $f(x) = \left(\frac{j}{x}\right)^k$, where j is a positive constant and k is a constant less than –1 ?

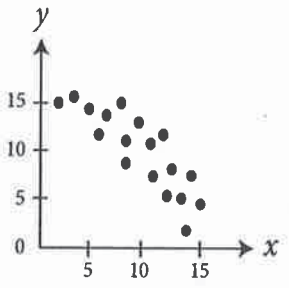
A)



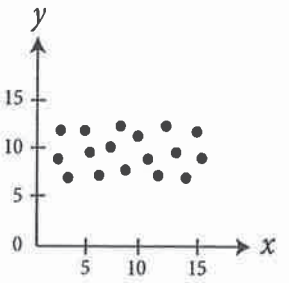
B)



C)



D)



14

The estimated number of bacteria in a laboratory culture over a span of 10 hours is shown in the table below.

Time (hours)	Number of bacteria
0	1,000,000
2	100,000
4	10,000
6	1,000
8	100
10	10

Which of the following is true about the relationship between time and the estimated number of bacteria during the 10-hour time span?

A) It is increasing linearly.

B) It is decreasing linearly.

C) It is increasing exponentially.

D) It is decreasing exponentially.

CONTINUE

15

The expression $20{,}000\left(1+\frac{p}{400}\right)^4$ shows the value, in dollars, one year after purchase, of a savings bond that has an initial value of $20,000 and that pays an interest rate of p percent, compounded quarterly. If Roger purchased a bond that pays an interest rate of 4 percent and Pete purchased a bond that pays an interest rate of 6 percent, which of the following expressions represents how much more Pete earned than Roger earned, after one year?

A) $20{,}000\left(1+\frac{6-4}{400}\right)^4$

B) $20{,}000\left(1+\frac{\frac{6}{4}}{400}\right)^4$

C) $20{,}000\left(1+\frac{6}{400}\right)^4-20{,}000\left(1+\frac{4}{400}\right)^4$

D) $\frac{20{,}000\left(1+\frac{6}{400}\right)^4}{20{,}000\left(1+\frac{4}{400}\right)^4}$

Questions 16 and 17 refer to the following information.

Stella is planning a vacation and deciding which travel package to purchase. The table below shows the cost of airfare, hotel, and car rental for three different travel packages.

Travel package	Cost of airfare, A (in dollars)	Cost of hotel, H (in dollars per day)	Cost of car rental, R (in dollars per day)
P	400	85	60
Q	550	75	50
R	500	80	70

The total cost, $f(x)$, of a travel package for x days is given by the function $f(x) = A + H(x - 1) + Rx$, where $x \geq 2$.

16

If the relationship between the total cost, $f(x)$, of airfare, hotel, and car rental with travel package R and the number of days, x, for the package is graphed in the xy-plane, the slope of the graph represents which of the following?

A) The combined daily cost of the hotel and car rental

B) The daily cost of the hotel

C) The daily cost of car rental

D) The total cost of airfare

CONTINUE

17

For how many days, x, will the total cost of travel package Q be less than or equal to the total cost of travel package P?

A) $x \leq 8$

B) $x \geq 8$

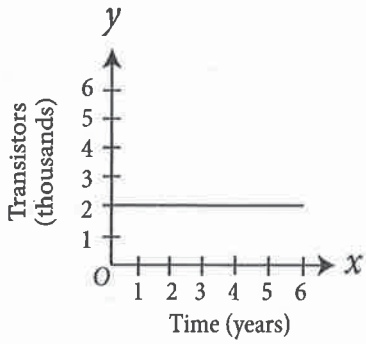
C) $x \leq 9.4$

D) $x \geq 9.4$

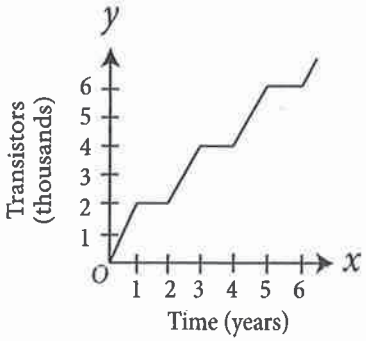
18

A well-known projection known as Moore's law states that the maximum number of transistors that can be placed on an integrated circuit doubles every two years. Which of the following graphs is an accurate representation of Moore's law? (Note: In each graph below, O represents (0, 0).)

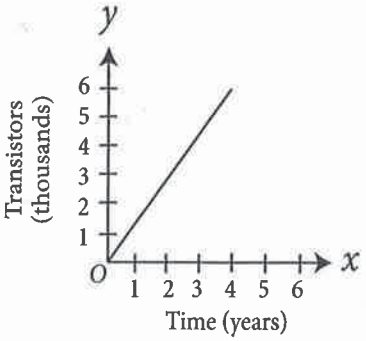
A)



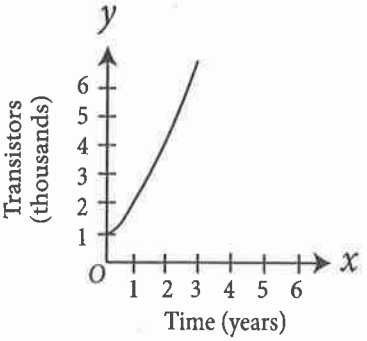
B)



C)



D)



CONTINUE

19

Bob has a number of identical right circular cylindrical buckets, each with an inside diameter of 1 foot. He pours oil from a 55-gallon drum into each bucket until it is full. If the height of the oil in each bucket is approximately 1.5 feet, what is the greatest number of full buckets Bob can pour from one 55-gallon drum of oil? (Note: There are 0.133 cubic feet in 1 gallon.)

A) 6

B) 7

C) 9

D) 10

20

If $2x + 5 \leq 9$, what is the greatest possible value of $2x - 5$?

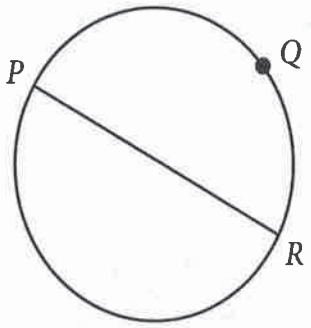
A) -3

B) -1

C) 0

D) 2

21



In the figure above, $\overline{PR}$ is a diameter. If the length of arc $\overset{\frown}{PQR}$ is 18π, what is the length of $\overline{PR}$?

A) 6

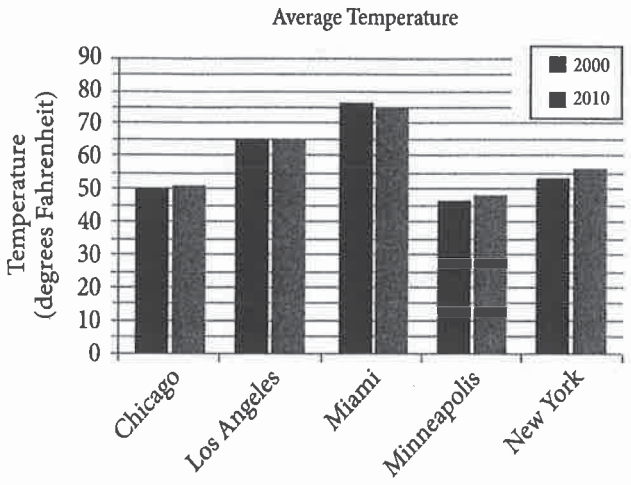
B) 12

C) 18

D) 36

CONTINUE

Questions 22 and 23 refer to the following information.



The bar graph above shows the average temperature in degrees Fahrenheit for five select cities in 2000 and 2010.

22

In a scatterplot of this data where the average temperature of each city in the year 2000 is plotted along the x-axis and the average in the year 2010 is plotted along the y-axis, how many data points would be below the line $y = x$?

A) 1

B) 2

C) 3

D) 4

23

Of the following, which best approximates the percent increase in the average temperature of New York from 2000 to 2010 ?

A) 0.5%

B) 1%

C) 6%

D) 12%

CONTINUE

24

The tables below show the distribution of scores of recent quizzes in English and Physics given to the same 33 students of a particular class.

English Quiz

Score	Frequency
1	5
2	7
3	8
4	7
5	6

Physics Quiz

Score	Frequency
1	1
2	2
3	3
4	22
5	5

Which of the following is true about the data provided for the 33 students?

A) The standard deviation of the scores on the English quiz is larger.

B) The standard deviation of scores on the Physics quiz is larger.

C) The standard deviation of the scores on the English quiz is the same as that of the Physics quiz.

D) The standard deviation for the scores on the two quizzes cannot be calculated from the data provided.

25

Let a and b be numbers such that $b < a < -b$. Which of the following must be true?

I. $a < 0$

II. $b < 0$

III. $a < |b|$

A) I only

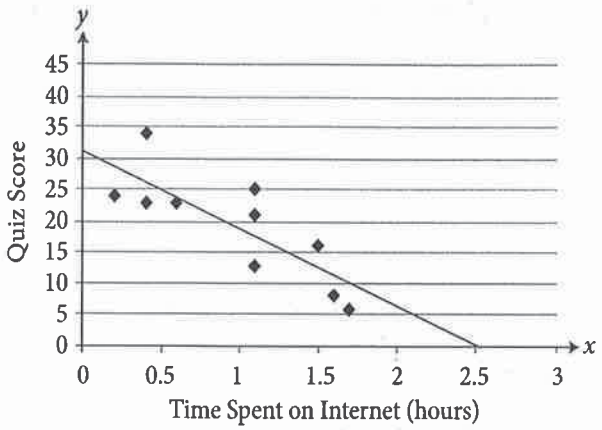
B) III only

C) I and II only

D) II and III only

CONTINUE

26



The scatterplot above shows scores on a recent quiz in a particular class and the number of hours the student spent on the Internet the day before. The line of best fit is also shown and can be described as $y = -12.408x + 31$. Which of the following best describes how the number 31 in the equation relates to the scatterplot?

A) On the quiz, even students who spend very little time on the Internet are unlikely to score above 31 on the quiz.

B) On the quiz, even students who spend very little time on the Internet never score above 31 on the quiz.

C) On the quiz, the lowest score was about 31% of the highest score.

D) On the quiz, the highest score on the test was 31.

27

$$r(x) = 3x^3 + 24x^2 + 21x$$

$$s(x) = x^2 + 8x + 7$$

The polynomials $r(x)$ and $s(x)$ are defined above. Which of the following polynomials is divisible by $3x + 4$?

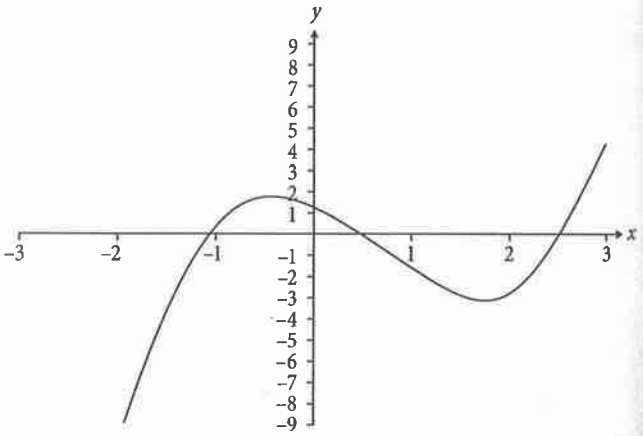
A) $a(x) = r(x) + s(x)$

B) $b(x) = r(x) + 2s(x)$

C) $c(x) = r(x) + 4s(x)$

D) $d(x) = 2r(x) + 4s(x)$

28



The function $g(x) = x^3 - 2x^2 - 2x + \frac{4}{3}$ is graphed in the xy-plane above. If c is a constant such that $g(x) = c$ has one real solution, which of the following could be the value of c?

A) 3

B) 1

C) 0

D) -1

CONTINUE

29

$$g(x) = (x - 10)(x + 4)$$

Which of the following is an equivalent of the function g shown above in which the minimum value of g appears as a constant or coefficient?

A) $g(x) = (x + 3)^2 - 31$

B) $g(x) = (x - 3)^2 - 49$

C) $g(x) = x^2 - 6x - 40$

D) $g(x) = x^2 - 40$

30

If a is the average (arithmetic mean) of $4x$ and 7, b is the average of $5x$ and 6, and c is the average of $3x$ and 11, what is the average of a, b, and c, in terms of x?

A) $x + 4$

B) $x + 8$

C) $2x + 4$

D) $4x + 8$

CONTINUE

DIRECTIONS

For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
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4. Some problems may have more than one correct answer. In such cases, grid only one answer.
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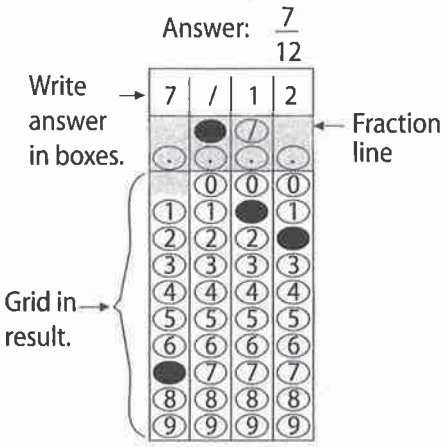
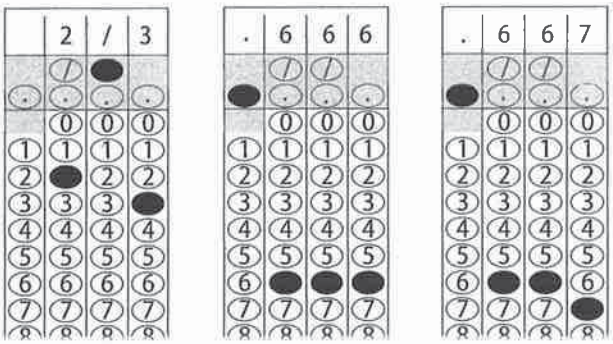
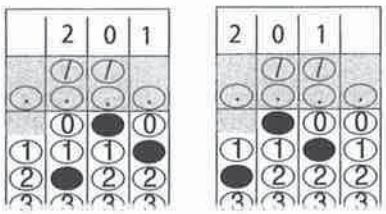
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.



Acceptable ways to grid $\frac{2}{3}$ are:



Answer: 201 – either position is correct



NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

31

The target heart rate during moderate activity R, in beats per minute, for an adult who is y years old can be estimated using the equation $R = \frac{3(220 - y)}{5}$. According to this estimate, for every increase of 2 years in age, by how many beats per minute will the target heart rate for adults engaged in moderate activity decrease?

32

At 1:00 P.M., a truck driver is 200 miles into a long journey to make a delivery. The driver continues on the journey and travels at an average speed of 60 miles per hour. How many total miles into the journey will the driver be at 8:00 P.M.?

33

$$d = \frac{1}{2}at^2$$

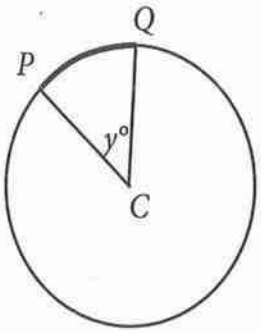
The displacement d of an object in a vacuum, starting from rest with an acceleration a can be found using the formula above, where t is the time the object has been moving. A physics student uses the formula to determine the displacement of an object in a vacuum accelerating from rest for time t and an object with the same acceleration from rest for time $2.5t$. What is the ratio of the displacement of the object that accelerated for more time to the displacement of the object that accelerated for less time?

34

The *deben*, an ancient Egyptian unit of weight, is approximately equal to 3.21 ounces. It is also equivalent to 12 smaller Egyptian units called *shematies*. Based on these relationships, 488 shematies is equal to how many pounds, to the nearest hundredth? (16 ounces = 1 pound)

CONTINUE

35



Note: Figure not drawn to scale.

The circle above has center C and has a radius of 20. If the length of arc $\overset{\frown}{PQ}$ (shown in bold) is between 15 and 16, what is one possible integer value of y?

36

A toy store keeps marbles in the closet of its stock room. In the closet, 230 marbles are blue and 370 marbles are red. If 110 red marbles are added, how many blue marbles must be added to the closet so that $\frac{2}{5}$ of the marbles in the closet are blue?

Questions 37 and 38 refer to the following information.

A CD account contains $5,400 today. The account earns an annual interest of 7% for each of the next four years. The bank uses the equation $A = 5{,}400(r)^y$ to determine the amount of money in the account, A, after y years if no other deposits or withdrawals are made.

37

What numerical value should the bank use for r?

38

To the nearest dollar, how much money will be in the CD account at the end of the four years? (Note: Disregard the $ sign when gridding your answer.)

STOP

If you finish before time is called, you may check your work on this section only. Do not turn to any other section in the test.

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Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

1.
YOUR NAME: _____ (Print) Last First M.I.
SIGNATURE: _____ DATE: / /
HOME ADDRESS: _____ (Print) Number and Street
City State Zip Code
PHONE NO.: _____ (Print)

IMPORTANT: Please fill in these boxes exactly as shown on the back cover of your test book.

2. TEST FORM

3. TEST CODE

4. REGISTRATION NUMBER

5. YOUR NAME

First 4 letters of last name					FIRST INIT	MID INIT
A	A	A	A		A	A
B	B	B	B		B	B
C	C	C	C		C	C
D	D	D	D		D	D
E	E	E	E		E	E
F	F	F	F		F	F
G	G	G	G		G	G
H	H	H	H		H	H
I	I	I	I		I	I
J	J	J	J		J	J
K	K	K	K		K	K
L	L	L	L		L	L
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N	N	N	N		N	N
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P	P	P	P		P	P
Q	Q	Q	Q		Q	Q
R	R	R	R		R	R
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X	X	X	X		X	X
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Z	Z	Z	Z		Z	Z

6. DATE OF BIRTH

Month	Day		Year	
JAN				
FEB	0	0	0	0
MAR	1	1	1	1
APR	2	2	2	2
MAY	3	3	3	3
JUN		4	4	4
JUL		5	5	5
AUG		6	6	6
SEP		7	7	7
OCT		8	8	8
NOV		9	9	9
DEC				

7. SEX
MALE
FEMALE

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Test 4 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 1—Reading

1. A B C D
2. A B C D
3. A B C D
4. A B C D
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50. A B C D
51. A B C D
52. A B C D

Section 2—Writing and Language Skills

1. A B C D
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41. A B C D
42. A B C D
43. A B C D
44. A B C D

TEST
TION.

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Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

Test 4 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 3—Mathematics: No Calculator

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ
6. Ⓐ Ⓑ Ⓒ Ⓓ
7. Ⓐ Ⓑ Ⓒ Ⓓ
8. Ⓐ Ⓑ Ⓒ Ⓓ
9. Ⓐ Ⓑ Ⓒ Ⓓ
10. Ⓐ Ⓑ Ⓒ Ⓓ
11. Ⓐ Ⓑ Ⓒ Ⓓ
12. Ⓐ Ⓑ Ⓒ Ⓓ
13. Ⓐ Ⓑ Ⓒ Ⓓ
14. Ⓐ Ⓑ Ⓒ Ⓓ
15. Ⓐ Ⓑ Ⓒ Ⓓ

16. 17. 18. 19. 20.

Section 4—Mathematics: Calculator

1. Ⓐ Ⓑ Ⓒ Ⓓ
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3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
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28. Ⓐ Ⓑ Ⓒ Ⓓ
29. Ⓐ Ⓑ Ⓒ Ⓓ
30. Ⓐ Ⓑ Ⓒ Ⓓ

31. 32. 33. 34. 35.

36. 37. 38.

Chapter 10 Practice Test 4: Answers and Explanations

Section 3: Math (No Calculator)

1. B
2. B
3. D
4. A
5. A
6. D
7. C
8. C
9. D
10. B
11. A
12. A
13. C
14. C
15. B
16. $\frac{5}{8}$ or .625
17. 3
18. 1
19. $\frac{20}{9}$ or 2.22
20. 4

Section 4: Math (Calculator)

1. D
2. B
3. C
4. B
5. C
6. C
7. A
8. B
9. A
10. D
11. C
12. D
13. A
14. D
15. C
16. A
17. B
18. D
19. A
20. B
21. D
22. A
23. C
24. A
25. D
26. A
27. C
28. A
29. B
30. C
31. 1.2
32. 620
33. $\frac{25}{4}$, $\frac{50}{8}$, or 6.25
34. 8.16
35. 43, 44, or 45
36. 90
37. 1.07
38. 7,078

ıles, please turn to page 565.

Section 3: Math (No Calculator)

1. **B** Start by plugging in 9 for x into the function to get $\frac{5}{3}(9) + k = 12$. Solve for k to get $15 + k = 12$ and $k = -3$. Therefore, $g(x) = \frac{5}{3}x - 3$, and $g(-3) = \frac{5}{3}(-3) + (-3) = -5 - 3 = -8$, so the answer is (B).

2. **B** Get rid of the fraction in the second equation by multiplying both sides of the equation by k to get $h = 5k$. Substitute $5k$ for h in the first equation to get $3(k + 2) = 5k$. Distribute the 3 to get $3k + 6 = 5k$. Solve for k to get $6 = 2k$, and $3 = k$, which is (B).

3. **D** Set the expressions in each of the answer choices equal to 1 and solve for y. Choice (A) becomes $|2 - y| + 2 = 1$ or $|2 - y| = -1$. The result of an absolute value is always greater than or equal to 0, so this doesn't work. Eliminate (A). The same thing happens with (B) and (C). Only (D) works: $|2 - y| - 2 = 1$ or $|2 - y| = 3$, which happens when $y = -1$ or 5. Therefore, (D) is the correct answer.

4. **A** According to the question, $\frac{x + y}{x} = \frac{6}{5}$. Plug in an easy value for x, such as $x = 5$, and solve for y. The equation becomes $\frac{5 + y}{5} = \frac{6}{5}$, so $5 + y = 6$, and $y = 1$. Try these values in the answer choices to see which one works. Choice (A) becomes $\frac{1}{5} = \frac{1}{5}$. This is true, so keep (A), but check the rest of the answers to be sure. Choice (B) becomes $\frac{1}{5} = \frac{11}{5}$, (C) becomes $\frac{5+1}{5} = \frac{1}{5}$, and (D) becomes $\frac{5 - 2(1)}{5} = -\frac{1}{5}$. None of these are true, so eliminate (B), (C), and (D), and choose (A).

5. **A** Plug $-2x$ in for x in the function to get $g(-2x) = -4(-2x) - 7 = 8x - 7$, which is (A).

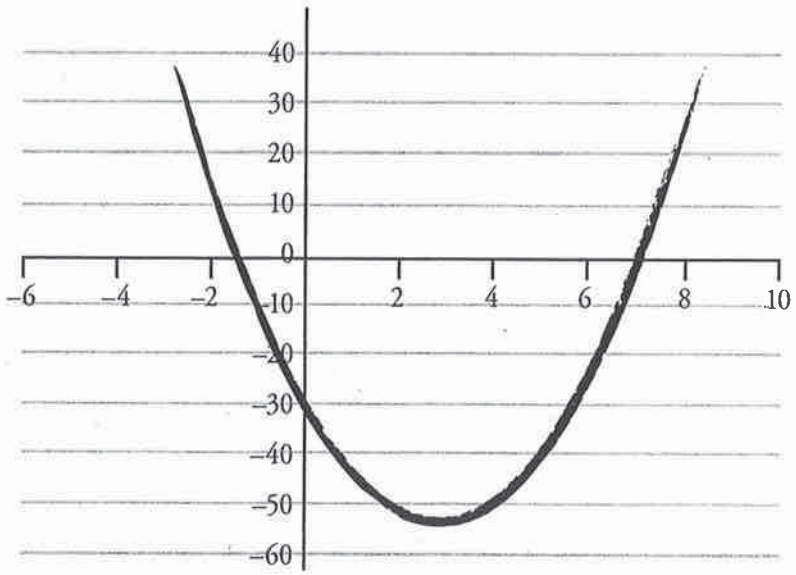
6. **D** Use FOIL to expand the quadratic to get $4(15x^2 - 6x - 10x + 4)$. Use Bite-Sized pieces to see that the first term is $4(15x^2) = 60x^2$. Eliminate (A) and (B). Likewise, the last term must be $4(4) = 16$. Therefore, eliminate (C). Choice (D) is correct.

7. **C** Plug 1 in for k to get $x - 7 = \sqrt{x - 1}$. Plug in the answers to solve. Start with $x = 5$ since 5 appears in two of the answers. If $x = 5$, the equation becomes $5 - 7 = \sqrt{5 - 1}$. Solve both sides of the equation to get $-2 = \sqrt{4}$. The square root of a number is always its positive value. Therefore, this expression is untrue. Eliminate (B) and (D). Next, try $x = 1$. If $x = 1$, the equation becomes $1 - 7 = \sqrt{1 - 1}$. Solve both sides of the equation to get $-6 = \sqrt{0}$. This is also untrue, so eliminate (A). The correct answer must therefore be (C).

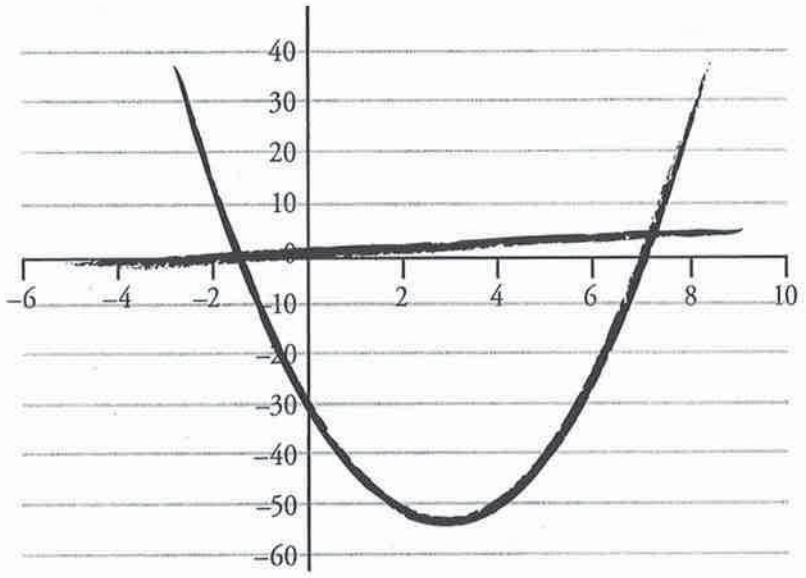
8. **C** According to the question, Alexi increased the amount he lifted by 225 – 180 = 45 pounds over 24 – 6 = 18 days. Calculate his daily increase to get 45 ÷ 18 = 2.5 pounds per day, which is (C).

9. **D** In the slope-intercept from of an equation, $y = mx + b$, m represents the slope. Therefore, the slope of the given line is –4. In the standard form of the equation $Ax + By = C$, the slope equals $-\frac{A}{B}$. For (A), the slope is $\frac{-4}{-1} = 4$. Eliminate (A). In (B), the slope is $-\frac{4}{2} = -2$. Eliminate (B). In (C), the slope is $-\frac{6}{3} = -2$. Eliminate (C). Therefore, the correct answer must be (D).

10. **B** The first equation is a parabola, because if FOILed out, it would contain an x^2 term, and the second equation is a line, because there is no exponent attached to x. The two can at most have two points of intersection, so eliminate (A). Next, draw a rough sketch of the parabola. Start by finding the roots of the equation by setting each of the binomials in the parentheses equal to 0. If $x - 7 = 0$, then $x = 7$. Therefore, one point on the parabola is (7, 0). If $3x + 4 = 0$, then $3x = -4$, and $x = -\frac{4}{3}$. Therefore, a second point on the parabola is $\left(-\frac{4}{3}, 0\right)$. Lastly, plug in 0 for x to get $y = (0 - 7)[3(0) + 4] = (-7)(4) = -28$. Therefore, a third point on the graph is (0, –28). Connecting the three points will result in a sketch that looks roughly like this:



Next, draw the line. Rearrange the equation into slope-intercept form, $y = mx + b$, where m stands for the slope and b stands for the y-intercept. This is $y = \frac{1}{3}x + \frac{1}{3}$. So, the line has a slope of $\frac{1}{3}$, and a y-intercept of $\frac{1}{3}$. A rough sketch of the line would look like this:



It is clear from a rough drawing of the two equations that the line must cross the parabola twice, and the answer is (B).

11. **A** There are variables in the answer choices, so plug in. If $d = 10$, then Joan's bouquet costs $10 - 4 = \$6$. The combined cost of both bouquets is $10 + 6 = \$16$, which means that each of them paid $\$16 \div 2 = \$8$ for the bouquets before the tax was added. The tax on each share is $\$8 \times 0.15 = \$1.20$, which means that each of them paid a total of $\$8 + \$1.20 = \$9.20$. Plug 10 in for d in each of the answers to see which answer equals the target of \$9.20. Choice (A) becomes $1.15(10) - 2.3 = 11.50 - 2.3 = 9.2$. This matches the target, but check the remaining answers just in case. Choice (B) becomes $2(10) - 1.15 = 20 - 1.15 = 18.85$. Eliminate (B). Choice (C) becomes $2.15(10) - 2 = 21.5 - 2 = 19.5$. Eliminate (C). Choice (D) becomes $2.3(10) - 4.6 = 23 - 4.6 = 18.4$. Eliminate (D). Therefore, the answer is (A).

12. **A** Multiply both sides of the equation by $(z + 3)$ to get $z - 3 = 8(z + 3)$. Distribute the 8 to get $z - 3 = 8z + 24$. Solve for z to get $z = 8z + 27$, $-7z = 27$, and $z = -\frac{27}{7}$. Choice (A) is correct.

13. **C** Plug in, picking easy numbers. Let $x = 3$, and $v = 6$. The equation becomes $(3)^2 - 3t = \frac{6}{3}(3)$. Solve for t to get $9 - 3t = 6$, and $t = 1$. In the answers, plug in 6 for v and 1 for t to see which answer could return a value of 3 for x. Choice (A) becomes $\frac{6}{3} \pm \frac{\sqrt{6^2 + 4(1)}}{3} = 2 \pm \frac{\sqrt{40}}{3}$, which will not come out to an integer like 3. Eliminate (A). Choice (B) becomes

$\frac{6}{3} \pm \frac{\sqrt{6^2 + 36(1)}}{6} = 2 \pm \frac{\sqrt{72}}{6}$, which won't be an integer either. Eliminate (B). Choice (C) becomes $\frac{6}{6} \pm \frac{\sqrt{6^2 + 108(1)}}{6} = 1 \pm \frac{\sqrt{144}}{6} = 1 \pm \frac{12}{6} = 1 \pm 2 = 3$. Keep (C), but check (D) just in case. Choice (D) becomes $\frac{6}{6} \pm \frac{\sqrt{6^2 + 4(1)}}{6} = 1 \pm \frac{\sqrt{40}}{6}$. This won't be an integer, either, so (C) is correct.

14. **C** The two equations intersect at points on the y-axis, $(0, s)$ and $(0, -s)$. To find the value of s, plug either of these points into either equation and solve for s. It is easier to use the first point in equation A to avoid having to deal with negative signs. Plugging $(0, s)$ into $x = 18y^2 - 2$ results in $0 = 18s^2 - 2$. Add 2 to both sides to get $2 = 18s^2$, then divide both sides by 18 to get $\frac{2}{18} = s^2$ or $\frac{1}{9} = s^2$. Take the square root of both sides to find that $s = \frac{1}{3}$, which is (C).

15. **B** To get i out of the denominator of a fraction, multiply by the complex conjugate of the denominator. Multiply the top and bottom of the fraction by $(4 - 3i)$ to get $\frac{(18 + i)(4 - 3i)}{(4 + 3i)(4 - 3i)} = \frac{72 - 54i + 4i - 3i^2}{16 - 9i^2}$. Because $i = \sqrt{-1}$, $i^2 = -1$. Substitute -1 for i^2 to get $\frac{72 - 54i + 4i - 3(-1)}{16 - 9(-1)} = \frac{72 - 50i + 3}{16 + 9} = \frac{75 - 50i}{25}$. The full equation becomes $3 - 2i = a + bi$. Therefore, $a = 3$, and the answer is (B).

16. $\frac{5}{8}$ or **0.625**

In a right triangle with angles $a°$ and $b°$, $\cos a = \sin b$. Knowing this fact about the complementary angles of a right triangle makes questions like this easier. Without that knowledge, plugging in can help. Convert 0.625 to a fraction, which is $\frac{5}{8}$. Cosine is defined as $\frac{adj}{hyp}$, so label the side next to a as 5 and the hypotenuse as 8. Sine is defined as $\frac{opp}{hyp}$, and the side opposite b is the side that is 5. Therefore, $\sin a° = \frac{5}{8}$ or 0.625 as well.

17. **3** Imagine the triangle as a right triangle with a height of 24 feet and a hypotenuse of $l + \frac{1}{4}l + \frac{3}{4}l = 2l$. The proportions that hold for the hypotenuse also hold for the height. To solve for the width, set $2l = 24$, which means that $l = 12$, and $\frac{1}{4}l = \left(\frac{1}{4}\right)(12) = 3$.

18. **1** Multiply the first equation by 2 to get $16x - 10y = 54$. Stack the two equations on top of each other and add them together to get:

$$\begin{array}{rl} & 16x - 10y = 54 \\ + & \underline{5x + 10y = 30} \\ & 21x \quad\quad = 84 \end{array}$$

Solve for x to get $x = 4$. Plug 4 in for x into the second equation to get $5(4) + 10y = 30$. Solve for y to get $20 + 10y = 30$, $10y = 10$, and $y = 1$.

19. $\frac{20}{9}$ or **2.22**

The difference in the known p values is $110 - 90 = 20$. The difference in the depths for which the p values are known is $215 - 170 = 45$ feet. Therefore, the pressure increase for every one foot of depth is $\frac{20}{45}$, which reduces to $\frac{4}{9}$. The question asks for the increase every 5 feet, though, so multiply this value by 5 to get $\frac{20}{9}$ or 2.22.

20. **4** Factor x^2 out of the first two terms to get $x^2(x - 4) + 3x - 12 = 0$. Factor a 3 out of the last two terms to get $x^2(x - 4) + 3(x - 4) = 0$. Rewrite the equation to get $(x^2 + 3)(x - 4) = 0$. Therefore, one of the solutions to the equation is $x - 4 = 0$. Solve for x to get $x = 4$. The other solutions come from $x^2 + 3 = 0$, so $x^2 = -3$. This will yield imaginary solutions, so the only real solution is 4.

Section 4: Math (Calculator)

1. **D** There are variables in the answer choices, so plug in. Let $w = 2$. In two weeks, his training time will be $7.2 - (0.2)(2) = 7.2 - 0.4 = 6.8$ seconds. Plug 2 in for w in each of the answers to see which answer equals the target answer of 6.8. Choice (A) becomes $0.2 - 7.2(2) = 0.2 - 14.4 = -14.2$. Eliminate (A). Choice (B) becomes $6.0 - 0.2(2) = 6.0 - 0.4 = 5.6$. Eliminate (B). Choice (C) becomes $7.2 + 0.2(2) = 7.2 + 0.4 = 7.6$. Eliminate (C). Check (D) just to be sure: $7.2 - 0.2(2) = 7.2 - 0.4 = 6.8$. Therefore, the correct answer is (D).

2. **B** Start by converting the yards to inches by setting up the following proportion: $\frac{1 \text{ yard}}{36 \text{ inches}} = \frac{4 \text{ yards}}{x \text{ inches}}$. Cross-multiply to get $x = (36)(4) = 144$ inches. After the first cut, the yarn's length is $144 \div 2 = 72$. After the second cut, the yarn's length is $72 \div 4 = 18$, which is (B).

3. **C** Start by subtracting the base fee to get $3.60 - 2.40 = 1.20$. Divide this amount by the cost per mile to get $1.20 \div 0.30 = 4$ miles, so the correct answer is (C).

4. **B** Let T represent the number of miles Tiki cycled and I represent the number of miles Irina cycled. According to the question, $T + I = 51$, and $T = I - 13$. Substitute the second equation into the first to get $(I - 13) + I = 51$. Solve for I to get $2I - 13 = 51$, $2I = 64$, and $I = 32$. Another approach is to plug in the answers. Either way, the correct answer is (B).

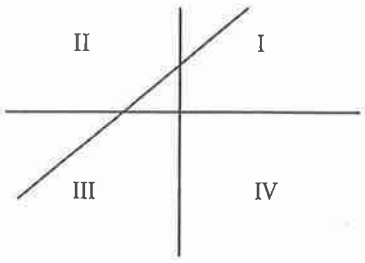
5. **C** According to the question, resistance = voltage applied ÷ number of amps. Plug the numbers given into the equation to get $9 = 54 \div x$. Solve for x to get $x = 6$, which is (C).

6. **C** According to the sample, 38.7% of the class would be expected to have O-positive blood. $265 \times 0.387 \approx 103$. Therefore, the closest answer is (C).

7. **A** The total number of 35- to 64-year-old viewers is 63,574 + 20,482 = 84,056. The total number of viewers in that age range who preferred network D is 12,084 + 3,676 = 15,760. Therefore, the probability that a viewer in this age group preferred Network D is $\frac{15,760}{84,056} \approx 0.2$, which is (A).

8. **B** According to the table, there were 75 total pieces of furniture made, of which 9 were desks made of maple. Therefore, the proportion of maple desks is $\frac{9}{75} = \frac{3}{25}$. The answer is (B).

9. **A** Eliminate (C) because a line that is undefined is parallel to the y-axis. Such a line would pass through exactly 2 quadrants. Likewise eliminate (D) because a line with a slope equal to 0 is parallel to the x–axis. Such a line would pass through exactly 2 quadrants. Make a quick sketch of a line that goes through Quadrants I, II, III, such as:



From the drawing, it is clear that the line has a positive slope, so the answer is (A).

10. **D** For the graph to have x-intercepts at –2, 2, and 5, the expression must equal 0 when $x = -2$, $x = 2$, and $x = 5$. For each answer choice, set each binomial equal to 0 to see if it results in these values for x. For (A) and (C), there is a squared binomial times another binomial. For (A), if $(x - 2) = 0$, $x = 2$, but that root will appear twice, leading to only 2 distinct roots. For this reason, eliminate (A) and (C). For (B), the first root is 2, then $(x + 2) = 0$ gives a root of $x = -2$,

and $(x + 5) = 0$ gives a root of –5. Eliminate (B). The roots for (D) will be 5, 2, and –2, respectively, so (D) is the answer.

11. **C** The animal with the greatest body weight is the one furthest along the x-axis. That animal weighs approximately 125 kilograms. Look to the y-axis to see that the same animal has a brain weight of 140 grams. Therefore, (C) is the correct answer.

12. **D** Remember that the brain weight is given in grams but the body weight is given in kilograms. 1 kilogram = 1,000 grams. Calculate the ratio of each of the points given in the answers in grams. The ratio in (A) is $\frac{70}{10(1{,}000)} = \frac{7}{1{,}000} = 0.007$. The ratio in (B) is $\frac{50}{30(1{,}000)} = \frac{5}{3{,}000} = 0.00\overline{16}$. Since this is less than the ratio in (A), eliminate (A). The ratio in (C) is $\frac{110}{65{,}000} = 0.00169$. Since this is bigger than (B), eliminate (C). The ratio in (D) is $\frac{130}{105{,}000} = 0.00124$. Since this is smaller than (B), eliminate (B) and choose (D).

13. **A** First, because an exponent other than 1 is applied to the fraction, the function is not a linear function. Because the scatterplots in (B) and (D) suggest a linear relationship between x and y, eliminate (B) and (D). Next, plug in some numbers to see what happens when x gets larger. If $x = 1$, $j = 4$, and $k = -2$, the function becomes $f(1) = \left(\frac{4}{1}\right)^{-2} = 4^{-2} = \frac{1}{4^2} = \frac{1}{16}$. If $x = 100$, $j = 4$, and $k = -2$, the function becomes $f(100) = \left(\frac{4}{100}\right)^{-2} = \left(\frac{1}{25}\right)^{-2} = 625$. Therefore, according to the function, as x increases, y also increases. Of the remaining answer choices, this is not true for (C). Eliminate (C). The correct answer is (A). Another option would be to plug in some values for the variables j and k and then graph the function on a graphing calculator.

14. **D** Over time, the estimated number of bacteria is clearly decreasing. Therefore, eliminate (A) and (C). If the number of bacteria were decreasing linearly, then it would be decreasing by the same amount every hour. However, between hours and 0 and 2 the number of bacteria decreased by 900,000, whereas between hours 2 and 4 the number of bacteria decreased by only 90,000. Since the rate of decrease is not the same every hour, eliminate (B) and choose (D).

15. **C** The value of Pete's bond after one year would be $20{,}000\left(1+\frac{6}{400}\right)^4$, and the value of Roger's savings bond after one year would be $20{,}000\left(1+\frac{4}{400}\right)^4$. The difference in the value of their two bonds would be $20{,}000\left(1+\frac{6}{400}\right)^4 - 20{,}000\left(1+\frac{4}{400}\right)^4$. Since both of them started with savings bonds in the same amount and held them over the same time period, the difference in the value of the bonds is equal to the difference in their earnings, so the answer is (C).

16. **A** To calculate the slope, plug in two values for x, for example, $x = 2$ and $x = 3$, and find the corresponding y-values. When $x = 2$, then $f(x) = 500 + 80(2 - 1) + 70(2) = 720$. When $x = 3$, then $f(x) = 500 + 80(3 - 1) + 70(3) = 870$. Two points on the graph would then be (2, 720) and (3, 870). Next, calculate the slope: $\frac{y_2 - y_1}{x_2 - x_1} = \frac{870 - 720}{3 - 2} = 150$. Now check the answer choices: For (A), the combined daily cost of the hotel and car rental is 70 + 80 = 150, so the correct answer is (A).

17. **B** According to the equation given, the total cost of package P is $400 + 85(x - 1) + 60x$, and the total cost of package Q is $550 + 75(x - 1) + 50x$, where x is the number of days travelled. Plug in the answers, starting with a value for a number of days that appears in (B). The cost of package $P = 400 + 85(8 - 1) + 60(8) = 400 + 595 + 480 = 1{,}475$, and the cost of package $Q = 550 + 75(8 - 1) + 50(8) = 550 + 525 + 400 = 1{,}475$. The cost of the two packages is the same at 8 days, which fits the requirements of the question. Eliminate (D), since that range does not include 8. Now test (A) by trying $x = 7$. Package P would cost $400 + 85(6) + 60(7) = 1{,}330$, and package Q would cost $550 + 75(6) + 50(7) = 1{,}350$. Travel package Q is not less than or equal to the total cost of travel package P, so eliminate ranges that include 7. This eliminates (A) and (C). Only (B) is left.

18. **D** Use Process of Elimination. According to Moore's law, the maximum number of transistors that can be placed on a circuit each year doubles. If there was 1 transistor to start, the next year there would be 2, then 4, then 8, then 16. The number of transistors would increase more and more rapidly over the years, which indicates exponential growth. Choice (A) is a flat, horizontal line, showing no growth at all, and (B) has flat sections, showing periods of no growth. Eliminate (A) and (B). Choice (C) shows growth, but it is a line, which indicates growth at a constant rate. Eliminate (C). Only (D) shows growth that increases exponentially.

19. **A** The volume of a cylinder can be calculated as $V = \pi r^2 h$. According to the information given, the radius of each bucket is 0.5 feet and the height of the oil in each bucket is 1.5 feet. Therefore, the volume of the oil in each bucket is $\pi(0.25)(1.5) \approx 1.1781$ cubic feet. Set up the

following proportion: $\frac{1 \text{ gallon}}{0.133 \text{ feet}^3} = \frac{x \text{ gallons}}{1.1781 \text{ feet}^3}$. Cross-multiply to get $0.133x = 1.1781$. Solve for x to get $x = 8.858$ gallons per bucket. $55 \div 8.858 \approx 6.2$ buckets. Only round at the last step to ensure a correct answer when the choices are close together. The question asks for the number of full buckets, so round this down to 6, which is (A).

20. **B** There is no need to solve all the way for x. Just make the first inequality look like the second one. Solve for $2x$ to get $2x \leq 4$. Subtract 5 from each side to get $2x - 5 \leq 4 - 5$ or $2x - 5 \leq -1$. Therefore, the greatest possible value is -1, and the answer is (B).

21. **D** The question says that the length of arc $\overset{\frown}{PQR}$ is 18π. An arc formed by the diameter is a semicircle. The length of a semicircle is equal to half the circumference of the circle, so the circumference of the circle is $18\pi \times 2 = 36\pi$. The formula for the circumference of a circle is $C = \pi d$, so $36\pi = \pi d$. Divide both sides by π to get $36 = d$. The question asks for the length of $\overline{PR}$, which is a diameter, so the length is 36. The answer is (D).

22. **A** The question asks which data points on a scatterplot are below the line $y = x$. To see what happens when a point is below a line, sketch a line on the coordinate plane and a point below it. Notice that the y-coordinate of the point is lower that the y-coordinate of the line at that same value of x. In case of the line $y = x$, a point is below the line if its y-value is less than its x-value. According to the question, the y-value is equal to a city's average temperature in 2010 and the x-value is equal to the city's average temperature in 2000, so find cities in which the average temperature in 2010 is less than its average temperature in 2000. The only city on the chart for which this is true is Miami. Since there is one such city, the answer is (A).

23. **C** The question asks for the approximate percent increase, so an estimate of the temperature will be enough. The top of the 2000 bar is between the 50 and 55 line, closer to 55, so call the average temperature 53. The top of the 2010 bar is between the 55 and 60 line, closer to 55, so call the average temperature 57. To calculate percent change, use the formula $\frac{\textit{difference}}{\textit{original}} \times 100$. The difference is $57 - 53 = 4$. Since the question asks for a percent *increase*, the original is the smaller value, which is 53. Therefore, the percent increase is about $\frac{4}{53} \times 100 \approx 7.55\%$. Since the closest choice is 6%, the answer is (C).

24. **A** The answer choices refer to standard deviation. All that is needed to compute standard deviation is the individual scores. Since this is provided by the table, eliminate (D). The formula to calculate standard deviation is very long and complicated. However, it is not necessary to use the formula here. Just understand that the standard deviation is a measure of how far apart the values are spread out. Notice that a strong majority of students received a 4 on the Physics quiz. Since most of

the students got the same score, the scores are not very spread out. Since the distribution of scores on the English quiz is more even, these scores are more spread out. Therefore, the standard deviation is higher for the English quiz. The answer is (A).

25. **D** The question asks what *must be true*, so expect to plug in more than once. Plug in a value for b such that $b < -b$. Let $b = -3$. If $b = -3$, then $-3 < a < 3$. Let $a = 2$. Go through each statement. Statement (I) says $a < 0$. Since $a = 2 > 0$, cross out (I) and eliminate the choices that include (I): (A) and (C). Since both remaining choices include (III), (III) must be true, so only worry about (II). Since $b = -3$, (II) is true, so keep (II) at least for now. Try to come up with a number a value of b that will satisfy the inequality but make (II) false. Try a positive number. If $b = 4$, then $4 < a < -4$. Since 4 is not less than -4, do not use $b = 4$. Notice that any positive number leads to the same problem. Try $b = 0$. If $b = 0$, then $0 < a < 0$. Again, 0 is not less than 0, so do not use $b = 0$. Since positive numbers and 0 do not satisfy the inequality, only negative numbers do. Therefore, (II) must be true. Eliminate the remaining answer that does not include (II), which is (B). The answer is (D).

26. **A** The question asks for how the number 31 relates to the scatterplot. The number 31 is the y-intercept of the line, or the point at which $x = 0$. The x-axis refers to the number of hours spent on the Internet, and the y-axis refers to the score on the quiz. Therefore, a student who spends no time on the Internet would be expected to score around a 31. Go through the answer choices. Choice (A) says that even students who spend very little time on the Internet are unlikely to score above a 31. This matches the prediction. Also, only one of the data points is above 31. Keep (A). Choice (B) says that even students who spend very little time on the Internet will never score above 31. This is more extreme than the prediction. Also, there is a data point above 31. Eliminate (B). Choice (C) says the lowest score was about 31% of the highest score. This doesn't match the prediction. Also, the highest score is about 34 and the lowest score is about 6, so the lowest score is $\frac{6}{34} \times 100 \approx 18\%$ of the highest score. Eliminate (C). Choice (D) says the highest score on the test was 31. Similar to (B), this is more extreme than the prediction. Also, there is a data point above 31. Eliminate (D). The answer is (A).

27. **C** To determine which polynomial is divisible, plug in a value for x. Let $x = 2$. If $x = 2$, then $r(x) = r(2) = 3(2)^3 + 24(2)^2 + 21(2) = 162$, $s(x) = s(2) = 2^2 + 8(2) + 7 = 27$, and $3x + 4 = 3(2) + 4 = 10$. The question asks which choice is divisible by $3x + 4$, plug in $x = 2$ to each choice and eliminate any choice that isn't divisible by 10. Choice (A) is $r(2) + s(2) = 162 + 27 = 189$. This is not divisible by 10, so eliminate (A). Choice (B) is $r(2) + 2s(2) = 162 + 2(27) = 216$. This is not divisible by 10, so eliminate (B). Choice (C) is $r(2) + 4s(2) = 162 + 4(27) = 270$. This is divisible by 10, so keep (C).

Choice (D) is $2r(2) + 4s(2) = 2(162) + 4(27) = 432$. This is not divisible by 10, so eliminate (D). The only remaining choice is (C).

28. **A** The question asks for what value of c does $g(x) = c$ have one real solution. Since c is on the other side of the equal sign, it is the y-value. Therefore, if $g(x) = c$ has one real solution, it will intersect the line $y = c$ exactly once. Let each answer choice equal c and draw the line $y = c$. Draw $y = 3$, $y = 1$, $y = 0$, and $y = -1$. Each line should be a horizontal line crossing the y-axis at 3, 1, 0, and -1, respectively. The lines $y = 1$, $y = 0$, and $y = -1$ cross the graph of g at three points each. Therefore, if c is any of these values, $g(x) = c$ has three real solutions. The line $y = 3$ crosses g exactly once, so $g(x) = 3$ has exactly one real solution. Therefore, the answer is (A).

29. **B** The question asks for the form of a quadratic in which the minimum value appears. A parabola reaches its minimum (or maximum) value at its vertex, so get the equation into vertex form, which is $y = a(x - h)^2 + k$, where (h, k) is the vertex. Choice (C) is not in this form, so eliminate it. To get g into vertex form, expand using FOIL: $(x - 10)(x + 4) = x^2 + 4x - 10x - 40 = x^2 - 6x - 40$. Eliminate (D), which is not equivalent to this. Get the quadratic into vertex form by completing the square. The coefficient on the x term is -6. Cut this value in half to get -3, and square the result to get 9. Add 9 to both sides (without combining like terms) to get $y + 9 = x^2 - 6x + 9 - 40$. Factor $(x^2 - 6x + 9)$ to get $y + 9 = (x - 3)^2 - 40$. Subtract 9 from both sides to get $y = (x - 3)^2 - 49$. Thus, the vertex is $(3, -49)$ and the minimum value is -49. Choice (B) is correct.

30. **C** There are variables in the answer choices, so plug in. Let $x = 2$. The question states that a is the average of $4x$ and 7. The sum of $4x$ and 7 is $4(2) + 7 = 15$, so the average is $\frac{15}{2} = 7.5$. The question also states that b is the average of $5x$ and 6. The sum of $5x$ and 6 is $5(2) + 6 = 16$, so the average is $\frac{16}{2} = 8$. Finally, the question states that c is the average of $3x$ and 11. The sum of $3x$ and 11 is $3(2) + 11 = 17$, so the average is $\frac{17}{2} = 8.5$. The question asks for the average of a, b, and c. The sum of a, b, and c is $7.5 + 8 + 8.5 = 24$, so the average is $\frac{24}{3} = 8$. Circle 8; this is the target number. Go through the answer choices and eliminate any choice that is not equal to 8. Choice (A) is $x + 4 = 2 + 4 = 6$, so eliminate (A). Choice (B) is $x + 8 = 2 + 8 = 10$, so eliminate (B). Choice (C) is $2x + 4 = 2(2) + 4 = 8$, so keep (C). Choice (D) is $4x + 8 = 4(2) + 8 = 16$, so eliminate (D). The answer is (C).

31. **1.2** The question asks how much of a decrease in target heart rate will occur if the person's age increases by 2 years. Plug in two values of y that are 2 years apart. Start with $y = 20$. If $y = 20$, then $R = \frac{3(220 - 20)}{5} = 120$. Now try $y = 22$. If $y = 22$, then $R = \frac{3(220 - 22)}{5} = 118.8$. To determine the decrease, subtract the two values of R to get $120 - 118.8 = 1.2$. The answer is 1.2.

32. **620** The question asks how many miles into the journey the driver will be at 8:00 P.M. From 1 P.M. to 8 P.M., the driver travels for 7 hours. To determine the distance traveled, use *distance* = *rate* × *time* to get $d = rt$ = (60 miles per hour)(7 hours) = 420 miles. This is not the answer. Note that at 1:00 P.M. the driver is already 200 miles into his journey. Therefore, the driver has traveled a total of 200 miles + 420 miles = 620 miles. The answer is 620.

33. $\frac{25}{4}$, $\frac{50}{8}$, or **6.25**

The variables in the question are given in terms of each other, so plug in. Let the first object travel at an acceleration of $a = 4$ for a time of $t = 10$. The displacement is $d = \frac{1}{2}(4)(10)^2 = 200$. The second object also has an acceleration of $a = 4$ but for a time of $2.5t = 2.5(10) = 25$. This displacement is $d = \frac{1}{2}(4)(25)^2 = 1{,}250$. The question asks for the ratio of velocity of the object that traveled for more time to the velocity of the object that traveled for less time. This is $\frac{1{,}250}{200}$. This requires more than four spaces on the answer sheet, so reduce the fraction to get $\frac{25}{4}$. (Note that $\frac{50}{8}$ is also an acceptable answer, as is 6.25.)

34. **8.16** The question asks for how many pounds are equivalent to 488 shematies. The question states that 12 shematies is equivalent to 1 deben, so set up the proportion $\frac{12 \text{ shematies}}{1 \text{ deben}} = \frac{488 \text{ shematies}}{x \text{ debens}}$. Cross-multiply to get $12x = 488$. Divide by 12 to get $x = 40.\overline{66}$, so 488 shematies is equivalent to $40.\overline{66}$ debens. The question also says that a deben is approximately equal to 3.21 ounces, so set up the proportion $\frac{3.21 \text{ ounces}}{1 \text{ deben}} = \frac{y \text{ ounces}}{40.66 \text{ debens}}$. Cross-multiply to get $y = 130.54$, so 488 shematies is equivalent to 130.54 ounces. Finally, the question states that 16 ounces is equivalent to one pound, so set up the proportion $\frac{16 \text{ ounces}}{1 \text{ pound}} = \frac{130.54 \text{ ounces}}{z \text{ pounds}}$. Cross-multiply to get $16z = 130.54$. Divide both sides by 16 to get $z = 8.15875$. The question asks for the answer to the nearest hundredth, so the answer is 8.16.

35. **43, 44, or 45**

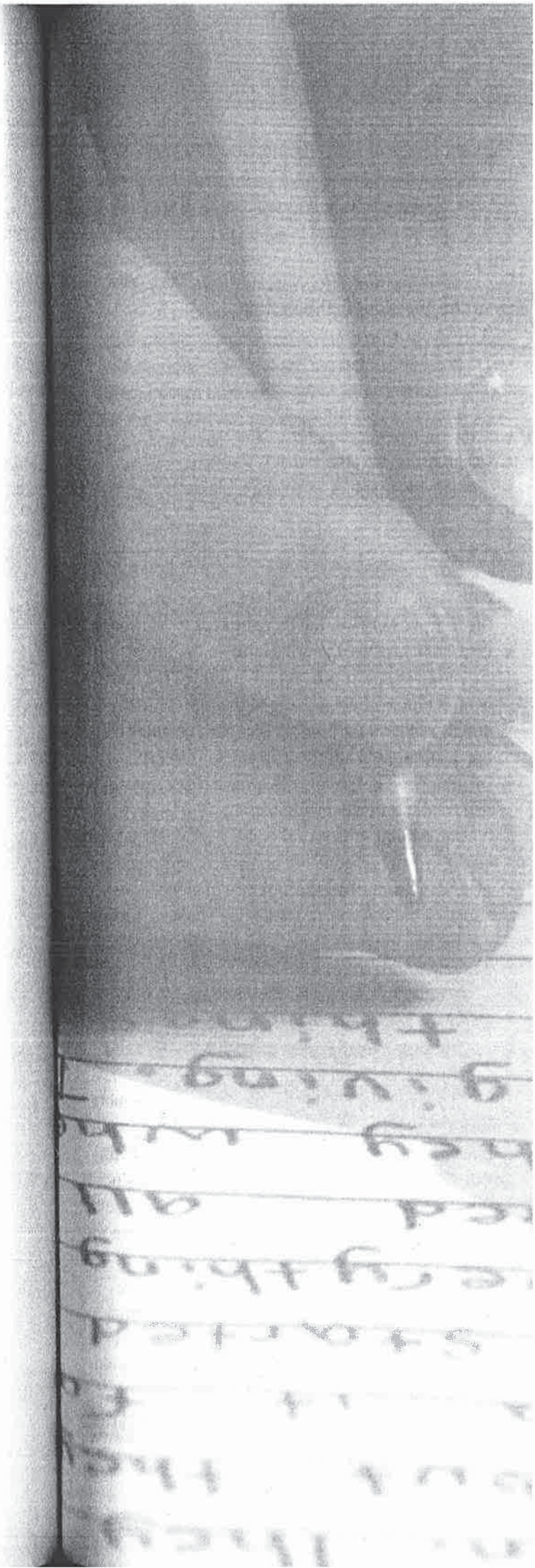
The question asks about arc, so use the arc formula, $\frac{arc}{circumference} = \frac{angle}{360}$. The radius is 20, so use the circumference formula to get that the circumference is $C = 2\pi r = 2\pi(20) = 40\pi$. The arc is between 15 and 16, so start with an arc of 15 to get $\frac{15}{40\pi} = \frac{y}{360}$. Cross-multiply to get $5{,}400 = 40\pi y$. Divide both sides by 40π to get $y = \frac{5{,}400}{40\pi} = \frac{135}{\pi} = 42.9718$. Now try an arc

of 16 to get $\frac{16}{40\pi} = \frac{y}{360}$. Cross-multiply to get $5{,}760 = 40\pi y$. Divide both sides by 40π to get $y = \frac{5{,}760}{40\pi} = \frac{144}{\pi} \approx 45.8366$. The angle is, therefore, in between these two values of y. The question specifies that the answer must be an integer. Therefore, to get credit, grid in one of the following answers: 43, 44, or 45.

36. **90** The question says that $\frac{2}{5}$ of the marbles in the closet must be blue. At the beginning, there are 230 blue marbles and 370 red marbles, so there are a total of 230 + 370 = 600 marbles. 110 red marbles are added, so there is now a total of 370 + 110 = 480 red marbles and 600 + 110 = 710 total marbles. The question asks how many blue marbles must be added so that $\frac{2}{5}$ of the marbles are blue. If b blue marbles are added, there will be 230 + b blue marbles and 710 + b total marbles. Set up the equation $\frac{230 + b}{710 + b} = \frac{2}{5}$. Cross-multiply to get $5(230 + b) = 2(710 + b)$. Distribute to get $1{,}150 + 5b = 1{,}420 + 2b$. Subtract $2b$ from both sides to get $1{,}150 + 3b = 1{,}420$. Subtract 1,150 from both sides to get $3b = 270$. Divide both sides by 3 to get $b = 90$. The answer is 90.

37. **1.07** The question asks for the value of r in the bank's interest formula. Interest is a type of exponential growth. The formula for this is *final amount* = *original amount*$(1 + \textit{rate})^{\textit{number of changes}}$. The original amount is \$5,400 and the rate of interest is 7%. In the formula, rate is in decimal form rather than percent form, so the rate is 0.07. The bank pays annual interest, so the number of changes is the number of years, which is y. The final amount is the amount in the bank after y years, which is A. Plug these into the exponential growth formula to get $A = 5{,}400(1 + 0.07)^y$ or $A = 5{,}400(1.07)^y$. This is now in the same form as the equation provided by the question, $A = 5{,}400(r)^y$. Since the question asks for the value of r in the question's formula, which is in the same position as 1.07 in the standard interest formula, the answer is 1.07.

38. **7,078** As discussed in the explanation for Question 38, $r = 1.07$, so $A = 5{,}400(1.07)^y$. The question asks for the value after four years, so $A = 5{,}400(1.07)^4$. Enter this into a calculator to get about \$7,078.29. The question asks for the value to the nearest dollar (disregarding the dollar sign), so the answer is 7,078. Without the formula, it is still possible to get the answer. Just add 7% of 5,400 to get the value after one year, 7% of that new value to get the value after two years, and do that 2 more times to get the value after four years.



Chapter 11
Practice Test 5

Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

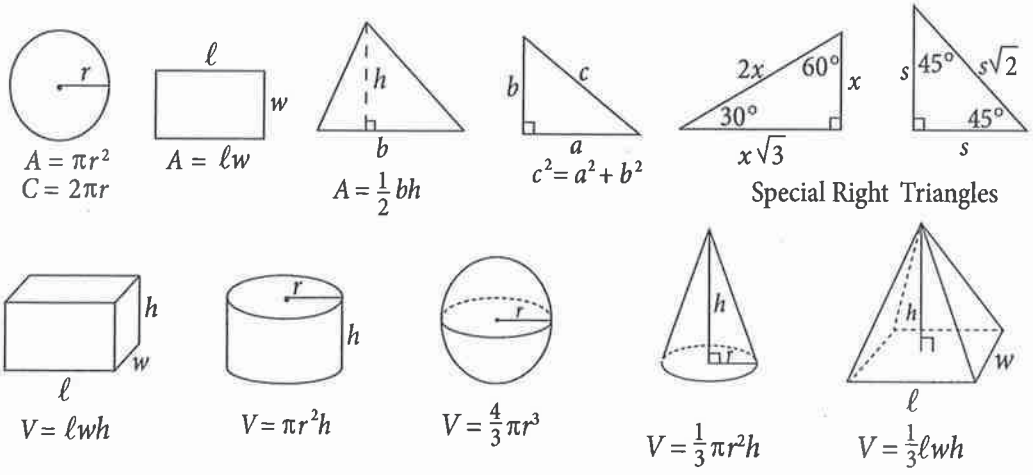
DIRECTIONS

For questions **1-15**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **16-20**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is not permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

An editor is paid $25 an hour to edit 3 essays and an additional $50 bonus when the edits on all three essays are completed. If the edits on the essays are completed, what expression could be used to determine how much the editor earned?

A) $50y + 25$, where y is the number of hours

B) $25y + 50$, where y is the number of hours

C) $y(25 + 2) + 3$, where y is the number of essays

D) $50y + (25 + 2)$, where y is the number of essays

2

$$(-mn^2 + 2n^2 - 6m^2n) + (2mn^2 - 2n^2 + 3m^2n)$$

The expression above is equivalent to which of the following?

A) $mn^2 + 4n^2 - 9m^2n$

B) $mn^2 - 3m^2n$

C) $3mn^2 - 4n^2$

D) $3m^2n - mn^2$

3

$$\frac{1}{12}x - \frac{1}{12}y = 13$$
$$\frac{1}{3}x - \frac{1}{6}y = 20$$

Which ordered pair (x, y) satisfies the equations above?

A) $(-35, 190)$

B) $(-36, -192)$

C) $(168, 25)$

D) $\left(\frac{752}{5}, \frac{304}{5}\right)$

4

Kelly is a salesperson at a shoe store, where she must sell a pre-set number of pairs of shoes each month. At the end of each workday, the number of pairs of shoes that she has left to sell that month is given by the equation $S = 300 - 15x$, where S is the number of pairs of shoes Kelly still needs to sell and x is the number of days she has worked that month. What is the meaning of the number 300 in this equation?

A) Kelly must sell 300 pairs of shoes per week.

B) Kelly must sell 300 pairs of shoes per day.

C) Kelly will sell the pairs of shoes in 300 days.

D) Kelly must sell 300 pairs of shoes each month.

CONTINUE

5

A certain amusement park sells half-day passes and all-day passes. The amusement park charges $40 for a half-day pass and $80 for an all-day pass. The amusement park sold a total of 70 passes one day for $4,600. How many all-day passes did the amusement park sell?

A) 25

B) 35

C) 45

D) 60

6

$$5x^2 + 7x - 6 = 0$$

If a and b are two solutions to the equation above and $a < b$, which of the following is the value of $b - a$?

A) $\frac{3}{5}$

B) $\frac{6}{5}$

C) $\frac{8}{5}$

D) $\frac{13}{5}$

7

Which of the following must be true if $\frac{t+u}{t} = \frac{12}{11}$?

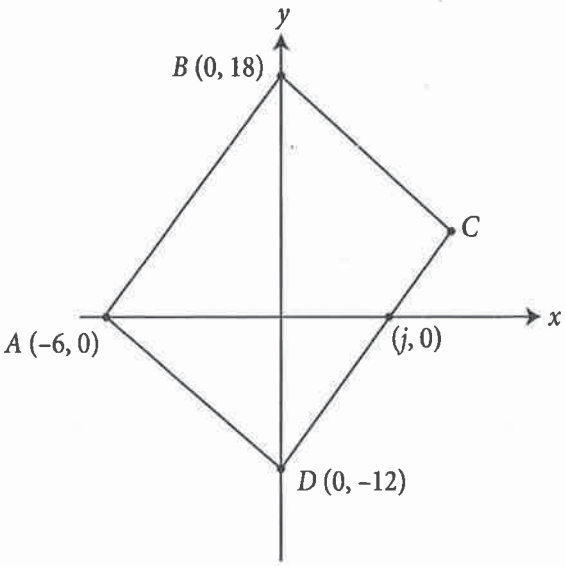
A) $\frac{u}{t} = \frac{1}{11}$

B) $\frac{u}{t} = \frac{23}{11}$

C) $\frac{t-u}{t} = \frac{1}{11}$

D) $\frac{t+2u}{t} = -\frac{8}{11}$

8



Parallelogram $ABCD$ is shown in the xy-plane above. What is the value of j?

A) 15

B) 12

C) 4

D) 3

CONTINUE

9

$$x = \frac{y(y-3)}{2}$$

The number of diagonals, x, that can be drawn within a polygon depends on the number of sides, y, of the polygon according to the formula above. If a polygon has at least 7 diagonals, what is the least number of sides it can have?

A) 7

B) 6

C) 5

D) 4

10

The value of a car decreases $500 for every 1,000 miles it is driven. The current value of the car is $23,000, and the car is driven an average of 10,000 miles per year. What will be the value of the car, in dollars, at a point in time y years from now?

A) $23,000 – $5,000$y$

B) $23,000 – 500y$

C) $23,000 – 0.02y$

D) $23,000 – 0.0002y$

11

$$7x - cy = 10$$

$$5x + 2y = 8$$

In the system of equations above, x and y are variables and c is a constant. What must the value of c be if the system of equations has no solution?

A) $\frac{14}{5}$

B) $\frac{27}{25}$

C) $-\frac{27}{25}$

D) $-\frac{14}{5}$

12

Which of the following complex numbers is equal to $\frac{4-7i}{6+3i}$? (Note: $i = \sqrt{-1}$)

A) $\frac{1}{15} + \frac{6i}{5}$

B) $\frac{1}{15} - \frac{6i}{5}$

C) $\frac{2}{3} - \frac{7i}{3}$

D) $\frac{2}{3} + \frac{7i}{3}$

CONTINUE

13

$$g(x) = 2(x^2 + 14x + 7) - 7(x + c)$$

In the polynomial $g(x)$ defined above, c is a constant. If $g(x)$ is divisible by x, what is the value of c?

A) -2

B) 0

C) 2

D) 5

14

If $3r - s = 10$, then which of the following is equivalent to $\frac{27^r}{3^s}$?

A) 27^2

B) 9^4

C) 3^{10}

D) The value cannot be determined from the information given.

15

Which of the following is equivalent to $\frac{4n + 9}{n - 5}$?

A) $4 + \frac{29}{n - 5}$

B) $4 + \frac{9}{n - 5}$

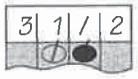
C) $4 - \frac{9}{5}$

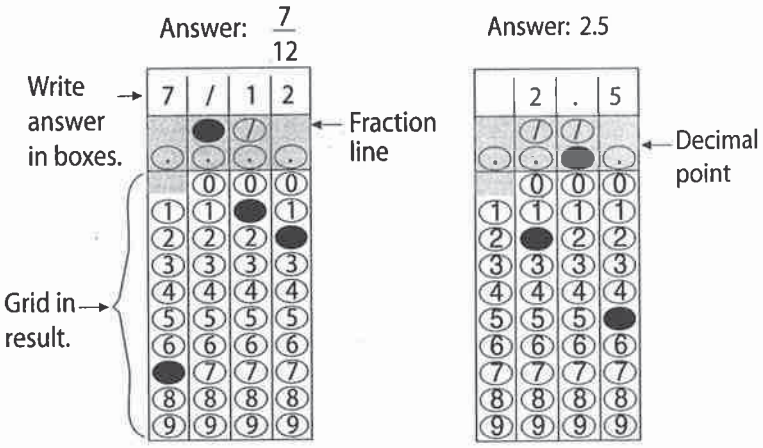
D) $-\frac{4 + 9}{5}$

CONTINUE

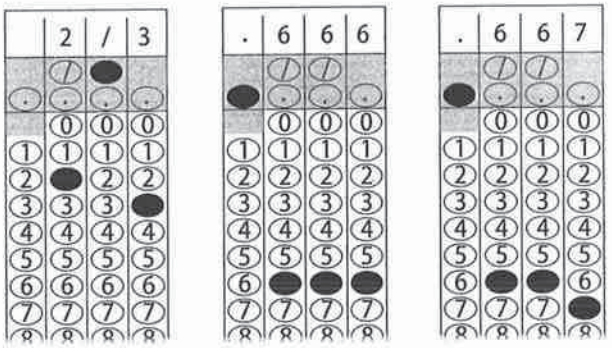
DIRECTIONS

For questions 16-20, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

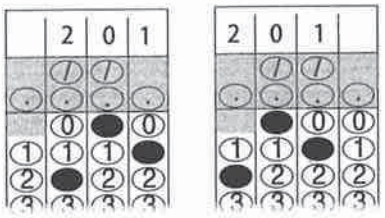
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.



Acceptable ways to grid $\frac{2}{3}$ are:



Answer: 201 – either position is correct



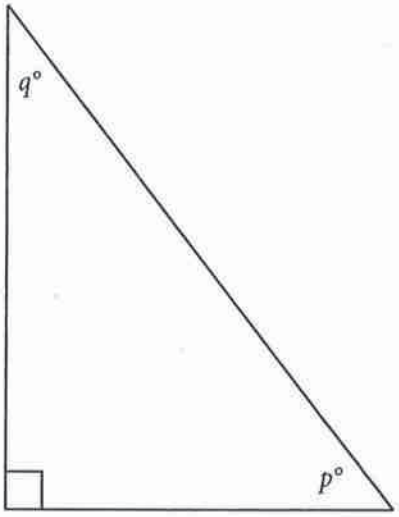
NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

16

For what value of x is $37 = \frac{x}{20} - 3$?

17



In the triangle above, the cosine of $p°$ is 0.8. What is the sine of $q°$?

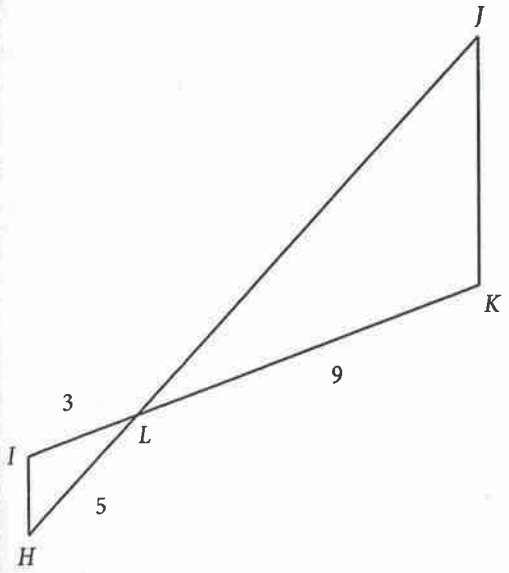
18

If $a \neq 0$, what is the value of $\frac{9(5a)^2}{(3a)^2}$?

19

CONTINUE

19



Segment $\overline{HJ}$ intersects segment IK at L in the figure above. If $\overline{HI} \parallel \overline{JK}$, what is the length of segment HJ?

20

What is the value of y if $z = 5\sqrt{3}$ and $3z = \sqrt{3y}$?

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section in the test.

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

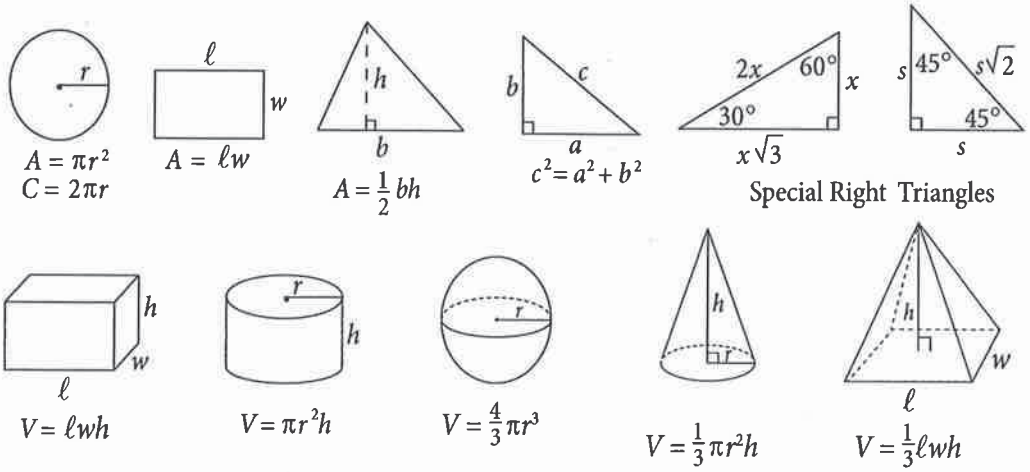
DIRECTIONS

For questions **1-30**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **31-38**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

NOTES

1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

David has a mobile data plan for which the monthly fee is $20.00 and the data usage fee is $2.50 per gigabyte. Which of the following functions expresses David's cost, in dollars, for a month in which he uses g gigabytes of data?

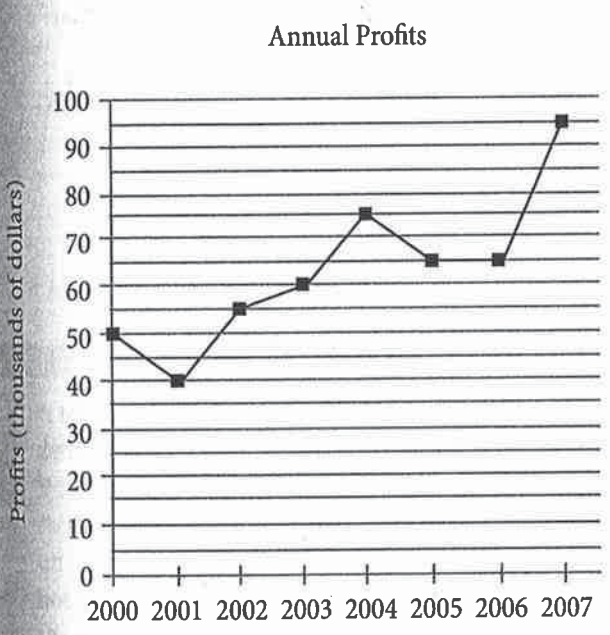
A) $f(g) = 22.50g$

B) $f(g) = 20g + 2.50$

C) $f(g) = 20 + 250g$

D) $f(g) = 20 + 2.50g$

2



The line graph above shows the annual profit of a particular clothing store from 2000 to 2007. According to the graph, what was the greatest change (in absolute value) in the annual profit between two consecutive years?

A) $25,000

B) $30,000

C) $35,000

D) $40,000

3

In order to qualify for a fitness competition, a person must be able to complete 30 pull-ups in one minute. Jim can currently do 14 pull-ups in one minute and believes that he can increase that amount by 7 pull-ups each year. Which of the following represents the number of pull-ups that Jim believes he will be able to complete in one minute y years from now?

A) $7y + 14$

B) $7y + 30$

C) $14y + 7$

D) $14 - 7y$

4

$$v = 17 + 2.5t$$

A constantly-accelerating particle is moving in a straight line. After t seconds, the particle is moving at a velocity of v, in meters per second, as shown in the equation above. What is t when v is 67 ?

A) 184.5

B) 67

C) 33.6

D) 20

CONTINUE

5

When function h is graphed in the xy-plane, it has x-intercepts at -4, 2, and 4. Which of the following could define h?

A) $h(x) = (x - 4)(x - 2)(x + 4)$

B) $h(x) = (x - 4)(x + 2)(x + 4)$

C) $h(x) = (x - 4)^2(x + 2)$

D) $h(x) = (x + 2)(x + 4)^2$

6

When three times a number n is added to 9, the result is 3. What is the result when 4 times n is added to 14?

A) -2

B) 3

C) 6

D) 22

7

A coffee shop is filling coffee cups from an industrial urn that contains 64 gallons of coffee. At most, how many 16-ounce cups of coffee can be filled from the urn? (1 gallon = 128 ounces)

A) 4

B) 512

C) 1,024

D) 2,048

8

What is the slope of the line in the xy-plane that passes through the points $\left(5, \frac{8}{3}\right)$ and $\left(1, -\frac{1}{3}\right)$?

A) -2

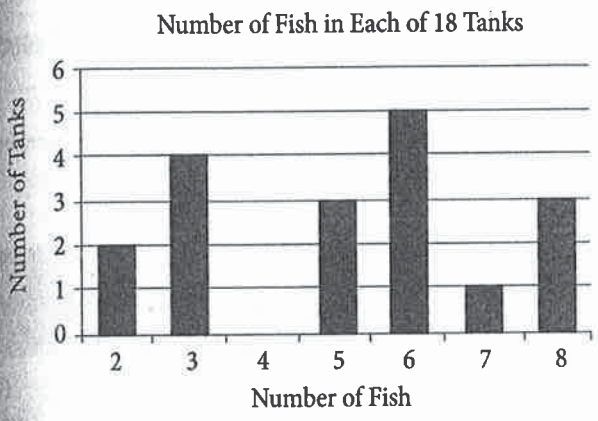
B) $-\frac{4}{3}$

C) $\frac{3}{4}$

D) 2

CONTINUE

9



Based on the histogram above, which of the following is closest to the average (arithmetic mean) number of fish per tank?

A) 5

B) 6

C) 7

D) 8

10

A telephone survey was conducted in order to determine if people in City C are more likely to work 9-to-5 office jobs than other jobs. The research team called 5,000 random people between 12 p.m. to 4 p.m. on a Thursday. Of the 5,000 people called, 3,000 did not answer, and 250 refused to participate. Which of the following was the biggest flaw in the design of the survey?

A) The time the survey was taken

B) Population size

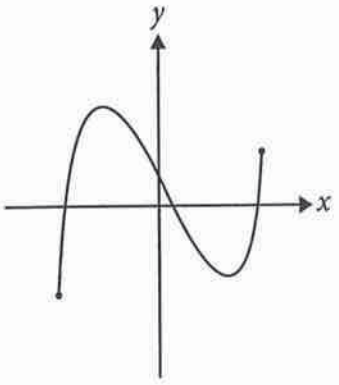
C) Sample size

D) The fact that the survey was done by telephone

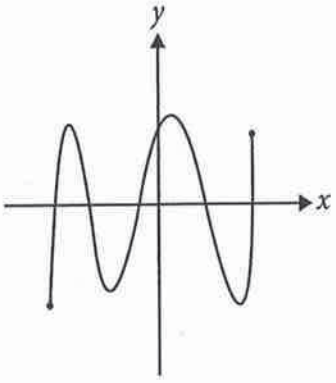
11

If the function p has exactly four distinct roots, which of the following could represent the complete graph of $y = p(x)$ in the xy-plane?

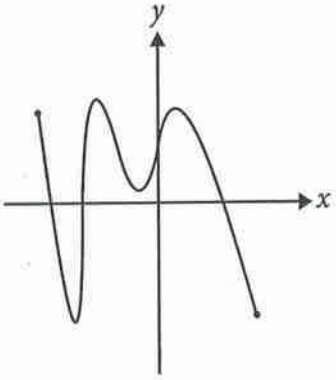
A)



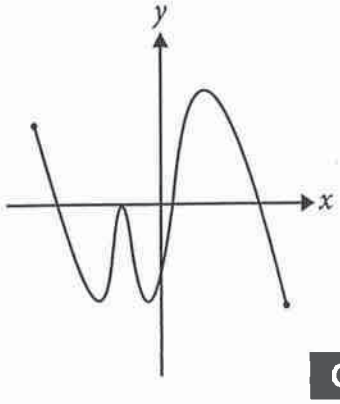
B)



C)



D)



CONTINUE

12

One morning in a particular restaurant, 85 percent of the customers ordered the brunch special. Which of the following could be the total number of customers in the restaurant that morning?

A) 40

B) 42

C) 44

D) 48

13

$$d = -8t^2 + vt + h$$

The equation above gives the distance d, in meters, a projectile is above the ground t seconds after it is released with an initial velocity of v meters per second from an initial height of h meters. Which of the following gives v in terms of d, t, and h ?

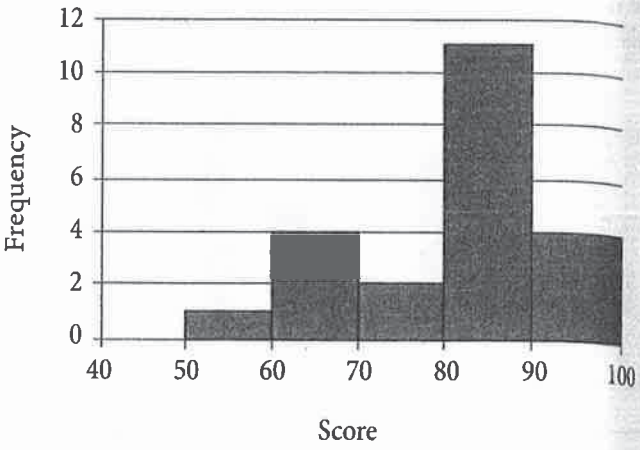
A) $v = \frac{d - h}{t} + 8t$

B) $v = \frac{d + h}{t} - 8t$

C) $v = \frac{d - h + 8}{t}$

D) $v = d + h - 8t$

14



The histogram above shows the distribution of the scores of 22 students on a recent biology test. Which of the following could be the median score of the 22 students represented in the histogram?

A) 68

B) 71

C) 77

D) 84

CONTINUE

Questions 15-17 refer to the following information.

A survey of 130 randomly selected workers in a particular metropolitan area was conducted to gather information about average daily commute times. The data are shown in the table below.

	Commutes by Public Transit	Does not commute by Public Transit	Total
Less than 1 hour	22	46	68
At least 1 hour	29	33	62
Total	51	79	130

15

Which of the following is closest to the percent of those surveyed who commute using public transit?

A) 65%

B) 46%

C) 39%

D) 32%

16

In 2014, the population of the metropolitan area from the survey was about 13 million. If the survey results were used to estimate information about commute times throughout the metropolitan area, which of the following is the best estimate for the number of individuals who used public transit and had an average daily commute of at least one hour?

A) 290,000

B) 2,200,000

C) 2,900,000

D) 6,200,000

17

Based on the data, how many times more likely is it for a person with a commute of less than 1 hour NOT to commute by public transit that it is for a person with a commute of at least one hour NOT to commute by public transit? (Round the answer to the nearest hundredth.)

A) 1.39 times as likely

B) 1.27 times as likely

C) 0.78 times as likely

D) 0.72 times as likely

CONTINUE

18

In order to determine the effect that caffeinated beverage *C* would have on sleep, researchers conducted a study. From a large population of people without sleep disorders, 500 subjects were randomly selected. Half the subjects were randomly selected to consume beverage *C* and the rest did not consume beverage *C*. The results of the study showed that the subjects who consumed beverage *C* slept less than those who did not consume beverage *C*. Based on the design and results of the study, which of the following statements is the best conclusion?

A) Beverage *C* will cause more loss in sleep than all other caffeinated beverages.

B) Beverage *C* will cause a substantial loss in sleep.

C) Beverage *C* is likely to reduce the amount of sleep of people without sleep disorders.

D) Beverage *C* will reduce sleep of anyone who consumes it.

19

The sum of four numbers is 1,764. One of the numbers, n, is 40% more than the sum of the other three numbers. What is the value of n ?

A) 287

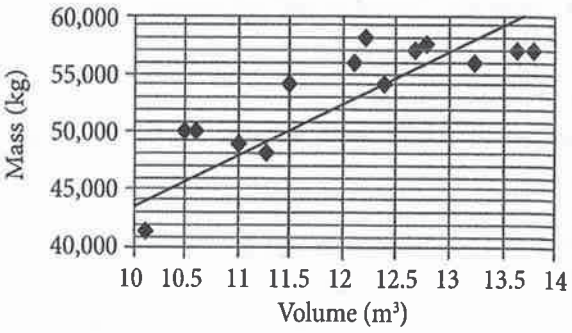
B) 735

C) 1,029

D) 1,260

20

Volume versus Mass



Selin weighs 14 different objects of similar density. The scatterplot shown above shows the volume of each object and the corresponding weight of each object. The line of best fit for the data is shown. For the object that had a volume of 11.5 m^3, the actual mass was about how many kilograms more than the mass predicted by the line of best fit?

A) 1,000

B) 2,000

C) 3,000

D) 4,000

21

CONTINUE

21

Jessica owns a store that sells only laptops and tablets. Last week, her store sold 90 laptops and 210 tablets. This week, the sales, in number of units, of laptops increased by 50 percent, and the sales, in number of units, of tablets increased by 30 percent. By what percentage did total sales, in units, in Jessica's store increase?

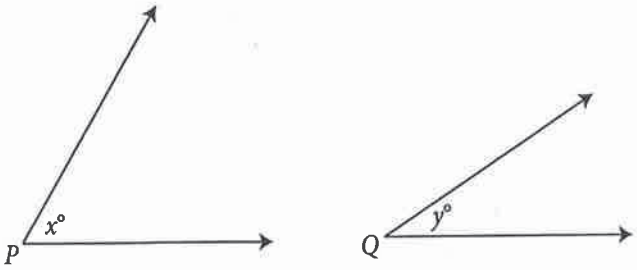
A) 20 percent

B) 25 percent

C) 36 percent

D) 80 percent

22



Note: Figures not drawn to scale

For acute angles P and Q shown above, $\cos(x°) = \sin(y°)$. If $x = 3c - 23$ and $y = 7c - 42$, what is the value of c?

A) 24.5

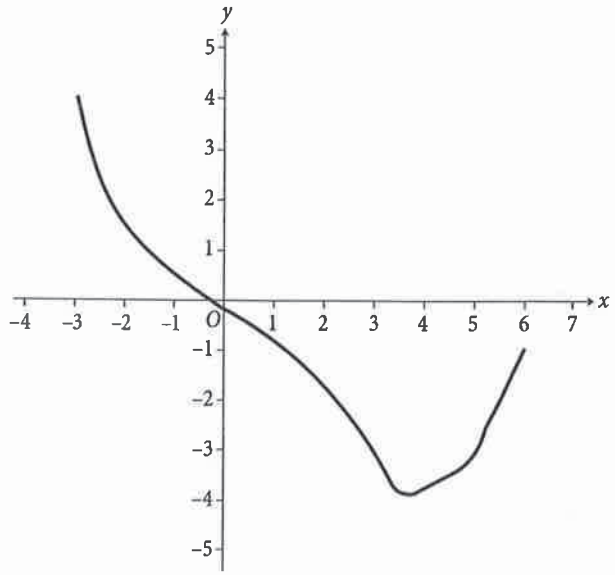
B) 15.5

C) 9.0

D) 6.0

CONTINUE

23



What is the maximum value of the function graphed in the xy-plane above, for $-3 \leq x \leq 6$?

A) 4

B) 5

C) 6

D) ∞

24

Matthew constructs a fence around a patch of grass in his backyard. The patch has a width that is 8 feet more than 4 times the length. What is the perimeter of the fence if Matthew's patch of grass has an area of 5,472 square feet?

A) 364 feet

B) 376 feet

C) 396 feet

D) 400 feet

25

In the xy-plane, the line determined by the points $(c, 3)$ and $(27, c)$ intersects the origin. Which of the following could be the value of c ?

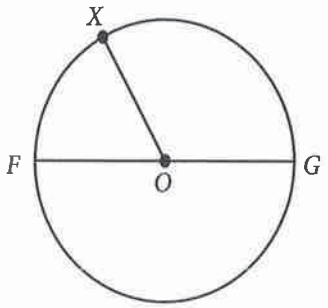
A) 0

B) 3

C) 6

D) 9

26



In the circle above, the length of arc $\overset{\frown}{FXG}$ is 14π. If $\overline{FOG}$ is a chord and O is the center, what is the length of the segment $\overline{XO}$?

A) 7

B) 14

C) 28

D) 56

CONTINUE

27

Let p and q be numbers such that $-|p| < q < |p|$. Which of the following must be true?

I. $p > 0$

II. $|p| > -q$

III. $p > |q|$

A) I only

B) II only

C) II and III only

D) I, II, and III only

28

A rectangular container with a base that measures 10 feet by 10 feet is filled with jelly beans. The container is divided into regions each with the same height as the container and a square base with sides that measure 1 foot each. Sherman randomly selects ten of these regions and counts the number of blue jelly beans in each region. The results are shown in the table below.

Region	Blue Jelly Beans	Region	Blue Jelly Beans
I	20	VI	22
II	21	VII	25
III	27	VIII	24
IV	31	IX	28
V	19	X	23

Which of the following is a reasonable approximation of the number of blue jelly beans in the entire container?

A) 25,000

B) 2,500

C) 250

D) 25

CONTINUE

29

	Flavor	
Product Type	Frozen Yogurt	Ice Cream
Vanilla		
Chocolate		
Total	32	152

The incomplete table above shows the sales for a particular sweet shop by product and flavor. There were 4 times as many vanilla ice creams sold as vanilla frozen yogurts, and there were 6 times as many chocolate ice creams sold as chocolate frozen yogurts. If there were a total of 32 frozen yogurts and 152 ice creams sold, and no flavors other than vanilla and chocolate were available, which of the following is closest to the probability that a randomly selected ice cream sold was vanilla?

A) 0.250

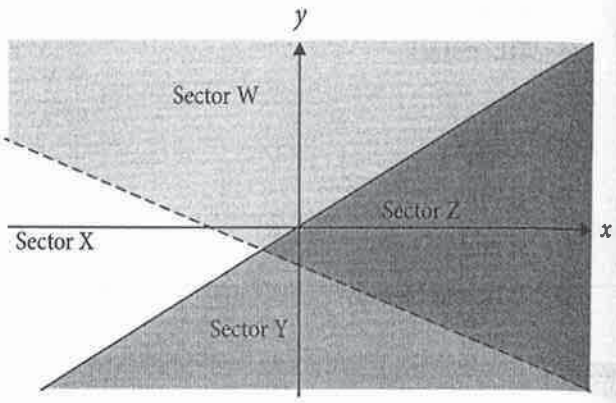
B) 0.435

C) 0.526

D) 0.667

30

$$\begin{cases} y \geq x \\ 3y < 2x - 3 \end{cases}$$



A system of inequalities is graphed above. Which sector or sectors on the graph could represent all of the solutions to the system shown?

A) Sectors Y and Z

B) Sectors W and Y

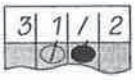
C) Sector W

D) Sector X

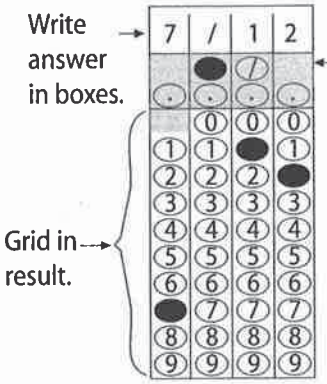
CONTINUE

DIRECTIONS

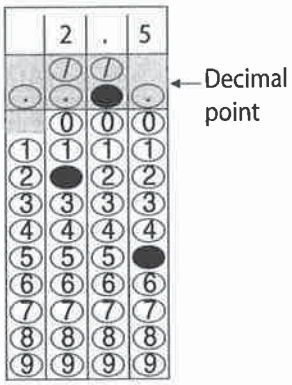
For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

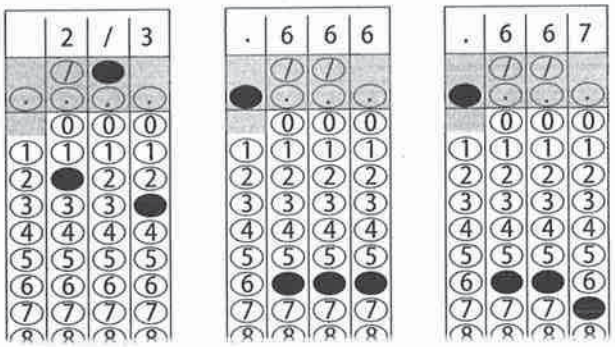
Answer: $\frac{7}{12}$



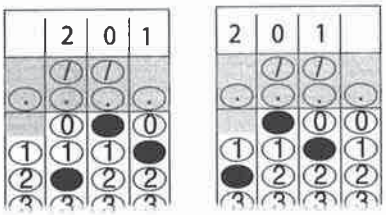
Answer: 2.5



Acceptable ways to grid $\frac{2}{3}$ are:



Answer: 201 – either position is correct



NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

31

At a certain food truck, hamburgers are sold for $5 each and hot dogs are $3 each. If Martina buys one hamburger and h hot dogs and spends at least $20 and no more than $25, what is one possible value of h ?

32

Number of States in 14 Federal Nations			
Nation	States	Nation	States
Australia	6	Micronesia	4
Austria	9	Nigeria	36
Brazil	26	Saint Kitts and Nevis	2
Germany	16	South Sudan	10
India	29	Sudan	17
Malaysia	13	United States	50
Mexico	31	Venezuela	23

The table above lists the number of states in each of the 14 federal nations that have subdivisions called states. According to the table, what is the mean number of states of these nations? (Round your answer to the nearest tenth.)

33

In the xy-plane, the point $(-2, 6)$ lies on the graph of the function $g(x) = 2x^2 + kx + 18$. What is the value of k ?

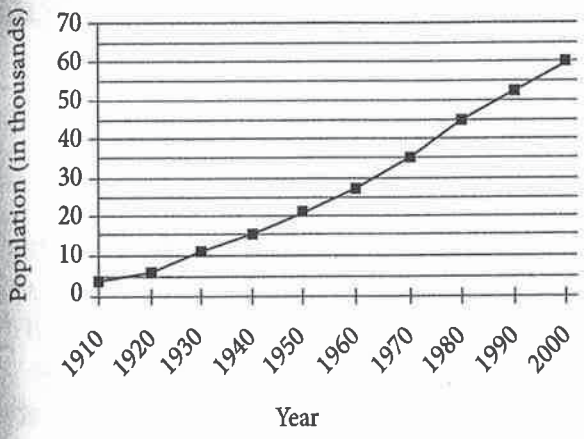
34

In a certain college dormitory, 108 students are assigned dorm rooms. The dormitory has 26 dorm rooms, each of which is assigned 3 or 5 students. How many of the dorm rooms will be assigned 3 students?

CONTINUE

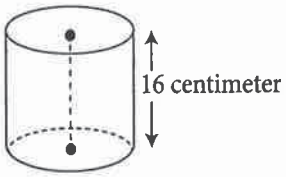
35

Population of Town A
Each Decade from 1910 to 2000



According to the figure shown above, the population of Town A in 1970 was what fraction of the population of Town A in 2000 ?

36



A wooden block is in the shape of the right circular cylinder shown above. If the volume of the wooden block is 64π cubic centimeters, what is the diameter of the base of the cylinder, in centimeters?

Questions 37 and 38 refer to the following information.

$\omega^2 = \omega_0^2 + 2\alpha\theta$ (angular position – angular velocity)

$\omega = \omega_0 + \alpha t$ (time – angular velocity)

$\theta = \omega_0 t + \frac{1}{2}\alpha t^2$ (time – angular position)

A carousel is rotating at an angular velocity of 90 degrees per second. The instant a particular point on the carousel reaches angular position $\theta = 0°$, the carousel operator flips a switch, causing the carousel at a constant angular acceleration to slow down and eventually change direction. The equations above describe the constant-acceleration motion of the carousel, where ω_0 represents the initial angular velocity, ω is the angular velocity as it travels, θ is the angular position of the particular point on the carousel, t is the time since the switch was flipped, and α is the constant angular acceleration ($-12.6°/s^2$).

37

To the nearest degree, at what angular position will the carousel change direction?

38

To the nearest second, how long will it take the carousel to come to a complete stop before it changes direction?

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section in the test.

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Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

1.
YOUR NAME: (Print) _____ (Last) (First) (M.I.)
SIGNATURE: _____ DATE: / /
HOME ADDRESS: (Print) _____ (Number and Street)
(City) (State) (Zip Code)
PHONE NO.: (Print)

IMPORTANT: Please fill in these boxes exactly as shown on the back cover of your test book.

2. TEST FORM

3. TEST CODE

4. REGISTRATION NUMBER

6. DATE OF BIRTH

Month	Day		Year	
JAN				
FEB	0	0	0	0
MAR	1	1	1	1
APR	2	2	2	2
MAY	3	3	3	3
JUN		4	4	4
JUL		5	5	5
AUG		6	6	6
SEP		7	7	7
OCT		8	8	8
NOV		9	9	9
DEC				

7. SEX
MALE
FEMALE

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5. YOUR NAME

First 4 letters of last name					FIRST INIT	MID INIT
A	A	A	A		A	A
B	B	B	B		B	B
C	C	C	C		C	C
D	D	D	D		D	D
E	E	E	E		E	E
F	F	F	F		F	F
G	G	G	G		G	G
H	H	H	H		H	H
I	I	I	I		I	I
J	J	J	J		J	J
K	K	K	K		K	K
L	L	L	L		L	L
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P	P	P	P		P	P
Q	Q	Q	Q		Q	Q
R	R	R	R		R	R
S	S	S	S		S	S
T	T	T	T		T	T
U	U	U	U		U	U
V	V	V	V		V	V
W	W	W	W		W	W
X	X	X	X		X	X
Y	Y	Y	Y		Y	Y
Z	Z	Z	Z		Z	Z

Test 5 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 1—Reading

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
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20. A B C D
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25. A B C D
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27. A B C D
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41. A B C D
42. A B C D
43. A B C D
44. A B C D
45. A B C D
46. A B C D
47. A B C D
48. A B C D
49. A B C D
50. A B C D
51. A B C D
52. A B C D

Section 2—Writing and Language Skills

1. A B C D
2. A B C D
3. A B C D
4. A B C D
5. A B C D
6. A B C D
7. A B C D
8. A B C D
9. A B C D
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34. A B C D
35. A B C D
36. A B C D
37. A B C D
38. A B C D
39. A B C D
40. A B C D
41. A B C D
42. A B C D
43. A B C D
44. A B C D

The Princeton Review

Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

Test 5 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 3—Mathematics: No Calculator

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ
6. Ⓐ Ⓑ Ⓒ Ⓓ
7. Ⓐ Ⓑ Ⓒ Ⓓ
8. Ⓐ Ⓑ Ⓒ Ⓓ
9. Ⓐ Ⓑ Ⓒ Ⓓ
10. Ⓐ Ⓑ Ⓒ Ⓓ
11. Ⓐ Ⓑ Ⓒ Ⓓ
12. Ⓐ Ⓑ Ⓒ Ⓓ
13. Ⓐ Ⓑ Ⓒ Ⓓ
14. Ⓐ Ⓑ Ⓒ Ⓓ
15. Ⓐ Ⓑ Ⓒ Ⓓ

16. 17. 18. 19. 20.

Section 4—Mathematics: Calculator

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ
6. Ⓐ Ⓑ Ⓒ Ⓓ
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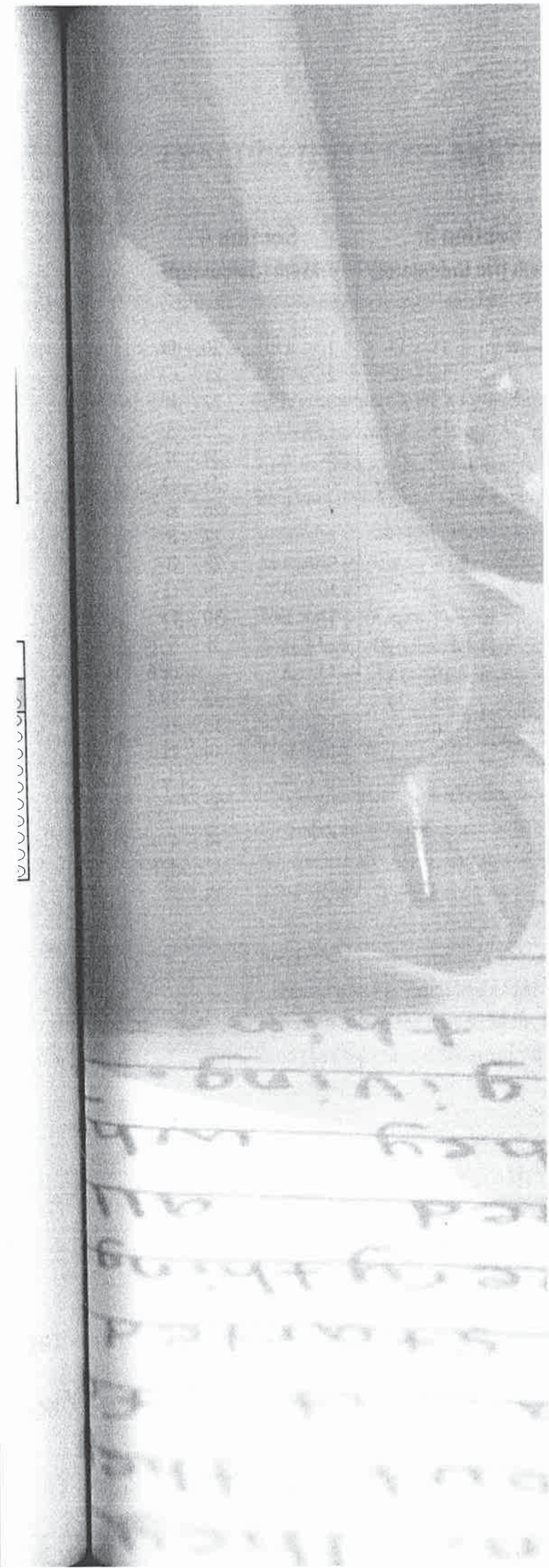
25. Ⓐ Ⓑ Ⓒ Ⓓ
26. Ⓐ Ⓑ Ⓒ Ⓓ
27. Ⓐ Ⓑ Ⓒ Ⓓ
28. Ⓐ Ⓑ Ⓒ Ⓓ
29. Ⓐ Ⓑ Ⓒ Ⓓ
30. Ⓐ Ⓑ Ⓒ Ⓓ

31. 32. 33. 34. 35.

36. 37. 38.



Chapter 12
Practice Test 5: Answers and Explanations

Section 3: Math (No Calculator)

1. B
2. B
3. B
4. D
5. C
6. D
7. A
8. C
9. B
10. A
11. D
12. B
13. C
14. C
15. A
16. 800
17. $\frac{8}{10}$, $\frac{4}{5}$, or 0.8
18. 25
19. 20
20. 225

Section 4: Math (Calculator)

1. D
2. B
3. A
4. D
5. A
6. C
7. B
8. C
9. A
10. A
11. D
12. A
13. A
14. D
15. C
16. C
17. B
18. C
19. C
20. D
21. C
22. B
23. A
24. B
25. D
26. B
27. B
28. B
29. C
30. D
31. 5 or 6
32. 19.4
33. 10
34. 11
35. $\frac{7}{12}$
36. 4
37. 321
38. 7

es, please turn to page 565.

Section 3: Math (No Calculator)

1. **B** Come up with the expression in bite-sized pieces. Notice that all of the choices use the variable y, which represents the number of hours for (A) and (B) but the number of essays for (C) and (D). The number of essays is given but the number of hours is not. Therefore, the variable has to represent the unknown value, the number of hours. Eliminate (C) and (D). The editor is paid $25 per hour. The total amount that the editor is paid for his or her time can be found by multiplying 25 by the number of hours. The remaining choices use y to represent the number of hours, so the product is $25y$. Eliminate the remaining choice that doesn't include $25y$, which is (A). Only one choice remains. To see why (B) is correct, note that the $50 bonus must be added to the editor's earnings for time spent. Also, the bonus is for *all three* essays rather than *each* essay, so it should only be added once. The answer is (B).

2. **B** Use bite-sized pieces and eliminate answer choices after each step. Start by combining $-mn^2 + 2mn^2$ to get mn^2, and use this to eliminate (C) and (D). Now combine the $2n^2$ terms, which cancel and should not appear in the correct answer. Use this to eliminate (A). The answer is (B).

3. **B** The question is made more complicated by fractions, so get rid of the fractions. Multiply both sides of the first equation by 12 to get $x - y = 156$. Multiply both sides of the second equation by 6 to get $2x - y = 120$. Subtract the first equation from the second equation.

$$\begin{aligned} 2x - y &= 120 \\ -(x - y &= 156) \\ x &= -36 \end{aligned}$$

Eliminate any choice that doesn't include $x = -36$. Eliminate (A), (C), and (D). Only one choice remains. To see why $y = -192$, plug $x = -36$ into the non-fraction version of the first equation to get $-36 - y = 156$, and solve for y. The answer is (B).

4. **D** The problem discusses how many shoes Kelly must sell in a month. Eliminate (C) because 300 days does not fit the problem. Since x is the number of days she works each month, plug in $x = 0$ to see how many shoes she starts with at the beginning of the month. The value for S would be 300 at day 0. Therefore, (D) is the answer.

5. **C** Since there are actual numbers in the answer choices, plug in the answers, starting with one of the middle two choices. Start with (B), which is 35. The question asks for the number of all-day passes sold, so assume that there were 35 all-day passes sold. Since there were a total of 70

passes sold, there must have been a total of 70 – 35 = 35 half-day passes sold. The park sells all-day passes for \$80 and half-day passes for \$40. Since there were 35 of each sold, the park took in a total of \$80 × 35 = \$2,800 for all-day passes and \$40 × 35 = \$1,400 for half-day passes. Therefore, the park took in a total of \$2,800 + \$1,400 = \$4,200. However, the question states that the park took in \$4,600, so eliminate (B). Since the total should be greater, the park needs to sell more of the \$80 tickets. Therefore, the number of all-day passes sold has to increase. Eliminate (A) as well. Only (C) and (D) remain. Since 60 is easier to work with than 45, try (D). If 60 all-day passes are sold, then 70 – 60 = 10 half-day passes are sold. The park takes in \$60 × 80 = \$4,800 from all-day passes. Since this is already too high, eliminate (D). Only one choice remains. The answer is (C).

6. **D** To find the solutions to a quadratic equation, either factor or use the quadratic formula. When the coefficient on the x^2 term is not 1, factoring is more difficult than usual but not impossible. Since 5 is prime, one factor will have $5x$ and the other will have x, so write $(5x\ \ )(x\ \ ) = 0$. Now find two factors of 6 that fit the equation. Since the sign on 6 is negative, one factor is negative and one is positive. To fit the equation, one of the factors must be multiplied by 5 and added to the other to get 7. The only pairs of factors of 6 are 1 and 6 and 2 and 3. Since $5 \times 2 + (-3) = 7$, the equation can be factored as $(5x - 3)(x + 2) = 0$. Set each factor to 0 to get $(5x - 3) = 0$ and $x + 2 = 0$. Solve each factor to get $x = \frac{3}{5}$ and $x = -2$. Another way to find the values for x of a quadratic in the form $ax^2 + bx + c$ is to use the quadratic formula, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. In this case, $a = 5$, $b = 7$, and $c = -6$. Either way of solving yields the solutions $\frac{3}{5}$ and -2. Since the question specifies that $a < b$, $a = -2$ and $b = \frac{3}{5}$. The question asks for $b - a$, which is $\frac{3}{5} - (-2) = \frac{3}{5} + 2 = \frac{3}{5} + \frac{10}{5} = \frac{13}{5}$. The answer is (D).

7. **A** Look at the denominators of the fractions to find easy numbers to plug in. Try $t = 11$. Now look at the numerator to see that $t + u = 12$, so u would then equal 1. Plug these values into the answers to see which is true. Only (A) works, so it must be the answer.

8. **C** Opposite sides of a parallelogram are parallel, and parallel lines have the same slope. Use the slope formula: $\frac{y_1 - y_2}{x_1 - x_2}$. Segment AB has a slope of $\frac{18 - 0}{0 - (-6)} = \frac{18}{6} = 3$. Segment DC is paral-

lel to AB and must have the same slope, so $3 = \frac{0-(-12)}{j-0}$. Then $3 = \frac{12}{j}$, so $3j = 12$, and $j = 4$. The answer is (C).

9. **B** Since the problem involves algebra and asks for the least possible value of y, plug in the answers starting with the smallest number. Try (D). If $y = 4$, then $x = \frac{4(4-3)}{2} = \frac{4(1)}{2} = \frac{4}{2} = 2$, so a polygon with 4 sides only has 2 diagonals. This is not at least 7, so eliminate (D) and try (C). If $y = 5$, then $x = \frac{5(5-3)}{2} = \frac{5(2)}{2} = \frac{10}{2} = 5$. This is not at least 7, so eliminate (C) and try (B). If $y = 6$, then $x = \frac{6(6-3)}{2} = \frac{6(3)}{2} = \frac{18}{2} = 9$. This is greater than 7, so choose (B).

10. **A** The question asks for the value of the car y years from now. Determine the value of the car each year. The car is driven 10,000 miles each year. Set up a proportion to determine the decrease in the value each year. Since the car's value decreases \$500 for every 1,000 miles driven, set up a proportion: $\frac{\$500}{1{,}000 \text{ miles}} = \frac{x}{10{,}000 \text{ miles}}$. Cross-multiply to get $1{,}000x = 5{,}000{,}000$. Divide both sides by 1,000 to get $x = 5{,}000$. Therefore, the car's value decreases by \$5,000 each year. Plug in a value for y, such as $y = 2$, and calculate the value of the car. After 2 years, the car's value decreases by \$10,000, so the value then would be \$13,000. Go through each answer, plug in $y = 2$, and eliminate each choice that is not equal to \$13,000. Choice (A) is \$23,000 – \$5,000(2) = \$23,000 – \$10,000 = \$13,000. Keep (A). Choice (B) is \$23,000 – \$500(2) = \$23,000 – \$1,000 = \$22,000. Eliminate (B). Choice (C) is \$23,000 – \$0.02(2) = \$23,000 – \$0.04 = \$22,999.96. Eliminate (C). Choice (D) is \$23,000 – \$0.0002(2) = \$23,000 – \$0.0004 = \$22,999.9996. Eliminate (D). The answer is (A).

11. **D** The problem states that the system of equations has no solution, which means that the lines are parallel and the slopes are equal. The slope of a line in standard form $Ax + By = C$ is given by $-\frac{A}{B}$, so the slope of the first line is $-\frac{7}{-c} = \frac{7}{c}$. The slope of the second line is $-\frac{5}{2}$. Set the

slopes equal to each other to solve for c: $\frac{7}{c} = -\frac{5}{2}$. Now cross-multiply to get $-5c = 14$, and divide both sides by -5 to find that $c = -\frac{14}{5}$. Alternatively, convert each line into the form $y = mx + b$ to find the slopes and set them equal. In either case, the answer is (D).

12. **B** Start by multiplying both the numerator and denominator of the given expression by the complex conjugate of the denominator: $\frac{4-7i}{6+3i} \times \frac{6-3i}{6-3i}$. Use FOIL to get $\frac{24-12i-42i+21i^2}{36-18i+18i-9i^2}$. Combine like terms to get $\frac{24-54i+21i^2}{36-9i^2}$. Plug in $i^2 = -1$, since the problem says that $i = \sqrt{-1}$. This gives $\frac{24-54i+21(-1)}{36-9(-1)} = \frac{24-54i-21}{36+9} = \frac{3-54i}{45}$. To make this look like the answer choices, turn the expression into two fractions and reduce: $\frac{3}{45} - \frac{54i}{45} = \frac{1}{15} - \frac{6i}{5}$, which is (B).

13. **C** If a polynomial is divisible by x, each term in the simplified form of the polynomial must have x as a factor. Write $g(x)$ in simplified form. If $g(x) = 2(x^2 + 14x + 7) - 7(x + c)$, distribute to get $g(x) = 2x^2 + 28x + 14 - 7x - 7c$. Combine like terms to get $g(x) = 2x^2 + 21x + 14 - 7c$. The two terms without x as a factor are 14 and $-7c$. In order for the polynomial to be divisible by x, $14 - 7c$ must equal 0, so that only the terms with x as a factor remain. If $14 - 7c = 0$, add $7c$ to both sides to get $14 = 7c$. Divide both sides by 7 to get $c = 2$. The answer is (C).

14. **C** Plugging in would normally be a good idea for a question like this, but this is the no-calculator section. Exponent questions are always easier to handle when the bases are the same, so rewrite 27 as 3^3. Use the rules of exponents to work out the expression as $\frac{27^r}{3^s} = \frac{(3^3)^r}{3^s} = \frac{3^{3r}}{3^s}$. Now that the terms have the same base, remember the MADSPM rule that division means subtraction of the exponents, so $\frac{3^{3r}}{3^s} = 3^{3r-s}$. The problem states that $3r - s = 10$, so $3^{3r-s} = 3^{10}$ and (C) is the answer.

15. **A** This question contains variables in the question and in the answer choices, so plug in. Use $n = 10$ so the calculations are straightforward. Then, $\frac{4n+9}{n-5} = \frac{4(10)+9}{10-5} = \frac{40+9}{5} = \frac{49}{5}$. This is the target value, so plug 10 in for n in the choices to find the one that matches the

target. Start with (A): $4 + \frac{29}{n-5} = 4 + \frac{29}{10-5} = 4 + \frac{29}{5} = \frac{20}{5} + \frac{29}{5} = \frac{49}{5}$. This matches the target, so keep (A) but remember to check all four choices when plugging in. Move to (B): $4 + \frac{9}{n-5} = 4 + \frac{9}{10-5} = 4 + \frac{9}{5} = \frac{20}{5} + \frac{9}{5} = \frac{29}{5}$. This doesn't match the target, so eliminate (B). Try (C): $4 - \frac{9}{5} = \frac{20}{5} - \frac{9}{5} = \frac{11}{5}$. This doesn't match the target, so eliminate (C). Try (D): $\frac{4+9}{-5} = \frac{13}{-5}$, which will be a negative number and won't match the target, so eliminate (D). Choice (A) is the answer.

16. **800** To solve for x, isolate the variable. First add 3 to both sides to get $40 = \frac{x}{20}$. Then, multiply both sides by 20 to get $x = 40 \times 20 = 800$. The answer is 800.

17. $\frac{8}{10}$, $\frac{4}{5}$, or **0.8**

In any triangle with angles of 90°, $x°$, and $y°$, $\cos x = \sin y$. Therefore, if $\cos p = 0.8$, then $\sin q = 0.8$ as well. Alternatively, remember from SOHCAHTOA that the cosine of an angle is the ratio of the adjacent side to the hypotenuse. The value 0.8 can also be written as $\frac{8}{10}$. Plug in 8 as the base of the triangle (adjacent to $p°$) and 10 as the hypotenuse. Sine is opposite over hypotenuse. To find the sine of $q°$, find the opposite side, which is 8, and the hypotenuse, which is 10. The sine of $q°$ is therefore $\frac{8}{10}$, which can also be written as $\frac{4}{5}$ or 0.8. Any of these are acceptable answers.

18. **25** Plug in a value for a that will be easy to use without a calculator. If $a = 2$, then $\frac{9(5a)^2}{(3a)^2} = \frac{9(5 \times 2)^2}{(3 \times 2)^2} = \frac{9(10)^2}{(6)^2} = \frac{9(100)}{36}$. Reduce this fraction now, rather than multiplying it out, since 36 is divisible by 9. The fraction becomes $\frac{100}{4}$, which is 25. The answer is 25.

19. **20** Vertical angles are congruent, so $\angle HLI = \angle JLK$. Also, $\angle IHL = \angle KJL$ because $\overline{HI} \parallel \overline{JK}$. Likewise, $\angle HIL = \angle JKL$. These triangles are similar, and similar triangles have proportional side lengths, so set up a proportion, which will help find $\overline{HJ}$: $\frac{3}{9} = \frac{5}{JL}$. Cross-multiply to find that $45 = 3(\overline{JL})$, and divide both sides by 3 to find that $\overline{JL} = 15$. The question asks for the length of $\overline{HJ}$, which is 5 (from $\overline{HL}$) plus 15 (from $\overline{JL}$) for a total length of 20, which is the answer.

20. **225** Start by plugging $z = 5\sqrt{3}$ into the second equation to get $3(5\sqrt{3}) = \sqrt{3y}$. Distribute the 3 on the left side to get $15\sqrt{3} = \sqrt{3y}$. Square both sides to get rid of the square root signs: $225 \times 3 = 3y$. Divide both sides by 3 to get $225 = y$.

Section 4: Math (Calculator)

1. **D** Translate the information in the question into an expression in bite-sized pieces. The monthly fee is \$20.00 and the data usage fee is \$2.50 per gigabyte. Start with the fee for data usage. The usage is \$2.50 per gigabyte used, so to get the fee in a month in which David used g gigabytes, multiply g by 2.50 to get $2.50g$. Eliminate any answer choice that doesn't include $2.50g$: (A), (B), and (C). Thus, only (D) remains. To determine why (D) is correct, note that the word *and* translates to +, so add 20 to $2.50g$ to get $20 + 2.50g$. The answer is (D).

2. **B** The question asks for the greatest change between consecutive years. Go through each year and determine the change in each. From 2000 to 2001, there is a decrease of \$50,000 – \$40,000 = \$10,000. From 2001 to 2002, there is an increase of \$55,000 – \$40,000 = \$15,000. From 2002 to 2003, there is an increase of \$60,000 – \$55,000 = \$5,000. From 2003 to 2004, there is an increase of \$75,000 – \$60,000 = \$15,000. From 2004 to 2005, there is a decrease of \$75,000 – \$65,000 = \$10,000. From 2005 to 2006, there is no change. From 2006 to 2007, there is an increase of \$95,000 – \$65,000 = \$30,000. The greatest is \$30,000, which is (B). Alternatively, ballpark. Look at the graph and notice that the change from 2006 to 2007 appears to be the steepest, so this difference would have to be the answer. The answer is (B).

3. **A** There are variables in the answers, so plug in. Currently Jim can do 14 pull-ups in a minute. He believes that he can increase this amount by 7 each year. Therefore, he believes that in 1 year he can do 14 + 7 = 21 pull-ups, and in 2 years he can do 21 + 7 = 28 pull-ups. Now plug $y = 2$ into each of the choices and eliminate any that isn't equal to 28. Choice (A) is $7(2) + 14 = 28$, so keep (A). Choice (B) is $7(2) + 30 = 44$, so eliminate (B). Choice (C) is $14(2) + 7 = 35$, so eliminate (C). Choice (D) is $14 - 7(2) = 0$, so eliminate (D). The answer is (A).

4. **D** The question gives an equation and a value for one of the variables in the equation. Plug in the given value to solve for the value of the other variable. If $v = 67$, the equation becomes $67 = 17 + 2.5t$. Subtract 17 from both sides to get $50 = 2.5t$. Divide both sides by 2.5 to get $t = 20$, so the answer is (D).

5. **A** The question asks for the equation of a function that could possibly define h. Each of the equations in the choices is in factored form. If a factor of the equation of a function is in the form $(x - r)$, r is one of the roots, or one of the x-intercepts. Since the roots of this function are –4, 2, and 4, the roots are $(x - (-4))$ or $(x + 4)$, $(x - 2)$, and $(x - 4)$. The only equation with all of these factors is (A), so the answer is (A).

6. **C** Translate the first statement into an equation. The phrase *three times a number n* translates to $3n$. The phrase *is added to* translates to +. The word *is* translates to =. Therefore, the sentence translates to $3n + 9 = 3$. Solve this for n: subtract 9 from both sides to get $3n = -6$, then divide both sides by 3 to get $n = -2$. This is (A). However, the question does not ask for the value of n, so (A) is a trap answer. The question asks for *the result when 4 times n is added to 14*. The phrase *4 times n* translates to $4n$. The phrase *is added to 14* translates to + 14. Therefore, *4 times n is added to 14* translates to $4n + 14$. Since $n = -2$, $4n + 14 = 4(-2) + 14 = -8 + 14 = 6$. The answer is (C).

7. **B** The question asks for how many 16-ounce cups can be filled from a 64-gallon urn. First, convert the 64 gallons into ounces. Use a proportion: $\frac{1 \text{ gallon}}{128 \text{ ounces}} = \frac{64 \text{ gallons}}{x \text{ ounces}}$. Cross-multiply to get $x = (128)(64) = 8{,}192$. Now determine the number of 16-ounce cups that can be filled from an 8,192-ounce urn. Use another proportion: $\frac{1 \text{ cup}}{16 \text{ ounces}} = \frac{y \text{ cups}}{8{,}192 \text{ ounces}}$. Cross-multiply to get $16y = 8{,}192$. Divide both sides by 16 to get $y = 512$. The answer is (B).

8. **C** To determine the slope of a line, use the slope formula, $slope = \frac{y_2 - y_1}{x_2 - x_1}$. Let $\left(1, -\frac{1}{3}\right)$ be (x_1, y_1) and $\left(5, \frac{8}{3}\right)$ be (x_2, y_2). The slope is $\frac{\frac{8}{3} - \left(-\frac{1}{3}\right)}{5 - 1} = \frac{\frac{8}{3} + \frac{1}{3}}{4} = \frac{\frac{9}{3}}{4} = \frac{3}{4}$. The answer is (C).

9. **A** The question asks for the average number of fish per tank. The average is $\frac{total}{number\ of\ things}$. The *things* in this case are the tanks. Since the title of the graph says that there are 18, the average is $\frac{\text{total}}{18}$. The *total* is the number of fish. To determine this, use the histogram. There are 2 tanks with 2 fish each, so these 2 tanks have a total of $2 \times 2 = 4$ fish. There are 4 tanks with 3 fish, so these 4 tanks have a total of $4 \times 3 = 12$ fish. There are no tanks with 4 fish, so ignore that column. There are 3 tanks with 5 fish, so these 3 tanks have a total of $3 \times 5 = 15$ fish. There are 5 tanks with 6 fish, so these 5 tanks have a total of $5 \times 6 = 30$ fish. There is 1 tank with 7 fish, so this 1 tank has a total of $1 \times 7 = 7$ fish. There are 3 tanks with 8 fish, so these 3 tanks have a total of $3 \times 8 = 24$ fish. Therefore, all the tanks have a total of $4 + 12 + 15 + 30 + 7 + 24 = 92$ fish, and the average number of fish per tank is $\frac{92}{18} = 5.\overline{1}$. The question asks for the *closest* choice, which is (A).

10. **A** The question asks for the design flaw in the survey. The survey was conducted to determine whether people in City C are more likely to work 9-to-5 office jobs than other jobs. The survey was conducted exclusively during the time in which people would be working at 9-to-5 office jobs.

Therefore, people at this type of job would be less likely to answer the call. Choice (A) matches the prediction, so keep (A). Choice (B) is population size. Population size is not necessarily a design flaw, since the population size is not given. Eliminate (B). Choice (C) is sample size. If the sample size were significantly less than the population size, this fact could lead to unreliable results. However, since population size is not known, sample size cannot be determined to be a design flaw. Eliminate (C). Choice (D) refers to the fact that the telephone was used. Since the problem does not mention telephone use by people with different types of jobs, there's no reason to believe that using a telephone to conduct the survey would make the results less reliable. Eliminate (D). The correct answer is (A).

11. **D** The question asks which graph could represent $y = p(x)$ and says that function p has exactly four roots. A *root* of a function is an x-value for which the y-value is 0. The y-value is 0 for all points on the x-axis, so p has to have exactly four x-intercepts (points where the graph intersects the x-axis). Go through each choice and determine the number of x-intercepts. Choices (A) and (C) have three x-intercepts, so eliminate these. Choice (B) has five intercepts. Since the question states that p has *exactly* four roots rather than *at least* four, eliminate (B) as well. Only (D) has exactly four x-intercepts, so the answer is (D).

12. **A** The question states that 85% of the customers ordered the brunch special. Since the question asks for which choice could be the number of customers, plug in the answers by taking 85% of each choice. Eliminate any choice that doesn't result in a whole number of customers. Start with (A): 85% of 40 is (0.85)(40) = 34. Since this is a whole number, this could be the number of customers, so the answer is (A).

13. **A** The question includes variables and uses the phrase *in terms of*, so plug in. Since an equation is given with d isolated, plug in for the other variables, t, v, and h, and calculate d. Let $t = 2$, $v = 10$, and $h = 20$. In this case, $d = -8t^2 + vt + h = -8(2)^2 + (10)(2) + 20 = 8$. The question asks for the value of v, so the target answer is 10. Go through the choices and eliminate any answer that is not 10. Choice (A) is $v = \frac{8 - 20}{2} + 8(2) = 10$, so keep (A). Choice (B) is $v = \frac{8 + 20}{2} - 8(2) = -2$, so eliminate (B). Choice (C) is $v = \frac{8 - 20 + 8}{2} = -2$, so eliminate (C). Choice (D) is $v = 8 + 20 - 8(2) = 12$, so eliminate (D). Only (A) matches, so the answer is (A).

14. **D** The question asks for what could be the median of 22 scores. The median of an even number of numbers is the average of the middle two when the numbers are listed in order. In this case, it is the average of the 11th and 12th score. Find the location of the 11th and 12th scores on the histogram. There is 1 score from 50 to 60. There are 4 scores from 60 to 70, so there are 5 scores from 50 to 70. There are 2 scores from 70 to 80, so there are 7 scores from 50 to 80. There are 11 scores from 80 to 90, so there are 18 scores from 50 to 90. Since the 11th and 12th scores were passed at the 80 to 90 interval, they must be in this interval. Therefore, the median must be within this interval, as well. The only choice within this interval is 84, so the answer is (D).

15. **C** The question asks for a percent, which is $\frac{part}{whole} \times 100$. The *part* is the total number of those surveyed who use public transit, which is 51, and the *whole* is the total number of those surveyed, which is 130. Therefore, the percent is $\frac{51}{130} \times 100 \approx 39$. The answer is (C).

16. **C** The proportion of people who fit the requirements in the survey can be expected to be the same proportion of people who will fit the requirements in the general population. First, find the number of commuters surveyed who used public transit and had an average daily commute of at least 1 hour. Find the column for *Commutes by Public Transit* and the row for *At least 1 hour.* At the intersection is 29, so this is the number of those surveyed who used public transit and had an average daily commute of at least 1 hour. Since the total number of those surveyed is 130 and the total population of the population is 13,000,000, set up the proportion $\frac{29}{130} = \frac{x}{13{,}000{,}000}$. Cross-multiply to get $130x = 377{,}000{,}000$. Divide both sides by 130 to get $x = 2{,}900{,}000$. The answer is (C).

17. **B** The question asks how many times more likely it is for a commuter whose average daily commute is less than 1 hour not to take public transit than it is for a commuter whose average daily commute is at least 1 hour not to take public transit. The term *more likely* refers to probability, so determine the probability of each. Go to the table and find the number of commuters who commute less than 1 hour and do NOT commute using public transit. Find the *Does Not Commute by Public Transit* column and the *Less than 1 hour* row. At the intersection is 46, so this is the number of commuters who commute less than 1 hour and do NOT commute using public transit. Now look in the same row under the *Total* column to find that the total number of commuters who commute less than 1 hour is 68. Therefore, the probability is $\frac{46}{68}$. Now do the same for the probability that someone who commutes at least one hour does not take public transit. Find the row for those who commute *At least 1 hour* and the columns for *Does Not Commute Using Public Transit* and *Total.* In this row, the number under *Does Not Commute by Public Transit* is 33 and the number under *Total* is 62, so the probability is $\frac{33}{62}$. The question asks *how many times more likely* is the first probability than the second. Set up the equation $\frac{46}{68} = \frac{33}{62}x$. Divide both sides by $\frac{33}{62}$ to get $x \approx 1.27$. The answer is (B).

18. **C** The question asks for the best conclusion from the study. The study takes a random sample of subjects without sleep disorders and gives half of them beverage *C*. The subjects who consume beverage *C* sleep less than the subjects who don't consume it. This would seem to indicate that beverage *C* caused people without sleep disorders to sleep less. Go through each of the choices. Choice (A) is incorrect because the study doesn't compare different caffeinated beverages. It only compares consuming beverage *C* to not consuming it. Choice (B) is incorrect, because the study does not indicate *substantial* loss is sleep. Furthermore, the sample only includes people without sleep disorders, so any conclusion must be restricted to this population. Choice (C) is similar to the prediction, so keep this choice. Choice (D), like (B), does not restrict the conclusion to people without sleep disorders. The answer is (C).

19. **C** The question involves algebra, asks for a value, and includes numbers in the answers, so plug in the answers. First, eliminate any answers that don't make sense: since n is 40% larger than the sum of the other three numbers, n will have to be greater than half of 1,764. Eliminate (A) and (B). Try one of the remaining answers, such as (D). If $n = 1{,}260$, then the remaining three numbers would add up to $1{,}764 - 1{,}260 = 504$. Since 1,260 is not 40% more than 504, eliminate (D) and choose (C). If desired, check (C): if $n = 1{,}029$, then the other three numbers add up to 735. Since $735 + 40\%\,(735) = 735 + 294 = 1{,}029$, (C) is the correct answer.

20. **D** The question asks how much more the 11.5 m^3 object weighed than was predicted by the line of best fit. This question can be solved by determining the actual weight of the object and the weight predicted by the line of best fit. However, finding the actual amounts is not necessary. Instead, simply find the difference between the two. Volume is represented by the horizontal axis, so find 11.5 on the horizontal axis. Trace straight up to the data point. From that point, trace the line downward, counting the number of intervals to the line of best fit. There are four intervals. Go to the vertical axis to determine the number of kilograms per interval. The labels are 5,000 kilograms apart, and there are 5 intervals between each label. Therefore, each interval is $\frac{5{,}000}{5} = 1{,}000$, so 4 intervals are 4,000 kg. The answer is (D).

21. **C** The question asks the percent increase in total sales. Since the number of laptops and the number of tablets are different, don't just add the two percent increases. Thus, (D) is a trap answer. A percent change is always equal to the expression $\frac{\textit{difference}}{\textit{original}} \times 100$. The *original* is the total number of units sold last week, which is $90 + 210 = 300$. To get the difference, get the increase in laptops and the increase in tablets separately and then add. There is a fifty percent increase in laptop sales,

so the increase is $\frac{50}{100} \times 90 = 45$. There is a thirty percent increase in tablet sales, so the increase is $\frac{30}{100} \times 210 = 63$. Therefore, the total *difference* is 45 + 63 = 108, and the percent increase is $\frac{108}{300} \times 100 = 36\%$. The answer is (C).

22. **B** According to the question, $\cos(x°) = \sin(y°)$. This can only be the case if the two angles are complementary, meaning the measures of the two angles have a sum of 90°. The question asks for the value of c, and there are numbers in the answer choices, so plug in the answers. Start with (B). If $c = 15.5$, then $x = 3(15.5) - 23 = 23.5$ and $y = 66.5$, so $x + y = 23.5 + 66.5 = 90$. Thus, the two angles are complementary, and the answer is (B).

23. **A** The question asks for the maximum value for $-3 \leq x \leq 6$. This is the domain sketched in the graph, so only worry about the points on the sketch. The value of the function is equal to each y-value. Although the values of the function appear to be increasing toward ∞, they do not actually go to ∞ within the points sketched, so eliminate (D). Since the question asks for the maximum value of the function, which is the maximum y-value, find the highest point on the graph. This appears on the far left. Draw a horizontal line to the y-axis to see that this line crosses the y-axis at 4. Therefore, the y-value at this point, or the maximum value of the function, is 4. The answer is (A).

24. **B** The question says that the width is 8 feet more than 4 times the length. Take this statement and translate it into an equation. Translate *the width* to w. Translate *is* to =. Translate *8 feet more than* to ____ + 8, leaving room on the left for what follows. Translate *4 times the length* to $4l$. Therefore, the statement translates to $w = 4l + 8$. The question also says that the area is 5,472. The area of a rectangle can be found using the formula $A = lw$. Substitute $A = 5{,}472$ and $w = 4l + 8$ to get $5{,}472 = l(4l + 8)$. Distribute the l on the left side to get $5{,}472 = 4l^2 + 8l$. Since this is quadratic equation, get one side equal to 0 by subtracting 5,472 from both sides to get $0 = 4l^2 + 8l - 5{,}472$. This is a difficult quadratic to factor, so use the quadratic formula, $l = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, where $a = 4$, $b = 8$, and $c = -5{,}472$. Substitute these values to get $l = \frac{-8 \pm \sqrt{8^2 - 4(4)(-5{,}472)}}{2(4)}$. Use a calculator to get that $8^2 - 4(4)(-5{,}472) = 87{,}616$ and that

$l = \frac{-8 \pm \sqrt{87{,}616}}{2(4)}$. Take the square root of 87,616 to get $l = \frac{-8 \pm 296}{2(4)} = \frac{-8 \pm 296}{8}$. Since length can only be positive, don't take the negative into account and $l = \frac{-8 \pm 296}{8}$ becomes $l = \frac{-8 + 296}{8} = \frac{288}{8} = 36$. If $l = 36$, then $w = 4l + 8 = 4(36) + 8 = 152$. To find the perimeter, use $P = 2l + 2w = 2(36) + 2(152) = 376$. The answer is (B).

25. **D** The line intersects the origin as well as the points $(c, 3)$ and $(27, c)$. Questions about lines in the xy-plane often involve slope, so determine the slope of this line. Any two points can be used to find the equation of a line (including the slope). Note that since the line intersects the origin, it intersects point (0, 0) as well as the other two points. Use points (0, 0) and $(c, 3)$ to calculate the slope: $slope = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 0}{c - 0} = \frac{3}{c}$. The slope can also be determined using points (0, 0) and $(27, c)$: $\frac{c - 0}{27 - 0} = \frac{c}{27}$. Since these two slopes must be equal, $\frac{3}{c} = \frac{c}{27}$. Cross-multiply to get $c^2 = 81$. Take the square root of both sides to get $c = \pm 9$. Since only 9 is a choice, the answer is (D).

26. **B** Since $\overline{FG}$ is a chord that includes the center, it is a diameter. Therefore, arc $\overset{\frown}{FXG}$ is a semicircle. Since the length of the semicircular arc is 14π, the circumference of the circle is $14\pi \times 2 = 28\pi$. The formula for circumference is $C = 2\pi r$, so $28\pi = 2\pi r$. Divide both sides by 2π to get $r = 14$. The question asks for the length of the segment $\overline{XO}$. Since $\overline{XO}$ is a radius, the length is 14. The answer is (B).

27. **B** Since the question says *must be*, plug in multiple values of p and q. Make sure that all values of p and q satisfy the inequality $-|p| < q < |p|$. Let $p = 4$ and $q = 2$. Go through each statement and eliminate any statement that is false. Statement (I) is $4 > 0$, which is true, so keep Statement (I). Statement (II) is $|4| > -2$, which is true, so keep Statement (II). Statement (III) is $4 > |2|$, which is true, so keep Statement (III). Try other values that might change the results. Since the question involves absolute values, try negative numbers. Let $p = -4$ and $q = -2$. In this case, Statement (I) is $-4 > 0$, which is false, so cross out (I). Eliminate (A) and (D), since they include Statement (I). Since both remaining choices include Statement (II), Statement (II) must be true, and no more testing of Statement (II) is necessary. Test Statement (III) using the same values of $p = -4$ and $q = -2$: $-4 > |-2|$. This is false, so cross out Statement (III), and eliminate (C). The answer is (B).

28. **B** The question asks for a reasonable estimate for the number of blue jelly beans in the entire container. The number of blue jelly beans is given for each of ten regions. Determine the total number of regions

in the container. The container has a base of 10 feet by 10 feet, so the area of the base of the entire container is $A = s^2 = (10)^2 = 100$. Each region has a base of 1 foot by 1 foot, so the area of the base of each region is $A = s^2 = (1)^2 = 1$. To get the number of regions, divide the area of the base of the container by the area of the base of each region to get $\frac{100}{1} = 100$. One way to get an estimate of the number of blue jelly beans in the entire container would be to find the average number of blue jelly beans in the counted regions and multiply that number by 100. The question asks for an approximation, though, and the answer choices are spread apart, so ballpark. All of the numbers in the table are around 25. Therefore, 25 is a reasonable estimate for the average number of blue jelly beans, and the total number of jelly beans should be about 25 × 100 = 2,500. The answer is (B).

29. **C** The question states that there are four times as many vanilla ice creams sold as vanilla frozen yogurts. Let x be the number of vanilla frozen yogurts sold; therefore, $4x$ is the number of vanilla ice creams sold. The question also says that there are six times as many chocolate ice creams sold as chocolate frozen yogurts, so let y be the number of chocolate frozen yogurts sold and $6y$ be the number of chocolate ice creams sold. Since there are a total of 32 frozen yogurts sold, $x + y = 32$. Since there are a total of 152 ice creams sold, $4x + 6y = 152$. Since there are two equations with two variables, it is possible to solve for the variables. Stack and add the two equations, trying to eliminate the chocolates to solve for the vanillas: multiply both sides of the first equation by –6 to get $-6x - 6y = -192$, then stack and add the equations like this:

$$\begin{array}{r} 4x + 6y = \ \ 152 \\ \underline{-6x - 6y = -192} \\ -2x \qquad = -40 \end{array}$$

Divide both sides by –2 to get $x = 20$. The question asks for the probability that a randomly selected ice cream sold is vanilla, which will be calculated by dividing the number of vanilla ice creams sold ($4x$) by the total number of ice creams sold (152). Since $x = 20$, the number of vanilla ice creams sold is $4x = 4(20) = 80$. The probability that one ice cream is vanilla is $\frac{80}{152} \approx 0.526$. The answer is (C).

30. **D** To graph an inequality, start by graphing the equation. If the inequality sign is ≥, draw the equation as a solid line and shade above. If the inequality sign is ≤, draw the equation as a solid line and shade below. If the sign is > or <, use the same rule as ≥ or ≤, respectively, but use a dashed line instead of a solid line. Use the inequalities given. Start with $y \geq x$. Since the inequality sign

is ≥ rather than >, the graph is the one with the solid line. Since the inequality sign is ≥, shade the solution above the line. Therefore, since only Sectors W and X are above the solid line, eliminate any choice that includes Y and Z. Eliminate (A) and (B). Now look at the inequality $3y < 2x - 3$. Divide both sides by 3 to get $y < \frac{2}{3}x - 1$. Since the inequality sign is <, the solution is below the dashed line. Since Sector W is above the dashed line, eliminate (C). The answer is (D).

31. **5 or 6** Martina spends between \$20 and \$25, inclusive, and she buys one hamburger at a cost of \$5. This would leave her at least \$20 – \$5 = \$15 and at most \$25 – \$5 = \$20 for hot dogs. In the first case, \$15 total divided by \$3 per hot dog would get her 5 hot dogs, so 5 is one possible value for h. If she spent up to \$20 on hot dogs, she could get \$20 divided by \$3 per hot dog for 6.67 hot dogs. She can only buy whole hot dogs, so 6 is another possible value of h. Therefore, the two possible correct answers are 5 and 6.

32. **19.4** The question asks for the average, so get the total and divide by the number of things. To get the total, add the number of states for each nation. The total is 6 + 9 + 26 + 16 + 29 + 13 + 31 + 4 + 36 + 2 + 10 + 17 + 50 + 23 = 272. Divide 272 by the 14 nations to get $\frac{272}{14} \approx 19.4285714$. Rounded to the nearest tenth, the answer is 19.4.

33. **10** The question gives the equation of a function and a point on the graph of the function. Plug the point into the equation. Substitute $x = -2$ and $y = g(x) = 6$ to get $6 = 2(-2)^2 + k(-2) + 18$. Simplify the right side to get $6 = 26 - 2k$. Subtract 26 from both sides to get $-20 = -2k$. Divide both sides by –2 to get $10 = k$. The answer is 10.

34. **11** The question asks how many rooms will be assigned three students. Consider the possibility that all rooms have three students. How many left over students would there be? If 26 rooms are assigned three students, then there are 26 × 3 = 78 students. However, the question says that there are 108 students, so there are 108 – 78 = 30 left over. These left over students have to be assigned to 5 student rooms. Since each room already has three students, to make five student rooms, pair the remaining students and add each pair to one of the three student rooms. Since there are 30 left over students, they make 15 pairs, so 15 rooms of three students become five-student rooms. Since there are a total of 26 rooms, there are 26 – 15 = 11 three-person rooms. The answer is 11.

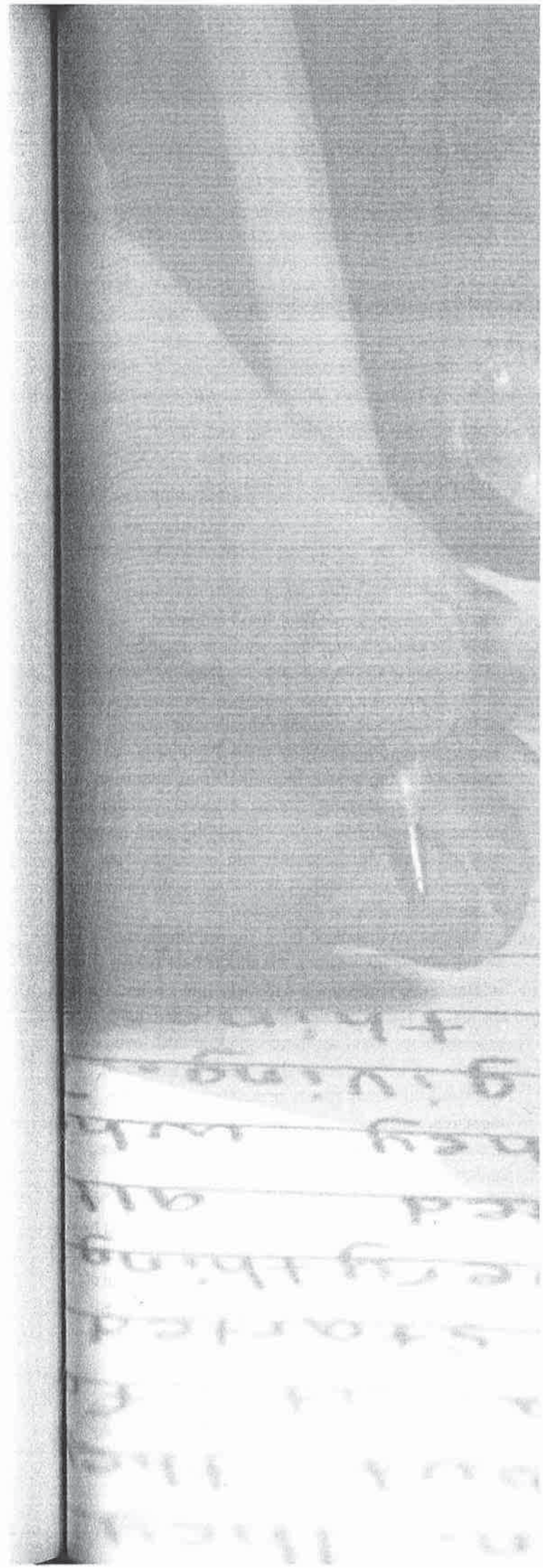
35. $\frac{7}{12}$ The question asks for what fraction Town A's 1970 population was of Town A's 2000 population. To determine the population in 1970, find 1970 on the horizontal axis, trace straight up to the curve, then straight across to the vertical axis. It hits the vertical axis on the only line between 30 and 40, so the population in 1970 was 35,000. (Note that the vertical axis label indicates that the population is in thousands.) To determine the population in 2000, find 2000 on the horizontal

axis, trace straight up to the curve, then straight across to the vertical axis. It hits the vertical axis at 60, so the population in 2000 was 60,000. Therefore, the fraction is $\frac{35{,}000}{60{,}000} = \frac{35}{60} = \frac{7}{12}$. The answer is $\frac{7}{12}$.

36. **4** The question states that the volume of the cylinder is 64π cubic centimeters. The formula for volume of a cylinder is $V = \pi r^2 h$. Plug in $V = 64\pi$ and $h = 16$, as indicated by the figure, to get $64\pi = \pi r^2(16)$. Divide both sides by 16π to get $4 = r^2$. Take the square root of both sides to get $2 = r$. Note, however, that the question asks for the *diameter* and not the radius. Since the diameter is twice the radius, $d = 2r = 2(2) = 4$. The answer is 4.

37. **321** This question asks for angular position, which is in equation 1 and represented by θ. Write down known variables and solve. When the carousel changes direction, the angular velocity is 0. Use the first equation, $\omega^2 = \omega_0^2 + 2\alpha\theta$. Plug in $\omega = 0$, $\omega_0 = 90$, and $\alpha = -12.6$ to get $0 = 90^2 + 2(-12.6)\theta$. Simplify the right side to get $0 = 8{,}100 - 25.2\theta$. Add 25.2θ to both sides to get $25.2\theta = 8{,}100$. Divide both sides to get $\theta = 321.4286$. Rounded to the nearest degree, the answer is 321.

38. **7** The question asks for time. Write down known variables, then choose the equation that gives only time as the unknown. This is equation 2. When the carousel changes direction, the angular velocity is 0. Use the second equation, $\omega = \omega_0 + \alpha t$. Plug in $\omega = 0$, $\omega_0 = 90$, and $\alpha = -12.6$ to get $0 = 90 + (-12.6)t$. Simplify the right side to get $0 = 90 - 12.6t$. Add $12.6t$ to both sides to get $12.6t = 90$. Divide both sides by 12.6 to get $t = 7.1429$. Rounded to the nearest second, the answer is 7.



Chapter 13
Practice Test 6

Math Test – Calculator

55 MINUTES, 38 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

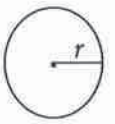
DIRECTIONS

For questions **1-30**, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions **31-38**, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

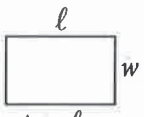
NOTES

1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

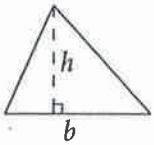
REFERENCE



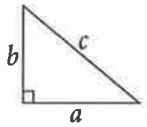
$A = \pi r^2$
$C = 2\pi r$



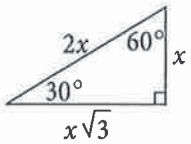
$A = \ell w$

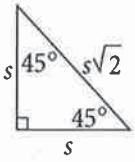


$A = \frac{1}{2}bh$

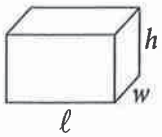


$c^2 = a^2 + b^2$

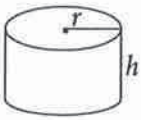




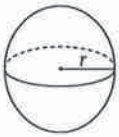
Special Right Triangles



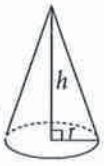
$V = \ell wh$



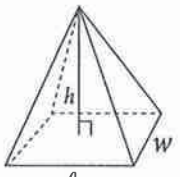
$V = \pi r^2 h$



$V = \frac{4}{3}\pi r^3$



$V = \frac{1}{3}\pi r^2 h$



$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

CONTINUE

1

A pizzeria sells pizzas in individual slices or in pies of 8 slices. On a certain day, the pizzeria sold a total of 364 slices, 84 of which were sold as individual slices. Which of the following shows the number of pies, n, sold on that day?

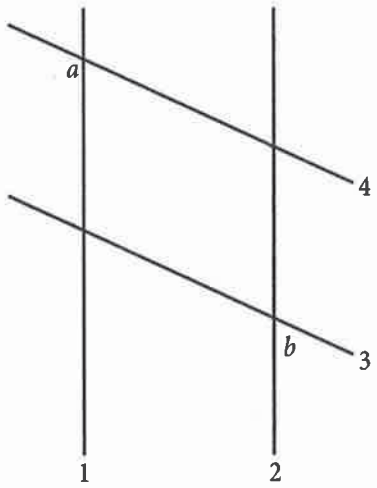
A) $n = \frac{364 + 84}{8}$

B) $n = \frac{364}{8} + 84$

C) $n = \frac{364}{8} - 84$

D) $n = \frac{364 - 84}{8}$

2



In the figure above, lines 1 and 2 are parallel, and lines 3 and 4 are parallel. If the measure of $\angle a$ is 125°, what is the measure of $\angle b$?

A) 40

B) 55

C) 110

D) 125

3

	Cream filling	No filling	Total
White chocolate	5	15	20
Dark chocolate	7	3	10
Total	12	18	30

A box contains 30 pieces of chocolate, distributed as shown in the table above. Each piece is made of either white chocolate or dark chocolate, and each piece contains either cream filling or no filling. If one piece is selected at random, what is the probability that the piece is either white chocolate with cream filling or dark chocolate with no filling?

A) $\frac{8}{30}$

B) $\frac{12}{30}$

C) $\frac{20}{30}$

D) $\frac{22}{30}$

CONTINUE

4

An isosceles triangle has perimeter T and sides of length x, x, and y. Which of the following represents x in terms of T and y?

A) $x = T - y$

B) $x = T - 2y$

C) $x = \dfrac{T - 2y}{2}$

D) $x = \dfrac{T - y}{2}$

5

$$2x + 3y = -6$$

$$x - 4y = 19$$

Which ordered pair satisfies the system of equations shown above?

A) (−9, 4)

B) (−3, 4)

C) (−1, −5)

D) (3, −4)

6

When 6 times the number n is subtracted from 8, the result is 20. What is the result when 3 times the number n is subtracted from 5?

A) −2

B) 8

C) 11

D) 20

7

At 12 P.M. on Sunday, there are 25,000 people in a football stadium that holds 65,000. Every minute after 12 P.M., the number of people in the stadium increases by 550. If m represents the time, in minutes, after 12 P.M., which of the inequalities below gives the set of minutes in which the football stadium is below capacity?

A) $550m < 25{,}000$

B) $550m < 65{,}000$

C) $550m + 25{,}000 < 65{,}000$

D) $25{,}000 - 550m < 65{,}000$

CONTINUE

8

Number of United States Residents
With Health Insurance in 2015, in Thousands

	Age in years						
Income in dollars	Under 19	19-25	26-34	35-44	45-64	65 and older	Total
Under 25,000	12,499	4,881	6,146	6,387	13,314	7,359	50,586
25,000-49,999	15,624	6,102	7,683	7,984	16,643	9,200	63,236
50,000-74,999	14,061	5,491	6,915	7,185	14,978	8,278	56,908
75,000-99,999	10,936	4,271	5,378	5,589	11,650	6,439	44,263
100,000 and above	24,998	9,762	12,293	12,774	26,628	14,718	101,173
Total	78,118	30,507	38,415	39,919	83,213	45,994	316,166

The table above shows the number of U.S. residents with health insurance in 2015, in thousands, categorized by age group and annual income. According to these results, if a U.S. resident with health insurance who was 35-64 in 2015 is selected at random, what is the approximate probability that this resident had an income between $50,000 and $74,999 ?

A) 0.20

B) 0.25

C) 0.40

D) 0.80

CONTINUE

9

A truck traveled at an average speed of 70 miles per hour for 4 hours and had a fuel efficiency of 18 miles per gallon. Approximately how many gallons of fuel did the truck use for the entire 4-hour drive?

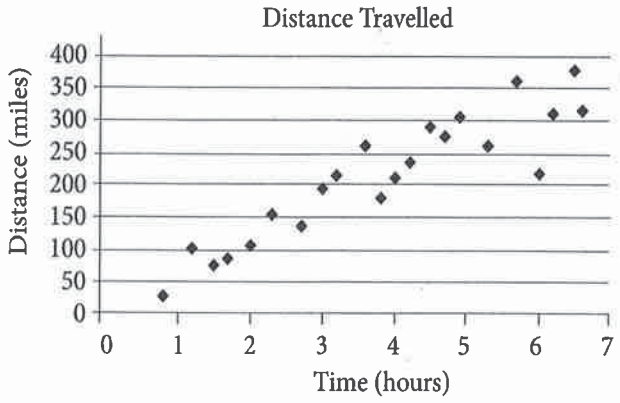
A) 4

B) 10

C) 16

D) 20

10



The scatterplot above shows the distances and times spent traveling for 22 trips by a driver. What is the time, in hours, of the trip represented by the data point farthest from the line of best fit (not shown)?

A) 4

B) 6

C) 8

D) 10

11

$$t_b = 212 - 0.0018a$$

The temperature at which water boils varies with altitude. The formula above models the relationship between t_b, the temperature at which water boils, in degrees Fahrenheit, and a, the altitude, in feet. Which of the following equations expresses altitude in terms of the temperature at which water boils?

A) $a = \dfrac{0.0018}{t_b - 212}$

B) $a = \dfrac{t_b + 212}{0.0018}$

C) $a = \dfrac{t_b - 212}{0.0018}$

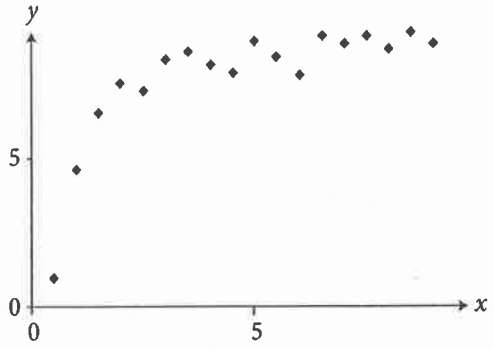
D) $a = \dfrac{212 - t_b}{0.0018}$

CONTINUE

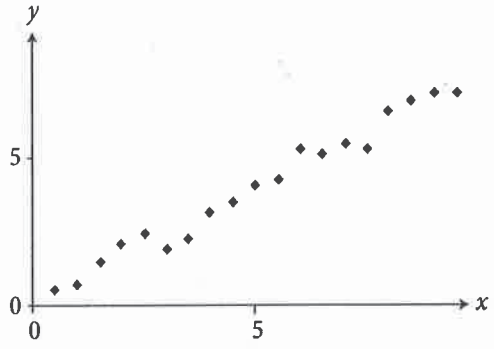
12

Which scatterplot below expresses a positive association that is not linear? (Note: A positive association between two variables is one in which higher values in one variable correspond to higher values in the other variable, and vice versa.)

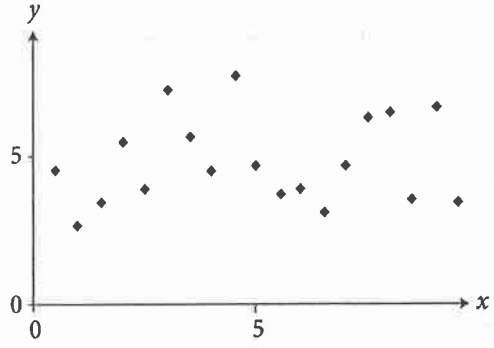
A)



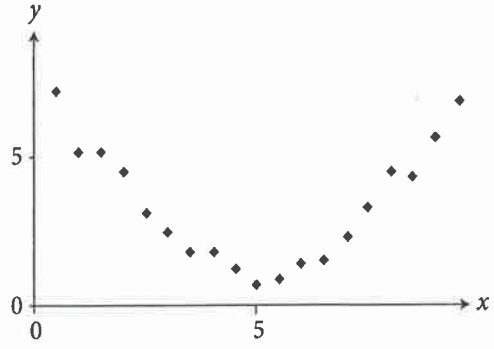
B)



C)



D)



13

$$v = \frac{h - m}{t} + 4.9t$$

For an object thrown straight upward, the formula above gives the relationship between v, the initial speed in meters per second, t, the time in seconds after the object was thrown, h, the height after t seconds, and m, the initial height from which the object was thrown. Which of the following expresses h in terms of v, t, and m ?

A) $h = -4.9t^2 + vt - m$

B) $h = -4.9t^2 + vt + m$

C) $h = -4.9t^2 - vt + m$

D) $h = 4.9t^2 - vt - m$

14

$$65x + y = 455$$

A grocery store receives a shipment of oranges and consistently sells the same number of oranges each day. The equation above models the number of oranges, y, that remain x days after the shipment is received. What does it mean that (7, 0) is a solution to the equation?

A) It takes 7 days after the shipment until none of the oranges are remaining.

B) There are 7 oranges in the shipment.

C) It takes 7 days for oranges to be sold to 455 customers.

D) After the shipment, 7 oranges are sold each day.

CONTINUE

Questions 15 and 16 refer to the following information.

A minor-league baseball player is offered a short-term contract by three teams: the Eagles, the Hawks, and the Jays. Each contract consists of a signing bonus, a daily salary, and a daily meal allowance, as shown in the table below.

Team	Signing bonus, b (in dollars)	Salary, s (in dollars per day)	Meal allowance, m (in dollars per day)
Eagles	1400	140	40
Hawks	1200	160	50
Jays	1500	130	30

The player's total compensation, C, for each contract in terms of the number of days, d, is given by the formula $C = b + (s + m)d$.

15

For what number of days, d, would the player's total compensation including signing bonus, salary, and meal allowance with the Eagles be greater than the total compensation with the Jays?

A) $d < 5$

B) $d > 5$

C) $d < 6$

D) $d > 6$

16

The relationship between the player's total compensation, C, for a contract with the Hawks as a function of the number of days, d, for which the contract lasts is graphed in the xy-plane, with d on the x-axis and C on the y-axis. What does the y-intercept of the graph represent?

A) The signing bonus

B) The daily salary

C) The daily meal allowance

D) The daily salary and meal allowance combined

17

The specific heat capacity of substance K, in calories per gram (cal/g), is approximately 30% less than that of methyl alcohol. The specific heat capacity of methyl alcohol is 0.60 cal/g. Which of the following is closest to the specific heat capacity, in cal/g, of substance K?

A) 0.18

B) 0.42

C) 0.56

D) 0.78

CONTINUE

18

In the xy-plane, if $(-1, 0)$ is a solution to the system of inequalities $y < x + c$ and $y < -x - d$, which of the following must be true about c and d?

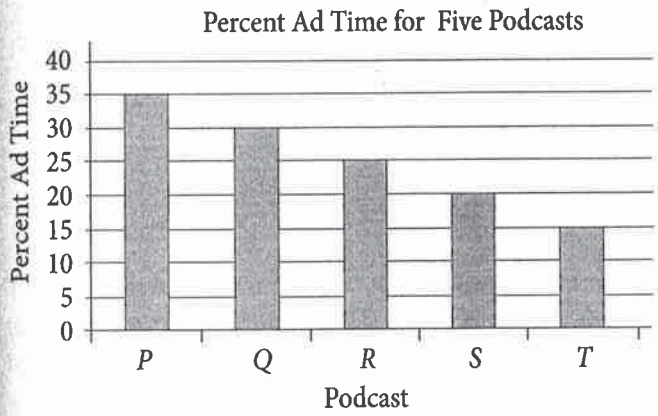
A) $c = d$

B) $c = -d$

C) $c < d$

D) $d < c$

19



A company advertises on five different podcasts: P, Q, R, S, and T. The graph above shows the amount of time used for the ad on the five different podcasts as a percentage of total run time. Each podcast runs for the same length of time, and the costs to advertise on podcasts P, Q, R, S and T are \$400, \$350, \$200, \$180, and \$150, respectively. Which of the following podcasts provides the most ad time per dollar?

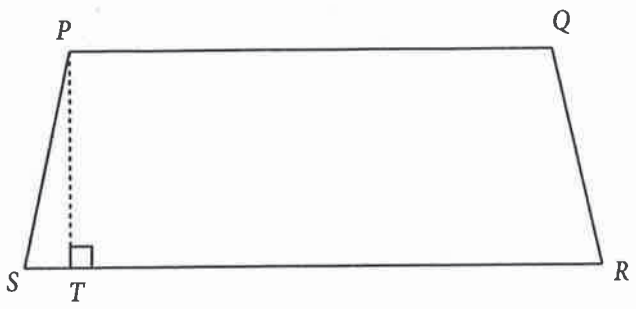
A) Q

B) R

C) S

D) T

20



In quadrilateral $PQRS$ above, $PS = QR$, and $\overline{PQ}$ is parallel to $\overline{SR}$. If PQ and SR were both decreased by 75% and PT were quadrupled, how would the area of $PQRS$ change?

A) The area of $PQRS$ would be quadrupled.

B) The area of $PQRS$ would be increased by 75%.

C) The area of $PQRS$ would be decreased by 75%.

D) The area of $PQRS$ would be unaffected.

CONTINUE

21

Number of times watching the news per week

	Never	1-2	3-4	More than 4	Total
Group A	7	14	18	11	50
Group B	4	13	21	12	50
Total	11	27	39	23	100

The table above shows the results of a survey in which 100 people were asked how often they watched the news. Group A consisted of people who were registered voters, and Group B consisted of people who were not registered to vote. If one person is randomly chosen from among those who watch the news fewer than three times a week, what is the probability that the person was a member of Group A ?

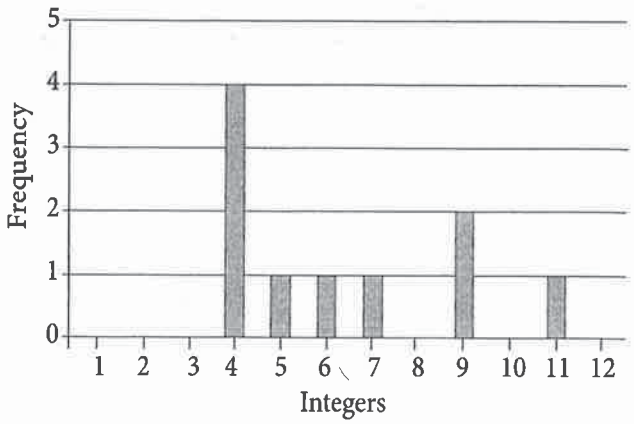
A) $\frac{21}{38}$

B) $\frac{4}{50}$

C) $\frac{21}{50}$

D) $\frac{38}{100}$

22



The bar graph above shows the distribution of randomly selected integers from 1 to 12. What is the mean of the list of numbers?

A) 5.5

B) 6.3

C) 7.0

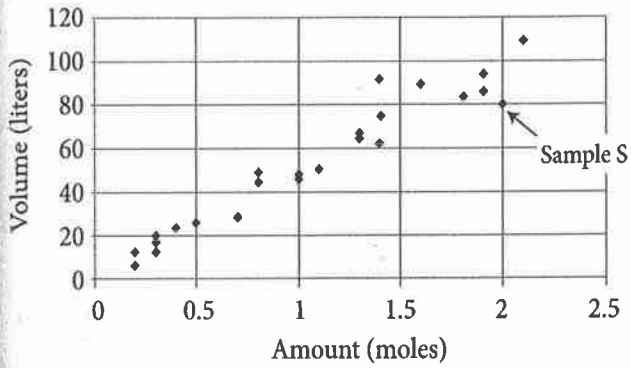
D) 10.0

CONTINUE

Questions 23-25 refer to the following information.

A team of scientists measures the volume of various samples of different gases with a constant pressure of 0.1 atm and a constant temperature of 610 K. The graph below plots the volume of each sample against the amount of the gas.

Volume-Amount Relationship among Samples of Gases



The ideal gas law predicts that at this pressure and temperature, the volume of an ideal gas can be modeled by the equation $V = 50n$, where V is the volume in liters and n is the amount of the substance, measured in moles. Assume that the relationship is valid for greater amounts of the substance than are shown in the graph. (A mole is approximately 6.022×10^{23} molecules.)

23

According to the data provided, what is the volume, in <u>milliliters</u>, of Sample S ?

A) 8×10^4

B) 2×10^3

C) 8×10^1

D) 4×10^1

24

There are three samples shown of approximately 1.4 moles. Which of the following is closest to the range of volumes of these four samples, in liters?

A) 30

B) 20

C) 9

D) 3

25

Based on the ideal gas law, what is the volume, in liters, of a sample that contains 1,200 moles?

A) 6,000

B) 24,000

C) 36,000

D) 60,000

CONTINUE

26

Let the polynomials f and g be defined by $f(x) = 3x^3 + 6x^2 + 11x$ and $g(x) = 8x^2 + 15x + 7$. Which of the following polynomials is divisible by $3x + 7$?

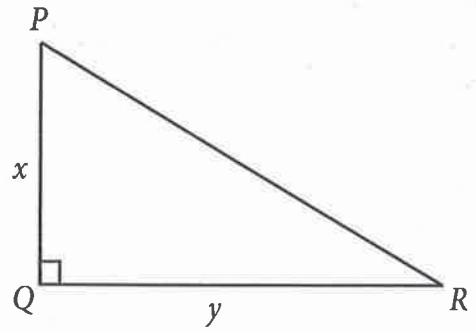
A) $j(x) = 2f(x) + g(x)$

B) $k(x) = f(x) + g(x)$

C) $m(x) = f(x) + 2g(x)$

D) $n(x) = f(x) + 3g(x)$

27



Given the right triangle PQR above, which of the following is equal to $\frac{y}{x}$?

A) cos P

B) cos Q

C) tan P

D) tan Q

28

Let the function f be defined by $f(x) = (x - 1)(x + 7)$. Which of the following is an equivalent form of f in which the minimum value of f appears as either a coefficient or a constant?

A) $f(x) = x^2 - 7$

B) $f(x) = x^2 + 6x - 7$

C) $f(x) = (x + 3)^2 - 16$

D) $f(x) = (x - 3)^2 - 20$

29

$$4a - j = 7a + 3$$

$$4b - k = 7b + 3$$

In the equations shown above, j and k are constants. If j is k plus 1, which of the following is true?

A) a is b plus $\frac{1}{3}$.

B) a is b minus $\frac{1}{3}$.

C) a is b minus 1.

D) a is b minus 3.

CONTINUE

30

If the average (arithmetic mean) of $3x$ and 11 is a, the average of $4x$ and 6 is b, and the average of $5x$ and 7 is c, what is the average of a, b, and c, in terms of x?

A) $x + 2$

B) $x + 3$

C) $2x + 4$

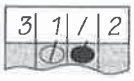
D) $4x + 8$

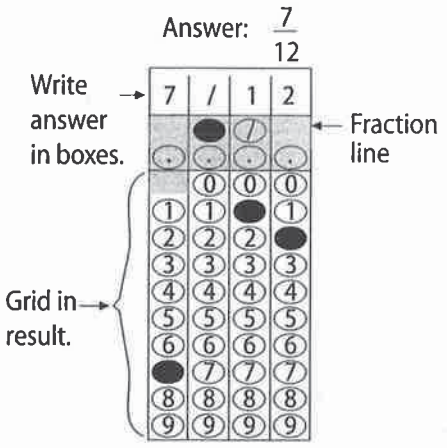
If

CONTINUE

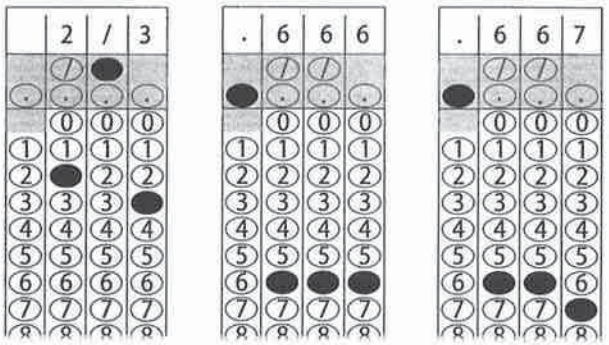
DIRECTIONS

For questions 31-38, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

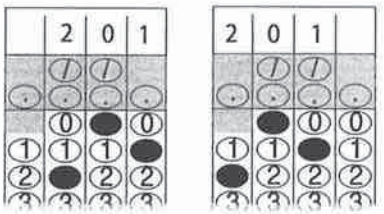
1. Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
2. Mark no more than one circle in any column.
3. No question has a negative answer.
4. Some problems may have more than one correct answer. In such cases, grid only one answer.
5. **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If  is entered into the grid, it will be interpreted as $\frac{31}{2}$, not as $3\frac{1}{2}$.)
6. **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.



Acceptable ways to grid $\frac{2}{3}$ are:



Answer: 201 – either position is correct



NOTE: You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

CONTINUE

31

A scientist estimates that the water level of a lake is dropping by 2.25 inches per year. If this trend continues, how many years will it take for the water level in the lake to drop by 27 inches?

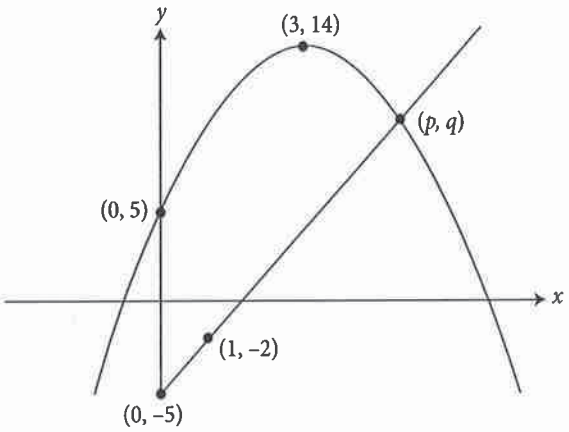
32

A car factory that operates 24 hours a day and 7 days a week produces one car every 20 minutes. How many cars does the factory produce in 3 days?

33

Scores in the game of bowling range from 0 to 300 per game, inclusive. Vito's average score in the first 6 games of a bowling tournament was 200. What is the lowest score he can receive in his 7th game and still have an average score of at least 240 for the entire 12-game tournament?

34



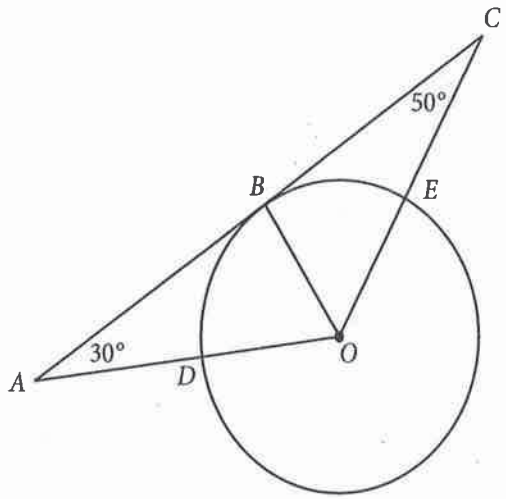
The xy-plane shows a point of intersection between a line and a parabola. The point of intersection has coordinates (p, q). If the vertex of the parabola is at (3, 14), what is the value of p ?

CONTINUE

35

To purchase a car, Harry makes a down payment, and every month thereafter, he pays a fixed amount to the car dealer. The total amount, T, in dollars, that Harry has paid after m months can be represented by the equation $T = 175m + 350$. According to this equation, how much, in dollars, was Harry's down payment? (Disregard the $ sign when gridding your answer.)

36



In the figure above, line segment AC is tangent to the circle with center O at point B. Line segments AO and CO intersect the circle at points D and E, respectively. If the circumference of circle O is 72, what is the length of minor arc $\overset{\frown}{DE}$?

Questions 37 and 38 refer to the following information.

The population of a small town is currently 800. A statistician estimates that the population of the town will decline by 14 percent per year for the next five years. The statistician models the population, P, of the town after x years using the equation $P = 800(k)^x$.

37

In the equation above, what value should be used for k ?

38

According to the statistician's model, what will the population of the town be, to the nearest whole number, after five years?

STOP

If you finish before time is called, you may check your work on this section only. Do not turn to any other section in the test.

The Princeton Review

Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

1.
YOUR NAME: (Print) _____ (Last) _____ (First) _____ (M.I.)
SIGNATURE: _____ DATE: ___/___/___
HOME ADDRESS: (Print) _____ (Number and Street)
_____ (City) _____ (State) _____ (Zip Code)
PHONE NO.: (Print) _____

IMPORTANT: Please fill in these boxes exactly as shown on the back cover of your test book.

2. TEST FORM

3. TEST CODE

4. REGISTRATION NUMBER

3. TEST CODE					4. REGISTRATION NUMBER					
0	A	J	0	0	0	0	0	0	0	0
1	B	K	1	1	1	1	1	1	1	1
2	C	L	2	2	2	2	2	2	2	2
3	D	M	3	3	3	3	3	3	3	3
4	E	N	4	4	4	4	4	4	4	4
5	F	O	5	5	5	5	5	5	5	5
6	G	P	6	6	6	6	6	6	6	6
7	H	Q	7	7	7	7	7	7	7	7
8	I	R	8	8	8	8	8	8	8	8
9			9	9	9	9	9	9	9	9

5. YOUR NAME

First 4 letters of last name					FIRST INIT	MID INIT
A	A	A	A		A	A
B	B	B	B		B	B
C	C	C	C		C	C
D	D	D	D		D	D
E	E	E	E		E	E
F	F	F	F		F	F
G	G	G	G		G	G
H	H	H	H		H	H
I	I	I	I		I	I
J	J	J	J		J	J
K	K	K	K		K	K
L	L	L	L		L	L
M	M	M	M		M	M
N	N	N	N		N	N
O	O	O	O		O	O
P	P	P	P		P	P
Q	Q	Q	Q		Q	Q
R	R	R	R		R	R
S	S	S	S		S	S
T	T	T	T		T	T
U	U	U	U		U	U
V	V	V	V		V	V
W	W	W	W		W	W
X	X	X	X		X	X
Y	Y	Y	Y		Y	Y
Z	Z	Z	Z		Z	Z

6. DATE OF BIRTH

Month	Day		Year	
JAN				
FEB	0	0	0	0
MAR	1	1	1	1
APR	2	2	2	2
MAY	3	3	3	3
JUN		4	4	4
JUL		5	5	5
AUG		6	6	6
SEP		7	7	7
OCT		8	8	8
NOV		9	9	9
DEC				

7. SEX
- MALE
- FEMALE

The Princeton Review

Test 6

Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 1—Reading

1.	A	B	C	D	27.	A	B	C	D
2.	A	B	C	D	28.	A	B	C	D
3.	A	B	C	D	29.	A	B	C	D
4.	A	B	C	D	30.	A	B	C	D
5.	A	B	C	D	31.	A	B	C	D
6.	A	B	C	D	32.	A	B	C	D
7.	A	B	C	D	33.	A	B	C	D
8.	A	B	C	D	34.	A	B	C	D
9.	A	B	C	D	35.	A	B	C	D
10.	A	B	C	D	36.	A	B	C	D
11.	A	B	C	D	37.	A	B	C	D
12.	A	B	C	D	38.	A	B	C	D
13.	A	B	C	D	39.	A	B	C	D
14.	A	B	C	D	40.	A	B	C	D
15.	A	B	C	D	41.	A	B	C	D
16.	A	B	C	D	42.	A	B	C	D
17.	A	B	C	D	43.	A	B	C	D
18.	A	B	C	D	44.	A	B	C	D
19.	A	B	C	D	45.	A	B	C	D
20.	A	B	C	D	46.	A	B	C	D
21.	A	B	C	D	47.	A	B	C	D
22.	A	B	C	D	48.	A	B	C	D
23.	A	B	C	D	49.	A	B	C	D
24.	A	B	C	D	50.	A	B	C	D
25.	A	B	C	D	51.	A	B	C	D
26.	A	B	C	D	52.	A	B	C	D

Section 2—Writing and Language Skills

1.	A	B	C	D	23.	A	B	C	D
2.	A	B	C	D	24.	A	B	C	D
3.	A	B	C	D	25.	A	B	C	D
4.	A	B	C	D	26.	A	B	C	D
5.	A	B	C	D	27.	A	B	C	D
6.	A	B	C	D	28.	A	B	C	D
7.	A	B	C	D	29.	A	B	C	D
8.	A	B	C	D	30.	A	B	C	D
9.	A	B	C	D	31.	A	B	C	D
10.	A	B	C	D	32.	A	B	C	D
11.	A	B	C	D	33.	A	B	C	D
12.	A	B	C	D	34.	A	B	C	D
13.	A	B	C	D	35.	A	B	C	D
14.	A	B	C	D	36.	A	B	C	D
15.	A	B	C	D	37.	A	B	C	D
16.	A	B	C	D	38.	A	B	C	D
17.	A	B	C	D	39.	A	B	C	D
18.	A	B	C	D	40.	A	B	C	D
19.	A	B	C	D	41.	A	B	C	D
20.	A	B	C	D	42.	A	B	C	D
21.	A	B	C	D	43.	A	B	C	D
22.	A	B	C	D	44.	A	B	C	D

The Princeton Review

Completely darken bubbles with a No. 2 pencil. If you make a mistake, be sure to erase mark completely. Erase all stray marks.

Test 6 Start with number 1 for each new section.
If a section has fewer questions than answer spaces, leave the extra answer spaces blank.

Section 3—Mathematics: No Calculator

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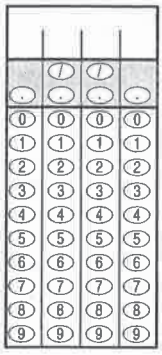
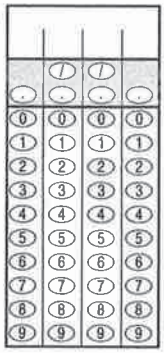
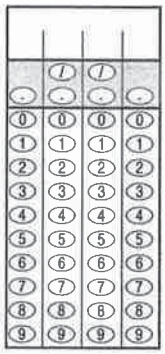
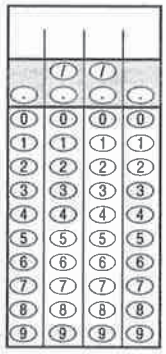
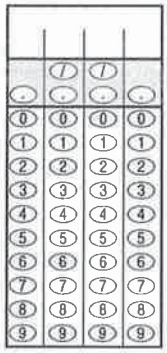
16. 
17. 
18. 
19. 
20. 

Section 4—Mathematics: Calculator

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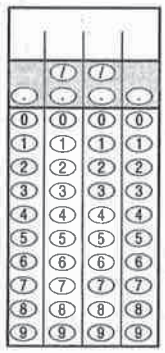
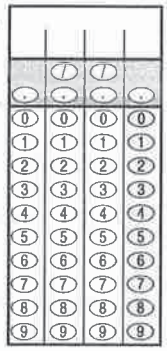
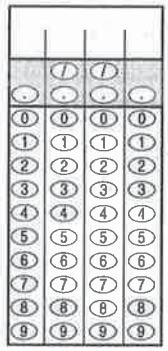
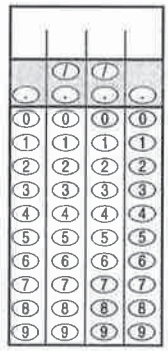
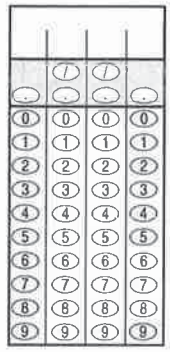
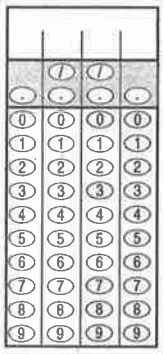
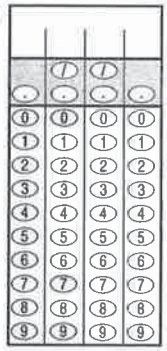
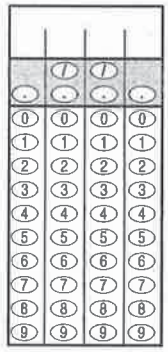
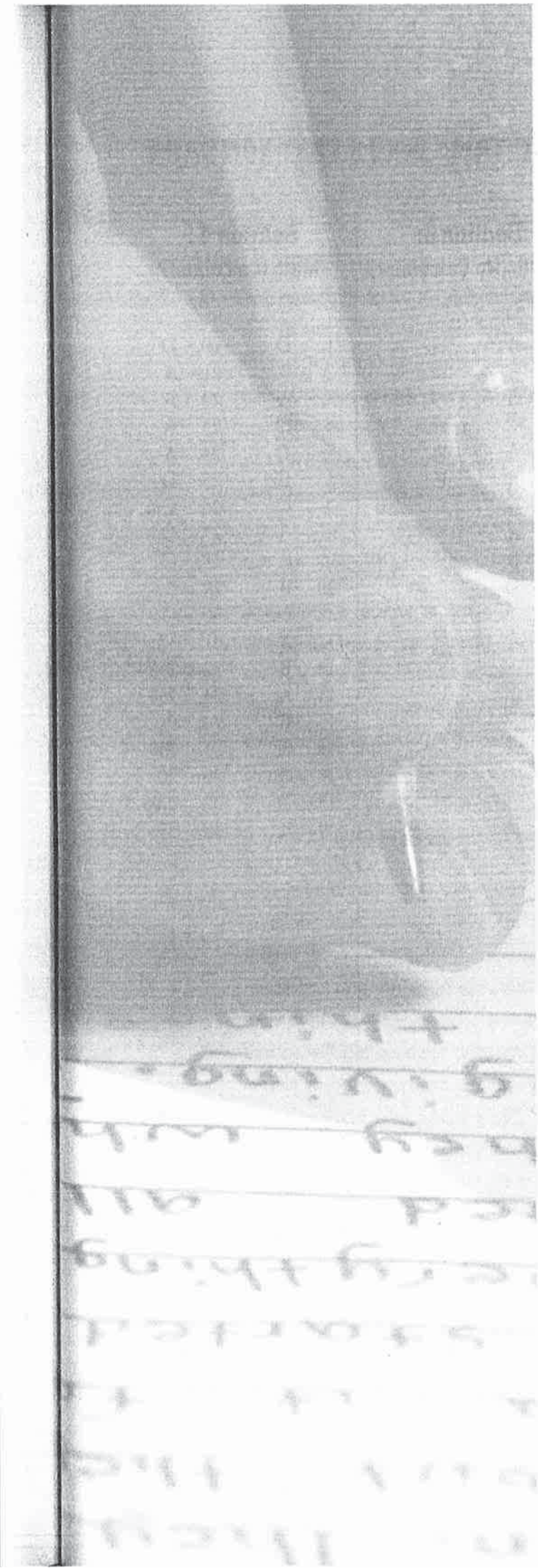
31. 
32. 
33. 
34. 
35. 
36. 
37. 
38. 



Chapter 14 Practice Test 6: Answers and Explanations

PRACTICE TEST 6 ANSWER KEY

Section 1: Reading

1.	D	27.	B
2.	C	28.	B
3.	B	29.	B
4.	D	30.	D
5.	C	31.	A
6.	C	32.	C
7.	C	33.	A
8.	A	34.	C
9.	C	35.	B
10.	C	36.	C
11.	B	37.	D
12.	B	38.	A
13.	B	39.	B
14.	D	40.	C
15.	A	41.	C
16.	C	42.	B
17.	B	43.	D
18.	A	44.	C
19.	C	45.	B
20.	D	46.	B
21.	A	47.	C
22.	A	48.	A
23.	A	49.	A
24.	D	50.	A
25.	A	51.	C
26.	D	52.	D

Section 2: Writing & Language

1.	D	23.	A
2.	D	24.	D
3.	D	25.	B
4.	A	26.	A
5.	B	27.	D
6.	B	28.	C
7.	D	29.	C
8.	B	30.	B
9.	C	31.	A
10.	A	32.	B
11.	A	33.	C
12.	C	34.	B
13.	A	35.	C
14.	D	36.	B
15.	B	37.	D
16.	A	38.	C
17.	B	39.	B
18.	D	40.	B
19.	B	41.	A
20.	D	42.	D
21.	C	43.	D
22.	D	44.	D

Section 3: Math (No Calculator)

1.	A	11.	A
2.	C	12.	C
3.	B	13.	B
4.	D	14.	A
5.	A	15.	C
6.	D	16.	3
7.	C	17.	250
8.	A	18.	$\frac{3}{5}$ or 0.6
9.	B	19.	9
10.	D	20.	3

Section 4 : Math (Calculator)

1.	D	20.	D
2.	B	21.	A
3.	A	22.	B
4.	D	23.	A
5.	D	24.	A
6.	C	25.	D
7.	C	26.	C
8.	A	27.	C
9.	C	28.	C
10.	B	29.	B
11.	D	30.	C
12.	A	31.	12
13.	B	32.	216
14.	A	33.	180
15.	B	34.	5
16.	A	35.	350
17.	B	36.	20
18.	D	37.	0.86
19.	B	38.	376

For self-scoring assessment tables, please turn to page 565.

Section 3: Math (No Calculator)

1. **A** The question involves Algebra and has numbers in the answers, so plug in the answers. Start with (B). Using the values given in (B), the first equation becomes $2(-1) + 3(-3) = -9$. Solve the left side of the equation to get $-2 - 9 = -9$ or $-11 = -9$. This isn't true, so eliminate (B). Whether to go up or down may not be clear, so just choose a direction. Using the values given in (A), the first equation becomes $2(-3) + 3(-1) = -9$. Solve the left side of the equation to get $-6 - 3 = -9$, or $-9 = -9$. That works, so plug the values into the second equation to get $-3 - (-1) = -2$. Solve the left side of the equation to get $-3 + 1 = -2$, and $-2 = -2$. Since the values given in (A) work in both equations, the correct answer is (A).

2. **C** The question gives an equation in terms of x and y and asks for an expression involving both. To solve this, plug in for one variable and solve for the other. Since there are two instances of the variable x in the equation, plug in for x. Let $x = 4$. Plug this into the equation to get $4 = 4(4 + y)$. Distribute the 4 to get $4 = 16 + 4y$. Subtract 16 from both sides to get $-12 = 4y$. Divide both sides by 4 to get $y = -3$. The question asks for $\frac{y}{x}$, which is $-\frac{3}{4}$. The answer is (C).

3. **B** The question involves multiple triangles and ratios. This is often an indication that the question involves similar triangles. The question gives the ratio of the lengths of $\overline{ST}$ and $\overline{SU}$. Since these two segments are sides of triangles PST and QSU, respectively, determine whether these two triangles are similar. All that is needed to prove that two triangles are similar is to find two pairs of congruent corresponding angles. Since both triangles have a right angle, there is one pair. Also, the question states that triangle PQR is isosceles with $PR = QR$. In an isosceles triangle, equal angles are opposite equal sides, so $\angle P \cong \angle Q$. Thus, triangles PST and QSU have a second pair of congruent corresponding angles and are similar. Therefore, all corresponding sides have the same ratio. The question asks for the length of $\overline{SQ}$, which is opposite the right angle. Since $\overline{PS}$ is also opposite a right angle, $\overline{PS}$ and $\overline{SQ}$ are corresponding. Therefore, their lengths are in a ratio of 5:3. On any ratio question, use the ratio box to keep track of the parts of a total and the actual numbers. Draw a 3 × 3 table, and label the columns $\overline{PS}$, $\overline{SQ}$, and $\overline{PQ}$, respectively. The top row of a ratio box is the ratio, so fill in the ratio with 5 under $\overline{PS}$ and 3 under $\overline{SQ}$. The bottom row is for actual numbers. Since the actual length of $\overline{PQ}$ is 64, fill in 64 in the third row under $\overline{PQ}$. The result is below.

$\overline{PS}$	$\overline{SQ}$	$\overline{PQ}$
5	3	
		64

The numbers in the top row form an addition equation, so add 3 and 5 to get 3 + 5 = 8 and fill in 8 in the top row under $\overline{QR}$. Each column in the ratio box forms a multiplication equation. Since 8 × 8 = 64, fill in the middle row under $\overline{PQ}$ with 8. This is the multiplier for all parts of the ratio, so fill in 8's across the middle row.

$\overline{PS}$	$\overline{SQ}$	$\overline{PQ}$
5	3	8
8	8	8
		64

The question asks for the length of $\overline{SQ}$. Multiply the ratio number for $\overline{SQ}$, which is 3, by the multiplier of 8 to get an actual length of 24. The answer is (B).

4. **D** Use Process of Elimination. Profit = Revenue – Expenses. According to the question, profit = $4cd - 200$. Therefore, the expression $4cd$ must be related to the revenue the chocolate-covered banana stand brings in. Since c represents the number of expected customers, and d is the number of days, the 4 must be related to revenue dollars. Eliminate (A) and (C) since neither of these answers is related to dollars. The question does not say that the price of bananas increases on any given day, so it's safe to assume that the price of a chocolate-covered banana remains the same irrespective of the day it is bought. Therefore, eliminate (B). The correct answer is (D).

5. **A** According to the question, 700 coffee stores existed in 2003, which is one-half of the number of coffee stores that were added from 2004 to 2014. Therefore, 2 × 700 = 1,400 stores were added from 2004 to 2014. Plug y = 1,400 into each of the answer choices to see which one works. Choice (A) becomes $\frac{1}{2}(1{,}400) = 700$, or 700 = 700. Since this equation works, keep it, but check the other answers. You'll see that only (A) works, so (A) is the correct answer.

6. **D** Plugging in could work on this question, but it may take a few tries to get down to one answer choice. A faster way to the answer is to translate the information in the question into an inequality and solve it. The question asks for values of m for which Stream Supreme's monthly cost is less than Download Empire's. *Less than* translates into <, not ≤, so eliminate (B) and (C). To watch m movies, the cost with Stream Supreme would be \$7 for the monthly fee plus \$1.75 for each movie, or \$7 + \$1.75m. The cost with Download Empire would be \$4 + \$2.25m. Therefore, the inequality is \$7 + \$1.75m < \$4 + \$2.25m. Subtract \$4 from both sides to get \$3 + \$1.75m < \$2.25m, then subtract \$1.75m from both sides to get \$3 < \$0.50m. Divide both sides by \$0.50 to get 6 < m, so the answer is (D).

7. **C** Solve the equation for h. Start by multiplying both sides of the equation by μd to get $q\mu d = (p_e - p_{wf})kh$. Next, divide both sides by $(p_e - p_{wf})k$ to get $\frac{q\mu d}{(p_e - p_{wf})k} = h$. The correct answer, (C), simply reorders the variables in the numerator, which is permissible since numbers can be multiplied in any order.

8. **A** The question asks for the relationship between s and C. Plug in values for C to determine the effect on s. To start, plug in C = 4 and C = 0 to determine what happens where there is an increase or decrease of 4°C. If C = 0, then s = 110 + 4(0) = 110. If C = 4, then s = 110 + 4(4) = 126. As the temperature, C, increases by 4 degrees from 0 to 4 there is an increase in s of 126 – 110 = 16, so eliminate (C). Also, as C decreases by 4 degrees from 4 to 0 there is a decrease in s of 16, so eliminate (D). Now, test a temperature change of 1°C. Plug in C = 1 to compare the results to those from C = 0. If C = 1, then s = 110 + 4(1) = 114. Therefore, as the temperature decreases from C = 1 to C = 0, there is a decrease in the number of scoops sold of 114 – 110. Choice (B) says there would be an increase, so eliminate (B). On an increase from C = 0 to C = 1, there is an increase of 4. This is what is described in (A), so the answer is (A).

9. **B** Information is given about Stephan's plan over a period of 9 months. Find the increase in savings over that time: \$280 – \$145 = \$135 increase in savings over the 9-month period. Find the increase each month: \$135 ÷ 9 = \$15 additional savings per month, which best matches (B).

10. **D** Since graphing on a calculator is not an option, try plugging in some numbers. Let x = 10. Choice (A) becomes $y = -(10^2) + 3 = -100 + 3 = -97$. Since y is less than 2, leave (A), but check

the remaining answers just in case. Choice (B) becomes $y = |-10| - 1 = 10 - 1 = 9$. Since y is greater than 2, eliminate (B). Choice (C) becomes $y = 10^3 - 4 = 1000 - 4 = 996$. Eliminate (C). Choice (D) becomes $y = -(10 - 1)^2 + 1 = -81 + 1 = -80$. Since this value for y is less than 2, keep (D). When plugging in more than once, try some weird numbers too. Next, try $x = 0$ in the remaining answer choices. Choice (A) becomes $y = -(0^2) + 3 = 0 + 3 = 3$. Since this is a value greater than 2, eliminate (A). Therefore, the correct answer is (D).

11. **A** The question asks for the value of $f(-4)$. If the function equation were given in $f(x)$ form, -4 would replace x. However, the function is written in $f(x + 1)$ form, so -4 replaces $x + 1$. Since $-4 = x + 1$, subtract 1 from both sides to get $x = -5$. Therefore, $f(-4) = 3(-5) - 4 = -15 - 4 = -19$. The answer is (A).

12. **C** To get rid of the fractions, get the i out of the denominator by multiplying the expression by the conjugate of the denominator. Multiplying the expression by $\frac{2 + 3i}{2 + 3i}$ is the same as multiplying by 1, so it won't change the value. This becomes $\frac{(5 - i)(2 + 3i)}{(2 - 3i)(2 + 3i)} = \frac{10 + 15i - 2i - 3i^2}{4 + 6i - 6i - 9i^2} = \frac{10 + 13i - 3i^2}{4 - 9i^2}$. Since $i = \sqrt{-1}$, $i^2 = -1$. Substitute -1 for i^2 to get $\frac{10 + 13i - 3(-1)}{4 - 9(-1)} = \frac{10 + 13i + 3}{4 + 9} = \frac{13 + 13i}{13}$. Divide by 13 to get $1 + i$. Therefore, if $a + bi = 1 + i$, then $a = 1$, and the answer is (C).

13. **B** For all quadratic equations in the form $y = ax^2 + bx + c$, the sum of the roots equals $-\frac{b}{a}$. In the equation given, $-\frac{b}{a} = -\left(\frac{24}{3}\right) = -8$. Without that handy trick, it is still possible to answer the question using the quadratic formula to find the roots. Then add them together to get -8. Either way, the answer is (B).

14. **A** The parabola passes through the point $(-1, -1)$, so plug $x = -1$ and $y = -1$ into the equation of the parabola. The equation of the parabola is $y = ax^2 + bx + c$, so $-1 = a(-1)^2 + b(-1) + c$. Simplify this equation to get $-1 = a(1) + b(-1) + c$ and $-1 = a - b + c$. The correct answer is (A).

15. **C** Start by expanding the left side of the equation to get $pqx^2 + 3px + 5qx + 15 = 8x^2 + rx + 15$. Subtract 15 from both sides of the equation to get $pqx^2 + 3px + 5qx = 8x^2 + rx$. The two x terms on the left can be combined as $(3p + 5q)x$. When two quadratics are equal to each other, the coefficients on the x^2 terms on both sides are equal, and the coefficients on the x terms on both sides are equal. From this, it can be determined that $pq = 8$ and $3px + 5qx = rx$. Simplify the second equation by dividing by x to get $3p + 5q = r$. Given that $2 \times 4 = 8$ and that the problem states that $p + q = 6$, one of the values for either p or q could be 2 and the other could be 4. If $p = 2$ and $q = 4$, then $3(2) + 5(4) = r$.

Solve the right side of the equation to get $6 + 20 = r$, and $26 = r$. The only choice with 26 as one of its answer is (C).

16. **3** To solve for y, isolate the variable. First distribute the negative sign to get $4y + 8 - 7y + 12 = 11$. Combine like terms to get $-3y + 20 = 11$. Subtract 20 from both sides to get $-3y = -9$. Divide both sides by -3 to get $y = 3$. The answer is 3.

17. **250** Let d represent the square footage of a double room, and s represent the square footage of a single room. According to the question, $d = s + 25$. Solve the equation for s to get $s = d - 25$. According to the question, $2d + 4s = 1{,}400$. Substitute $d - 25$ in for s to get $2d + 4(d - 25) = 1{,}400$. Distribute the 4 to get $2d + 4d - 100 = 1{,}400$. Combine like terms to get $6d - 100 = 1{,}400$. Solve for d to get $6d = 1{,}500$, so $d = 250$.

18. $\frac{3}{5}$ or **0.6**

There is a useful trigonometry rule that states $\cos\theta = \sin(90 - \theta)$. Therefore, $\sin(90 - a^\circ) = \cos a^\circ = \frac{3}{5}$. Without knowing that rule, it is still possible to answer this question. Draw a right triangle and label one of the acute angles as a° and the other as $(90 - a^\circ)$. If $\cos a^\circ = \frac{3}{5}$, the side adjacent to the angle with a° is 3 and the hypotenuse is 5. Now find $\sin(90 - a^\circ)$: it is the value of the side opposite $(90 - a^\circ)$ over the hypotenuse, or $\frac{3}{5}$. This can also be entered as 0.6 in the grid-in box.

19. **9** The question says that $x + 3$ is a factor of $x^2 + kx + 2k$. By definition, this means that $x^2 + kx + 2k = 0$ if $x + 3 = 0$. If $x + 3 = 0$, subtract 3 from both sides to get $x = -3$. Plug this value in for x into the equation $x^2 + kx + 2k = 0$ to get $(-3)^2 + (-3)k + 2k = 0$. Simplify the equation to get $9 - 3k + 2k = 0$. Combine like terms to get $9 - k = 0$. Add k to both sides to get $9 = k$. The answer is 9.

20. **3** Factor x^2 out of the first two terms to get $x^2(x - 3) + 5x - 15 = 0$. Factor 5 out of the last two terms to get $x^2(x - 3) + 5(x - 3) = 0$. Factor out the $(x - 3)$ from both parts of the left side and rewrite the equation as $(x^2 + 5)(x - 3) = 0$. If $x^2 + 5 = 0$, then $x^2 = -5$, which results in 2 imaginary values for x: $\sqrt{-5}$ and $-\sqrt{-5}$. Therefore, the real value of x is when $x - 3 = 0$, and $x = 3$.

Section 4: Math (Calculator)

1. **D** Translate the information in the question into an equation. The question asks for the number of pies sold. The store sold a total of 364 slices, 84 of which were individual slices. Since individual slices sold do not affect the number of pies sold, these 84 slices should not be counted. In order not to count them, subtract them from the total to get the total number of slices sold as parts of pies. Therefore, eliminate any choice that does not include $364 - 84$. This

eliminates (A), (B), and (C). Only (D) remains. To determine why (D) is correct, note that 364 – 84 represents the number of slices sold in pies. To get the number of pies, divide this total by the number of slices in each pie, which is 8. Therefore, the number of pies sold is $\frac{364-84}{8}$. The answer is (D).

2. **B** In this scenario, parallel lines are cut by another set of parallel lines, and two kinds of angles are created—big and small. All the small angles are equal to each other, all the large angles are equal to each other, and any large angle plus any small angle equals 180°. The given angle, $\angle a$, is a big angle, and $\angle b$ is a small angle. So $125 + \angle b = 180$, and angle $\angle b = 55°$, which is (B).

3. **A** According to the table, there are 5 white chocolate pieces with cream filling, 3 dark chocolate pieces with no filling, and 30 total pieces in the box. Therefore, the probability of selecting a piece that is either white chocolate with cream filling or dark chocolate with no filling is $\frac{5+3}{30} = \frac{8}{30}$, which is (A).

4. **D** The perimeter of a triangle is the sum of the individual sides. Plug in for the sides. The question says that the sides have length x, x, and y, so let $x = 3$ and $y = 4$. Thus, the perimeter is $T = 3 + 3 + 4 = 10$. The question asks for the value of x, which is 3, so this is the target number. Plug $T = 10$ and $y = 4$ into each choice and eliminate any that are not equal to 3. Choice (A) is $3 = 10 - 4$. Since this is false, eliminate (A). Choice (B) is $3 = 10 - 2(4)$. Since this is false, eliminate (B). Choice (C) is $3 = \frac{10-2(4)}{2}$. Since this is false, eliminate (C). Choice (D) is $3 = \frac{10-4}{2}$. Since this is true, the answer is (D).

5. **D** To solve a system of equations, stack and then add them to try to make a variable disappear. To do this, it may be necessary to manipulate the equations first. In this case, multiply the second equation by –2 to get $-2x + 8y = -38$. Stack and add the equations.

$$\begin{array}{r} 2x + 3y = \quad -6 \\ \underline{-2x + 8y = \quad -38} \\ 0x + 11y = -44 \end{array}$$

Therefore, the result is $11y = -44$. Divide both sides by 11 to get $y = -4$. Eliminate any answer choice for which the y-coordinate is not –4: (A), (B), and (C). Only (D) remains. To determine why the x-coordinate is 3, plug $y = -4$ into one of the equations. Try the original form of the second equation. If $x - 4y = 19$, then $x - 4(-4) = 19$, and $x + 16 = 19$. Subtract 16 from both sides to get $x = 3$. The answer is (D).

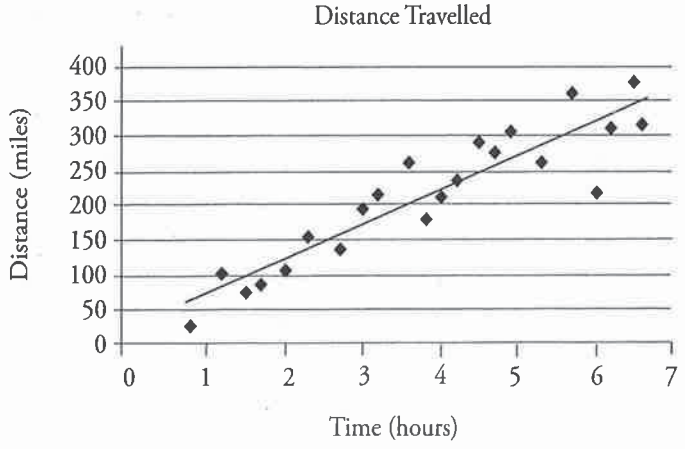
6. **C** Translate the question. The first part of the question indicates that $8 - 6n = 20$. Solve for n to get $-6n = 12$, and $n = -2$. The question is asking for the value of $5 - 3n$. Substitute -2 for n to get $5 - 3(-2) = 5 + 6 = 11$. Choice (C) is correct.

7. **C** Translate the question. Given that there are 25,000 attendees at 12 P.M and the number of attendees increases by 550 every minute, the number of attendees m minutes after 12 P.M. can be expressed as $25{,}000 + 550m$. The full capacity of the stadium is 65,000. To calculate the time prior to the stadium reaching full capacity, the equation would read $25{,}000 + 550m < 65{,}000$. Choice (C) is correct.

8. **A** According to the table, the total number of residents between the ages of 35 and 64 who have an income between \$50,000 and \$74,999 is 7,185 + 14,978 = 22,163. These numbers are all in the thousands, but the total will be as well. Those extra zeros cancel out when making the probability, so don't worry about them. The total number of residents between the ages of 35 and 64 is 39,919 + 83,213 = 123,132. Therefore, the approximate probability that a resident randomly selected in this age range has an income between \$50,000 and \$74,999 is $\frac{22{,}163}{123{,}132} \approx 0.18$. The closest answer is 20%, which is (A).

9. **C** The question says the truck traveled at an average speed of 70 miles per hour for 4 hours. If the speed and time are given, multiply them to get the distance, so d = (70 mph)(4 hours) = 280 miles. The truck has a fuel efficiency of 18 miles per gallon. Set up a proportion: $\frac{1 \text{ gallon}}{18 \text{ miles}} = \frac{g \text{ gallons}}{280 \text{ miles}}$. Cross-multiply to get $280 = 18g$. Divide both sides by 18 to get $g \approx 15.56$. The question says *approximately*, so select the closest choice, which is (C).

10. **B** The question asks about the data point farthest from the best fit line, so draw an estimate of the best fit line onto the graph itself. It should look something like this.



Notice that one point is far away from the line, the point at about (6, 220). The question asks for the time of the trip represented by this data point. Since time is represented by the x-axis, the time is 6 hours. The answer is (B).

11. **D** Start by subtracting 212 from both sides of the equation to get $t_b - 212 = -0.0018a$. Multiply both sides of the equation by –1 to get $-t_b + 212 = 0.0018a$. Divide both sides by 0.0018 to get $\frac{-t_b + 212}{0.0018} = a$. Reorder the terms in the numerator to get $\frac{212 - t_b}{0.0018} = a$. This matches (D).

12. **A** The question asks for the scatterplot with a positive association that is not linear. First eliminate any answer that does not have a positive association. In a positive association, y increases as x increases, so eliminate any choice for which this is not true. Eliminate (C), since it doesn't appear to have a clear positive or negative association. Eliminate (D), since it decreases then increases, so it's not consistently increasing. The question asks for the one that is not linear, so eliminate the answer that is linear. A linear association is one in which a line rather than a curve best fits the data points. In (B), the data points roughly form a linear pattern, so eliminate this choice. The answer is (A).

13. **B** Start by multiplying the entire equation by t to get $vt = h - m + 4.9t^2$. Isolate the h by adding m and subtracting $4.9t^2$ on both sides to get $vt + m - 4.9t^2 = h$. Reorder the terms to get $-4.9t^2 + vt + m = h$, which is (B).

14. **A** The question says that x refers to the number of days after the shipment is received and y refers to the number of oranges that remain. Therefore, since (7, 0) is a solution, there are 0 oranges remaining 7 days after the shipment. Go through each choice and determine whether it reflects this information. Choice (A) seems to be consistent with this, so keep (A). Choice (B) says that there are 7 oranges, but 7 refers to days rather than oranges, so eliminate (B). Choice (C) refers to 455 customers, but since there is no information about how many oranges are sold to each customer, the number of customers cannot be determined. Eliminate (C). Similar to (B), (D) refers to 7 oranges rather than 7 days, so eliminate (D). The answer is (A).

15. **B** There are variables in the answer choices, so plug in. Let $d = 4$. The player's total compensation if he played for the Eagles would be 1,400 + (140 + 40)4 = 1,400 + 720 = 2,120, and his compensation if he played for the Jays would be 1,500 + (130 + 30)4 = 1,500 + 640 = 2,140. Given that his compensation would be higher with the Jays, eliminate (A) and (C). Next, try $d = 6$. His compensation with the Eagles would be 1,400 + (140 + 40)6 = 1,400 + 1,080 = 2,480, and his compensation with the Jays would be 1,500 + (130 + 30)6 = 1,500 + 960 = 2,460. Given that his compensation is greater with the Eagles, eliminate (D). The correct answer is (B).

16. **A** The question states that days are on the x-axis and compensation is on the y-axis. The y-intercept is where the line crosses the y-axis, at a point where $x = 0$. Plug in 0 for days, and the function becomes $y = b + (s + m)0$. Simplify the function to get $y = b$. Therefore, when $x = 0$, y is equal to b, which is the signing bonus. Choice (A) is correct.

17. **B** Start by using Process of Elimination. The question states that substance K has a heat capacity that is lower than that of methyl alcohol. Eliminate (D) since it is greater than 0.6. To calculate the heat capacity of substance K, find 30% of 0.6, which is $0.3 \times 0.6 = 0.18$. Therefore, the heat capacity of substance K is $0.6 - 0.18 = 0.42$, so (B) is correct.

18. **D** If a point is a solution to two inequalities, it means that point is on the graphs of both. Plug $x = -1$ and $y = 0$ into both inequalities and solve them for c and d, respectively. The first inequality becomes $0 < -1 + c$. Add 1 to both sides to get $1 < c$. The second inequality becomes $0 < -(-1) - d$ or $0 < 1 - d$. Add d to both sides to get $d < 1$. If $d < 1$ and $c > 1$, then $d < c$, and the correct answer is (D).

19. **B** The question asks for which podcast had the most ad time per dollar. To get this for each podcast that is a choice, divide the amount of ad time by the cost of the ad. To get the amount of ad time, take the percent of ad time multiplied by the length of each podcast. However, since the length of each podcast is the same, the percent can be used rather than the amount itself. The ad times per dollar for Q, R, S, and T, respectively are $\frac{30}{\$350} \approx 0.086$ per dollar, $\frac{25}{\$200} = 0.125$ per dollar, $\frac{20}{\$180} = 0.111$ per dollar, and $\frac{15}{\$150} = 0.1$ per dollar. Since R has the greatest result, the answer is (B).

20. **D** The formula for the area of a trapezoid is $A = \frac{1}{2}(b_1 + b_2)h$, where b_1 and b_2 represent the two bases, or the two parallel sides on the trapezoid, and h represents the height, or the perpendicular distance between the two bases. Plug in for the bases and height. Let $b_1 = 4$, $b_2 = 8$, and $h = 3$. The area is $A = \frac{1}{2}(4 + 8)(3) = 18$. The question says that PQ and SR are decreased by 75% and PT is quadrupled. Since PQ and SR are parallel, they are b_1 and b_2. Decrease each of these by 75%. 75% of 4 is $\frac{75}{100}(4) = 3$, so decrease by 3 to get $b_1 = 4 - 3 = 1$. 75% of 8 is $\frac{75}{100}(8) = 6$, so decrease by 6 to get $b_2 = 8 - 6 = 2$. Since PT is perpendicular to the two bases, it is the height. Since the height is quadrupled, the new height is $4 \times 3 = 12$. Therefore, the new area is $A = \frac{1}{2}(1 + 2)(12) = 18$. Since the area is unchanged, the answer is (D).

21. **A** According to the table, 11 people never watch the news, and 27 people watch between 1 and 2 times a week, which makes $11 + 27 = 38$ people who watch the news fewer than 3 times a week. Of those viewers, there are $7 + 14 = 21$ people who belong to Group A. Therefore, the probability that a person randomly chosen from among those who watch fewer than 3 times a week is a member of Group A is $\frac{21}{38}$. Choice (A) is correct.

22. **B** Use the graph to determine the frequency of each integer. There are four 4's, one 5, one 6, one 7, two 9's, and one 11. To get the mean, take the sum of these numbers and divide by the number of terms. The sum is $4 + 4 + 4 + 4 + 5 + 6 + 7 + 9 + 9 + 11 = 63$. Count the numbers to get that there are 10 numbers. Therefore, the average is $\frac{63}{10} = 6.3$. The answer is (B).

23. **A** Find the point representing Sample S on the graph. The volume of the sample is represented by the vertical axis, so trace the horizontal line from Sample S to the vertical axis at 80. However, this is 80 liters and the question asks for milliliters. The answer should begin with an 8, so eliminate (B) and (D). There are 1,000 milliliters in a liter, so set up the proportion $\frac{1{,}000 \text{ mL}}{1 \text{ L}} = \frac{x \text{ mL}}{80 \text{ L}}$. Cross-multiply to get $x = 80{,}000$. The choices are in scientific notation. Since 80,000 is an 8 followed by four 0's, it is equal to 8×10^4. The answer is (A).

24. **A** The question asks for the range, or the difference between the greatest and least values, of the volume of the three samples of approximately 1.4 moles. The horizontal axis represents amount. Go just to the left of the line representing 1.5 moles, trace a line straight upward and cross three points. To determine the volume of the sample represented by each point, trace a line directly to the left of each point and see where it crosses the vertical axis, which represents volume. The highest point is between 80 and 100 liters, closer to 100, so it between 90 and 100. The lowest is between 60 and 80 liters, closer to 60, so it is between 60 and 70. Therefore, the range must be greater than $90 - 70 = 20$ and less than $100 - 60 = 40$. The only choice in this range is 30, so the answer is (A).

25. **D** According to the ideal gas law prediction given, $V = 50n$, where V is the volume and n is the number of moles. The question asks about a sample with 1,200 moles, so the volume is $V = 50(1{,}200) = 60{,}000$. The answer is (D).

26. **C** There is a variable in the question, so plug in. If $x = 2$, $f(x) = 3(2^3) + 6(2^2) + 11(2) = 24 + 24 + 22 = 70$, $g(x) = 8(2^2) + 15(2) + 7 = 32 + 30 + 7 = 69$, and $3x + 7 = 3(2) + 7 = 13$. In the answers, plug in 70 for $f(x)$ and 69 for $g(x)$ to see which answer is divisible by 13. Choice (A) becomes $j(x) = 2(70) + 69 = 140 + 69 = 209$, which is not divisible by 13. Eliminate (A). Choice (B) becomes $k(x) = 70 + 69 = 139$, which is not divisible by 13. Eliminate (B). Choice (C) becomes $m(x) = 70 + 2(69) = 70 + 138 = 208$. $208 \div 13 = 16$. Keep (C), but check (D) just in case. Choice (D) becomes $n(x) = 70 + 3(69) = 70 + 207 = 277$, which is not divisible by 13. Eliminate (D); the answer is (C).

27. **C** The question asks for which of the trigonometric function in the choices is equal to $\frac{y}{x}$. The answer choices include two different functions and two different angles, so use POE (Process of Elimination) in bite-sized pieces. The function cosine is equal to $\frac{opp}{hyp}$. Since neither x nor y is the hypotenuse, eliminate the choices that use cosine, (A) and (B). The only two remaining choices use tangent, which is $\frac{opp}{adj}$. Therefore, $\frac{opp}{adj} = \frac{y}{x}$. Since P is opposite side y, $\frac{y}{x} = \tan P$. The answer is (C).

28. **C** The given equation of $f(x)$ is a quadratic equation which when graphed will be a parabola. The minimum value of a parabola is the vertex. The vertex form of a quadratic equation is $y = a(x - h)^2 + k$, where (h, k) is the vertex. Eliminate (B), since it is not in the vertex form of the equation. Expand the function to get $f(x) = x^2 + 7x - x - 7 = x^2 + 6x - 7$. Eliminate (A), since it is not an equivalent form of this quadratic. Set the quadratic to 0 to get $x^2 + 6x - 7 = 0$. Complete the square to get $(x^2 + 6x + 9) - 7 = 0 + 9$. Factor the equation to get $(x + 3)^2 - 7 = 9$. Subtract 9 from both sides to get $f(x) = (x + 3)^2 - 16$. The correct answer is (C).

29. **B** Simplify the top equation to get $-j = 3a + 3$. Multiply both sides of the equation by -1 to get $j = -3a - 3$. Substitute $k + 1$ for j to get $k + 1 = -3a - 3$. Solve for k to get $k = -3a - 4$. Simplify the bottom equation to get $-k = 3b + 3$. Multiply both sides of the equation by -1 to get $k = -3b - 3$. Therefore, $-3a - 4 = -3b - 3$. Solve for a to get $-3a = -3b + 1$, and $a = b - \frac{1}{3}$. Choice (B) is correct.

30. **C** There are variables in the question and answer choices, so plug in. If $x = 3$, $3x = 9$, $4x = 12$, and $5x = 15$. Use these values to find the values of a, b, and c. *Average = total ÷ number of things,* so $a = \frac{9 + 11}{2} = \frac{20}{2} = 10$, $b = \frac{12 + 6}{2} = \frac{18}{2} = 9$, and $c = \frac{15 + 7}{2} = \frac{22}{2} = 11$. Now take the average of a, b, and c: $\frac{10 + 9 + 11}{3} = \frac{30}{3} = 10$. Plug $x = 3$ into the answers to see which one matches this target number. Choice (A) becomes $3 + 2 = 5$, (B) becomes $3 + 3 = 6$, (C) becomes $2(3) + 4 = 10$, and (D) becomes $4(3) + 8 = 20$. Choice (C) is correct.

31. **12** Let y represent number of years. Set up the following equation: $2.25y = 27$. Divide both sides by 2.25 to get $y = 12$.

32. **216** Given that the car factory produces one car every 20 minutes, it produces 3 cars in 1 hour. Since the car factory operates 24 hours a day, the factory produces $3 \times 24 = 72$ cars per day. Therefore, in 3 days the factory produces $72 \times 3 = 216$ cars.

33. **180** To average 240 over all 12 games, Vito must score a total of $240 \times 12 = 2{,}880$ points. In his first 6 games, Vito scored a total of $6 \times 200 = 1{,}200$ points. To find the least number of points he would need to earn on his 7th game, calculate the maximum number of points Vito could get on his last 5 games. If he bowled a perfect game for the last 5 games, he would receive a total of $5 \times 300 = 1{,}500$ additional points. Add this to the total of his first 6 games to get $1{,}200 + 1{,}500 = 2{,}700$ points scored. Therefore, the minimum number of points Vito must score on his 7th game is $2{,}880 - 2{,}700 = 180$ points.

34. **5** Only two points on the parabola are given. However, one of the points is the vertex, so use the vertex form of the equation of a parabola: $y = a(x - h)^2 + k$, where (h, k) is the vertex. Plug the point

(3, 14) in as the vertex to get $y = a(x - 3)^2 + 14$. To determine the value of a, plug in the other point (0, 5) to get $5 = a(0 - 3)^2 + 14$. Simplify the parentheses to get $5 = a(-3)^2 + 14$, and square –3 to get $5 = 9a + 14$. Subtract 14 from both sides to get $-9 = 9a$. Divide by 9 to get $a = -1$. Therefore, the equation of the parabola is $y = -(x - 3)^2 + 14$. To determine the point of intersection, find the equation of the line, which contains the points (0, –5) and (1, –2). The equation of a line can be put into the form $y = mx + b$, where m is the slope and b is the y-intercept. The y-intercept is the point at which $x = 0$. Since (0, –5) is on the line, the y-intercept is –5. Now get the slope by using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$. Let $(x_1, y_1) = (0, -5)$ and $(x_2, y_2) = (1, -2)$, so $m = \frac{-2 - (-5)}{1 - 0} = \frac{-2 + 5}{1} = -2 + 5 = 3$. Therefore, the equation of the line is $y = 3x - 5$. Now set the two equations equal to each other to get $-(x - 3)^2 + 14 = 3x - 5$. FOIL $(x - 3)^2$ to get $-(x^2 - 6x + 9) + 14 = 3x - 5$. Distribute the negative to get $-x^2 + 6x - 9 + 14 = 3x - 5$. Combine like terms to get $-x^2 + 6x + 5 = 3x - 5$. To solve a quadratic, get one side equal to 0. Subtract $3x$ from and add 5 to both sides to get $-x^2 + 3x + 10 = 0$. Divide both sides by –1 to get $x^2 - 3x - 10 = 0$. Factor to get $(x - 5)(x + 2) = 0$. Set both factors equal to 0 to get $(x - 5) = 0$ and $(x + 2) = 0$. Solve the two equations to get $x = 5$ and $x = -2$. Since the point (p, q) is in Quadrant I, the x-coordinate is positive, so use $x = 5$. Since p is the x-coordinate, the answer is 5.

35. **350** The total amount paid = monthly payments + his down payment. In the function given, the $175m$ represents the monthly payments, which means his down payment must have been the 350 dollars.

36. **20** A line of tangency is always perpendicular to the radius of the circle. Therefore, $\angle ABO = 90°$ and $\angle CBO = 90°$. Given that the interior angles of a triangle add up to 180°, $\angle AOB = 60°$, and $\angle BOC = 40°$. The interior angle $\angle AOC = 60° + 40° = 100°$. To determine the circumference of minor arc $\overset{\frown}{DE}$ set up the following proportion: $\frac{\text{angle}}{360°} = \frac{\text{minor arc}}{\text{circumference}}$. In this case, $\frac{100°}{360°} = \frac{x}{72}$. Cross-multiply to get $360x = 7{,}200$. Divide both sides by 360 to get $x = 20$.

37. **0.86** The decay formula states that *final amount* = *original amount* × $(1 - rate)^n$. The rate is 14% per year, which is written as a decimal in the decay formula. Therefore, $k = 1 - 0.14 = 0.86$.

38. **376** Use the decay formula, *final amount* = *original amount* × $(1 - rate)^n$, and the value for k found in the last question to find the population in 5 years. Plug 800 in for the original amount, 0.86 in for k, and 5 in for x to get $P = 800(0.86)^5 \approx 376$. Without the formula, it is still possible to get this question right. Just use a calculator to find the population after 1 year, which would be 800 – 0.14(800) = 688. Then do it again for the population after 2 years: 688 – 0.14(688) = 591.68. Continue the process 3 more times to find the population after five years, which will round to 376.