KALLIS

SAT® Practice Test #1

IMPORTANT REMINDERS:

1. When you take the official SAT, you will need to use a No. 2 pencil. Do not use a pen or a mechanical pencil.

2. On the official SAT, sharing any of the question on the test violates the College Board's policies and may result in your scores being canceled.

(This cover is modeled after the cover you'll see when you take the official SAT.)

Math Test 1 – No Calculator

25 MINUTES, 20 QUESTIONS

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

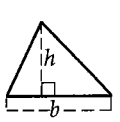
DIRECTIONS

For questions **1 – 15**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **16 – 20**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

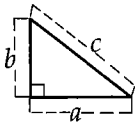
NOTES

1. The use of a calculator on any part of this section is forbidden.
2. Unless otherwise indicated, all variables and expressions used in this test represent real numbers.
3. Unless otherwise indicated, all figures used in this test are drawn to scale.
4. Unless otherwise indicated, all figures used in this test lie on a plane.
5. Unless specified otherwise, a given function, f has the domain the set of all real numbers x for which $f(x)$ is a real number.

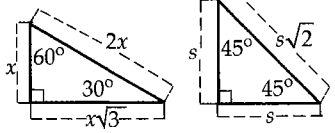
REFERENCE



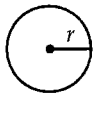
$A = \frac{1}{2}bh$



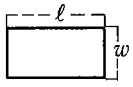
$c^2 = a^2 + b^2$



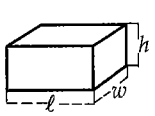
Special Right Triangles



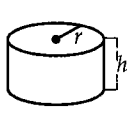
$A = \pi r^2$
$C = 2\pi r$



$A = \ell w$

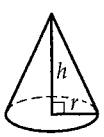


$V = \ell wh$

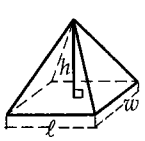


$V = \pi r^2 h$

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



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



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

The arc of a circle is 360 degrees or 2π radians.
A triangle has angles that sum to 180 degrees.

1. Jenny has a job that pays \$8 per hour plus tips (t). Jenny worked for 4 hours on Monday and made \$65 in all. Which equation could be used to find t, the amount Jenny made in tips?

   (A) $65 = 4t + 8$
   (B) $65 = 8t \div 4$
   (C) $65 = 8t + 4$
   (D) $65 = 8(4) + t$

2. Anna burned 15 calories per minute running for x minutes and 10 calories per minute hiking for y minutes. She spent a total of 60 minutes running and hiking and burned 700 calories. The system of equations shown below can be used to determine how much time Anna spent on each exercise:

$$15x + 10y = 700$$
$$x + y = 60$$

   How many minutes x, did Anna spend running?

   (A) 10
   (B) 20
   (C) 30
   (D) 40

3. Solve $\sqrt{13 - x} = x - 1$.

   (A) {4}
   (B) {4, −3}
   (C) {−3}
   (D) {9}

4. A baseball team has \$1,000 to spend on supplies. One baseball bat costs \$185. New baseballs are \$4 each. The inequality $185 + 4b < 1{,}000$ is used to determine the number of new baseballs b that the team can purchase. Which statement about the number of new baseballs that can be purchased is true?

   (A) The team can purchase 204 new baseballs.
   (B) The minimum number of new baseballs that can be purchased is 185.
   (C) The maximum number of new baseballs that can be purchased is 185.
   (D) The team can purchase 185 new baseballs, but this number is neither the maximum nor the minimum.

5. Which statement best describes the relationship between the graphs of $y = 2$ and $x = 2$?

   (A) The two lines have the same slope.
   (B) The lines are perpendicular.
   (C) The lines are parallel.
   (D) The lines intersect at (2, 0).

6. What is the solution set of this system of equations?

$$x^2 + y - 1 = 0$$
$$x - y + 1 = 0$$

(A) $\{(-1, -1), (-1, 0)\}$
(B) $\{(-1, 0), (-1, 1)\}$
(C) $\{(-1, 0), (0, 1)\}$
(D) $\{(1, 0), (1, 1)\}$

7. A set of data has 10 values, no two of which are the same. If the smallest value is removed from the set, which of the following statements MUST be true?

(A) The range of the first data set is greater than the range of the second data set.
(B) The mode of the first data set is greater than the mode of the second data set.
(C) The medians of the two data sets are the same.
(D) The mean of the first data set is greater than the mean of the second data set.

8. Hattie went to a candle store in the mall and saw all the candles in the store were on sale for 17% off. She had her calculator with her and programmed it to give her the sale price based on the original price. What expression did she use to find the sale price, if the original price in dollars is represented by m?

(A) $m + 0.17m$
(B) $-0.17m$
(C) $0.17m$
(D) $m - 0.17m$

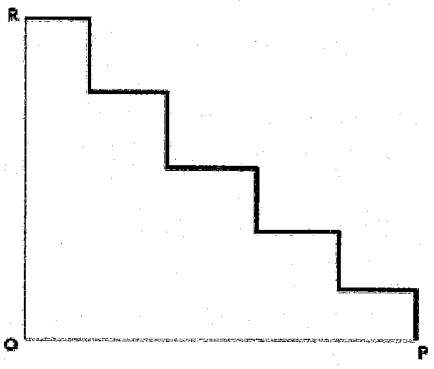
9. Which of the following describes the graph of the function $f(x) = (-x + 3)(x - 5)$?

(A) Opens up with x-intercepts at $(-5, 0)$ and $(3, 0)$
(B) Opens up with x-intercepts at $(5, 0)$ and $(3, 0)$
(C) Opens down with x-intercepts at $(-5, 0)$ and $(-3, 0)$
(D) Opens down with x-intercepts at $(5, 0)$ and $(3, 0)$

10. A board 79 inches long is cut into 3 pieces. The second piece is 5 inches longer than the first. The third piece is twice as long as the second. If x represents the length of the first piece, then which equation can be used to determine the length of the first piece?

(A) $79 = 5x + 15$
(B) $79 = x + (x + 5) + 2x$
(C) $79 = 3x + 12$
(D) $79 = x + (x + 5) + 2(x + 5)$

11.



In the figure above, the heavy segmented line from P to R is composed of line segments that are parallel to either $\overline{OR}$ or $\overline{OP}$. If the length of $\overline{OR}$ is x and the length of $\overline{OP}$ is y, what is the total length of the heavy broken line from P to R?

(A) $\sqrt{x^2 - y^2}$
(B) $x + y$
(C) $2(x + y)$
(D) $x^2 + y^2$

12. Copper production increased at a rate of about 4.9% per year between 1988 and 1993. In 1993, copper production was approximately 1.801 billion kilograms. If this trend continues, which equation best models the copper production (P), in billions of kilograms since 1993? (Let $t = 0$ for 1993.)

(A) $P = 1.801(4.900)^t$
(B) $P = 1.801(1.490)^t$
(C) $P = 1.801(1.049)^t$
(D) $P = 1.801(0.049)^t$

13. If the range of $f(x) = x^2 + 4$ is all real numbers from 13 to 29, what positive numbers lie in the domain of $f(x)$?

(A) $3 \le x \le 5$
(B) $5 \le x \le 21$
(C) $9 \le x \le 25$
(D) $13 \le x \le 29$

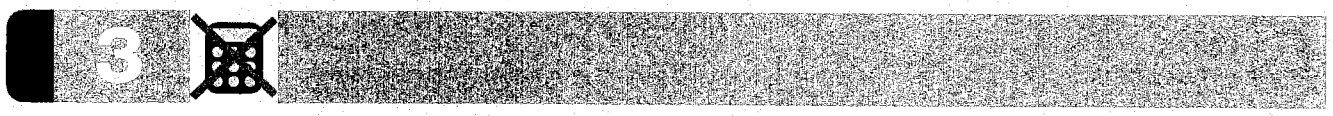
14. Which quadrants contain the solutions to this system of inequalities?

$$y - 2x \le -3$$
$$3y - x \ge -4$$

(A) Quadrants I and IV
(B) Quadrants II and III
(C) Quadrants III and IV
(D) Quadrants II, III, and IV

15. If $i = \sqrt{-1}$, which of the following is equivalent to $\frac{2}{5+i}$?

(A) $\frac{5-i}{12}$
(B) $\frac{5+i}{12}$
(C) $\frac{5-i}{13}$
(D) $\frac{5+i}{13}$



16. If $h(x+1) = \frac{3h(x)+4}{3}$ for all positive integers x and $h(1) = -\frac{2}{3}$, what is the value of $h(3)$?

ANSWER: _____

17. If $x + y = 5$ and $x^2 + 3xy + 2y^2 = 40$, find the value of $2x + 4y$.

ANSWER: _____

18.

$$y = 11x + 3x^2$$
$$y = 11x^2 - 3x$$

Consider the system of equations above for $x > 0$. What is the value of x?

ANSWER: _____

19. The equation $\frac{x-3}{2} = \frac{1}{x-4}$ has two solutions.

What is their product?

ANSWER: _____

20. When the polynomial $x^4 - 3x^3 - 7x^2 + 7x + 2$ is divided by $x + 2$, the quotient is $x^3 + Bx^2 + Cx + 1$.

Find the value of $|B + C|$.

ANSWER: _____

Math Test 1 – 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**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **31 – 38**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

NOTES

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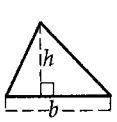
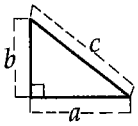


$A = \frac{1}{2}bh$



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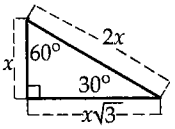
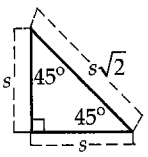
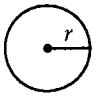
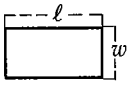




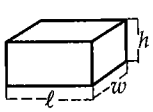
Special Right Triangles



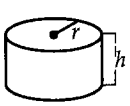
$A = \pi r^2$
$C = 2\pi r$



$A = \ell w$

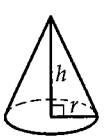


$V = \ell wh$

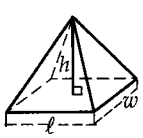


$V = \pi r^2 h$

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



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



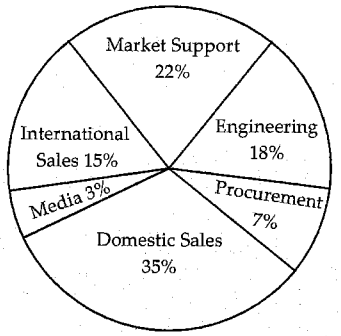
$V = \frac{1}{3}\ell wh$

The arc of a circle is 360 degrees or 2π radians.
A triangle has angles that sum to 180 degrees.

4

1.

ANNUAL BUDGET BY DEPARTMENT



The pie graph above shows the annual budget for the Heavy Equipment Company. If the total budget is $60,000,000, what amount is budgeted for the Market Support and Engineering departments combined?

(A) $18 million
(B) $22 million
(C) $24 million
(D) $28 million

2. A climber measures the oxygen content of the air at 2,000 feet above sea level at 18%. The climber measures it again at 4,500 feet, this time at 14%. By how much does the oxygen content of the air change for every 1,000 feet of elevation?

(A) −1.6%
(B) +1.6%
(C) −2.0%
(D) +2.0%

3. Which of the following expresses the complete solution to the inequality $3x - 5 > 5x - 9$?

(A) $x > -\frac{7}{4}$
(B) $x > 2$
(C) $x < 2$
(D) $x > -2$

4. The owner of a store displays a large jar of nickels and dimes and offers the value of the coins to the person who guesses how many dimes there are. If there are 1,130 coins valued at $100, how many dimes are there?

(A) 130
(B) 260
(C) 870
(D) 970

5. If $y \neq 3$ and $\frac{3x}{y}$ is a prime integer greater than 2, which of the following must be true?

I. $x = y$
II. $y = 1$
III. x and y are prime integers.

(A) None
(B) I only
(C) II only
(D) I and III

6. Cynthia is sailing from Florida to Massachusetts and back to Florida. She will make two stops along the way, in North Carolina and at the New Jersey shore. It costs \$1.45 per foot to dock in North Carolina, \$2.50 per foot to dock in Southern New Jersey, and \$300/night to dock at Cape Cod, Massachusetts. Which of the following choices models how much she will spend on docking fees if she plans on spending 3 nights in Massachusetts, making the same stops on the way back, and sails a boat that requires x feet of dockage?

(A) $2x(1.45 + 2.5) + 900$

(B) $x(1.45 + 2.5) + 300$

(C) $x(1.45 + 2.5) - 300$

(D) $\frac{1.45 + 2.50}{x} + 900$

7. Which of the following is the equation of the line that passes through the points (–5, –2), (3, –1)?

(A) $y = \frac{1}{8}x + \frac{11}{8}$

(B) $y = \frac{1}{8}x - \frac{11}{8}$

(C) $y = -\frac{1}{8}x - \frac{11}{8}$

(D) $y = -\frac{1}{8}x + \frac{11}{8}$

8. At a banquet of 36 people, each person has the choice of roast beef, chicken divan, and linguine primavera. If 25% choose roast beef and 17 people choose chicken divan, how many people choose linguine primavera?

(A) 7

(B) 8

(C) 9

(D) 10

9. A scientist performs an experiment in which she measures four values two times each, with the following results:

	w	x	y	z
First Measurement	0.2	6	0.5	10
Second Measurement	0.6	3	1	30

Which of the following conclusions is supported by the data?

(A) w and y are directly proportional.

(B) w and z are inversely proportional.

(C) x and y are inversely proportional.

(D) x and z are inversely proportional.

10. Martha picked out a pair of shoes that were 30% off the original price. After 5% sales tax, the final cost was \$58.80. What was the original price?

(A) \$70

(B) \$75

(C) \$80

(D) \$85

11. Of the 126 students who applied for a full scholarship to Kent College, 9 were successful. What is the ratio of students receiving a scholarship to those who are not?

(A) 1 to 11

(B) 1 to 12

(C) 1 to 13

(D) 1 to 14

4

12. If p percent of 250 is 75, what is 75% of p?

(A) 22.5
(B) 25
(C) 75
(D) 225

13. This semester, Gerry scored an average of 93 on his five history exams. He got the same score on his first two exams, and then a 94, an 85, and a 90 on the remaining exams. What score did he receive on his first two exams?

(A) 95
(B) 96
(C) 97
(D) 98

14. Logan runs x miles per day. Which of the following represents the total distance he runs in a year, if he takes one day off per week, and a week off every 3 months?

(A) $(52 - \frac{12}{3})(6)x$
(B) $(52 - \frac{52}{3})(6)x$
(C) $\left[(365)\left(\frac{6}{7}\right) - \frac{12}{3}\right]x$
(D) $\left[(365)\left(\frac{6}{7}\right) - 21\right]x$

15. If $f(x) = a(x-2)^2 + 15$ and $f(1) = 2$, then $a =$

(A) −13
(B) −10
(C) 10
(D) 13

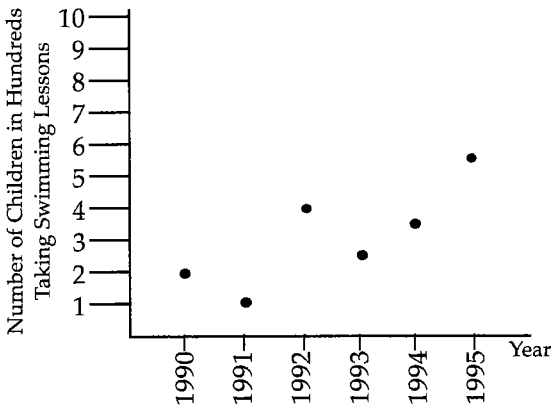
16. Where are the points (1, 2) and (−1, 1) in relation to the line $3x + 4y = 7$?

(A) Both are on the line.
(B) One is on the line and the other is off the line.
(C) Both are above the line.
(D) One is above the line and the other is below the line.

17. If $f(x) = 3x + 2$, then $f(a + b) =$

(A) $3a + 3b + 2$
(B) $3a + 3b + 4$
(C) $3x + 2 + a + b$
(D) $3x + 4 + 3a + 3b$

Refer to the graph below to answer questions 18 and 19.



18. Between which years did the largest decrease in children taking swimming lessons occur?

(A) 1990 – 1991
(B) 1991 – 1992
(C) 1992 – 1993
(D) 1993 – 1994

19. What was the approximate average number of children taking swim lessons from 1990 to 1995?

(A) 250
(B) 308
(C) 385
(D) 450

20. What is the length of a line segment drawn from (–3, 7) to (6, –5) on the coordinate plane?

(A) 15
(B) 16
(C) 17
(D) 18

21. If $f(x)$ is a function for which $f(2 + k) = f(2 - k)$, and $f(-3) = 0$, for which of the following is $f(x)$ also equal to zero?

(A) $x = 7$
(B) $x = 5$
(C) $x = 3$
(D) $x = -1$

22. David is staying at a hotel that charges \$79.50 per night plus tax for a room. A tax of 7.2% is applied to the room rate, and there is an additional one-time untaxed fee of \$10.00. Which of the following represents David's total charges, in cents, for a stay of x nights?

(A) $(7950 + 0.072x) + 1000$
(B) $1.072(7950x) + 1000$
(C) $1.072\ (7950x + 1000)$
(D) $1.072\ (7950 + 1000)x$

23. At 1:00 PM, a car leaves St. Louis for Chicago, traveling at a constant speed of 65 miles per hour. At 2:00 PM, a truck leaves Chicago for St. Louis, traveling at a constant speed of 55 miles per hour. If it is a 305-mile drive between St. Louis and Chicago, at what time the car and truck pass each other?

(A) 2:30 PM
(B) 3:00 PM
(C) 4:00 PM
(D) 4:30 PM

24. To celebrate a colleague's retirement, the coworkers in an office agree to contribute equally to a catered lunch that costs a total of b dollars. If there are a coworkers in the office, and if c coworkers fail to contribute, which of the following represents the extra amount, in dollars, that each of the remaining coworkers must contribute to cover the cost of lunch?

(A) $\frac{b}{c}$
(B) $\frac{b}{a-c}$
(C) $\frac{bc}{a-c}$
(D) $\frac{bc}{a(a-c)}$

25. A store charges \$39 per pair for a certain type of pants. This price is 30% more than the wholesale price. At a Thanksgiving sale, store employees can purchase any remaining items at 40% off the wholesale price. How much would it cost an employee to purchase a pair of pants of this type at this sale?

(A) \$12.00
(B) \$14.00
(C) \$18.00
(D) \$21.00

26.

Quiz Score	Number of Students
0	2
10	4
20	13
30	6

A class of 25 students took a 3-question quiz. The table shows the possible scores on this quiz and the number of students who received each of these scores. What is the average (arithmetic mean) of the scores for this class?

(A) 18.9
(B) 19.1
(C) 19.2
(D) 19.7

27. A manufacturing company processes raw ore. The number of tons of refined material the company can produce during t days using Process A is $A(t) = t^2 + 2t$ and using Process B is $B(t) = 10t$. The company has only 7 days to process ore and must choose one of the processes. What is the maximum output of refined material, in tons, for this time period?

(A) 10
(B) 51
(C) 63
(D) 70

28. The angle created by an individual's line of vision from sea level to the top of a lighthouse is 60°. The lighthouse is known to rise 180 feet above sea level. What is the distance (to the nearest foot) between the observer and the base of the lighthouse?

(A) 104 feet
(B) 180 feet
(C) 208 feet
(D) 254 feet

29. If $i = \sqrt{-1}$, which of following is equivalent to $\frac{2i}{1+i}$?

(A) -2
(B) $-1 + 2i$
(C) $1 - i$
(D) $1 + i$

30. If $\sin x = \frac{1}{2}$ and x is between $\frac{\pi}{2}$ and $\frac{3\pi}{2}$, what is the value of $\frac{x}{2}$?

(A) $\frac{5\pi}{6}$
(B) $\frac{7\pi}{12}$
(C) $\frac{5\pi}{12}$
(D) $\frac{\pi}{12}$

31. What is the slope of the line $9x - 3y = 10$?

ANSWER: _____

32. Angel works part-time as an underwear fit model for \$50 an hour, and part-time as a pastry chef for \$12.50 an hour. This past week, he worked for 25 hours and made \$625. How many hours did he work as a chef?

ANSWER: _____

33. At a convenience store, two candy bars and two bags of potato chips cost \$4.00, and three candy bars and two bags of potato chips cost \$4.75. What is the price, in dollars, of one bag of potato chips?

ANSWER: _____

34. A two-digit number from 10 to 99, inclusive, is chosen at random. What is the probability that this number is divisible by 5?

ANSWER: _____

35. If Aaron can do a job in 8 days, and Ben can do the same job in 12 days, how long does it take, in hours, for the two men, working together, to complete the same job? (Round your answer to the nearest hour.)

ANSWER: _____

36. The base of a pyramid has the same area as the base of a cylinder, and the cylinder is twice the height of the pyramid. What is the ratio of the volume of the pyramid to the volume of the cylinder?

ANSWER: _____

37. **PART 1**

Karen runs a flower shop. She determines that it takes her two hours of online marketing to bring in five new orders. If each order bills an average of $30, how many hours of marketing are necessary for her business to bill $10,000 a month? (Round your answer to the nearest hour.)

ANSWER: _____

38. **PART 2**

Karen hires a marketing assistant to bolster her online presence, and finds that it now takes only one hour of online marketing to bring in five new orders. If she pays her assistant $15 per hour, and the cost to fill an order is $5, how many hours must her assistant work each month for Karen's business to make a monthly profit of $10,000?

ANSWER: _____

SAT Practice Test 1: Answers & Explanations

Math Test

No Calculator Portion

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

Calculator Portion

1.	C	7.	B	13.	D	19.	B	25.	C	31.	3	36.	$\frac{1}{6}$				
2.	A	8.	D	14.	A	20.	A	26.	C	32.	16.7						
3.	C	9.	C	15.	A	21.	A	27.	D	33.	1.25	37.	133				
4.	C	10.	C	16.	D	22.	B	28.	A	34.	0.2 or $\frac{1}{5}$	38.	90.9				
5.	A	11.	C	17.	A	23.	C	29.	D								
6.	A	12.	A	18.	C	24.	D	30.	C	35.	115						

No Calculator Portion

1) ➡ D

Jenny's earnings can be modeled as a linear function, dependent on hourly wage, time worked, and tips. Hourly wage is set at \$8 per hour, and tips are not dependent on hours worked; the independent variable is hours worked. This relationship is modeled as the equation $65 = (8)4 + t$.

2) ➡ B

To solve the system of equations for x, multiply the second equation by 10:

$10(x + y) = 10(60)$
$10x + 10y = 600$

Subtracting this equation from the first equation gives the following equation: $5x = 100$

The amount of time, x, spent running is 20 minutes.

3) ➡ A

Taking the square of both sides of the equation gives:

$\left(\sqrt{13 - x}\right)^2 = (x - 1)^2 \rightarrow 13 - x = x^2 - 2x + 1$

Move all terms to one side of the equation, setting them equal to zero: $x^2 - x - 12 = 0$
Factor: $(x - 4)(x + 3) = 0$
$x = 4, -3$

Testing these solutions in the original expression shows that $x = -3$ is not a viable solution.

4) ➡ D

The answer choices describe the number of baseballs that can be purchased. Solve the inequality:

$185 + 4b < 1000 \rightarrow 4b < 815 \rightarrow b < 203.75$

The inequality states that the number of baseballs that can be purchased is 203.75. Since baseballs cannot be purchased in parts, the maximum number of baseballs that can be purchased is 203. The only choice consistent with this result is (D).

5) ➡ B

The line $y = 2$ is a horizontal line, and line $x = 2$ is a vertical line, so they are perpendicular to each other.

6) ➡ C

Moving y to the other side of the first equation gives:
$x^2 - 1 = -y \rightarrow -1(1 - x^2) = -1(y) \rightarrow 1 - x^2 = y$

Similarly, the second equation gives: $y = x + 1$
Set these two equations equal to each other and solve:

$1 - x^2 = x + 1 \rightarrow x^2 + x = 0 \rightarrow x(x + 1) = 0$

$x = 0, -1$

$x = 0, y = 1; x = -1, y = 0.$

The only choice that includes both of these x values as solutions is (C).

7) ➡ A

The range of a set is the difference between the smallest and largest values. Since no two values of the set are the same, removing the smallest value

of the set will alter the difference between the smallest and largest values.

8) ⟹ D

The sale price is the original price minus 17% of the original price; 17% can also be written, in decimal form, as $0.17m$. The final price is modeled in choice (D).

9) ⟹ D

Determine the intercepts by setting the function equal to zero:

$(-x + 3)(x - 5) = 0$

$x = 3, 5$

If the function is written in the form $f(x) = ax^2 + bx + c$, a is a negative number. This indicates that the parabola opens downward.

10) ⟹ D

The respective lengths of the pieces can be written as follows:

1st piece: x

2nd piece: $x + 5$

3rd piece: $2(x + 5)$

$x + (x + 5) + 2(x + 5) = 79$

11) ⟹ B

The horizontal components of the heavy lines sum to y and the vertical components of the same line sum to x. The total length is the sum of x and y.

12) ⟹ C

The annual increase is 4.9%, so the amount at the end of each year can be determined by multiplying the previous year's production by a factor of 1.049. This factor must be raised to an exponent equal to the number of years of increase.

13) ⟹ A

The range of the function can be expressed in the following inequality:

$13 \le x^2 + 4 \le 29$

$9 \le x^2 \le 25$

Since we are only looking for positive numbers in the domain, we take the square root of all values in the inequality but consider only positive roots:

$3 \le x \le 5$

14) ⟹ A

To determine the region bounded by the system of inequalities, graph the two inequalities as lines. For ease of graphing, convert the inequalities to equations in slope-intercept form:

$y = 2x - 3$

$y = \frac{1}{3}x - \frac{4}{3}$

Examine the inequalities to determine if the regions are below or above the lines. The first inequality opens to the right, so the region is below the line; the second opens to the left, so the region is above the line. The region bounded by the system is restricted to quadrants I and IV.

15) ⟹ C

To simplify this expression, begin by rationalizing the denominator:

$$\frac{2}{5+i} \cdot \frac{(5-i)}{(5-i)} = \frac{2(5-i)}{25-i^2}$$

Making use of the identity $i^2 = -1$:

$$\frac{2(5-i)}{25-(-1)} = \frac{2(5-i)}{26}$$

$$= \frac{5-i}{13}$$

16) ⟹ 2

Since $h(1) = -\frac{2}{3}$,

$$h(2) = \frac{3\left(-\frac{2}{3}\right)+4}{3} = \frac{2}{3},$$

and

$$h(3) = \frac{3\left(\frac{2}{3}\right)+4}{3} = \frac{6}{3} = 2$$

17) ⟹ 16

Factor the second equation:

$x^2 + 3xy + 2y^2 = 40$

$(x + y)(x + 2y) = 40$

According to the first equation, we can substitute 5 for $(x + y)$.

$5(x + 2y) = 40$

$x + 2y = 8$

Multiply both sides of the equation by two:

$2x + 4y = 16$

18) ⟹ $\frac{7}{4}$

Set the two equations equal to each other and solve:

$11x + 3x^2 = 11x^2 - 3x$

$14x - 8x^2 = 0 \rightarrow x(14 - 8x) = 0$

$x = 0$ and $(14 - 8x) = 0$

Since $x > 0$, x cannot be equal to zero. To find the

second solution:

$14 - 8x = 0 \rightarrow 8x = 14$

$x = \frac{14}{8} = \frac{7}{4}$

19) ➡ 10

Simplify the expression:

$\frac{x-3}{2} = \frac{1}{x-4}$

$(x-3)(x-4) = 2$

$x^2 - 7x + 12 = 2$

$x^2 - 7x + 10 = 0$

Factor and solve:

$(x-5)(x-2) = 0$

$x = 2, 5$

The product of the two solutions is 10.

20) ➡ 2

$$
\begin{array}{r}
x^3 - 5x^2 + 3x + 1 \\
x+2 \overline{)\, x^4 - 3x^3 - 7x^2 + 7x + 2} \\
-)\underline{x^4 + 2x^3} \\
-5x^3 - 7x^2 \\
-)\underline{-5x^3 - 10x^2} \\
3x^2 + 7x \\
-)\underline{3x^2 + 6x} \\
x + 2 \\
-)\underline{x + 2} \\
0
\end{array}
$$

$B = -5$

$C = 3$

$|B + C| = |-5 + 3|$

$= |-2| = 2$

Calculator Portion

1) ➡ C

Market Support is 22% of the budget, and Engineering is 18%. The combined amount is 40% of the total budget:

$(0.4)(60{,}000{,}000) = 24{,}000{,}000$

2) ➡ A

To apply a ratio, note that oxygen content falls 4% (from 18% to 14%) as elevation increases 2500 feet (from 2000 feet to 4500 feet). The variable x is the change in oxygen content per 1000 feet of elevation:

$\frac{4}{2500} = \frac{x}{1000}$

$x = \frac{4000}{2500}$

$x = 1.6$

The oxygen content falls 1.6% per 1000 feet of elevation.

3) ➡ C

Solve the inequality:

$3x - 5 > 5x - 9$

$4 > 2x$

$x < 2$

4) ➡ C

Set the variable x as the number of nickels in the jar, and y as the number of dimes. There are 1,130 coins total, valued at $100:

$x + y = 1130 \rightarrow x = 1130 - y$

$0.05x + 0.1y = 100$

Use substitution to solve for y:

$0.05(1130 - y) + 0.1y = 100$

$56.5 - 0.05y + 0.1y = 100$

$0.05y = 43.5$

$y = 870$

There are 870 dimes in the jar.

5) ➡ A

Examine Roman numeral I. If x and y are equal, $\frac{3x}{y}$ is reduced to 3, which is a prime integer. There exist, however, values of x and y which are not equal to each other that will produce a prime integer greater than 2; for example, the values $x = 14$, $y = 6$ also satisfy the requirement. Roman numeral I is not always true, thus choices (B) and (D) are eliminated. Roman numeral II is not always true, as demonstrated above. Thus, the correct choice is (A).

6) ➡ A

On her way to Florida, Cynthia spends $1.45x$ dollars to dock her boat in North Carolina and

$2.50x$ dollars to dock her boat in New Jersey. She pays $300 per night to dock for three nights in Massachusetts, a total of $900. To model total docking fees, the amount spent in North Carolina and New Jersey are doubled to account for the trip back to Florida:

$2(1.45x) + 2(2.50x) + 900$
$2x(1.45 + 2.50) + 900$

7) ➡ B

The slope-intercept form of a line is $y = mx + b$. To calculate slope:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{(-1) - (-2)}{3 - (-5)}$$

$$m = \frac{1}{8}$$

To find the y-intercept, substitute x and y values of the point $(-5, -2)$:

$$y = \frac{1}{8}x + b$$

$$-2 = \frac{1}{8}(-5) + b$$

$$b = -\frac{11}{8}$$

8) ➡ D

Roast beef + *Chicken divan* + *Linguine primavera* = 36
Linguine primavera = 36 − *Roast beef* − *Chicken divan*
L.P. = 36 − (0.25)(36) − 17
L.P. = 36 − 9 − 17 = 10

9) ➡ C

The following is a directly proportional relationship (also called "direct variation"), where x and y are variables and k is a constant:

Direct Variation: $y = kx$, $k = \frac{y}{x}$ (k is a constant.)

The following is an inversely proportional relationship (also called "inverse variation"), where x and y are variables and k is a constant:

Inverse Variation: $xy = k$, $y = \frac{k}{x}$ (k is a constant.)

Since $k = \frac{(w)}{(y)} = \frac{(0.2)}{(0.5)} \neq \frac{(0.6)}{(1)}$, w and y are not directly proportional and (A) is incorrect.
Since $k = wz$; $(0.2)(10) \neq (0.6)(30)$ w and z are not inversely proportional, and (B) is incorrect.
Since $k = xy$; $6(0.5) = 3(1) = 3$, x and y are inversely proportional. Therefore, (C) is correct.

10) ➡ C

Let the variable x be the original price of the shoes. The sale price is 30% off the original price, or 70% of the original price. The 5% sales tax is applied to the sale price:

$(0.7x)(1.05) = 58.50$

$$x = \frac{58.50}{(0.7)(1.05)}$$

$x = 80$

11) ➡ C

There are 126 applicants, 9 successful applicants, and 117 non-successful applicants. The ratio of successful to unsuccessful applicants is:

$$\frac{successful}{unsuccessful} = \frac{9}{117} = \frac{1}{13}$$

12) ➡ A

P percent of 250 is 75; let p percent be represented by the variable p:

$p(250) = 75$
$p = 0.3$, or 30%

To find 75% of p:
$(0.75)p = (0.75)(30) = 22.5$

13) ➡ D

Let the variable x represent the student's scores on the first and second exams. The sum of all scores divided by the number of scores is the average score, 93:

$$\frac{x + x + 94 + 85 + 90}{5} = 93$$

$$\frac{2x + 269}{5} = 93$$

$2x = 196$

$x = 98$

14) ➡ A

Logan runs x miles per day, 6 days per week. To determine how many weeks he runs, note that he takes off a full week every three months:

$$Weeks\ off = 12\ months \times \frac{1\ week}{3\ months} = \frac{12}{3}$$

With 52 weeks in a year, the number of weeks that Logan runs is:

$$Week\ on = 52 - \frac{12}{3}$$

To model the total number of miles for the year, multiply the number of weeks on by six (running days per week) and miles per day (x):

$$\left(52-\frac{12}{3}\right)(6)x$$

15) ➡ A

To find a, replace x with 1 and set the function equal to 2:

$2 = a(1-2)^2 + 15$

$2 = a + 15$

$a = -13$

16) ➡ D

This question can be solved by graphing the line on the coordinate plane and comparing it to the positions of the two points. Algebraically, it can be solved by substituting the x-values into the equation of the line and comparing the y-values of points on the line to the y-values of the points given. Begin with the point (1, 2), which has x-coordinate 1:

$3(1) + 4y = 7 \longrightarrow 4y = 4 \longrightarrow y = 1$

At $x = 1$, the point on the line is (1, 1). The point (1, 2) is above the line.

The second point is (–1, 1). Substituting $x = -1$ into the equation of the line:

$$3(-1) + 4y = 7 \longrightarrow 4y = 10 \longrightarrow y = \frac{10}{4} = \frac{5}{2}$$

At $x = -1$, the point on the line is (–1, 2.5). The point (–1, 1) is below the line.

17) ➡ A

$f(x) = 3x + 2$

$f(a + b) = 3(a + b) + 2$

$f(a + b) = 3a + 3b + 2$

18) ➡ C

The period 1990 – 1991 decreases 100 lessons. The period 1992 – 1993 decreases 150 lessons. Thus, the answer is (C).

19) ➡ B

By year, the number of children taking swim lessons is: 200 in 1990, 100 in 1991, 400 in 1992, 250 in 1993, 350 in 1994, 550 in 1995. To find the average per year:

$$\frac{200+100+400+250+350+550}{6} = 308.3$$

This is closest to choice (B)

20) ➡ A

The distance between two points on the coordinate plane is:

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

The distance between the points (– 3, 7) and (6, – 5) is:

$d = \sqrt{(6-(-3))^2 + (-5-7)^2}$

$d = \sqrt{81+144} \rightarrow d = \sqrt{225} \rightarrow d = 15$

21) ➡ A

If $k = -5, f(2 + k) = f(-3) = 0$.

Since $f(2 + k) = f(2 - k) = 0, f(2 - (-5)) = f(7) = 0$.

22) ➡ B

The nightly rate is \$79.50 plus 7.2% of that rate. Including tax, the nightly rate is written as (79.50)(1.072) *dollars*. Including the one-time fee, the cost of staying x nights is: $(79.50)(1.072)x + 10.00$

In cents, the cost can be written as $1.072(7950x) + 1000$

23) ➡ C

The vehicles will meet when their combined distance equals the distance between the cities, 305 miles. Set t as the time, in hours, that has passed since 2:00 pm; the distance traveled by the car is $65t + 65$, with the additional 65 miles accounting for the one hour head-start. The distance traveled by the truck is simply its speed, 55 miles per hour, multiplied by t. These distances sum to 305 miles:

$(65t + 65) + 55t = 305$

$120t = 240$

$t = 2$

The two cars pass each other two hours after 2:00 pm, at 4:00 pm.

24) ➡ D

To determine the additional amount certain coworkers must pay as a result of other coworkers not contributing to the lunch, we require expressions for the amount paid if all coworkers contributed and the actual amount contributed only by those coworkers that participated. The first expression, the amount expected if all coworkers contributed, is the total cost divided by the total number of coworkers: $\frac{b}{a}$

The actual amount paid is equivalent to the expression: $\frac{b}{a-c}$

The difference between the expressions is the

additional amount that must be contributed by the coworkers that participated:

$$\frac{b}{a-c}-\frac{b}{a}=\frac{ba-b(a-c)}{a(a-c)}$$

$$=\frac{ba-ba+bc}{a(a-c)}=\frac{bc}{a(a-c)}$$

25) ➡ C

The selling price is the cost price marked up 30%. Let the cost price be x:

$(1.3)x = 39$

$x = 30$

The employee price is 40% off, or 60% of the cost price:

Employee price = (30)(0.6) = 18

26) ➡ C

$$\textit{Average score} = \frac{\textit{Sum of all scores}}{\textit{Number of students}}$$

$$\textit{Average score} = \frac{2(0)+4(10)+13(20)+6(30)}{25} = \frac{480}{25}$$

$= 19.2$

27) ➡ D

If the company uses Process A for seven days, the output is:

$A(7) = 7^2 + 14 = 63$ *tons*

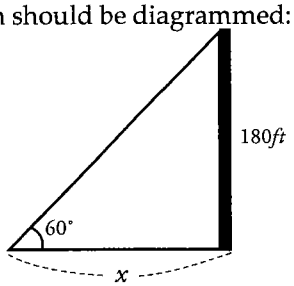
If the company uses Process B for seven days, the output is:

$B(t) = 10(7) = 70$ *tons*

Maximum output is achieved with Process B and is 70 tons.

28) ➡ A

The question should be diagrammed:



Note: Figure not drawn to scale

The thick black line to the right represents the lighthouse, and x is the distance from the observer to the lighthouse. To calculate the distance to the lighthouse, use the trigonometric identity:

$$\tan 60^\circ = \frac{\textit{opposite side}}{\textit{adjacent side}}$$

$$\tan 60^\circ = \frac{180}{x}$$

$$x = \frac{180}{\tan 60^\circ}$$

$x = 104$

29) ➡ D

Rationalize the denominator: $\frac{2i}{1+i}\cdot\frac{(1-i)}{(1-i)}=\frac{2i-2i^2}{1-i^2}$

Taking $i^2 = -1$,

$$\frac{2i-2(-1)}{1-(-1)}=\frac{2i+2}{2}=i+1$$

30) ➡ C

By looking at the 30–60–90 triangle, $\sin 30^\circ = \frac{1}{2}$.

Based on the unit circle, the function $\sin\theta = y$.

The angle between $\frac{\pi}{2}$ and $\frac{3\pi}{2}$ that corresponds to a point on the unit circle with y-value equal to $\frac{1}{2}$ is 30° above the x-axis in quadrant II, or 150°. In radian measure, then, $x=\frac{5\pi}{6}$. Therefore, $\frac{x}{2}=\frac{5\pi}{12}$

31) ➡ 3

Convert the equation into the slope–intercept form, $y = mx + b$:

$9x - 3y = 10 \rightarrow 3y = 9x - 10$

$y = 3x - \frac{10}{3}$

The slope, m, of the line is 3.

32) ➡ 16.7

Let x be the number of hours worked as a model, and y be the number of hours worked as a chef. Angel's total hours are 25: $x + y = 25$

He works for \$50 per hour as a model and \$12.50 per hour as a chef, and makes a total of \$625 for the week:

$50x + 12.5y = 625$

Multiply both sides of the first equation by 50 and subtract the second equation from the multiplied form of the first equation:

$$\begin{array}{r} 50x+50y=1250 \\ -)\,50x+12.5y=625 \\ \hline 37.5y=625 \end{array}$$

Solve for y: $y=\frac{625}{37.5}=16.7$

33) ➡ 1.25

Let b be the price of one candy bar and c be the price of one bag of chips.

$2b+2c=4$

$3b+2c=4.75$

Subtracting the first equation from the second gives:

$b=0.75$

According to the first equation, the cost of one candy bar, in dollars, is

$c=2-b$

$c=1.25$

34) ➡ 0.2 *or* $\frac{1}{5}$

One way to answer this question is to count the number of two-digit numbers divisible by five and divide by the total number of two-digit numbers. We can also calculate the numbers divisible by five by noting that there are twenty such numbers between 1 and 100. Excluding the numbers 5 and 100, which are not included in the set, leaves 18 two-digit numbers divisible by five. As there are 90 two digit numbers in the set, the probability of picking a number divisible by 5 at random is:

$p=\frac{18}{90}=\frac{1}{5}$

35) ➡ 115

Aaron is able to complete one-eighth of the job in a single day, and Ben is able to complete one–twelfth of the job in a single day. Let x be the time in days it takes the two men, working together, to complete the job:

$\frac{1}{8}x+\frac{1}{12}x=1$

$\frac{5}{24}x=1$

$x=\frac{24}{5}$

To calculate the number of hours:

$\frac{24}{5}\,days\times\frac{24\,hours}{1\,day}=115.2\,hours$

Rounded to the nearest hour: 115 *hours.*

36) ➡ $\frac{1}{6}$

The volume of a general cylinder is: $V=bh$ where b is the area of the base of the cylinder. The volume of a general cone is: $V=\frac{1}{3}bh$ where b is the area of the base of the cone. A pyramid is a type of general cone that has a polygonal base. The area of the base of this cylinder is the same as the area of the base of the cone. The cylinder has a height twice the height of the pyramid: $h_c=2h_p$

The ratio of the volume of the pyramid to the volume of the cylinder is:

$$\frac{Volume\ of\ pyramid}{Volume\ of\ cylinder}=\frac{\frac{1}{3}bh_p}{bh_c}=\frac{\frac{1}{3}h_p}{2h_p}=\frac{1}{6}$$

37) ➡ 133

Two hours of marketing bring in five orders at \$30 each; for every two hours of marketing, Karen bills \$150. If x is the number of marketing hours needed to bill \$10,000, then

$x=2\cdot\left(\frac{10{,}000}{150}\right)$

$x=133.3$

Rounded to the nearest hour: 133

38) ➡ 90.9

Each hour worked by the assistant costs \$15 in wages and \$25 to fill orders (five orders at \$5 each). Each hour worked by the assistant brings in \$150 in billings (five orders at \$30 each). The profit to the business per hour is:

$Profit\ by\ hour=150-(15+25)=110$

To bill \$10,000 in a month:

$$Hours\ worked=\frac{10{,}000}{110}=90.9$$

KALLIS

SAT® Practice Test #2

IMPORTANT REMINDERS:

1. When you take the official SAT, you will need to use a No. 2 pencil. Do not use a pen or a mechanical pencil.

2. On the official SAT, sharing any of the question on the test violates the College Board's policies and may result in your scores being canceled.

(This cover is modeled after the cover you'll see when you take the official SAT.)

Math Test 2 – No Calculator

25 MINUTES, 20 QUESTIONS

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

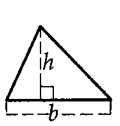
DIRECTIONS

For questions **1 – 15**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **16 – 20**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

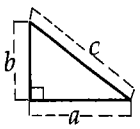
NOTES

1. The use of a calculator on any part of this section is forbidden.
2. Unless otherwise indicated, all variables and expressions used in this test represent real numbers.
3. Unless otherwise indicated, all figures used in this test are drawn to scale.
4. Unless otherwise indicated, all figures used in this test lie on a plane.
5. Unless specified otherwise, a given function, f, has the domain the set of all real numbers x for which $f(x)$ is a real number.

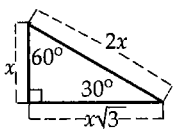
REFERENCE

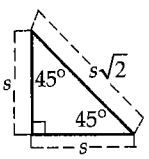


$A = \frac{1}{2}bh$

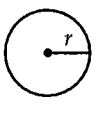


$c^2 = a^2 + b^2$



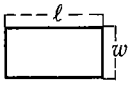


Special Right Triangles

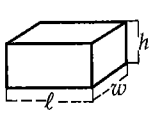


$A = \pi r^2$

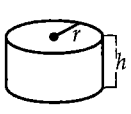
$C = 2\pi r$



$A = \ell w$

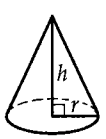


$V = \ell wh$

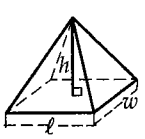


$V = \pi r^2 h$

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



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



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

The arc of a circle is 360 degrees or 2π radians.

A triangle has angles that sum to 180 degrees.

1. James rents a car for x days. The rate is \$19.95 per day, which includes 20 miles of driving, and \$0.40 per mile for each additional mile. If James drives 30 miles per day for the duration of this period, which of the following represents the cost of the rental as a function of x?

   (A) $f(x) = (23.95)x$
   (B) $f(x) = (31.95)x$
   (C) $f(x) = (19.95)x + 4$
   (D) $f(x) = (39.95)x$

2. David and Peter are starting a lawn mowing service. They must buy a lawn mower for \$250 and plan to charge \$15 per lawn. Which of the following inequalities represents the number of lawns (l) they need to mow to earn at least \$800 over the cost of the lawn mower?

   (A) $l \leq 54$
   (B) $l \geq 54$
   (C) $l \leq 70$
   (D) $l \geq 70$

3. A car travels 125 miles at 60 miles per hour, and then a further 30 miles at 45 miles per hour. What is the total time for the trip?

   (A) 2 hours, 45 minutes
   (B) 3 hours, 15 minutes
   (C) 3 hours, 20 minutes
   (D) 4 hours

4. $$3x + 2y = -1$$
   $$6x + 4y = -2$$

   The system of equations above represents two straight lines. What is true of these lines?

   (A) They meet at the origin.
   (B) They never meet.
   (C) They are perpendicular to each other.
   (D) They are the same line.

5. A cellphone plan charges a \$2 monthly fee plus \$0.10 per minute of talk time. Which of the following functions represents the cost, in dollars, for a month in which m minutes of talk time are used?

   (A) $C(m) = 10 + 2m$
   (B) $C(m) = 2 + 10m$
   (C) $C(m) = 0.1 + 2m$
   (D) $C(m) = 2 + 0.1m$

6. What is the value of a if $(x + 2y)^2 + (x - y)^2 = 2ax + 5y^2$?

   (A) 1
   (B) x
   (C) $x + y$
   (D) $x - y$

7. The sum of two numbers that differ by 3 is q. What is the the smaller of the two numbers in terms of q?

(A) $\frac{q}{2}-1$

(B) $\frac{q}{2}$

(C) $\frac{q+3}{2}$

(D) $\frac{q-3}{2}$

8. A sphere has a surface area of 36π square centimeters. What is the volume of the sphere? (the formula for the surface area of a sphere is $A = 4\pi r^2$.)

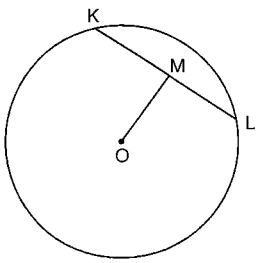
(A) 27π cm^3

(B) 36π cm^3

(C) 54π cm^3

(D) 72π cm^3

9.



In the figure above, $\overline{KL}$ is a chord of the circle centered at O, with $\overline{KL} \perp \overline{MO}$. If $\overline{KL} = 12$ and $\overline{MO} = 6$, what is the area of the circle?

(A) 36π

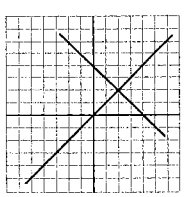
(B) 48π

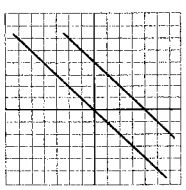
(C) 72π

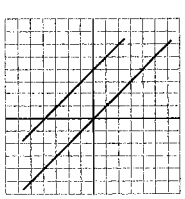
(D) 96π

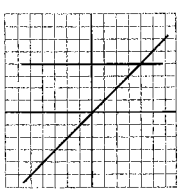
10. $x + y = 4$
$x - y = 0$

Which of the following corresponds to the system of equations above?

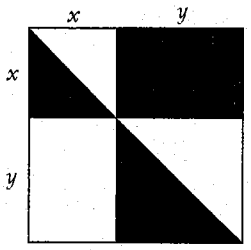
(A) 

(B) 

(C) 

(D) 

11.



The large quadrilateral above is a square. What is the area of the shaded region in terms of x and y?

(A) $\frac{x^2 + y^2}{2}$

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

(C) $\frac{\sqrt{x^2+y^2}}{2}$

(D) $\frac{(x^2+y^2)}{4}$

12. Water is poured from a full 1.5L bottle into an empty glass until the glass and the bottle are $\frac{3}{4}$ full. What is the volume of the glass?

(A) 0.5 L

(B) 0.75 L

(C) 1.125 L

(D) 0.4 L

13. If $\frac{a}{b} + \frac{a+2}{3b} = \frac{1}{4}$, what is the value of a in terms of b?

(A) $\frac{b+4}{2}$

(B) $\frac{3b+2}{4}$

(C) $\frac{3b-2}{4}$

(D) $\frac{3b-8}{16}$

14. A car travels 180 km from A to B at 60 km/h and returns from B to A along the same route at 90 km/h. What is the average speed in kilometers per hour for the round trip?

(A) 72

(B) 75

(C) 78

(D) 81

15. If $\frac{a^2+2ab+b^2}{a^2-b^2} = 2(a+b)$, what is the value of $a - b$?

(A) 1

(B) $-\frac{1}{2}$

(C) 2

(D) $\frac{1}{2}$

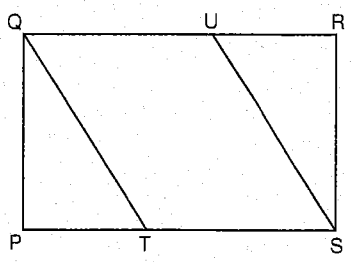
16. If $x^2 + 7x - 33 = 11$, and $x > 0$, what is the value of $x + 11$?

ANSWER: _____

17. Eight men working together can build a house in 12 days. How many days would it take six men working together to build the same house?

ANSWER: _____

18.



Note: Figure not drawn to scale

PQRS is a rectangle. The length of $\overline{QR}$ is 15, the length of $\overline{QU}$ is 10, and the length of $\overline{SU}$ is 13. What is the area of parallelogram *QUST*?

ANSWER: _____

19. $2x^2 + 5x - 25 = 0$

If p and q are solutions to the equation above, and $p < q$, what is the value of $\frac{p^2}{q^2}$?

ANSWER: _____

20. If $f(n-1) = 13 + 4n$ for all values of n, what is the value of $f(3)$?

ANSWER: _____

STOP

Math Test 2 – Calculator

55 MINUTES, 38 QUESTIONS

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

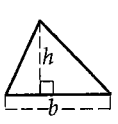
DIRECTIONS

For questions **1 – 30**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **31 – 38**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

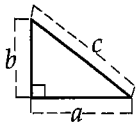
NOTES

1. The use of a calculator on any part of this section is allowed.
2. Unless otherwise indicated, all variables and expressions used in this test represent real numbers.
3. Unless otherwise indicated, all figures used in this test are drawn to scale.
4. Unless otherwise indicated, all figures used in this test lie on a plane.
5. Unless specified otherwise, a given function, f, has the domain the set of all real numbers x for which $f(x)$ is a real number.

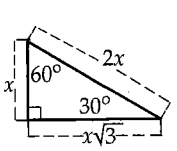
REFERENCE

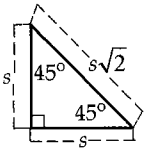


$A = \frac{1}{2}bh$

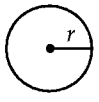


$c^2 = a^2 + b^2$

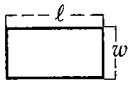




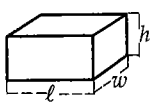
Special Right Triangles



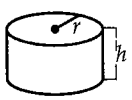
$A = \pi r^2$
$C = 2\pi r$



$A = \ell w$

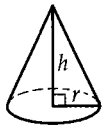


$V = \ell wh$

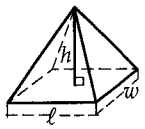


$V = \pi r^2 h$

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



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



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

The arc of a circle is 360 degrees or 2π radians.
A triangle has angles that sum to 180 degrees.

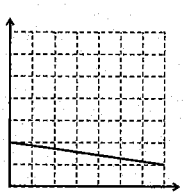
1. There are 200 pieces of cookie in a bag, 15% of which are wrapped. If 80% of the pieces of cookie are oatmeal, what is the smallest number of wrapped oatmeal pieces that could be in the bag?

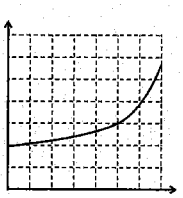
(A) 0
(B) 15
(C) 25
(D) 55

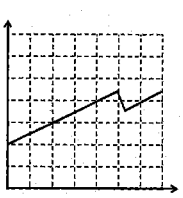
Questions 2 and 3 refer to the following information.

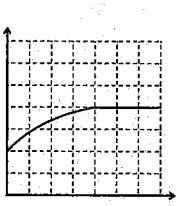
Ellen opened a savings account with an initial balance of $1,000. For the next 8 months, she made one deposit per month, always for the same amount. During that time, she made just one withdrawal.

2. Which of the following graphs accurately describes those transactions over an 8–month period?

(A) 

(B) 

(C) 

(D) 

3. If each of Ellen's 8 deposits was for $200, and her withdrawal was for $350, how much money did she have in her account after 8 months?

(A) $850
(B) $1,550
(C) $2,250
(D) $2,350

4. A clown at an amusement park makes animals from balloons. She sells each animal based on the number of balloons it requires, according to the following chart:

# of Balloons	1	2	3	4	5
Price	$4.00	$4.50	$5.00	$5.50	$6.00

What is the price, in dollars, of an animal that takes x balloons to make?

(A) x
(B) $x + 4$
(C) $0.5x + 4$
(D) $0.5x + 3.5$

5. The value of a house increased from $2.0 million to $2.6 million. What was the percent increase in value?

(A) 15%
(B) 30%
(C) 40%
(D) 50%

6. A bag contains six marbles: two red, one yellow, and three blue. What is the probability of randomly selecting two red marbles in a row, assuming the marbles are not put back in the bag after being drawn?

(A) $\frac{1}{15}$

(B) $\frac{2}{15}$

(C) $\frac{1}{10}$

(D) $\frac{1}{10}$

7. For a set of eleven different rational numbers, which of the following CANNOT affect the value of the median?

(A) Doubling each number
(B) Increasing each number by 10
(C) Increasing the smallest number only
(D) Increasing the largest number only

8. Which of the following equations represents the line with the same x-intercept as the line with the equation $y = 2x - 5$?

(A) $y = \frac{1}{2}x + 10$

(B) $y = \frac{1}{3}x + \frac{10}{3}$

(C) $y = -\frac{2}{3}x + 5$

(D) $y = -\frac{2}{3}x + \frac{5}{3}$

9. Rhudopsinol is a new drug designed to treat sleepwalking, and has a half-life of two hours. It is produced in 500mg tablets. If 40% of the orally ingested drug is absorbed into the bloodstream, which of the following functions gives the amount of Rhudopsinol in the bloodstream, in milligrams, t hours after the ingestion of a single tablet?

(A) $f(t) = (400)(0.5)^{2+t}$
(B) $f(t) = (0.4)(500)(0.5)^{\frac{t}{2}}$
(C) $f(t) = (0.4)(500)(0.5t)$
(D) $f(t) = (400)(0.5)^{2t}$

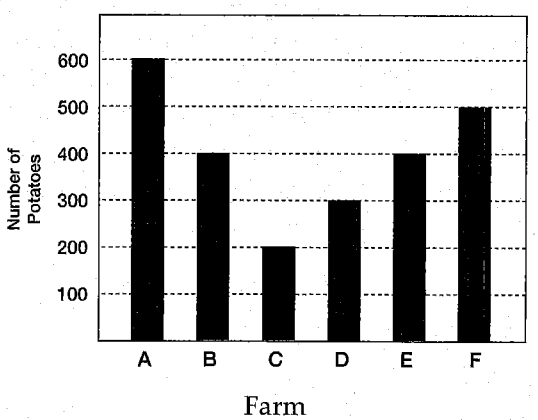
10. Paris and Genevieve are waiting in line to buy tacos. It's Tuesday, and the taqueria has a Taco Tuesday special: all tacos are 50% off. Fish tacos normally sell for \$2.50 each, and beef and chicken tacos are normally \$1.50. They need exactly 16 tacos, and cannot spend more than \$15. What is the most they can spend on fish tacos?

(A) \$6
(B) \$7.50
(C) \$10
(D) \$15

11. A chemistry student has a 25% solution of acetic acid and a 55% solution of sodium bicarbonate, a base. How much of each solution does the student need to make a 120 milliliters (mL) solution with equal parts acid and base?

(A) 82.5mL of the 25% solution, 37.5mL of the 55% solution
(B) 85mL of the 25% solution, 35mL of the 55% solution
(C) 40.5mL of the 25% solution, 79.5mL of the 55% solution
(D) 60mL of the 25% solution, 60mL of the 55% solution

12. According to the chart below, what is the average number of potatoes harvested by the six farms?



(A) 200
(B) 400
(C) 500
(D) 600

13. A basketball team had a ratio of wins to losses of 3 to 1. After winning six games in a row, the team's ratio of wins to losses was 5 to 1. How many games had the team won before it won the six games?

(A) 3
(B) 6
(C) 9
(D) 24

Questions 14 and 15 refer to the information below.

An engineer performed strength-tests to measure the durability of a certain plastic. Fifty samples of the plastic were subjected to increasing pressures, and the results are presented below:

Pressure (psi)	# Broken	# Cracked
25	0	1
50	0	1
100	3	6
125	14	30
150	32	18

14. If 10,000 samples were subjected to 100 pounds per square inch (psi) of pressure, based on the results above, how many are expected to break?

(A) 60
(B) 300
(C) 600
(D) 1200

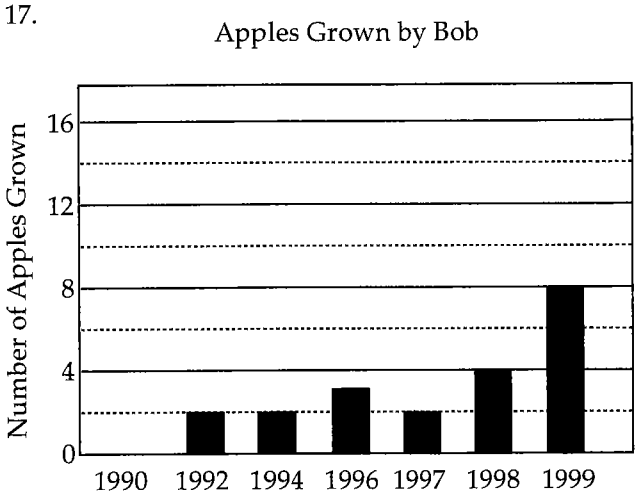
15. At 125 pounds per square inch (psi), the break rate for sample sizes of fifty has a standard error (SE) of 0.06, and a critical value (CV) for a 95% confidence level of 1.96. Using the equation ME = CV × SE, find the margin of error (ME) for the break rate of the entire population of samples at 125 psi.

(A) 0.06
(B) 0.12
(C) 0.68
(D) 0.95

16. Which of the following functions, when graphed, crosses the x-axis three times?

(A) $f(x) = x^3 + 4x^2$
(B) $f(x) = x^3 + 4x^2 - 5x$
(C) $f(x) = 7x^2 - 5x + 75$
(D) $f(x) = x^{\frac{1}{3}}$

17.



The figure above shows the number of apples grown in Bob's backyard every year. One year, Bob read about a new kind of fertilizer guaranteed to double the number of apples grown the year before. Assuming that the fertilizer works, in which year did Bob first try the fertilizer?

(A) 1995
(B) 1996
(C) 1998
(D) 1999

18. An isosceles triangle has three angles that measure 40°, x°, and y°. Which of the following CANNOT be true?

(A) $x = y$
(B) $x = 50°$
(C) $x - y = 60°$
(D) $x = 70°$

19. A dessert recipe requires p tablespoons of sugar and q cups of flour. If Peter wants to make a larger batch using $p + 2$ tablespoons of sugar, how many cups of flour does he need to keep the ingredients in the original proportion?

(A) $\frac{p}{(p+2)q}$
(B) $\frac{p}{q}$
(C) $\frac{(p+2)}{q}$
(D) $\frac{(p+2)q}{p}$

20. If $f(x) = |x + 3| - 7$, which of the following must be true?

(A) $f(x) \leq -7$
(B) $f(x) \leq 0$
(C) $f(x) \geq -4$
(D) $f(x) \geq -7$

21. A bungee jumper leaps off a cliff 122 meters from the ground. Her cord, when fully stretched, is 72 meters long, and it takes 6 seconds after the jump for it to extend fully. The distance between the jumper and the ground as a function of time can be modeled as a quadratic function. Which equation represents her distance from the ground as a function of time?

(A) $f(t) = t^2 - 12t + 122$

(B) $f(t) = 2t^2 - 24t + 122$

(C) $f(t) = 2t^2 - 28t + 122$

(D) $f(t) = t^2 - 12t + 122$

22. $$x = \frac{2k}{x} + 2$$

Which of the following is a possible solution for x in terms of k for the equation shown above?

(A) $\sqrt{2}$

(B) $\sqrt{-2k}$

(C) $\sqrt{1+2k}+1$

(D) $\sqrt{1+2k}-1$

23. For which real number x will $\frac{2}{x} + \frac{x+2}{x(x-2)} = \frac{4}{x(x-2)}$?

(A) –1

(B) 1

(C) 2

(D) No real number

24. If $f(x) = \frac{x^2+2x+1}{x+1}$, what is $f(i)$?

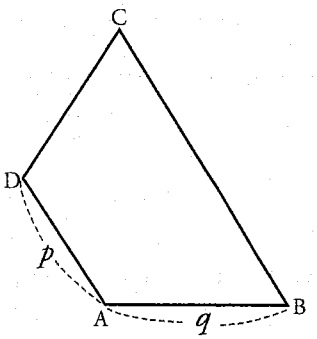
(A) 2

(B) $\frac{2}{i+1}$

(C) $i - 1$

(D) $i + 1$

25. In $ABCD$, $\overline{AD}$ and $\overline{BC}$ are parallel. What is the length of $\overline{BC}$?



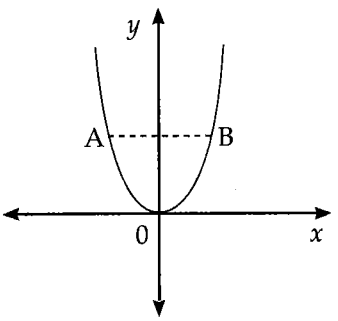
(A) $2p$

(B) $p + q$

(C) $p + 2q$

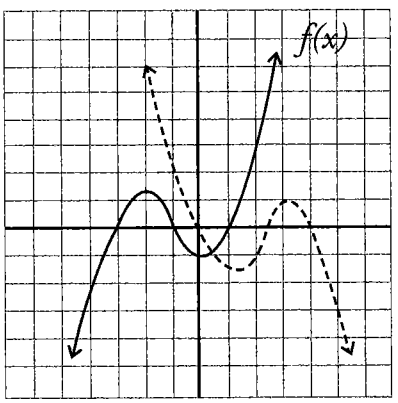
(D) $2p + q$

26. The equation of the parabola below is $y = x^2$. If the y-coordinate of A and the y-coordinate of B are both 8, what is the length of $\overline{AB}$?



(A) 16
(B) 8
(C) $2\sqrt{2}$
(D) $4\sqrt{2}$

27. If the function $f(x)$ is translated three units to the right, then reflected across the x-axis, a new function is produced. Which of the following is equivalent to the new function?



(A) $f(-x) + 3$
(B) $f(-x) - 3$
(C) $-f(x + 3)$
(D) $-f(x - 3)$

28. Sixty cookies were equally distributed to x campers. Eight campers did not want cookies, so their share was redistributed to the other campers, who each received two more. What is the total number of campers?

(A) 12
(B) 20
(C) 32
(D) 40

29. Recent polls indicate that only 15% of those registered to vote in an upcoming election is in the age group 18 to 25. A voter registration drive wants to raise this figure to 20% before the day of the election, so it begins to target this demographic exclusively. If there are currently 51,000 registered voters in the district, and assuming all new registrations are in the target demographic, approximately how many new voters does the drive need to register to meet its goal?

(A) 2,600
(B) 3,200
(C) 6,800
(D) 10,200

30. If x is an acute angle and $\cos\left(\frac{\pi}{2} - 2x\right) = \frac{1}{2}$, what is the possible value of x?

(A) $\frac{\pi}{12}$
(B) $\frac{\pi}{3}$
(C) $-\frac{5\pi}{12}$
(D) $\frac{\pi}{6}$

31. Tickets to a play cost \$15 for adults and \$2 for children. If 750 tickets were sold for a total of \$4,100, how many children's tickets were sold?

ANSWER: _____

32. The force, *f*, needed to break a board varies inversely with the length, *l*, of the board. If it takes 5 pounds of force to break a board 2 feet long, how many pounds of force will it take to break a board that is 6 feet long?

ANSWER: _____

33. Two students started walking from the same point in opposite directions. They each walked 12 feet and then one student made a 90 degree turn to the left and walked 5 feet. The other student made a 90 degree turn to the right and walked 5 feet. How many feet apart are two students?

ANSWER: _____

34. If the population of bacteria in a culture flask doubles every 20 minutes, by what factor has the population increased after 3 hours 20 minutes?

ANSWER: _____

35. A bookstore has 18,000 books in stock, of which 70% are paperback and 30% are hardcover. The books are either fiction or nonfiction. If 6,800 books are nonfiction, and 4,800 of the nonfiction books are paperback, how many books are both fiction and hardcover?

ANSWER: _____

36. The function f is defined as $f(x) = x^2 - 6$, and the function p is defined as $p(x) = f\left(-\frac{x}{2}\right) + 5$. What is the value of $p(-4)$?

ANSWER: _____

Questions 37 and 38 refer to the information below.

Price Summary
U.S Energy Information

	2012	2013	2014	2015 (projected)
WTI Crude Oil	94.12	97.91	93.82	62.75
Brent Crude Oil	111.65	108.64	99.54	68.08
Gasoline	3.63	3.51	3.37	2.60
Diesel	3.97	3.92	3.82	3.07
Natural Gas	10.69	10.30	10.97	10.96
Electricity	11.88	12.12	12.47	12.69

*Crude oil in $ per barrel; 42 gallons per barrel
*Gasoline, and diesel in $ per gallon
*Natural gas in $ per 1,000ft^3
*Electricity in cents per kilowatt-hour

37. **Part 1**
What was the average price of natural gas, in dollars per cubic meter (m^3), from 2012 to 2014 (1 foot = 0.305 meters)?

ANSWER: _____

38. **Part 2**
Recent analysis by the U.S. Energy Information Administration indicates that Brent crude oil, an international benchmark, is a better indicator of domestic gasoline prices than WTI Crude Oil. Assuming that there is a direct relationship between the price of crude oil and the price of gasoline, by how much would the price of gasoline rise, in dollars, from its 2014 levels if the price of Brent crude oil goes up from its 2014 levels by $12.76 per barrel?

ANSWER: _____

SAT Practice Test 2: Answers & Explanations

Math Test

No Calculator Portion

1.	(A)	7.	(D)	13.	(D)	19.	4
2.	(D)	8.	(B)	14.	(A)	20.	29
3.	(A)	9.	(C)	15.	(D)		
4.	(D)	10.	(A)	16.	15		
5.	(D)	11.	(B)	17.	16		
6.	(C)	12.	(A)	18.	120		

Calculator Portion

1.	(A)	7.	(D)	13.	(C)	19.	(D)	25.	(B)	31.	550
2.	(C)	8.	(D)	14.	(C)	20.	(D)	26.	(D)	32.	$\frac{5}{3}$
3.	(C)	9.	(B)	15.	(B)	21.	(B)	27.	(D)		
4.	(D)	10.	(B)	16.	(B)	22.	(C)	28.	(B)	33.	26
5.	(B)	11.	(A)	17.	(C)	23.	(D)	29.	(B)	34.	1,024
6.	(A)	12.	(B)	18.	(B)	24.	(D)	30.	(A)	35.	3,400

36.	3	
37.	0.38	
38.	0.43	

No Calculator Portion

1) ➡ A

James drives 30 miles a day, so the daily cost of rental is:

Daily cost = 19.95 + (30 − 20)(0.4)
Daily cost = 23.95
The cost of the rental as a function of days rented is: $f(x) = (23.95)x$

2) ➡ D

The money earned mowing lawns less the cost of the mower must be equal to or greater $800:

$15l - 250 \geq 800$
$15l \geq 1050$
$l \geq 70$

3) ➡ A

$$Travel\ time = \frac{125\ miles}{60\ miles\ per\ hour} + \frac{30\ miles}{45\ miles\ per\ hour}$$

$$Travel\ time = 2\frac{1}{12}hours + \frac{2}{3}hours = 2\frac{3}{4}hours$$

4) ➡ D

The second line is equivalent to the first line multiplied by a factor of 2; a simple transformation shows that they are the same line:

$2(3x + 2y) = 2(-1)$
$6x + 4y = -2$

5) ➡ D

The monthly cost can be modeled as a function of minutes of talk time ($0.1m$) with the monthly fee (2) as the constant: $C(m) = 0.1m + 2$

6) ➡ C

$(x + 2y)^2 + (x - y)^2 = 2ax + 5y^2$
$(x^2 + 4xy + 4y^2) + (x^2 - 2xy + y^2) = 2ax + 5y^2$
$2x^2 + 2xy + 5y^2 = 2ax + 5y^2$

$$a = \frac{2x^2 + 2xy}{2x}$$

$a = x + y$

7) ➡ D

Let the smaller of the two numbers be a.
The larger of the two numbers is then $a + 3$.

$q = a + (a + 3)$
$q = 2a + 3$

$$a = \frac{q - 3}{2}$$

8) ➡ B

The radius of the sphere can be determined from the formula for surface area:

$4\pi r^2 = 36\pi$
$r^2 = 9$
$r = 3$

The volume of the sphere is:

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

$$V = \frac{4}{3}\pi(3)^3$$

$V = 36\pi\ cm^3$

9) ⟹ C

A radius perpendicular to a chord bisects the chord, therefore $\overline{KM} = \overline{ML} = 6$. If we consider the right triangle ΔLMO, with the hypotenuse of the triangle equivalent to the radius of the circle:

$\overline{OM}^2 + \overline{ML}^2 = \overline{OL}^2$

$6^2 + 6^2 = r^2$

$72 = r^2$

The area of the circle is 72π

10) ⟹ A

The second equation is equivalent to the line $x = y$. Eliminate answer choice (B), which does not contain this line. The second line can be written as $y = -x + 4$, which has a negative slope. Of the remaining choices, only (A) has a line with negative slope.

11) ⟹ B

Area of small triangle = $\frac{x^2}{2}$

Area of large triangle = $\frac{y^2}{2}$

Area of rectangele = xy

The sum of these areas is the area of the shaded region:

Area of shaded region = $\frac{x^2}{2} + \frac{y^2}{2} + xy$

$= \frac{x^2 + y^2 + 2xy}{2} = \frac{(x+y)^2}{2}$

12) ⟹ A

One fourth of the volume of the bottle constitutes three fourths of the volume of the glass (V_g):

$\frac{1}{4}(1.5\text{L}) = \frac{3}{4}V_g$

$V_g = \frac{4}{3}\cdot\frac{1}{4}(1.5\text{L})$

$V_g = 0.5\text{L}$

13) ⟹ D

$\frac{a}{b} + \frac{a+2}{3b} = \frac{1}{4} \rightarrow \left(\frac{3}{3}\right)\left(\frac{a}{b}\right) + \frac{a+2}{3b} = \frac{1}{4}$

$\frac{3a+a+2}{3b} = \frac{1}{4} \rightarrow 4a+2 = \frac{3b}{4}$

$a = \frac{3b-8}{16}$

14) ⟹ A

$\textit{Time driving } A \rightarrow \text{B} = \frac{180km}{60km/hr} = 3hrs$

$\textit{Time driving } B \rightarrow \text{A} = \frac{180km}{90km/hr} = 2hrs$

$\textit{Average speed} = \frac{\textit{Total distance}}{\textit{Total time}}$

$\textit{Average speed} = \frac{360km}{5\,hr} = 72\ km/hr$

15) ⟹ D

$\frac{a^2 + 2ab + b^2}{a^2 - b^2} = 2(a+b)$

$\frac{(a+b)^2}{(a-b)(a+b)} = 2(a+b)$

$(a-b) = \frac{1}{2}$

16) ⟹ 15

$x^2 + 7x - 33 = 11$

$x^2 + 7x - 44 = 0$

$(x + 11)(x - 4) = 0$

Since $x > 0$,

$x = 4$

Therefore, $x + 11 = 15$.

17) ⟹ 16

Eight men build one-twelfth of a house in one day. One man builds one-eighth of one-twelfth of a house in one day:

Work done by one man in one day

$= \left(\frac{1}{8}\right)\left(\frac{1}{12}\right) = \frac{1}{96}$ of a house

In one day, six men can build $\frac{6}{96}$, *or* $\frac{1}{16}$ of a house. Six men take 16 days to build a house.

18) ⟹ 120

The formula for the area of a parallelogram is:

$A = bh$

The base of the parallelogram is the length of $\overline{QU}$, which is 10. The height of the parallelogram is the length of $\overline{RS}$. The right triangle ΔRSU is a 5–12–13 right triangle, with $\overline{RS} = 12$. The area of the parallelogram is: $A = (10)(12) = 120$

19) ⟹ 4

$2x^2 + 5x - 25 = 0$

$(2x-5)(x+5)=0$

$x=\frac{5}{2}, -5$

As $p<q$, $p=-5$ and $q=\frac{5}{2}$.

$\frac{p^2}{q^2}=\frac{(-5)^2}{\left(\frac{5}{2}\right)^2}=4$

20) ➡ 29

If $f(n-1)=f(3)$, then n must equal 4.
For $n=4$, $f(n-1)=f(3)=13+4(4)=29$.

Calculator Portion

1) ➡ A

15% of the cookie pieces are wrapped, and 85% of the pieces are not wrapped. Since only 80% of the pieces are oatmeal, it is possible that none of oatmeal pieces are wrapped.

2) ➡ C

Ellen's account balance increases by a constant amount each month, so the slope of the line that represents her balance is a straight line with positive slope. Her single withdrawal is visible as region of the function with negative slope.

3) ➡ C

Account Balance
= Initial Deposit + Additional Deposits − Withdrawals
Account balance = 1000 + 8(200) − 350 = 2250

4) ➡ D

If $x=1$, the price is \$4.00.
Only choice (D) meets this requirement:
If $x=1$, then $0.5x+3.5=4$

5) ➡ B

The increase in price is \$600,000. The percentage increase is:

$$\%\ increase=\frac{amount\ increase}{initial\ amount}\times 100\%$$

$$\%\ increase=\frac{600{,}000}{2{,}000{,}000}\times 100\%=30\%$$

6) ➡ A

There are two red marbles and six marbles total. The probability of selecting one red marble from the bag is $\frac{2}{6}$, which simplifies to $\frac{1}{3}$.
After one red marble has been selected, there is one red marble in the bag and five marbles total. The probability of selecting a second red marble is $\frac{1}{5}$. The probability of both events happening together is the product of their individual probabilities:

$\frac{1}{3}\cdot\frac{1}{5}=\frac{1}{15}$

7) ➡ D

The median will only be affected if the number of values or sequence of values is changed. If the largest number is increased, it remains the largest number and does not affect the sequence of the other numbers in increasing value, so it does not affect the median.

8) ➡ D

Calculate the x-intercept by setting $y=0$:

$0=2x-5$

$x=\frac{5}{2}$

The line in choice (D) has the same x-intercept. Verify this by setting $y=0$:

$0=-\frac{2}{3}x+\frac{5}{3}\rightarrow\frac{2}{3}x=\frac{5}{3}\rightarrow x=\frac{5}{2}$

9) ➡ B

One tablet contains 500mg of Rhudopsinol, of which 40% is absorbed into the bloodstream, that is, (0.4)(500mg).

The half-life of the drug is two hours, so the number of half-lives in t hours is $\frac{t}{2}$.

The amount of Rhudopsinal in the bloodstream after t hours is: $f(t)=(0.4)(500)(0.5)^{\frac{t}{2}}$

10) ➡ B

Let x be the number of fish tacos they purchase, and y be the number of beef or chicken tacos. On Tuesdays, all tacos are 50% off; fish tacos are \$1.25 and beef and chicken tacos are \$0.75.

$x + y = 16$
$(1.25)x + (0.75)y \le 15$

Combine the two equations by substitution:

$(1.25)x + (0.75)(16 - x) \le 15$
$1.25x + 12 - 0.75x \le 15$
$x \le 6$

Paris and Genevieve buy 6 fish tacos at \$1.25 each:
Most spent on fish tacos = (6)(1.25) = \$7.50

11) ➡ A

Let x by milliliters of acetic acid solution, and y be milliliters of sodium bicarbonate solution.

Amount of acetic acid = $0.25x$
Amount of sodium bicarbonate = $0.55y$

$x + y = 120$

The final solution has equal parts acetic acid and sodium bicarbonate:

$0.25x = 0.55y$

$$y = \frac{0.25}{0.55}x = \frac{5}{11}x$$

Substitute this equation into the equation above:

$$x + \frac{5}{11}x = 120$$

$$\frac{16}{11}x = 120$$

$x = 82.5$, and $y = 37.5$

12) ➡ B

$$\textit{Average harvest} = \frac{\textit{Total harvest}}{\textit{Number of farms}}$$

$$\textit{Average harvest} = \frac{600 + 400 + 200 + 300 + 400 + 500}{6}$$

$= 400$

13) ➡ C

Let x be the number of wins before the streak. The number of losses is $\frac{x}{3}$. After the streak:

$$\frac{x + 6}{\frac{x}{3}} = \frac{5}{1}$$

$$x + 6 = \frac{5x}{3}$$

$3x + 18 = 5x$

$x = 9$

14) ➡ C

At 100psi, 3 of 50 samples broke. Let x be the number of samples that break in a group of samples:

$$\frac{x}{10,000} = \frac{3}{50}$$

$x = 600$

15) ➡ B

Margin of Error = Critical Value × Standard Error
Margin of Error = (0.06)(1.96) = 0.12

16) ➡ B

Choices (A) and (B) are polynomials of order three, but only choice (B) has three distinct roots, or solutions, making it the only choice that will cross the x-intercept 3 times.

17) ➡ C

According to the bar graph, the first year in which the number of apples doubled from the previous year was 1998.

18) ➡ B

Two angles must be equal in an isosceles triangle. If $x = 50°$, then $y = 180° - 40° - 50° = 90°$, which is not possible for an isosceles triangle.

19) ➡ D

Let x be the amount of flour needed for the adjusted recipe:

$$\frac{p}{q} = \frac{p + 2}{x}$$

$$x = \frac{(p + 2)q}{p}$$

20) ➡ D

The expression $|x + 3|$ is greater than or equal to zero for all values of x. Therefore, $f(x) \ge -7$.

21) ➡ B

At $t = 6$, the cord is fully extended. The cliff is 122 meters high, and the cord in 72 meters long, so when the cord is fully extended, the jumper is 50 meters from the ground. Substituting $t = 6$ in the answer choices, only choice (B) produces the correct value:

$$f(t) = 2(6)^2 + 24(6) + 122 = 50$$

22) ⟹ C

$$x=\frac{2k}{x}+2 \rightarrow x-\frac{2k}{x}=2 \rightarrow \left(\frac{x}{x}\right)x-\frac{2k}{x}=2$$

$$\rightarrow \frac{x^2-2k}{x}=2 \rightarrow x^2-2x-2k=0$$

Use the quadratic formula:

$$x=\frac{-(-2)\pm\sqrt{(-2)^2-4(1)(-2k)}}{2}$$

$$=\frac{2\pm\sqrt{4+8k}}{2}=1\pm\sqrt{1+2k}$$

23) ⟹ D

$$\frac{2}{x}+\frac{x+2}{x(x-2)}=\frac{4}{x(x-2)}$$

$$\frac{2}{x}=\frac{4-(x+2)}{x(x-2)}$$

$$\frac{2}{x}=\frac{2-x}{x(x-2)} \rightarrow \frac{2}{x}=\frac{-(x-2)}{x(x-2)}$$

$$\frac{2}{x}=-\frac{1}{x}$$

There is no real number for which this equation is true.

24) ⟹ D

$$f(x)=\frac{x^2+2x+1}{x+1}$$

$$f(i)=\frac{i^2+2i+1}{i+1}$$

$$=\frac{-1+2i+1}{i+1}$$

$$=\frac{2i}{i+1}$$

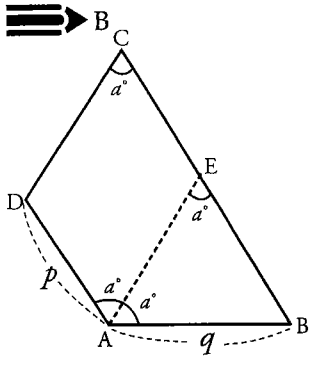
Rationalize the denominator:

$$f(i)=\frac{2i}{i+1}\cdot\frac{(1-i)}{(1-i)}$$

$$=\frac{2i-2i^2}{1-i^2} \rightarrow \frac{2(i-(-1))}{1-(-1)}=\frac{2(i+1)}{2}$$

$$=i+1$$

25) ⟹ B



ΔAEB is an isosceles triangle, and the length of $\overline{EB}=q$. The quadrilateral formed by the bisector, ADCE, is a parallelogram, so the length of $\overline{CE}=p$. The length of $\overline{CB}$ is:

$$\overline{CB}=\overline{CE}+\overline{EB}=p+q$$

26) ⟹ D

For $y=8$,

$x^2-8=0 \rightarrow x^2=8$

$\sqrt{x^2}=\pm\sqrt{8}=+2\sqrt{2}$

The distance between the points $(2\sqrt{2},8)$ *and* $(-2\sqrt{2},8)$ *is* $4\sqrt{2}$.

27) ⟹ D

A horizontal translation of a function $f(x)$ by a units is the new function $f(x-a)$. A reflection of the function $f(x)$ across the y-axis is the transformation $-f(x)$. If the function $f(x)$ is translated three units to the right and reflected across the y-axis, the function produced is $-f(x-3)$.

28) ⟹ B

This is a complex word problem to be approached step-by-step. To set up the equation, note that the initial share is $\frac{60}{x}$ cookies per camper. Eight returned their share, which were distributed two each to the remaining campers:

$$8\left(\frac{60}{x}\right)=2(x-8)$$

$$\frac{480}{x}=2x-16$$

$2x^2-16x-480=0$

$2(x^2-8x-240)=0$

$2(x-20)(x+12)=0 \rightarrow x=20,-12$

There are 20 campers in total.

29) ⟹ B

The number of voters 18 to 25 is:

Voters = (0.15)(51,000) = 7650

Let x be the number of new voters added to this group:

$$\frac{7650+x}{51{,}000+x}=0.2$$

$7650+x=10{,}200+0.2x$

$0.8x=2250$

$x=3188$

30) ⟹ A

The question tells us that $x < 90°$. From the ratio of the sides of a 30–60–90 right triangle, we confirm that $\cos 60° = \frac{1}{2}$. To convert this angle to radians:

$60°\left(\frac{\pi}{180°}\right) = \frac{\pi}{3}$ *radians*. Therefore, $\frac{\pi}{2} - 2x = \frac{\pi}{3}$

$\frac{\pi}{6} = 2x \rightarrow x = \frac{\pi}{12}$

31) ⟹ 550

Let x be the number of adult tickets and y be the number of children's tickets:

$x + y = 750$
$15x + 2y = 4100$
Substitute the second equation into the first:

$15(750 - y) + 2y = 4100$
$11250 - 15y + 2y = 4100$
$13y = 7150$
$y = 550$

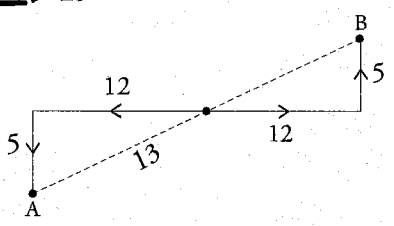
32) ⟹ $\frac{5}{3}$

Force and length are inversely related. Let x be the force needed to break a board 6 feet long:

$(5\ lb)(2\ ft) = x(6\ ft) \rightarrow x = \frac{5\ lb \cdot 2\ ft}{6\ ft}$

$x = \frac{5\ lb}{3}$

33) ⟹ 26



The path taken by each student marks a 5–12–13 right triangle. Since they walk parallel paths, the distance between them is 26 feet.

34) ⟹ 1,024

The number of 20 minute periods is:

$Number\ of\ periods = \frac{3\ hours\ 20\ minutes}{20\ minutes} = 10$

As the population doubles once per period, the factor of increase is:

$Factor\ of\ increase = 2^{10} = 1024$

35) ⟹ 3,400

The number of hardcover books is:
(18,000)(0.3) = 5400

There are 6800 nonfiction books, of which 4800 are paperback, and 2000 are hardcover. The remaining hardcover books must be fiction:

Hardcover fiction = 5400 – 2000 = 3400

36) ⟹ 3

$p(x) = f\left(-\frac{x}{2}\right) + 5 \rightarrow p(-4) = f\left(-\frac{-4}{2}\right) + 5$

$\rightarrow p(-4) = f(2) + 5 \rightarrow f(2) = 2^2 - 6$

$p(-4) = (2^2 - 6) + 5 = 3$

37) ⟹ 0.38

The average price of natural gas from 2012 to 2014 is:

$\frac{10.69 + 10.30 + 10.97}{3} = \$10.65 / 1000\ ft^3$

Convert to dollars per cubic meter:

$Price = \frac{\$10.65}{1000\ ft^3} \cdot \frac{ft^3}{(0.305\ meter)^3} = \frac{\$10.65}{(1000)(0.305^3)\ meter^3}$

$= \$0.38$

38) ⟹ 0.43

Let x be the price of gasoline in 2015:

$\frac{12.76}{99.54} = \frac{x}{3.37}$

$x = 0.43$

KALLIS

SAT® Practice Test #3

IMPORTANT REMINDERS:

1. When you take the official SAT, you will need to use a No. 2 pencil. Do not use a pen or a mechanical pencil.

2. On the official SAT, sharing any of the question on the test violates the College Board's policies and may result in your scores being canceled.

(This cover is modeled after the cover you'll see when you take the official SAT.)

3

Math Test 3 – No Calculator

25 MINUTES, 20 QUESTIONS

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

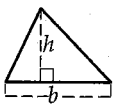
DIRECTIONS

For questions **1 – 15**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **16 – 20**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

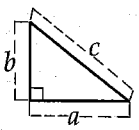
NOTES

1. The use of a calculator on any part of this section is forbidden.
2. Unless otherwise indicated, all variables and expressions used in this test represent real numbers.
3. Unless otherwise indicated, all figures used in this test are drawn to scale.
4. Unless otherwise indicated, all figures used in this test lie on a plane.
5. Unless specified otherwise, a given function, f, has the domain the set of all real numbers x for which $f(x)$ is a real number.

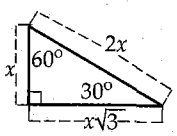
REFERENCE

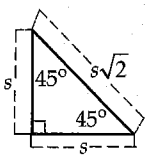


$A = \frac{1}{2}bh$

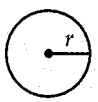


$c^2 = a^2 + b^2$

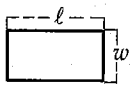




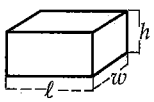
Special Right Triangles



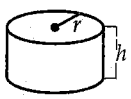
$A = \pi r^2$
$C = 2\pi r$



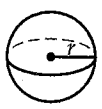
$A = \ell w$



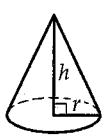
$V = \ell wh$



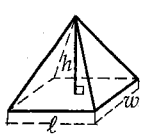
$V = \pi r^2 h$



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



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



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

The arc of a circle is 360 degrees or 2π radians.
A triangle has angles that sum to 180 degrees.

1. $x^2(y + 3) = 12$

If (x, y) is a solution to the equation above, and x and y are both integers, which of the following could NOT be a value of x?

(A) -1
(B) 0
(C) 2
(D) 3

2. A sociologist determines that the population of a city will grow at 3% per year for the next 20 years. If the current population is 850,000, which of the following expressions represents the population x years in the future?

(A) $(850{,}000)(1.03)^x$
(B) $(850{,}000) + (1.03)^x$
(C) $\frac{850{,}000}{1.03^x}$
(D) $(850{,}000)(1.03)x^2$

3. What is the equation of the line that passes through the point (1, 2) and is perpendicular to the line $x + y = 2$?

(A) $y = 1 - x$
(B) $y = 3 - x$
(C) $y = 1 + x$
(D) $y = 2 + x$

4. Mary wants to print flyers for her fundraising event. Printing costs \$0.25 per copy for the first 100 copies, \$0.20 per copy for the next 200 copies, and \$0.10 per copy for every copy after that. The entire purchase is subject to an 11% sales tax. Which of the following represents the cost of printing, in dollars, as a function of the number of flyers, x, assuming Mary prints at least 500 flyers?

(A) $[(100)(0.25) + (200)(0.2) + (x - 300)(0.1)](1.11)$
(B) $[(100)(0.25) + (100)(0.2) + (x - 200)(0.1)](1.11)$
(C) $(100)(0.25) + (200)(0.2) + (x - 300)(0.1)$
(D) $[(x - 100)(0.25) + (x - 200)(0.2) + (x - 300)(0.1)](1.11)$

5. Three boys can paint a fence in 5 hours. How many hours would it take four boys to paint the same fence?

(A) $\frac{3}{2}$
(B) 3
(C) $3\frac{3}{4}$
(D) 4

6. Angelo makes x dollars for y hours of work. Sarah makes the same amount of money for one less hour of work. Which of the following expressions represents the positive difference between their hourly wages?

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

(B) $\frac{x}{y}-\frac{x}{y-1}$

(C) $\frac{x}{y-1}-\frac{x}{y}$

(D) $\frac{y-1}{x}-\frac{y}{x}$

7.

$$\frac{1}{2}x-\frac{1}{4}y=5$$

$$ax-3y=20$$

If the system of linear equations above has no solution, what is the value of the constant a?

(A) $\frac{1}{2}$

(B) 2

(C) 6

(D) 12

8. Barbara is planning a lunch for her Sailing Club. It costs \$250 to rent the venue, and \$15 per guest for food. If the total cost of the lunch is graphed as a function of the number of guests, which of the following represents the slope?

(A) 1

(B) 15

(C) 25

(D) 250

9. If $(x+1)^2=4$ and $(x-1)^2=16$, what is the value of x?

(A) –3

(B) –1

(C) 1

(D) 3

10. If the rational expression $\frac{9x^2+4}{x+1}$ is rewritten in the equivalent form $\frac{5}{x+1}+A$, what is A in terms of x?

(A) $x-1$

(B) $x+1$

(C) $9x-9$

(D) $12x-3$

11. Julie, the manager of a tea shop decides to experiment with a new blend. She mixes some Earl Grey tea at \$5 per pound with Orange Pekoe tea at \$3 per pound to make 100 pounds of the new blend. The selling price for the new blend is \$4.50 per pound, reflecting the prices and proportions of the component teas. How many pounds of the Earl Grey are in the blend?

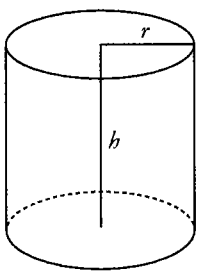
(A) 70

(B) 75

(C) 80

(D) 85

12. If the radius of a circular cylinder is decreased by 50%, and its height is simultaneously increased by 60%, what is the change in volume?



(A) An increase of 40%

(B) A decrease of 40%

(C) An increase of 60%

(D) A decrease of 60%

13. If A, B, and C are constants such that for all values of x, $x^2 - x - 2 = (Ax + B)(x - 2) + C(x + 3)$, what is the value of A?

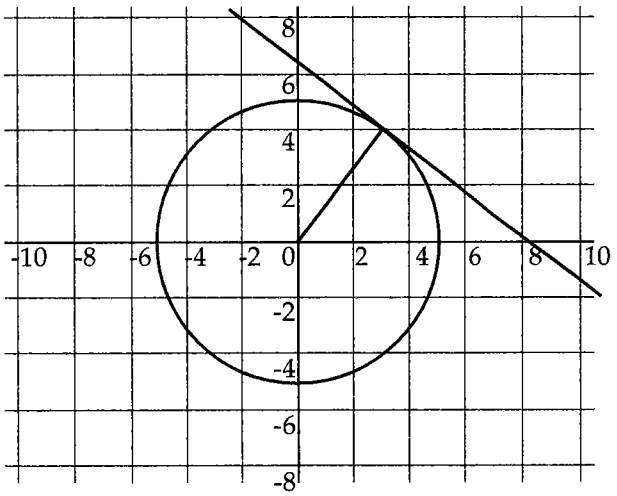
(A) 1

(B) 2

(C) 3

(D) 4

14.



Which of the following equations represents the line tangent to the circle $x^2 + y^2 = 25$ at the point $(3, 4)$?

(A) $3x + 4y - 25 = 0$

(B) $3x - 4y - 25 = 0$

(C) $4x + 3y + 3 = 0$

(D) $4x - 3y = 0$

15. An equilateral triangle is inscribed in a circle with a radius of 2 meters. What is the area of this triangle?

(A) $\sqrt{3}$

(B) $2\sqrt{3}$

(C) $3\sqrt{3}$

(D) $\pi\sqrt{3}$

16. Daisha bought a car for \$15,000, and its value depreciated linearly. After 3 years, the value of the car was \$11,250. What is the amount, in dollars, of yearly depreciation?

ANSWER: _____

17. If a and b are numbers such that $(a-4)(b+6)=0$, then what is the smallest possible value of a^2+b^2?

ANSWER: _____

18. If the graph of $y=x^2+mx+n$ passes through the points (1, 12) and (3, 28), what is the value of the product mn?

ANSWER: _____

19. If $x-2$ is a factor of x^3-kx^2+kx+2, where k is a constant, what is the value of k?

ANSWER: _____

20. The table below shows some values for the function N.

t	0	1	2
$N(t)$	128	16	2

If $N(t)=k\cdot 2^{-at}$ for positive constants k and a, what is the value of a?

ANSWER: _____

4

Math Test 3 – 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**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **31 – 38**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

NOTES

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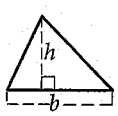
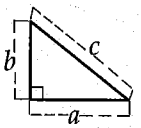
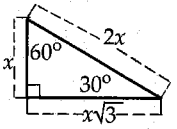
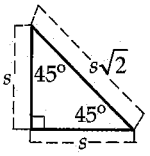


$A = \frac{1}{2}bh$

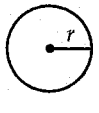


$c^2 = a^2 + b^2$

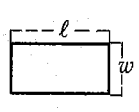




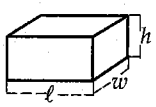
Special Right Triangles



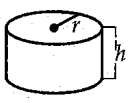
$A = \pi r^2$
$C = 2\pi r$



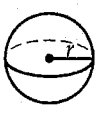
$A = \ell w$



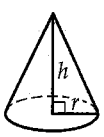
$V = \ell wh$



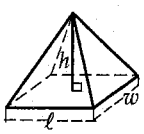
$V = \pi r^2 h$



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



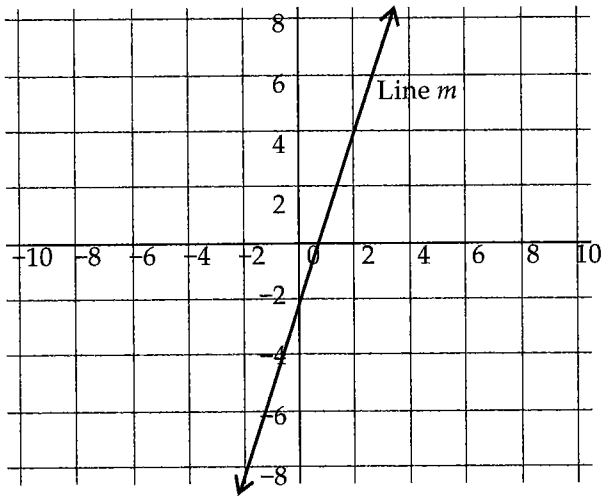
$V = \frac{1}{3}\pi r^2 h$



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

The arc of a circle is 360 degrees or 2π radians.
A triangle has angles that sum to 180 degrees.

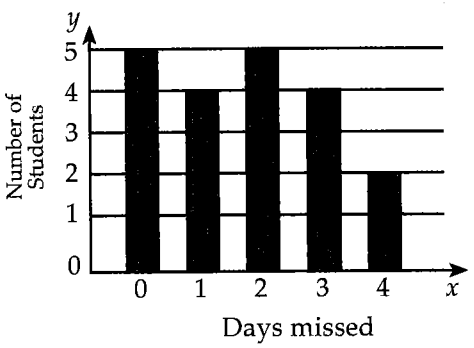
1.



Line m has a positive slope and a negative y-intercept. What happens to the x-intercept if the slope and the y-intercept are doubled?

(A) The x-intercept becomes four times larger.
(B) The x-intercept becomes twice as large.
(C) The x-intercept becomes one-fourth as large.
(D) The x-intercept remains the same.

2.



According to the bar graph above, what is the average number of days missed by students in the class?

(A) 1.5
(B) 1.7
(C) 3.4
(D) 4

3. If $f(x)$ is a linear function, $f(3) = 1$ and $f(2) = 5$, what is the y-intercept?

(A) −4
(B) 1
(C) 11
(D) 13

Questions 4 and 5 refer to the following information.

The following table shows the results of a survey distributed to thousands of households. Households were asked to select which, if any, forms of public transportation they use regularly. Some households used more than one form of public transportation.

Households Using Public Transport, 2010 (numbers in thousands): U.S. Census Bureau

	Northeast	Midwest	South	West
Local Public Bus	4595	2365	2853	4501
Subway, Lightrail, Trolley	3487	816	1337	2067
Commuter or Inner-city Train	1296	457	187	457
Total Number of Households Using Public Transportation	6862	3265	4116	5925

4. Which region had the highest proportion of households using public transportation that used the public bus in 2010?

(A) Northeast
(B) Midwest
(C) South
(D) West

5. What percentage of households that used public transport in the Midwest made use of a commuter or inner-city train?

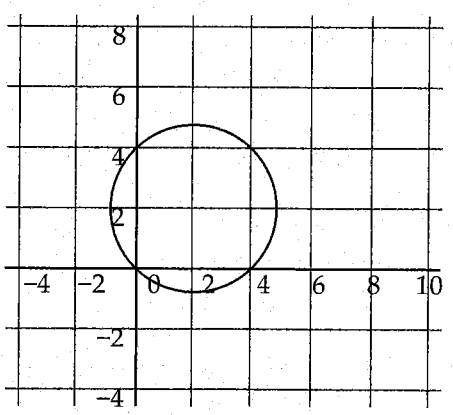
(A) 7.7

(B) 12.6

(C) 14.0

(D) 18.9

6.



What is the area of the circle that passes through the points (0, 0), (0, 4), and (4, 0)?

(A) 3π

(B) $2\sqrt{2}\pi$

(C) 8π

(D) 16π

7. Larry is driving from Charlotte to Charleston—a distance of 380 miles—with his friend, Omar. Larry and Omar have agreed to split the cost of gas in half. If Omar's car gets 28 miles per gallon, and gas costs x dollars per gallon, which of the following represents the total cost of the trip for Larry?

(A) $\frac{380x}{28} \times \frac{1}{2}$

(B) $\frac{380x}{28}$

(C) $\frac{380x}{28} \times \frac{1}{28} \times \frac{1}{2}$

(D) $\frac{190x}{28} \times \frac{1}{2}$

8. During a 3-year boom, a government experienced a budget surplus of \$15 million per year. An economist predicts that annual revenue will drop to \$40 million below current levels and remain at that level for the next 5 years. By how much must the government reduce expenditures yearly to maintain a balanced budget over this period?

(A) \$8 million

(B) \$16 million

(C) \$25 million

(D) \$40 million

9. A region is defined by the system:

$$y > 2x + 1$$
$$y \leq -x + 2$$

In which quadrants of the coordinate plane is the region located?

(A) I, II, III only

(B) II, III only

(C) III, IV only

(D) I, II, III, IV

10. If 10 boys averaged 88% on a test on which 15 girls averaged 75%, what was the test average for all 25 students?

(A) 76.4%
(B) 80.2%
(C) 84.6%
(D) 86.2%

11. The difference of two numbers is 2. If the difference of their squares is 18, what is their sum?

(A) 20
(B) a number between 10 and 16
(C) a number between 5 and 8
(D) a number between 7 and 10

12. The function h given by $h(t) = -16t^2 + 48t + 5$ represents the height of a ball, in feet, t seconds after it is thrown. To the nearest foot, what is the maximum height reached by the ball?

(A) 5
(B) 23
(C) 31
(D) 41

13. Brad and Tom are comparing their classes' scores on a math test. Both of their classes had mean scores of 80 on the test, but Brad's class had a range of 6 while Tom's class had a range of 30. If the highest possible score was 100, which class had the LOWEST score in it?

(A) Brad's class had the lowest score in it.
(B) Tom's class had the lowest score in it.
(C) The lowest score occurred in both classes.
(D) It cannot be determined from the information.

14. A 2-cup mixture consists of $\frac{1}{3}$ flour and $\frac{2}{3}$ cornmeal. If 1 cup of flour is added to make a 3-cup mixture, approximately what percent of the 3-cup mixture is flour?

(A) 65%
(B) 56%
(C) 50%
(D) 45%

15. Brian has taken five exams in his biochemistry class and scored 56, 55, 41, 29, and 86 (out of a possible 100). The only exam remaining is the class final, which is worth twice as many points as each of the previous exams. If he must average 65 to pass the course, what is the minimum grade he must receive on the final exam to pass?

(A) 62
(B) 94
(C) 100
(D) He cannot pass the course.

16. A taxi charges \$0.30 for the first mile and \$0.15 for each additional mile a passenger travels. If a passenger rides in the taxi for x miles, which of the following expressions describes the cost of this ride in dollars as a function $f(x)$?

(A) $f(x) = 0.30 + 0.15x$

(B) $f(x) = 0.30 + 0.15(1 - x)$

(C) $f(x) = 0.30 + 0.15(x - 1)$

(D) $f(x) = 0.30 + 0.15x - 1$

17. A store received \$823.00 for the sale of 5 tape recorders and 7 radios. If the receipts from the tape recorders exceeded the receipts from the radios by \$137.00, what is the price of a tape recorder?

(A) \$49

(B) \$96

(C) \$68

(D) \$84

18. Car A takes 15 seconds to go once around a circular racetrack, and car B takes 25 seconds to go once around the same track. If the two cars begin racing from the same position at the same time, how many seconds will it take for car A to pass car B?

(A) 1.67 seconds

(B) 10.5 seconds

(C) 31.4 seconds

(D) 37.5 seconds

19. The distance in meters that has been covered by a car at a given time, t (in seconds), after its departure is equal to $35t + 5t^2$. During what time period will the car travel between 75 and 130 meters?

(A) $1.7 \le t \le 2.7$

(B) $1.5 \le t \le 2.5$

(C) $1.6 \le t \le 2.8$

(D) $1.8 \le t \le 2.8$

20. Peter has invested \$8,000 in stocks and bonds. The stocks pay 4% interest, and the bonds pay 7% interest. If his annual income from both is \$500, how much is invested in bonds?

(A) \$2,000

(B) \$3,500

(C) \$4,000

(D) \$6,000

21. The cost of a piece of lumber is directly proportionally to its length. A piece of lumber 16 feet long costs \$12.00. What is the cost, in dollars, of a piece of lumber x yards long?
(1 yard = 3 feet)

(A) $x - 2$

(B) $3x - 2$

(C) $\frac{3}{4}x$

(D) $\frac{9}{4}x$

22. Let a and b be numbers such that $a^3 = b^2$. Which of the following is equivalent to $b\sqrt{a}$?

(A) $b^{\frac{2}{3}}$

(B) $b^{\frac{1}{4}}$

(C) $b^{\frac{3}{2}}$

(D) $b^{\frac{4}{3}}$

23. A website makes \$0.002 for every page view, an additional \$0.01 if a visitor clicks through, and additional \$0.10 if a visitor that clicks through clicks more than once. If 30% of visitors clicks through, and 10% of visitors that click-through clicks more than once, how many total visitors are needed to reach an advertising revenue of \$100,000?

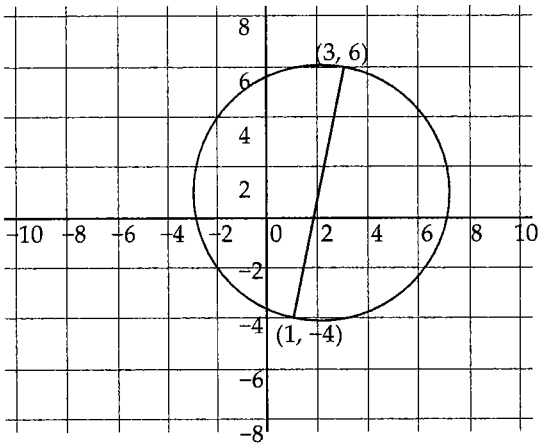
(A) 6.3 million

(B) 12.5 million

(C) 20 million

(D) 125 million

24.



Which of the following is the equation of the circle whose diameter is the line segment connecting points (3, 6) and (1, –4)?

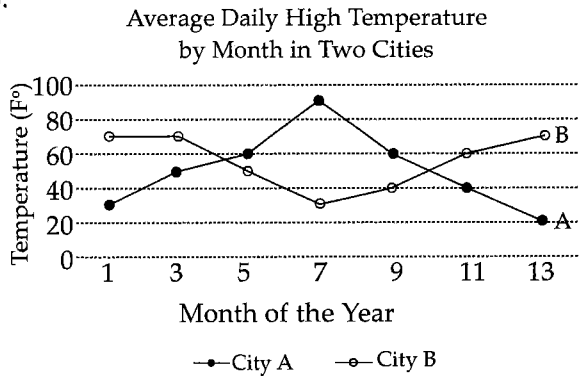
(A) $(x-2)^2 + (y-1)^2 = 26$

(B) $(x-1)^2 + (y+4)^2 = 104$

(C) $(x+2)^2 + (y+1)^2 = 26$

(D) $(x+2)^2 + (y+1)^2 = 25$

25.



According to the graph, what was City B's average daily high, in Fahrenheit, during the two month period over which City A's average daily temperature increased by the greatest percentage?

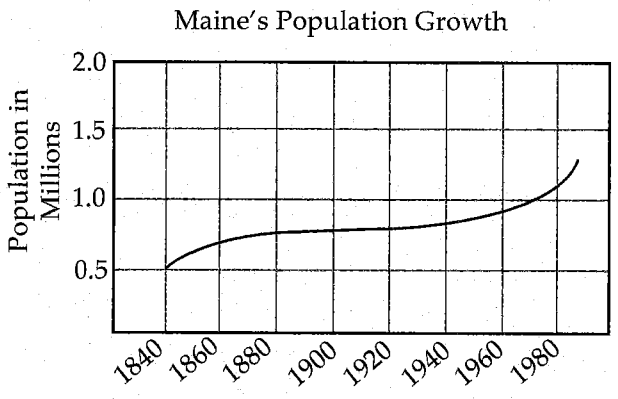
(A) 38

(B) 40

(C) 52

(D) 66

26.



According to the graph, approximately how many years did it take for Maine's population to double from what it was in 1840?

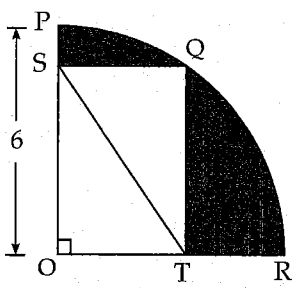
(A) 25

(B) 40

(C) 70

(D) 130

27.



In the figure, arc PQR is one quarter of a circle with center O and radius 6. If the quadrilateral OSQT is a rectangle, what is the perimeter of shaded region?

(A) $8 + 3\pi$

(B) $12 + 3\pi$

(C) $14 + 3\pi$

(D) $1 + 6\pi$

28. If $(3 + 2i) - (a + 3i) = 10 - i$, what is the real number a?

(A) $2^{\frac{1}{2}}$

(B) $-7 - 2i$

(C) -7

(D) 6

29. $2\cos x - \sqrt{2} = 0$

Find the value of an acute angle x that satisfies the equation above.

(A) 30°

(B) 60°

(C) 40°

(D) 45°

30. Let $f(x)$ be a function such that $f(x) = 2f(x - 1) + 4$ and $f(0) = 16$. What is the value of $f(-2) + f(2)$?

(A) 0

(B) 16

(C) 32

(D) 77

31. On a map, a quarter inch represents 20 actual miles. How many inches on the map separate two towns that are 325 miles apart?

ANSWER: _____

32. A chemistry student has 45 milliliters of a 20% salt solution. How many milliliters of salt are in the solution?

ANSWER: _____

33.

$$y = 4$$
$$-3x^2 + y^2 = 52$$

If (x, y) is a solution to the system of equations above and $x > 0$, what is the value of x?

ANSWER: _____

34. A ball is dropped from a height of 30 feet. Each time it strikes the ground, it bounces up to $\frac{4}{5}$ of the previous height. How many times does the ball hit the ground before it bounces up less than 6 feet?

ANSWER: _____

35. Linda receives 3% in royalties for every paper copy of her book that is sold. In addition, she receives 20% in royalties for every electronic copy. In the month of February, her book sold 1,200 paper copies at $29.95, and 800 electronic copies at $16.95. How much did she receive from royalties in February? (Round your answer to the nearest dollar.)

ANSWER: _____

36. To measure the height of Lincoln's head on Mt. Rushmore, two sightings 800 feet from the base of the mountain are taken. If the angle of elevation to the bottom of Lincoln's face is 32°, and the angle of elevation to the top is 35°, what is the height, in feet, of Lincoln's face? (Round you answer to the nearest foot.)

ANSWER: _____

Questions 37 and 38 are based on the following information:

A new online music streaming service reached peak volume the previous year with 8-billion songs streamed.

37. **Part 1**
If volume increased 50% during the second half of the year, what was the average number streams per month, in millions, during this period?

ANSWER: _____

38. **Part 2**
The most-streamed single of the year represented 0.3% of all plays during the fifth, sixth, and seventh months of the year. If the song was streamed 7.1 million times during this period, what was the total number of all streams, in billions, during the same three-month period?

ANSWER: _____

SAT Practice Test 3: Answers & Explanations

Math Test

No Calculator Portion

1.	B	7.	C	13.	A	19.	5				
2.	A	8.	B	14.	A	20.	3				
3.	C	9.	A	15.	C						
4.	A	10.	C	16.	1,250						
5.	C	11.	B	17.	16						
6.	C	12.	D	18.	28						

Calculator Portion

1.	D	7.	A	13.	B	19.	A	25.	B	31.	4.06	37.	800		
2.	B	8.	B	14.	B	20.	D	26.	D	32.	9	38.	2.37		
3.	D	9.	A	15.	B	21.	D	27.	B	33.	2				
4.	D	10.	B	16.	C	22.	D	28.	C	34.	8				
5.	C	11.	D	17.	B	23.	B	29.	D	35.	3,790				
6.	C	12.	D	18.	D	24.	A	30.	D	36.	60				

No Calculator Portion

1) ➡ B

It must be true that $x^2 \neq 0$ and $(y + 3) \neq 0$.

2) ➡ A

Every year, the population grows by a factor of 1.03—an increase of 3%. Over the course of x years, the factor of increase is $(1.03)^x$.

3) ➡ C

Convert the equation of the line to slope–intercept form to determine slope:

$y = -x + 2$

The slope of the line is –1. The slope of the line perpendicular to this line is 1. To determine the equation of the line, use the coordinates of the point through which the line passes:

$y = (1)x + b$

Since $x = 1$ and $y = 2$:

$2 = 1 + b$

$b = 1$

4) ➡ A

If Mary prints at least 500 flyers, the first 100 are charged at \$0.25 each, 200 at \$0.20, and the remaining flyers, $(x - 300)$, at \$0.10. The entire purchase is multiplied by a factor of 1.11 to account for the 11% sales tax.

5) ➡ C

In one hour, three boys paint $\frac{1}{5}$ of a fence, so one boy is able to paint $\frac{1}{15}$ of a fence per hour.

Therefore:

$$\text{Four boys} = 4 \times \frac{\frac{1}{15}\text{fence}}{\text{hour}} = \frac{4}{15} \text{ fence per hour}$$

It takes $\frac{15}{4}$ hours for four boys to paint a fence.

6) ➡ C

$$\text{Angelo's hourly wage} = \frac{x}{y}$$

$$\text{Sarah's hourly wage} = \frac{x}{y-1}$$

As $y > y - 1$, the positive difference between hourly wages is:

$$\frac{x}{y-1} - \frac{x}{y}$$

7) ➡ C

A system of equations has no solution if the equations contradict each other. To verify that this is the case, multiply the first equation by 12:

$$12\left(\frac{1}{2}x - \frac{1}{4}y\right) = (5)12 \rightarrow 6x - 3y = 60$$

If $a = 6$ in the second equation, the system has no solution.

8) ➡ B

The cost of the lunch can be written as a function of the number of guests (x):

$C(x) = 250 + 15x$

The slope of this graph is 15.

9) ⟹ A

Solve for x in the first equation:

$(x+1)^2 = 4$

$x+1 = \pm 2$

$x = -3, 1$

Only $x = -3$ satisfies the second equation.

10) ⟹ C

Set the expression as a long-division:

$$\begin{array}{r} 9x-9 \\ x+1\overline{)\,9x^2+0x-4} \\ -)\,9x^2+9x \\ \hline -9x-4 \\ -)\,-9x-9 \\ \hline 5 \end{array}$$

The quotient is $9x-9+\frac{5}{x+1}$.

11) ⟹ B

Let x be pounds of Earl Grey, and y be pounds of Orange Pekoe:

$x + y = 100$

$5x + 3y = (100)(4.50)$

Multiplying the first equation by factor of 3 and subtracting from the second gives:

$2x = 150$

$x = 75$

12) ⟹ D

The volume of a circular cylinder is: $V = \pi r^2 h$

The radii of the cylinder before (r_1) and after (r_2) the change are expressed in the relationship:

$r_2 = \frac{r_1}{2}$

The heights of the cylinder before (h_1) and after (h_2) the change are expressed as: $h_2 = 1.6h_1$

The ratio of the volume of the initial cylinder (v_1) to the volume of the new cylinder (v_2) is:

$$\frac{V_2}{V_1} = \frac{\pi r_2^2 h_2}{\pi r_1^2 h_1} = \frac{\left(\frac{r_1}{2}\right)^2 (1.6h_1)}{r_1^2 h_1} = 0.4$$

The volume of the new cylinder is 40% of the volume of the initial cylinder, a decrease of 60%.

13) ⟹ A

$x^2 - x - 2 = (x+1)(x-2)$

We can infer that A = 1, B = 1, and C = 0.

14) ⟹ A

Because the radius includes the points (0, 0) and (3, 4), the slope of the radius to the tangent is $\frac{4}{3}$. The tangent line, which is perpendicular to the radius at the point of contact, is $-\frac{3}{4}$. The equation of the tangent line is:

$y = -\frac{3}{4}x + b$

$4 = -\frac{3}{4}(3) + b$

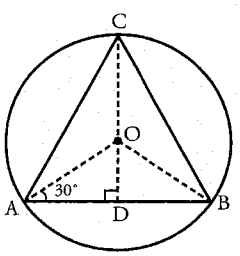
$b = \frac{25}{4}$

The equation is:

$y = -\frac{3}{4}x + \frac{25}{4}$

$3x + 4y - 25 = 0$

15) ⟹ C



The central angle inscribed by each of the sides of the triangle (for example, $\angle COB$) is twice the measure of the angles of the equilateral triangle ($\angle CAB$), that is, 120°. This implies that the radii to the vertices divide the circle into equivalent thirds, and also bisect the angles of the triangle. The angle $\angle OAD = 30°$. If a line is drawn from O to $\overline{AB}$ at D, a 30–60–90 triangle is created. According to the ratio of lengths of a 30–60–90 triangle, $\overline{OD} = 1$ and $\overline{AD} = \sqrt{3}$. The area of ΔAOB is:

$\text{Area} = \frac{1}{2}(1)(2\sqrt{3}) = \sqrt{3}$

As the equilateral triangle is made up of three triangles all equivalent to ΔAOB, the area of the equilateral triangle is:

Area of $\Delta ABC = 3\sqrt{3}$

16) ➡ 1,250

The price depreciation per year is:

$$\text{Depreciation} = \frac{\text{Total decrease in value}}{\text{Number of years}} = \frac{15{,}000 - 11{,}250}{3 \text{ years}}$$

$= 1{,}250$/year

17) ➡ 16

For the equation to be true, either $a = 4$ or $b = -6$

If $a = 4$ and $b = 0$, then $a^2 + b^2 = 4^2 + 0 = 16$

If $a = 0$ and $b = -6$, then $0 + 36 = 36$

18) ➡ 28

Plug in values for the point (1, 12):

$12 = (1)^2 + (1)m + n$

$11 = m + n$

Plug in values for the point (3, 28):

$28 = (3)^2 + 3m + n$

$19 = 3m + n$

Subtract the first equation from the second:

$19 = 3m + n$

$-\,)11 = m + n$

$8 = 2m$

$4 = m \rightarrow n = 7$

Thus, $mn = 4 \times 7 = 28$

19) ➡ 5

If $x - 2$ is a factor, $f(2) = 0$:

$2^3 - (2^2)k + 2k + 2 = 0$

$10 - 2k = 0$

$k = 5$

20) ➡ 3

When $t = 0$, $128 = k \cdot 2^0 \rightarrow k = 128$

When $t = 1$, $16 = 128 \cdot 2^{-a}$

$16 = \frac{128}{2^a}$

$2^a = 8 \rightarrow 2^a = 2^3 \rightarrow a = 3$

Calculator Portion

1) ➡ D

Using the intercepts $(x, 0)$ and $(0, y)$, calculate the slope of line m:

$$slope = \frac{(y-0)}{(0-x)} = -\frac{y}{x}$$

$$x = -\frac{y}{slope}$$

If the y-intercept is doubled, the new y-intercept is $(0, 2y)$. If the slope is also doubled, the new x-intercept $(x_a, 0)$ can be calculated as:

$$2(slope) = \frac{2y - 0}{0 - x_a}$$

$$x_a = -\frac{y}{slope}$$

The x-intercept is unchanged.

2) ➡ B

$$Average\ days\ missed = \frac{Total\ days\ missed}{Number\ of\ students}$$

$$= \frac{5(0) + 4(1) + 5(2) + 4(3) + 2(4)}{20}$$

$$= \frac{34}{20} = 1.7$$

3) ➡ D

The question provides the coordinates (3, 1) and (2, 5), so the slope of the linear function $f(x)$ is:

$$m = \frac{5-1}{2-3} = -4$$

Use the slope-intercept form of the equation of a line to determine the y-intercept:

$y = mx + b \rightarrow y = -4x + b \rightarrow 1 = -4(3) + b$

$b = 13$

4) ➡ D

$$Northeast = \frac{4595}{6862} = 0.67$$

$$Midwest = \frac{2365}{3265} = 0.72$$

$$South = \frac{2853}{4116} = 0.69$$

$$West = \frac{4501}{5925} = 0.76$$

5) ➡ C

Percentage using train in Midwest:

$$\frac{457}{3{,}265} \times 100\% = 14\%$$

6) ➡ C

The perpendicular bisector of a chord passes through the center of the circle. The chord represented by the line segment between points (0 , 0) and (0 , 4) is perpendicular to and bisected by the line that passes through the points (0 , 2) and (2 , 2). The portion of this bisector that is within the circle is the diameter of the circle. The same is true of the line that passes through points (0 , 0) and (4 , 0). The intersection of these diameters is the center of the circle and is located at (2 , 2). The radius of the circle is the line segment from (2 , 2) to (0 , 0) and has length $2\sqrt{2}$ according to the 45–45–90 right triangle.

The area is: Area = $\pi r^2 = \pi(2\sqrt{2})^2 = 8\pi$

7) ➡ A

Cost for Larry:

$$Distance\ of\ trip \times \frac{Gallon}{Distance} \times \frac{Cost}{Gallon} \times Larry's\ share$$

$$= (380)\left(\frac{1}{28}\right)(x)\left(\frac{1}{2}\right)$$

$$= \frac{380x}{28} \times \frac{1}{2}$$

8) ➡ B

For the preceding 3-year period:

$$Total\ Surplus = \left(\frac{\$15\ million}{year}\right)(3\ years) = \$45\ million$$

If revenue drops to \$40 million below current levels, expenditure will drop \$25 million per year (from a point of a \$15 million surplus) for the government to break even:

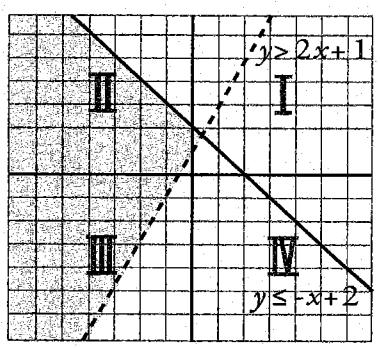
$$Cut\ in\ expenditures = \left(\frac{\$25\ million}{year}\right)(5\ years) = \$125\ million$$

Taking the existing surplus into account, we can determine the yearly reduction in expenditures:

$$Yearly\ reduction = \frac{\$125\ million - \$45\ million}{5\ years} = \frac{\$16\ million}{year}$$

9) ➡ A

Graph the two inequalities. Note that the two lines intersect in quadrant I:



10) ➡ B

$$Class\ average = \frac{Total\ points\ for\ boys + Total\ points\ for\ girls}{Number\ of\ boys + Number\ of\ girls}$$

$$= \frac{10(88) + 15(75)}{25} = 80.2$$

11) ➡ D

Let the two numbers be represented by variables x and y, and $x > y$:

$x - y = 2$

$x^2 - y^2 = 18$

Factor the difference of square and solve for the sum of the two numbers:

$(x - y)(x + y) = 18$

$2(x + y) = 18$

$x + y = 9$

12) ➡ D

Convert the quadratic into vertex form:

$h(t) = -16t^2 + 48t + 5 = -16t^2 + 48t - 36 + 5 + 36$

$= -16(t^2 - 3t + \frac{9}{4}) + 41$

$= -16(t - \frac{3}{2})^2 + 41$

Since $a < 0$, the parabola is inverted and the vertex $(\frac{3}{2}, 41)$ is the highest point of the arc.

13) ➡ B

The range of scores is the difference between the highest and lowest scores; the mean must be between these scores. This necessitates that in Brad's class the lowest score is within 6 points of the mean. In Tom's class, a range of 30 points requires that the lowest score be equal to or less than 70, as the highest possible score is 100 points. This places the lowest score in Tom's class below the lowest possible score in Brad's class: $70 < 80 - 6$.

14) ➡ B

In the 2–cup mixture, the amount of flour is:

$$Amount\ of\ flour = \left(\frac{1}{3}\right)(2\ cups) = \frac{2}{3}\ cup$$

After one cup of flour is added, the percentage of flour in the mixture is:

$$Percent\ flour = \frac{\left(\frac{2}{3}+1\right)cups}{3\,cups} \times 100\%$$

$$= \frac{5}{9} \times 100\% = 55.6\%, \text{ which is approximately } 56\%.$$

15) ➡ B

Let x be Brian's score on the final, and because the final is worth two tests, let the total number of tests be the 5 Brian has already taken plus 2 additional tests representing the final:

$$\frac{56+55+41+29+86+2x}{7} \geq 65$$

$$267 + 2x \geq 455$$

$$x \geq 94$$

16) ➡ C

The cost of the first mile is \$0.30, and the remainder of the trip, $x - 1$ miles, is charged at \$0.15 per mile:

$$f(x) = 0.30 + 0.15(x - 1)$$

17) ➡ B

Let x be the price of one tape recorder and y be the price of one radio:

$$5x + 7y = 823$$
$$5x - 7y = 137$$

Add the two equations:

$$10x = 960$$
$$x = 96$$

18) ➡ D

Because the racetrack is circular, the distance once around the racetrack is $2\pi r$ where r represents the radius of the circular track. The velocities of A and B are $\frac{2\pi r}{15\,sec}$ and $\frac{2\pi r}{25\,sec}$ respectively. If A passes B at time t, at this time B has traveled a distance x, and A has traveled a distance $x + 2\pi r$:

Time for A to travel $x + 2\pi r$ = Time for B to travel x

Time expressed in terms of velocity and distance is:

Therefore, $Time = \frac{Distance}{Velocity}$

$$\frac{Distance_A}{Velocity_A} = \frac{Distance_B}{Velocity_B}$$

$$\frac{x+2\pi r}{\left(\frac{2\pi r}{15}\right)} = \frac{x}{\left(\frac{2\pi r}{25}\right)}$$

$$15(x + 2\pi r) = 25x$$

$$x = 3\pi r$$

The time at which A passes B is:

$$Time = \frac{3\pi r}{\left(\frac{2\pi r}{25}\right)} = 37.5\,sec$$

19) ➡ A

$$75 \leq 35t + 5t^2 \leq 130$$

To determine the lower limit of t:

$$5t^2 + 35t \leq 75$$
$$5t^2 + 35t - 75 \leq 0$$
$$5(t^2 + 7t - 15) \leq 0$$

From this inequality was can infer that

$$t^2 + 7t - 150 \leq 0$$

Use the quadratic formula to determine the solutions for t:

$$t = \frac{-7 \pm \sqrt{(-7)^2 - 4(-15)}}{2}$$

$$t = \frac{-7 \pm \sqrt{109}}{2}$$

$$t = 1.7, -8.7$$

The value of t must be positive, so the car has traveled 75 meters at 1.7 seconds.

20) ➡ D

Let x be the amount invested in stocks and y be the amount invested in bonds:

$$x + y = 8000 \rightarrow x = 8000 - y$$
$$(0.04)x + (0.07)y = 500$$

Substitute the first equation into the second:

$$(0.04)(8000 - y) + (0.07)y = 500$$
$$320 - 0.04y + 0.07y = 500$$
$$0.03y = 180$$
$$y = 6000$$

21) ➡ D

The cost per yard of lumber, in dollars, is:

$$\text{Cost} = \frac{12}{\frac{16}{3}\text{\$/yard}} = \frac{36}{16} = \frac{9}{4}\text{\$/yard}$$

The cost of x yards of lumber is $\frac{9}{4}x$ dollars.

22) ➡ D

$a^3 = b^2$

The structure of the answer choices indicate that we need to find b in terms of a.

$(a^3)^{\frac{1}{6}} = (b^2)^{\frac{1}{6}}$

$a^{\frac{1}{2}} = b^{\frac{1}{3}}$

Because $a^{\frac{1}{2}} = \sqrt{a}$, substitute $b^{\frac{1}{3}}$ for $\sqrt{a}$ in $b\sqrt{a}$:

$b\sqrt{a} = b\sqrt{a} \cdot b^{\frac{1}{3}} = b^{\frac{4}{3}}$

23) ➡ B

Let x be the number of page views. The number of visitors that click–through is $0.3x$ and the number of visitors that click through more than once is one–tenth of the preceding number, that is, $(0.1)(0.3x)$ or $0.03x$. Revenue is:

$$\begin{aligned}\text{Revenue} &= (0.002)x + (0.01)(0.3x) + (0.1)(0.03x)\\ &= 0.002x + 0.003x + 0.003x\\ &= 0.008x\end{aligned}$$

For a revenue of \$100,000:

$0.008x = 100{,}000$

$x = 12{,}500{,}000$

24) ➡ A

The length of the diameter is the distance between the points (3, 6) and (1, –4):

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$= \sqrt{(3-1)^2 + (6-(-4))^2}$$

$$= \sqrt{104}$$

The radius is:

$$r = \frac{1}{2}diameter = \frac{\sqrt{104}}{2}$$

and the square of the radius is:

$$r^2 = \left(\frac{\sqrt{104}}{2}\right)^2 = \frac{104}{4} = 26$$

Two answer choices, (A) and (C), have a value for r^2 of 26. To determine the correct choice, observe that circle represented in (C) would have a center at the point (–2, –1). The diameter of a circle must pass through its center, and because the diameter of the circle in the diagram does not pass through quadrant IV, the center of the circle cannot be in this quadrant.

25) ➡ B

City A experiences its greatest increase in average daily temperature by percentage from month 5 to month 7. During this period, the average daily high in City B drops from 50 degrees to 30 degrees. The average daily high in City B over this two month period is:

$$Average = \frac{50+30}{2} = 40$$

26) ➡ D

The population of Maine in 1840 is 500,000. The population reaches 1 million at some point between 1960 and 1980, that is, between 120 and 140 years after 1840.

27) ➡ B

The length of the curve is one–fourth the circumference of the circle, and $r = 6$:

$$\text{Length of curve} = \frac{2\pi r}{4} = \frac{12\pi}{4} = 3\pi$$

It can be seen that $\overline{PS} + \overline{SO} = \overline{PO} = 6$.

As OSQT is a rectangle, $\overline{SO} = \overline{QT}$.

It follows that $\overline{PS} + \overline{QT} = 6$.

In a similar fashion it can be seen that $\overline{SQ} + \overline{TR} = 6$

The perimeter of the shaded region is:

$$\begin{aligned}\text{Perimeter} &= PQR + \left(\overline{SQ} + \overline{TR}\right) + \left(\overline{PS} + \overline{QT}\right)\\ &= 3\pi + 6 + 6\\ &= 3\pi + 12\end{aligned}$$

28) ➡ C

$(3 + 2i) - (a + 3i) = 10 - i$

$(3 - a) - i = 10 - i$

$a = -7$

29) ⟹ D

$2\cos x = \sqrt{2}$

$\cos x = \frac{\sqrt{2}}{2}$

According to the 45–45–90 triangle, the ratio of the hypotenuse to either side is $x\sqrt{2}$ to x. Therefore:

$\cos 45^{\circ} = \frac{\sqrt{2}}{2}$

30) ⟹ D

$f(1) = 2 \cdot f(0) + 4 \rightarrow f(1) = 2 \cdot 16 + 4 = 36$

$f(2) = 2 \cdot 36 + 4 = 76$

To calculate for negative values of x, rewrite the function:

$f(x) = 2 \cdot f(x-1) + 4$

$f(x-1) = \frac{f(x)-4}{2}$

This implies that:

$f(-1) = \frac{f(0)-4}{2} = \frac{16-4}{2} = 6$

$f(-2) = \frac{6-4}{2} = 1$

Finally, $f(2) + f(-2) = 77$

31) ⟹ 4.06

$\frac{0.25\,inch}{20\,miles} = \frac{x}{325\,miles}$

$x = \frac{(0.25)(325)}{20} inches$

$x = 4.06\,inches$

32) ⟹ 9

$mL\ of\ salt = (0.2)(45\ mL) = 9\ mL$

33) ⟹ 2

$-3x^2 + (4x)^2 = 52$

$-3x^2 + 16x^2 = 52$

$x^2 = 4$

$x = 2, -2$

34) ⟹ 8

The height that the ball reaches after x bounces is:

$Height = (30)(0.8)^x$

To determine x for which height is below 6 feet—that is, below 20% (0.2) of its original bounce:

$(30)(0.8)^x < 6$

$(0.8)^x < 0.2$

For $x = 7$, the bounce is: $(0.8)^7 = 0.21$

For $x = 8$, the bounce is: $(0.8)^8 = 0.16$

35) ⟹ 3790

Royalties = (1200)(29.95)(0.03) + (800)(16.95)(0.2)

= 3790

36) ⟹ 60

Let h_1 be the height of the top of Lincoln's face and h_2 be the height of the bottom of Lincoln's face. Because we are given two angle measurements (32 and 35 degrees) and the length of a side adjacent to the angles (800 feet), and because we are trying to find the length(s) of the side opposite these angles (h_1 and h_2), we must use tangent:

$h_1 = 800 \tan 35$

$h_2 = 800 \tan 32$

The height of his face is $800(\tan 35 - \tan 32) = 60$

37) ⟹ 800

Let x be the number of streams during the first half of the year:

$x + 1.5x = 8\ billion$

$x = 3.2\ billion$

During the second half of the year, the service streamed 4.8 billion songs. To determine the monthly streams:

$Monthly\ average = \frac{4.8\ billion}{6} = 800\ million$

38) ⟹ 2.37

Let x be the total streams in the three-month period:

$(0.003)x = 7.1\ million$

$x = 2.37\ billion$

KALLIS

SAT® Practice Test #4

IMPORTANT REMINDERS:

1. When you take the official SAT, you will need to use a No. 2 pencil. Do not use a pen or a mechanical pencil.

2. On the official SAT, sharing any of the question on the test violates the College Board's policies and may result in your scores being canceled.

(This cover is modeled after the cover you'll see when you take the official SAT.)

Math Test 4 – No Calculator

25 MINUTES, 20 QUESTIONS

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

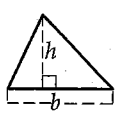
DIRECTIONS

For questions **1 – 15**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **16 – 20**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

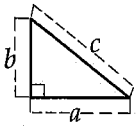
NOTES

1. The use of a calculator on any part of this section is forbidden.
2. Unless otherwise indicated, all variables and expressions used in this test represent real numbers.
3. Unless otherwise indicated, all figures used in this test are drawn to scale.
4. Unless otherwise indicated, all figures used in this test lie on a plane.
5. Unless specified otherwise, a given function, f, has the domain the set of all real numbers x for which $f(x)$ is a real number.

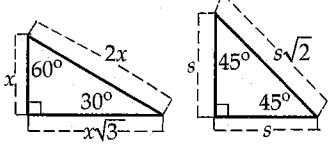
REFERENCE



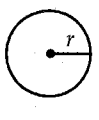
$A = \frac{1}{2}bh$



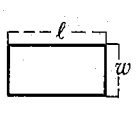
$c^2 = a^2 + b^2$



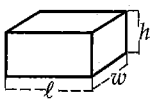
Special Right Triangles



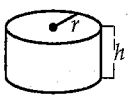
$A = \pi r^2$
$C = 2\pi r$



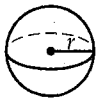
$A = \ell w$



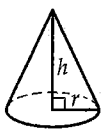
$V = \ell wh$



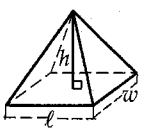
$V = \pi r^2 h$



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



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



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

The arc of a circle is 360 degrees or 2π radians.
A triangle has angles that sum to 180 degrees.

1. David has a total of $3m$ books for sale at n dollars each. He sells all but p books. Which of the following represents the total dollar amount he received in sales?

(A) $n(3m - p)$

(B) $n(p - 3m)$

(C) $pn - 3m$

(D) $3m - pn$

2.

$$-2x + 2 = 9y - 4x$$
$$2x + y = -6$$

Based on the system of equations above, what is the value of the quotient $\frac{x}{y}$?

(A) –7

(B) –5

(C) 5

(D) 7

3. There are 6 people in a room. Each person shakes hands with everyone else in the room. What is the total number of handshakes?

(A) 6

(B) 12

(C) 15

(D) 30

4. TRI–SCHOOL MEET

	Event I	Event II	Event III
1st Place (5 points)	C	A	
2nd Place (3 points)	A		
3rd Place (1 point)	B		

In a three-school meet, schools A, B, and C each entered one team for each of three events. If the score card above is completed and there are no ties in any event, what is the greatest possible number of points by which B's total score could exceed A's total score?

(A) 0

(B) 2

(C) 4

(D) 8

5.

$$-6 < 2x + 4 \leq 0$$

What are all the values of x which satisfy the above inequality?

(A) $-5 < x \leq -2$

(B) $-3 < x \leq -2$

(C) $2 \leq x < 3$

(D) $2 \leq x < 5$

6. Given $f(x) = -3x^2 + 5$ for all real numbers x, what is the range of the function?

(A) All real numbers less than or equal to 5

(B) All integers less than or equal to 5

(C) All nonnegative real numbers

(D) All nonnegative integers

7. If $f(x) = x^2$, and $g(x) = x^2 - 6x + 14$, which of the following best describes the graph of $g(x)$ relative to $f(x)$?

   (A) Raised 5 units and shifted 3 units to the left
   (B) Raised 5 units and shifted 3 units to the right
   (C) Same vertical position shifted 3 units to the left
   (D) Raised 14 units and shifted 6 units to the right

8. Paul is selling concert tickets at \$5 for adults and \$2 for students. At the end of the day, he has sold 10 tickets but is unsure if he collected \$39 or \$41. Can the number of student tickets sold be determined? If so, how many were sold?

   (A) Yes, 3 were sold.
   (B) Yes, 4 were sold.
   (C) Yes, 5 were sold.
   (D) No, it cannot be determined.

9. Which of the following describes the solution set of the equation $\sqrt{x+4} = x$?

   (A) There is one solution; it is a rational number.
   (B) There are two solutions; they are rational numbers.
   (C) There is one solution; it is an irrational number.
   (D) There are two solutions; they are irrational numbers.

10. An object is fired upward at an initial velocity (v_0) of 240 feet per second. The height, $h(t)$, of the object as a function of time is $h(t) = v_0t - 16t^2$. How long will it take the object to hit the ground after takeoff?

    (A) 16 seconds
    (B) 15 seconds
    (C) 7.5 seconds
    (D) 4 seconds

11. If $f(x) = x + 3$ and $g(x) = \frac{x^2 - 9}{x - 3}$, which of the following statements are true about the graphs of f and g in the coordinate plane?

    I. The graphs are exactly the same.
    II. The graphs are the same except when $x = 3$.
    III. The graphs have an infinite number of points in common.

    (A) I only
    (B) II only
    (C) I and III
    (D) II and III

12. The function $f(x)$ has the value 0 if and only if x is in the set $\{-3, 0, 1\}$. For what values of x is $f(x - 3) = 0$?

    (A) $\{-3, 0, 1\}$
    (B) $\{0, 1\}$
    (C) $\{0, 3, 4\}$
    (D) $\{3, 0, 2\}$

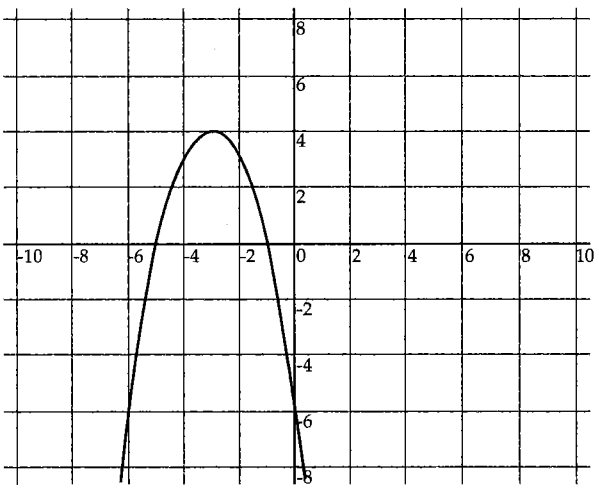
13. Jack and Jill went to Burger King. Jack bought 2 hamburgers and 3 shakes for $4.21 while Jill bought 3 hamburgers and 2 shakes for $5.24. The combined cost of a hamburger and a shake is

(A) $1.03
(B) $1.54
(C) $1.89
(D) $9.45

14. The front, side, and bottom faces of a rectangular solid have areas of 24, 8, and 3 centimeters squared, respectively. What is the volume of the solid in cubic centimeters?

(A) 24
(B) 96
(C) 192
(D) 288

15. What is the equation for the graph below?



(A) $y = (x + 3)^2 + 4$
(B) $y = -x^2 - 6x - 5$
(C) $y = (x - 3)^2 + 4$
(D) $y = -x^2 - 6x - 9$

16. The quadratic $x^2 - x = 2$ has two solutions. What is the larger of the two solutions?

ANSWER: _____

17. If $\frac{3}{x-3} + \frac{5}{2x-6} = \frac{11}{12}$, then the value of $2x - 6$ is

ANSWER: _____

18. If $x + y = 11$, $y + z = 14$ and $x + z = 13$, what is the value of $x + y + z$?

ANSWER: _____

19. In a weight-lifting competition, the total weight of Peter's two lifts was 750 pounds. If twice the weight of his first lift was 300 pounds more than the weight of his second lift, what was the weight, in pounds, of his first lift?

ANSWER: _____

20. A baseball team has won 15 games and lost 9. If these games represent $16\frac{2}{3}$ percent of all games to be played, how many more games must the team win to achieve a win percentage of 75% for the season?

ANSWER: _____

4

Math Test 4 – 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**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **31 – 38**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

NOTES

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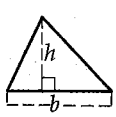
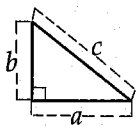
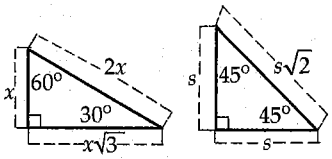
REFERENCE



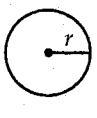
$A = \frac{1}{2}bh$



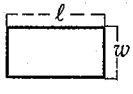
$c^2 = a^2 + b^2$



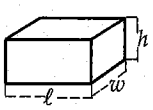
Special Right Triangles



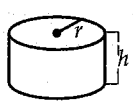
$A = \pi r^2$
$C = 2\pi r$



$A = \ell w$

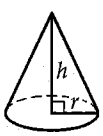


$V = \ell wh$

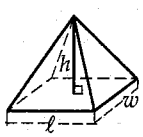


$V = \pi r^2 h$

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



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



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

The arc of a circle is 360 degrees or 2π radians.
A triangle has angles that sum to 180 degrees.

1.
PROPORTIONS SPENT ON RAW MATERIALS BY FACTORY Y IN 1987

Material	Percent (%)
Paper	28
Wood	32
Metal	40

In the table above, if the total amount spent on wood and paper by Factory Y in 1987 was $277,200, how much was spent on paper?

(A) $77,616
(B) $129,360
(C) $147,840
(D) $184,800

2. Which of the following is the equation of a line with x-intercept (6, 0) and y-intercept (0, 15)?

(A) $y = \frac{5}{2}x - 15$
(B) $y = -\frac{5}{2}x - 15$
(C) $y = \frac{5}{2}x + 15$
(D) $y = -\frac{5}{2}x + 15$

3. Six peaches of a certain variety weigh collectively 1.5 pounds. Twenty pounds are being sold for $24.00. At this rate, what is the cost, in dollars, of one dozen peaches?

(A) $0.30
(B) $1.80
(C) $3.60
(D) $7.20

4. Seven students played a game. Their scores, from lowest to highest, were as follows: 20, 30, 50, 70, 80, 80, and 90.

Which of the following is true of the scores?

I. The average score is above 70.
II. The median is greater than 70.
III. The mode is greater than 70.

(A) None
(B) III only
(C) I and II only
(D) II and III only

5. Which ordered pair is in the solution set of the system of inequalities $y \leq 3x + 1$ and $x - y > 1$?

(A) (–1, –2)
(B) (1, 2)
(C) (2, –1)
(D) (–1, 2)

6. What is the range of the function defined by $f(x) = \frac{1}{x} + 2$?

(A) All real numbers
(B) All real numbers except $-\frac{1}{2}$
(C) All real numbers except 0
(D) All real numbers except 2

7. The United States' deer population increases 30% every 20 years. If the deer population is x in the year 2000, what factor of x will the deer population be in the year 2080?

(A) 2.197

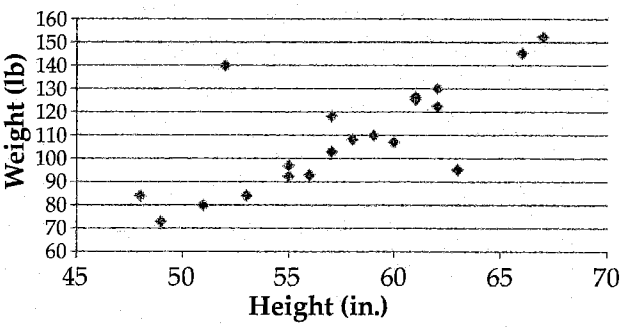
(B) 2.636

(C) 2.5

(D) 2.856

Question 8 and 9 refer to the following information.

Height/Weight Boys age 12



8. Height and weight information was taken for 22 twelve-year-old boys in the same 7th grade class. The data is represented in the scatterplot above. Which of the following best represents the relationship between height (x) and weight (y) in this group?

(A) $y = 4x + b$

(B) $y = 0.1x^2 - 200$

(C) $y^2 = x - 1{,}000$

(D) $y = -3.5x + b$

9. Body Mass Index (BMI) is calculated by using height and weight to determine the value of the expression $\frac{weight}{(height)^2}$. If one inch is equal to 2.54 centimeters, and one pound is equal to 453 grams, by what number must a BMI in pounds and inches be multiplied to produce a BMI in $\frac{kilograms}{meters^2}$?

(A) 0.07

(B) 0.17

(C) 14.2

(D) 702

10. A student solves the following system of equations using the substitution method:

$$2x - y = 5$$
$$3x + 2y = -3$$

Which of the following expresses the first step in the student's substitution process?

(A) $3x + 2(2x - 5) = -3$

(B) $3x + 2(5 - 2x) = -3$

(C) $3(y + \frac{5}{2}) + 2y = -3$

(D) $3(\frac{5}{2} - y) + 2y = -3$

11. The quadratic equation $2x^2 + 7x + 5 = 0$ has two solutions. What is the sum of these two solutions?

(A) -7

(B) $-\frac{3}{2}$

(C) $-\frac{7}{2}$

(D) $\frac{7}{2}$

12. At how many points do the curves $y = x^2$ and $y = x^{2003}$ intersect?

(A) 3
(B) 2
(C) 1
(D) 0

13. When Robert was born, his grandfather invested $1,000 in a college education fund for his grandson. The amount of money in the account, A, is given by the formula $A = P(1+ r)^t$, where P is the principal, r is the interest rate, and t is the time in years. At an interest rate of 4.5%, compounded annually, approximately how much money is in the fund when Robert is 18?

(A) $1,810
(B) $2,200
(C) $3,680
(D) $18,810

14. In 1980, the price of a certain antique car was 30 percent more than in 1975. In 1985 the price of the same car was 50 percent more than in 1980. The price of the car in 1985 is what percent greater than in 1975?

(A) 40%
(B) 45%
(C) 90%
(D) 95%

15. In 2013, the United States Postal Service charged $0.46 to mail a letter weighing up to 1 ounce and $0.20 per ounce for each additional ounce. Which function represents the cost in dollars, c (z), of mailing a letter weighing z ounces, where z is an integer greater than 1?

(A) $c(z) = 0.46z + 0.20$
(B) $c(z) = 0.46(z - 1) + 0.20$
(C) $c(z) = 0.20z + 0.46$
(D) $c(z) = 0.20(z - 1) + 0.46$

16. A company decides to give every one of its employees a $1,000 raise. What happens to the mean and median of the salaries as a result?

(A) The mean stays the same; the median increases by $1,000.
(B) The mean increases by $1,000; the median stays the same.
(C) The mean and median are the same.
(D) The mean and median both increase by $1,000.

17. Which of the following is true of the intersection of the lines $4x - y = 7$ and $x + 3y = 5$?

(A) They intersect at a point (x, y); both x and y are positive.
(B) They intersect at a point (x, y); both x and y are negative.
(C) They intersect at a point (x, y); x is positive, y is negative.
(D) The lines do not intersect.

18. If $2a = b$, $3b = c$, and $a + c = 70$, what is $a + b + c$?

(A) 30
(B) 60
(C) 70
(D) 90

19. If $f(x, y) = \frac{1}{4}x - y$, which of the following is equal to $f(8, 3)$?

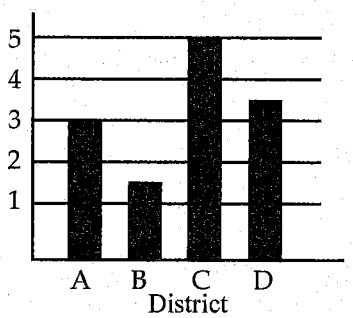
(A) $f(12, 2)$
(B) $f(16, 6)$
(C) $f(2, 1)$
(D) $f(-12, -2)$

20. If you have 16 milliliters (mL) of a 24% glucose solution, how much of a 50% glucose solution must be added to this solution to get a final mixture with a glucose concentration of 35%?

(A) 10.7 mL
(B) 11.7 mL
(C) 12.3 mL
(D) 12.7 mL

21.

TRASH COLLECTION BY DISTRICT IN MAY 2015



The graph above represents trash collection in four districts in a city in a single month. The total trash collected in the four districts is 130,000 tons. Which of the following could label the vertical axis?

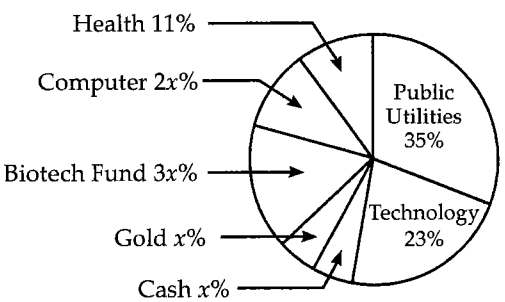
(A) Trash collected (tons)
(B) Trash collected (thousands of tons)
(C) Trash collected (tens of thousands fo tons)
(D) Trash collected (hundreds of thousands of tons)

22. Water is flowing into a basement at a rate of 50 liters per hour. The water can be bailed out at a rate of 60 liters per hour. If the water flows for two hours before anyone begins removing it, how long will it take to bail out all the water in the basement?

(A) 10
(B) 20
(C) 30
(D) 40

23.

Investment Portfolio Valued at $500,000



Note: Figure not to scale

The graph shows how $500,000 is invested. Twenty percent of the amount invested in technology stocks above is reinvested in health stocks. How much total money is invested in health stocks after the transfer?

(A) $155,000
(B) $130,000
(C) $90,000
(D) $78,000

24. Peter went upstream in a canoe at an average speed of 12 miles per hour. He returned by the same route at an average speed of 18 miles per hour. What was Peter's average speed for the round trip, in miles per hour?

(A) 14.0
(B) 14.4
(C) 15.0
(D) 15.6

25. In the United States, 55 million computers, 32 million televisions, and 150 million cellphones were either disposed of or recycled in the past year. If 30% of computers, 20% of televisions, and 10% of cellphones were recycled, and the average weight of a television is twice the average weight of a computer and 100 times the average weight of a cellphone, what is the approximate percentage by weight of recycled electronics made up of cellphones?

(A) 0.1%
(B) 0.5%
(C) 1%
(D) 10%

26. At Springfield University, there are 10,000 students, half of whom are male and half of whom are female. Each student is enrolled either in the Arts Program or the Science Program, but not in both. Sixty percent of students are in the Arts Program, and 40% of the students in the Science Program are male. What percent of students in the Arts Program are female?

(A) 26%
(B) 43%
(C) 50%
(D) 52%

27. An equation of the circle with center (2, –3) and diameter 4 is

(A) $x^2 + y^2 - 4x + 6y + 9 = 0$
(B) $x^2 + y^2 - 4x + 6y = 0$
(C) $x^2 + y^2 - 4x + 6y + 13 = 0$
(D) $x^2 + y^2 - 4x - 6y + 9 = 0$

28. If $f(x) = x^3 + x^2 + 2x + 6$, then $f(i) =$

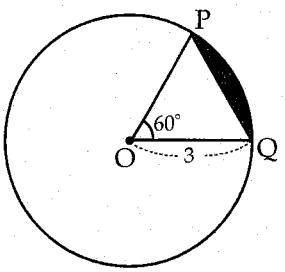
(A) $2i$
(B) $2 + i$
(C) $5 - i$
(D) $5 + i$

29. If $\sin x = \frac{3}{5}$ and $\cos x < 0$, then find $\tan x$.

(Note: $\sin^2 x + \cos^2 x = 1$)

(A) $-\frac{4}{3}$
(B) $-\frac{3}{4}$
(C) $\frac{3}{4}$
(D) $\frac{4}{5}$

30.



In the figure above, the radius of the circle is 3 and $\angle POQ = 60°$. What is the perimeter of the shaded region?

(A) $3 + \frac{\pi}{2}$
(B) $\sqrt{3} + \pi$
(C) $3 + \pi$
(D) $2\sqrt{3} + \pi$

31. A jar with a 3-gallon capacity is used to fill a tank with water. The jar is partly or fully filled with water from a faucet, and the jar is then taken to the tank where the water is emptied into the tank. If the tank's capacity is 91 gallons, what is the minimum number of trips needed to fill the tank?

ANSWER: _____

32. In a car race, David gives Peter a head start of 10 miles. David's car goes 80 miles per hour, and Peter's car goes 60 miles per hour. How long, in minutes, will it take David to catch up to Peter if they leave their starting marks at the same time?

ANSWER: _____

33. Solve the following for x:

$$\frac{5}{3}(x-3) = \frac{3}{2}(x-2)$$

ANSWER: _____

34. A box contains 4 red balls and 8 white balls. How much greater is the probability of simultaneously drawing 2 white balls at random than simultaneously drawing 2 red balls at random?

ANSWER: _____

35.

$$h = 70 + 5m$$

A runner has a resting heart rate of 70 beats per minute. For every minute he runs, his heart rate increases by a constant number of beats per minute. The runner's heart rate, h, is modeled by the equation above as a function of m minutes of running. On the basis of this equation, what is the increase in heart rate for every five minutes of running?

ANSWER: _____

36. To find the image length, L, of a 4-foot-tall object in a spherical mirror with a focal length of 2 feet, the formula $L = 4\left(\frac{2}{a-2}\right)^2$ can be used, where a is the distance, in feet, of the object from the mirror. What is the image length, in feet, of the object when it is 1.5 feet away from the mirror?

ANSWER: _____

Questions 37 and 38 refer to the information below.

Employment in Brazil, 1997
Total Labor Force: 65.5 million

	% Employed	
	Men	**Women**
Service	42	66
Industry	23	14
Business	15	15
Civil Construction	11	0
Other	9	5

37. **PART 1**
Assuming the workforce is split equally into men and women, how many men, in millions, in Brazil work in Industry?

ANSWER: _____

38. **PART 2**
In reality, men held 61% of all jobs in Brazil in 1997. With this in mind, what is the probability that a worker selected at random will be a woman who is employed in Business?

ANSWER: _____

SAT Practice Test 4: Answers & Explanations

Math Test

No Calculator Portion

1.	A	7.	B	13.	C	19.	*350*												
2.	D	8.	A	14.	A	20.	*93*												
3.	C	9.	C	15.	B														
4.	A	10.	B	16.	*2*														
5.	A	11.	D	17.	*12*														
6.	A	12.	C	18.	*19*														

Calculator Portion

1.	B	7.	D	13.	B	19.	D	25.	C	31.	*31*	36.	*64*						
2.	D	8.	A	14.	D	20.	B	26.	B	32.	*30*	37.	*7.53*						
3.	C	9.	D	15.	D	21.	C	27.	A	33.	*12*	38.	*0.06*						
4.	B	10.	A	16.	D	22.	A	28.	D	34.	$\frac{1}{3}$ *or* 0.333								
5.	C	11.	C	17.	A	23.	D	29.	B										
6.	D	12.	B	18.	D	24.	B	30.	C	35.	*25*								

No Calculator Portion

1) ➡ A

The number of books sold is $3m - p$ and books are sold at n dollars each.

2) ➡ D

Rewrite the first equation so that the variables are on the same side: $-2x + 2 = 9y - 4x \rightarrow 2x - 9y = -2$

Subtracting the second equation from the equation above:

$$\begin{array}{r} 2x - 9y = -2 \\ -)\ 2x + y = -6 \\ \hline -10y = 4 \end{array} \rightarrow y = -\frac{2}{5}$$

Substitute this value into the second equation in the system:

$$2x + \left(-\frac{2}{5}\right) = -6 \rightarrow 2x = \frac{2-30}{5} \rightarrow x = -\frac{14}{5}$$

Finally, $\frac{x}{y} = \frac{-\frac{14}{5}}{-\frac{2}{5}} = 7$

3) ➡ C

Person 1 shakes five times with each of the others.
Person 2 shakes four times with Persons 3, 4, 5, and 6.
Person 3 shakes three times with Persons 4, 5, and 6.
Person 4 shakes twice with Persons 5 and 6.
Person 5 shakes with Person 6.
The total number of handshakes is:
$5 + 4 + 3 + 2 + 1 = 15$

4) ➡ A

Calculate the lowest possible score for A and the highest possible score for B. If A is in 3rd place in Event III, its total is:

Total points for A = 3 + 5 + 1 = 9

If B comes in 2nd place in Event II and 1st place in Event III, its total is:

Total points for B = 1 + 3 + 5 = 9

It is apparent that B cannot exceed A in points.

5) ➡ A

$-6 < 2x + 4 \leq 0$
$-10 < 2x \leq -4$
$-5 < x \leq -2$

6) ➡ A

If x is a real number, the term $-3x^2$ is always negative, the largest value for the function is $f(0) = 5$. All values of $f(x)$ must be less than or equal to 5.

7) ➡ B

Rewrite the function $g(x)$ in vertex form:
$g(x) = x^2 - 6x + 14$
$g(x) = x^2 - 6x + 9 + 14 - 9$
$= (x - 3)^2 + 5$

The vertex of the parabola that is the graph of $g(x)$ is (3, 5). The vertex of $f(x) = x^2$ is (0 , 0).

8) ➡ A

Let x be the number of adult tickets sold and y be the number of student tickets sold: $x + y = 10$

This equation is equivalent to: $5x + 5y = 50$

As the total could have been \$39 or \$41, there are two equations that could express the total:

$5x + 2y = 39$ OR $5x + 2y = 41$

By using the subtraction method on the equations we have created, we can determine that only the second of these gives an integer value for y when subtracted from $5x + 5y = 50$:

$$\begin{array}{r} 5x+5y=50 \\ -)\,5x+2y=41 \\ \hline 3y=9 \\ y=3 \end{array}$$

9) ➡ C

$\sqrt{x+4} = x$

$x + 4 = x^2$

$x^2 - x - 4 = 0$

Solve for x:

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(-4)}}{2}$$

$$x = \frac{1 \pm \sqrt{17}}{2}$$

Both solutions are irrational. Approximating the value of $\sqrt{17}$: $x = 2.56, -1.56$

As the square root of a number cannot be negative, $x = -1.56$ is not a solution to the original equation.

10) ➡ B

The object hits the ground when $h(t) = 0$:

$240t - 16t^2 = 0$

$t(240 - 16t) = 0$

Therefore,

$240 - 16t = 0$

$t = 15$

11) ➡ D

The function $g(x)$ can be rewritten as:

$$g(x) = \frac{x^2 - 9}{x - 3} = \frac{(x-3)(x+3)}{x-3} = x + 3 \text{ for } x \neq 3$$

The graph of $g(x)$ is the same as the graph of $f(x)$ except for $x = 3$.

12) ➡ C

For $f(x - 3) = 0$, $x - 3$ must have a value equal to one of the members of the set $\{-3, 0, 1\}$. If $x - 3 = 1$, then: $x - 3 = 1 \rightarrow x = 4$

Only choice (C) includes $x = 4$ in its set.

13) ➡ C

Let x be the cost of one hamburger and y be the cost of one shake: $2x + 3y = 4.21$, $3x + 2y = 5.24$

Adding these equations gives: $5x + 5y = 9.45$

Dividing both sides of the equation above by 5 gives: $x + y = 1.89$

14) ➡ A

The dimensions of the rectangular solid are 8 centimeters by 3 centimeters by 1 centimeter. The volume of the solid is:

$V = l \times h \times w$

$V = 8\ cm \times 3\ cm \times 1\ cm = 24\ cm^3$

15) ➡ B

The vertex of the parabola is $(-3, 4)$. We can write the equation for the parabola in vertex form, for which $a < 0$ because the parabola is inverted:

$y = a(x - h)^2 + k$

$y = -(x + 3)^2 + 4$

$y = -(x^2 + 6x + 9) + 4$

$y = -x^2 - 6x - 5$

16) ➡ 2

$x^2 - x = 2$

$x^2 - x - 2 = 0$

$(x - 2)(x + 1) = 0$

$x = 2, -1$

17) ➡ 12

$$\frac{3}{x-3} + \frac{5}{2x-6} = \frac{11}{12}$$

$$\frac{6}{2x-6} + \frac{5}{2x-6} = \frac{11}{12}$$

$$\frac{11}{2x-6} = \frac{11}{12} \rightarrow 2x - 6 = 12$$

18) ➡ 19

Add all three equations:

$x + y = 11$

$y + z = 14$

$x + z = 13$

$2x + 2y + 2z = 38$

Therefore, $x + y + z = 19$

19) ➡ 350

Let x be the weight, in pounds, of the first lift and y be the weight of the second lift. We can write the following two equations:

$x + y = 750$

$2x - 300 = y$

Substitute the second equation into the first:

$x + (2x - 300) = 750$

$x = 350$

20) ➡ 93

The team has played a total of 24 games, with 15 wins and 9 losses. This constitutes $16\frac{2}{3}\%$ or $\frac{1}{6}$ of all games in the season. Let x be the number of games in the season:

$\frac{x}{6} = 24$

$x = 144$

In order to achieve a 75% win percentage:
Total wins needed = $(0.75)144 = 108$
The number of additional wins needed is:
Additional wins needed = $108 - 15 = 93$

Calculator Portion

1) ➡ B

Paper and wood, together, make up 60% of the budget. If x represents total expenditures:

$(0.6)x = 277{,}200 \rightarrow x = 462{,}000$

To determine the share of this portion that is spent on paper:

$462{,}000 \times 0.28 = 129{,}360$

2) ➡ D

The y-intercept is given. To determine slope:

$m = \frac{15 - 0}{0 - 6}$

$m = -\frac{5}{2}$

The equation of the line is: $y = -\frac{5}{2}x + 15$

3) ➡ C

$\frac{12\ peaches}{1\ dozen} \times \frac{1.5\ lb}{6\ peaches} \times \frac{\$24.00}{20\ lb}$

$= \frac{(12)(1.5)(24)}{(6)(20)} \$ / dozen$

$= \$3.60 / dozen$

4) ➡ B

Begin by evaluating III: the mode is the value that appears most often. Looking at the list, it is clear that the mode is 80, so III is true. Eliminate choices (A) and (C). Next, evaluate II: as there are seven scores, the median score is 70. II is not true.

5) ➡ C

Test the ordered pairs with the inequalities. The second inequality is the easier to work with:

$x - y > 1$

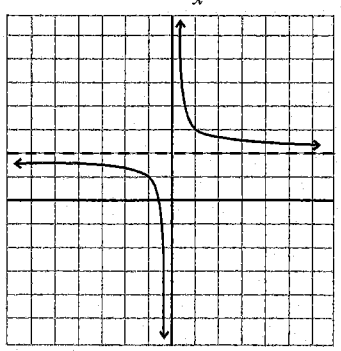
Only choice (C) satisfies this inequality:

$2 - (-1) > 1$

$3 > 1$

6) ➡ D

The graph of the function $f(x) = \frac{1}{x} + 2$ is the graph of $f(x) = \frac{1}{x}$ translated vertically 2 units:



The only value of $f(x)$ that is excluded is $f(x) = 2$.

7) ➡ D

Let n be the number of years that have passed since 2000. The increase in the deer population is:

Factor of increase = $(1.3)^{\frac{n}{20}}$

In the year 2080:

Factor of increase = $(1.3)^{\frac{80}{20}} = (1.3)^4 = 2.856$

8) ➡ A

The points on the scatterplot indicate a positive linear relationship between height and weight. Only choice (A) represents this type of relationship.

9) ➡ D

Let x represent the BMI in units $\frac{lb}{inch^2}$.

$$x \cdot \frac{lb}{inch^2} \times \frac{0.453kg}{lb} \times \left(\frac{inch}{0.0254m}\right)^2$$

$$= x \cdot \frac{0.453}{0.0254^2} \times \frac{kg}{m^2} = x \cdot 702 \frac{kg}{m^2}$$

10) ➡ A

The first equation can be rewritten as:

$y = 2x - 5$

Substituting into the second equation gives:

$3x + 2(2x - 5) = -3$

11) ➡ C

$2x^2 + 7x + 5 = 0$

$(2x + 5)(x + 1) = 0$

$x = -\frac{5}{2}, -1$

The sum of the solutions is: $-\frac{5}{2} + (-1) = -\frac{7}{2}$

12) ➡ B

The two functions have the same values at only two points, $x = 0$ and $x = 1$.

13) ➡ B

Use the formula $A = P(1 + r)^t$, where A is the amount in the fund, P is the principal, r is the interest rate, and t is the time in years. Here, the principal is \$1000, the interest rate is 4.5%, and the term is 18 years:

$A = P(1 + r)^t \rightarrow A = 1000(1.045)^{18} \approx 2200$

14) ➡ D

Let x be the price of the car in 1975:

Price in 1980 = $(1.3)x$

Price in 1985 = $(1.5)(1.3x) = 1.95x$

The price of the car in 1985 is 95% greater than the price in 1975.

15) ➡ D

The cost of mailing is a linear function. The y-intercept is the baseline cost, \$0.46. The slope is the cost per additional ounce, \$0.20: $c(z) = 0.2(z - 1) + 0.46$

16) ➡ D

As all salaries increase by the same amount, the median will increase by this amount. If a is the number of employees and x is the mean before the raises:

Adjusted mean $= \frac{xa + 1000a}{a} = x + 1000$

17) ➡ A

Solve the system of equations by multiplying the second equation by a factor of 4 and subtracting the two equations:

$$\begin{array}{r} 4x - y = 7 \\ -)\underline{4x + 12y = 20} \\ -13y = -13 \\ y = 1 \end{array}$$

Solve for x:

$x + 3(1) = 5$

$x = 2$

18) ➡ D

Write the equation $a + c = 70$ in terms of b:

$a = \frac{b}{2}, c = 3b$

$\frac{b}{2} + 3b = 70$

$\frac{7}{2}b = 70$

$b = 20$

Therefore, $a = 10$, $c = 60$

$a + b + c = 90$

19) ➡ D

$f(8, 3) = \frac{1}{4}(8) - 3 = -1$

$f(-12, -2) = \frac{1}{4}(-12) - (-2) = -1$

20) ➡ B

Let x be the amount of 50% glucose solution that is added:

$(0.24)(16) + (0.5)(x) = (0.35)(16 + x)$

$3.84 + 0.5x = 5.6 + 0.35x$

$x = 11.7$

21) C

The axis lines indicate that the total amount of trash collected across districts is "13." The unit of measurement indicated by the axis lines can be represented by x:

$13x = 130{,}000\ tons \rightarrow x = 10{,}000\ tons$

22) A

Let x be number of hours it takes to remove the water. 50 liters of water enter the basement for 2 hours before removal begins, and for x hours of removal: $50(2 + x)$. We can set this expression equal to the amount of water removed per hour:
60 liters $\times x$.
Therefore:

$50(2 + x) = 60x \rightarrow 100 + 50x = 60x \rightarrow x = 10$

23) D

23% of the portfolio is invested in Technology. Twenty percent of this portion is: (0.2)(23%) = 4.6%
The percent invested in Health after the transfer is: 11% + 4.6% = 15.6%

The dollar amount invested in Health is:

(0.156)(500,000) = 78,000

24) B

Let x be the distance of the one-way trip. The times to travel up and down the route are:

$$Time_{up} = \frac{x\ mile}{12\frac{mile}{hr}} = \frac{x}{12} hr$$

$$Time_{down} = \frac{x\ mile}{18\frac{mile}{hr}} = \frac{x}{18} hr$$

The time for the round trip is: $\frac{x}{18} + \frac{x}{12} = \frac{5x}{36} hours$

The average speed for the round trip ($2x$) is:

$$\frac{2x}{\left(\frac{5x}{36}\right)} = \frac{72}{5} = 14.4\frac{miles}{hour}$$

25) C

Let x be the weight of one cellphone. The weight of all recycled cellphones is:
$(150\ million)(0.1)x = (15\ million)x$

The percentage by weight of all recycled electronics made up cellphones is:

$$100\% \times \frac{(15M)x}{(55M)(0.3)(100x) + (32M)(0.2)(10x) + (15M)x}$$

$$= 100\% \times \frac{15}{1729} \approx 1\%$$

26) B

As sixty percent of students are in the Arts Program, 40% of students—or 4000 students—are in the Science program. The Science program is forty percent male and sixty percent female:
Female students in Science program = (4000)(0.6) = 2400
The remaining female students are in the Arts program:

Female students in the Arts program = 5000 − 2400 = 2600

The percentage of students in the Arts program that are female is:

% of students in Arts that are female

$$= \frac{2600}{6000} \times 100\% = 43\%$$

27) A

The equation of a circle with center (2, −3) and diameter of 4 units—radius 2 units—is:
$(x - 2)^2 + (y + 3)^2 = 4$
Expanding the expressions in brackets:
$x^2 - 4x + 4 + y^2 + 6y + 9 = 4$
$x^2 + y^2 - 4x + 6y + 9 = 0$

28) D

$f(i) = i^3 + i^2 + 2i + 6$
$= i(i^2) + i^2 + 2i + 6$
$= -i - 1 + 2i + 6$
$= 5 + i$

29) B

To answer this question, use the trigonometric identity:

$(\sin x)^2 + (\cos x)^2 = 1$
$\cos x = \pm\sqrt{1 - (\sin x)^2}$

Since $\cos x < 0$, $\cos x = -\sqrt{1 - \left(\frac{3}{5}\right)^2} = -\frac{4}{5}$

We can calculate $\tan x$ using the identity:

$$\tan x = \frac{\sin x}{\cos x}$$

$$\tan x = \frac{\left(\frac{3}{5}\right)}{\left(-\frac{4}{5}\right)} = -\frac{3}{4}$$

30) ▶ C

The perimeter of the shaded region is made up of one side of the triangle and a portion of the circumference of the circle. Beginning with the side of the triangle: $\overline{PO} = \overline{OQ}$ so ΔPOQ is an isosceles triangle.

$\angle OPQ = \angle PQO$ and $\angle OPQ + \angle PQO = 120^\circ$

Therefore, $\angle OPQ = \angle PQO = \angle POQ = 60^\circ$
ΔPOQ is an equilateral triangle, and $\overline{PQ} = 3$

Next, consider the arc. The length of the arc is proportional to the central angle:

$$\frac{60^\circ}{360^\circ} = \frac{\widehat{PQ}}{2\pi r}$$

$$\widehat{PQ} = \frac{6\pi}{6} = \pi$$

The perimeter of the shaded region is $= 3 + \pi$.

31) ▶ 31

$$\text{Number of trips} = \frac{91\,gallons}{3\frac{gallons}{trip}} = 30.3\,trips$$

The minimum number of trips is 31. There are 30 trips where the jar is filled, and the last trip, when the jar is filled to 1 gallon.

32) ▶ 30

Let the distance that Peter has traveled when David catches up to him be x. The time it takes for David to catch Peter is:

$$\frac{x\,miles}{60\frac{miles}{hour}} = \frac{x+10}{80\frac{miles}{hour}}$$

$80x = 60x + 600$

$20x = 600$

$x = 30\ miles$

David will catch Peter at time t:

$$t = \frac{30\,miles}{60\frac{miles}{hour}} = \frac{1}{2}\,hour = 30\,minutes$$

33) ▶ 12

$$\frac{5}{3}(x-3) = \frac{3}{2}(x-2)$$

$$\frac{5}{3}x - 5 = \frac{3}{2}x - 3$$

$$\frac{10x - 9x}{6} = 2$$

$$x = 12$$

34) ▶ $\frac{1}{3}$ or 0.33

Although the question asks about the probability of drawing two balls simultaneously, we get the same result if we think of drawing the balls one at a time.

For red balls:

$$P(one\ red\ ball) = \frac{4}{12} = \frac{1}{3}$$

$$P(second\ red\ ball) = \frac{3}{11}$$

$$P(drawing\ two\ red\ balls) = \frac{1}{3}\cdot\frac{3}{11} = \frac{3}{33}$$

For white balls:

$$P(one\ white\ ball) = \frac{8}{12} = \frac{2}{3}$$

$$P(second\ white\ ball) = \frac{7}{11}$$

$$P(drawing\ two\ red\ balls) = \frac{2}{3}\cdot\frac{7}{11} = \frac{14}{33}$$

The difference in probabilities is: $\frac{14}{33} - \frac{3}{33} = \frac{11}{33} = \frac{1}{3}$

35) ▶ 25

The heartrate is modeled as a linear function, with slope of the function representing the change in beats per minute and equal to 5. The increase in beats per five minutes of running is 25.

36) ▶ 64

The distance of the object from the mirror is 1.5 *feet*:

$$L = 4\left(\frac{2}{1.5-2}\right)^2 = 4(-4)^2 = 64$$

37) ▶ 7.53

Men in workforce
$= (0.5)(65.5\ million) = 32.75\ million$

Men in Industry
$= (0.23)(32.75\ million) = 7.53\ million$

38) ▶ 0.06

If 61% of the workforce is male, 39% of the workforce is female. Among females, 15% work in business:

P(woman in business) $= (0.39)(0.15) \approx 0.06$

KALLIS

SAT® Practice Test #5

IMPORTANT REMINDERS:

1. When you take the official SAT, you will need to use a No. 2 pencil. Do not use a pen or a mechanical pencil.

2. On the official SAT, sharing any of the question on the test violates the College Board's policies and may result in your scores being canceled.

(This cover is modeled after the cover you'll see when you take the official SAT.)

Math Test 5 – No Calculator

25 MINUTES, 20 QUESTIONS

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

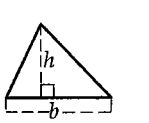
DIRECTIONS

For questions **1 – 15**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **16 – 20**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

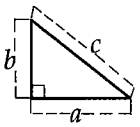
NOTES

1. The use of a calculator on any part of this section is forbidden.
2. Unless otherwise indicated, all variables and expressions used in this test represent real numbers.
3. Unless otherwise indicated, all figures used in this test are drawn to scale.
4. Unless otherwise indicated, all figures used in this test lie on a plane.
5. Unless specified otherwise, a given function, f, has the domain the set of all real numbers x for which $f(x)$ is a real number.

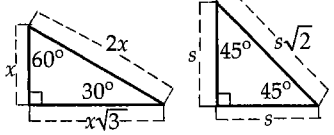
REFERENCE



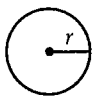
$A = \frac{1}{2}bh$



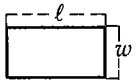
$c^2 = a^2 + b^2$



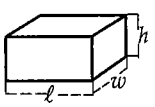
Special Right Triangles



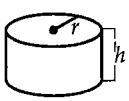
$A = \pi r^2$
$C = 2\pi r$



$A = \ell w$

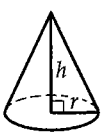


$V = \ell wh$

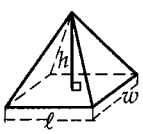


$V = \pi r^2 h$

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

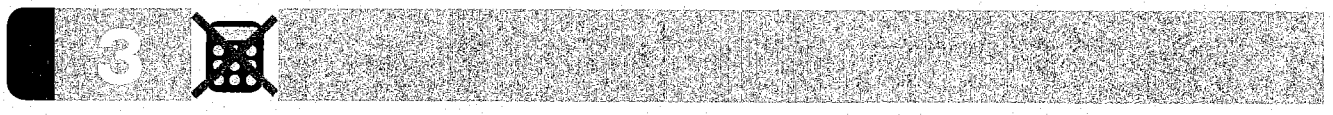


$V = \frac{1}{3}\pi r^2 h$



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

The arc of a circle is 360 degrees or 2π radians.
A triangle has angles that sum to 180 degrees.



1. A college dining hall took a survey of 260 students on their favorite meals. One-fifth of students selected macaroni and cheese as their favorite, and 15% selected breakfast sandwiches as their favorite. How many students chose a food other than the two above?

   (A) 52
   (B) 65
   (C) 91
   (D) 169

2. How is the graph of $g(x) = -x^2$ related to the graph of $f(x) = x^2$?

   (A) Reflected vertically
   (B) Reflected horizontally
   (C) Shifted upwards
   (D) Shifted to the left

3. A cell phone provider charges \$0.40 for the first minute of a call and \$0.20 for each additional minute. The customer is charged at the beginning of each minute. What is the cost of a 12.25-minute call?

   (A) \$2.60
   (B) \$2.65
   (C) \$2.80
   (D) \$2.85

4. A linear regression $C = 13.2m + 20.5$ models the relationship between calories burned on a new exercise machine, C, and the number of minutes a person uses the machine, m. Which of the following statements about this model must be true?

   I. A person that spends 22 minutes using the machine burns approximately 311 calories.
   II. C and m are inversely related.
   III. A person burns approximately 13.2 calories per minute while on the machine.

   (A) I only
   (B) III only
   (C) I and II only
   (D) I and III only

5. If $S = \frac{11(n-2)}{5}$, what is n in terms of S?

   (A) $5S - 9$
   (B) $\frac{5(S+2)}{11}$
   (C) $\frac{5S}{11} + 2$
   (D) $\frac{5S+2}{11}$

6. A line in the xy-plane that has the equation $x = 3$

   (A) has a point at (0, 3).
   (B) is a line that has a slope of 3.
   (C) is a line that is parallel to $y = 3x$.
   (D) is a line that is parallel to the y-axis.

7. If x is not equal to zero, for what value(s) of x is $x + 1 = \frac{20}{x}$?

   (A) 4 only
   (B) –5 only
   (C) –4 or 5
   (D) –5 or 4

8. A line with the equation $y = mx + 4$ passes through quadrant IV. What must be true of m?

   (A) $m = 0$
   (B) $m < 0$
   (C) $0 < m < 1$
   (D) $m > 0$

9. The point (2, 4) is on the graph of the function $f(x)$. Which of the following points is on the graph of $f(x + 3)$?

   (A) (5, 4)
   (B) (–1, 4)
   (C) (2, 1)
   (D) (2, 7)

10. If $f(x) = 2x + 1$, then $\frac{f(x+h) - f(x)}{h}$ is

    (A) $\frac{1}{2}$
    (B) 2
    (C) $\frac{h-1}{h}$
    (D) $\frac{2h+2}{h}$

11. The area of a rectangle is 192 feet squared. If the width of the rectangle is $\frac{3}{4}$ of its length, what is the width of the rectangle?

    (A) 12 feet
    (B) 16 feet
    (C) 24 feet
    (D) 144 feet

12. If $f(x) = (x-2)(2-x)^{-1}$ for all values of x except 2, which of the following statements must be true?

I. $f(1) = f(-1)$

II. $f(4) = f(0)$

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

(A) I only

(B) I and II only

(C) II and III only

(D) I, II, and III

13. The expression $2^0 - \left(\frac{1}{2}\right)^{-2} + (4-1)^{-1}$ is equal to

(A) -5

(B) $-\frac{8}{3}$

(C) $-\frac{5}{3}$

(D) $\frac{13}{12}$

14. A journeyman mechanic works at an auto shop. He services cars, SUVs, and trucks, and he is paid according to the type of vehicle: \$14 per hour for cars and SUVs, and \$36 per hour for trucks. Cars and SUVs take an average of 2 hours to service, whereas trucks require an average of 4 hours each. This past week, he worked 48 hours and made a total of \$1,288. How many trucks did he service?

(A) 7

(B) 10

(C) 22

(D) 119

15. The angle a is an acute angle. If $\sin a = x$, and $b = 90° - a$, what is the value of $\cos b$?

(A) x

(B) $\frac{1}{x}$

(C) $90 - x$

(D) Cannot be determined.

16. A bag contains balls that are red, green, or blue. One-third of the balls are red, and $\frac{2}{7}$ are blue. The number of green balls is eight fewer than twice the number of blue balls. How many green balls are in the bag?

ANSWER: _____

17. If $\frac{2}{x}+\frac{3}{y}=21$, and $\frac{4}{x}-\frac{1}{y}=7$, what is the value of $\frac{y}{x}$?

ANSWER: _____

18. If a, b, and c are positive integers and $\frac{16}{5}=a+\frac{1}{b+\frac{1}{c}}$, what is the value of $a+b+c$?

ANSWER: _____

19. If the expression $\frac{3x^4-2x^2-3}{x+2}$ is written in the equivalent form $A+\frac{B}{x+2}$, what is the value of B?

ANSWER: _____

20. If a sector of a circle has an arc length of 2π inches and an area of 6π square inches, what is the length of the radius of the circle?

ANSWER: _____

Math Test 5 – 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**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **31 – 38**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

NOTES

1. The use of a calculator on any part of this section is allowed.
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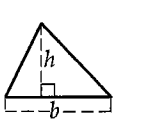
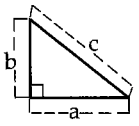
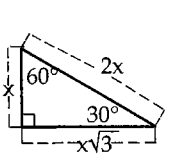
REFERENCE

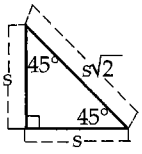


$A = \frac{1}{2}bh$

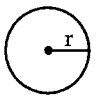


$c^2 = a^2 + b^2$

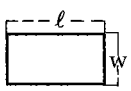




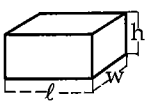
Special Right Triangles



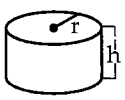
$A = \pi r^2$
$C = 2\pi r$



$A = \ell w$

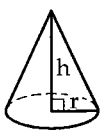


$V = \ell wh$

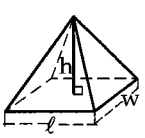


$V = \pi r^2 h$

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



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



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

The arc of a circle is 360 degrees or 2π radians.
A triangle has angles that sum to 180 degrees.

4

1. What is the slope of the line m with equation $2x - 5y = 10$?

   (A) $-\frac{2}{5}$

   (B) $\frac{5}{2}$

   (C) $\frac{2}{5}$

   (D) -2

2. The concentration of a substance in a solution is 2×10^{-5} milligrams per millimeter. How many milligrams of the substance are in 3×10^{8} milliliters?

   (A) 6×10^{-13}

   (B) 5×10^{-13}

   (C) 5×10

   (D) 6×10^{3}

3. What is the solution set of this system of equations?

$$x^2 - y = -3$$
$$2x^2 - y = -2$$

   (A) $\{(-1, -4), (-1, 4)\}$

   (B) $\{(-1, -4), (1, 4)\}$

   (C) $\{(-1, 4), (1, -4)\}$

   (D) $\{(-1, 4), (1, 4)\}$

4. Tom deposits \$100 into a bank, and the amount in his bank account increases by 5% each year. Christine deposits \$100 into a different bank, and the amount in her bank account increases by \$5 each year. Which statement is true about the amounts in Tom's and Christine's bank accounts?

   (A) The amount in Tom's bank account can be modeled by an exponential function and the amount in Christine's bank account can be modeled by a linear function.

   (B) The amount in Tom's bank account can be modeled by a linear function and the amount in Christine's bank account can be modeled by an exponential function.

   (C) The amounts in both bank accounts can both be modeled by exponential functions.

   (D) The amounts in both bank accounts can both be modeled by linear functions.

5. John has four more nickels than dimes in his pocket, for a total of \$1.25. Which equation could be used to determine the number of dimes, x, in his pocket?

   (A) $0.10(x + 4) + 0.05(x) = \$1.25$

   (B) $0.05(x + 4) + 0.10(x) = \$1.25$

   (C) $0.10(4x) + 0.05(x) = \$1.25$

   (D) $0.05(4x) + 0.10(x) = \$1.25$

6. Two functions, $y = |x - 3|$ and $3x + 3y = 27$, are graphed on the same coordinate plane. Which statement is true about the solution to the system of equations?

   (A) (3, 0) is the solution to the system because it satisfies the equation $y = |x - 3|$.
   (B) (9, 0) is the solution to the system because it satisfies the equation $3x + 3y = 27$.
   (C) (6, 3) is the solution to the system because it satisfies both equations.
   (D) (3, 0), (9, 0), and (6, 3) are the solutions to the system of equations because they all satisfy at least one of the equations.

7. Tim plays a video game five times and achieves the following scores in this order:

   4,526 4,599 4,672 4,745 4,818

   The scores follow a pattern. Which expression could be used to determine his score on playing the game for the n^{th} time?

   (A) $73n + 4{,}453$
   (B) $73(n + 4{,}453)$
   (C) $4{,}453n + 73$
   (D) $4{,}526n$

8. Anna works out for one hour with a mixture of running and walking. She burns fifteen calories per minute while running and ten calories per minute while walking, and burns 700 calories overall. How many minutes does Anna spend running?

   (A) 10
   (B) 20
   (C) 30
   (D) 40

9. A cetologist wants to estimate the size of a whale population. She observes their migration over several weeks and bases her estimation of the population on her count. The data indicates that there are 3 whales migrating through a particular 5-mile stretch of ocean every hour for 8 weeks. Based on this information, what is the approximate whale population in the area?

   (A) 200
   (B) 3,000
   (C) 4,000
   (D) 20,000

10. When Mike eats at a restaurant, he always tips from eight to twenty percent of the cost of the meal. Which of the following must be true?

    (A) When the cost of the dinner is \$10.00, the tip is between \$2.00 and \$8.00.
    (B) When the cost of the dinner is \$15, the tip is between \$1.20 and \$3.00.
    (C) When the tip is \$3.00, the amount of the dinner is between \$11.00 and \$23.00.
    (D) When the tip is \$2.40, the amount of the dinner is between \$3.00 and \$6.00.

Questions 11 and 12 refer to the information below.

The chart below shows the current enrollment in all social studies classes (Geography, U.S. History, World Cultures, and Government) at Iron Mountain High School.

COURSE TITLE	SECTION	PERIOD	ENROLLMENT
Geography	A	1	23
Geography	B	2	24
U.S. History	A	2	25
U.S. History	B	3	29
U.S. History	C	4	24
World Cultures	A	3	27
Government	A	4	26
Government	B	6	27

11. What is the average number of students enrolled per section in U.S. History?

(A) 25
(B) 26
(C) 27
(D) 29

12. Every student in the school is required to read the same book in preparation for a talk that will be given at a school assembly by the author. The school purchases two classroom sets of thirty books each, but shortly afterwards three books go missing from one set and five go missing from the other. If one class period uses both sets at a time, and each student needs his own book, which period(s) will not have enough books for its(their) students?

(A) Period 2 only
(B) Period 3 only
(C) Period 4 only
(D) Periods 3 and 4

13. Francisco spent ten dollars on hot dogs and hamburgers at a baseball game. Hot dogs are three dollars each, and hamburgers are four dollars each. How many hot dogs and hamburgers did he buy?

(A) One hot dog and one hamburger
(B) One hot dog and two hamburgers
(C) Two hot dogs and one hamburger
(D) Two hot dogs and two hamburgers

14. If $\frac{x+2}{x-5} \geq 0$, then which of the following is true of x?

(A) $x \geq -2$
(B) $-2 \leq x \leq 5$
(C) $x \leq -2$ or $x > 5$
(D) $x > 5$

Questions 15 – 18 refer to information below.

Types of Wildlife Habitat on Public Lands 2012
(100,000's acres)

	CA	NV	OR	UT
Shrub/Scrub	119	392	125	146
Herbaceous	5.5	20	7.2	17
Evergreen Forest	7.0	44	21	37
Mixed Forest	0	0	1.7	0
Barren Land	16	44	2.9	25
Other	2.3	2.5	3.3	3.0

15. Approximately what percentage of Utah's wildlife habitat is either herbaceous or evergreen forest?

(A) 7.5
(B) 24
(C) 27
(D) 31

16. Which state has the highest proportion of its wildlife habitat classified as barren land?

(A) California
(B) Nevada
(C) Oregon
(D) Utah

17. An ecologist projects that 15% of Oregon's herbaceous habitat will be transformed into a shrubby habitat over the next ten years. According to this projection, what will be the total amount of shrubby habitat in Oregon in ten years time?

(A) 126,000 acres
(B) 11.8 million acres
(C) 12.6 million acres
(D) 13.5 million acres

18. A developer bought 3% of California's public barren lands several years ago at $350 per acre. Since then, the value of the land has increased by 850%. Approximately how much would the developer stand to profit if he sold the land today in its entirety?

(A) $126 million
(B) $131 million
(C) $143 million
(D) $149 million

19. A band is recording an album. They rent a studio at $200 per day, which gives them access for 12 hours. The day rate cannot be prorated, so studio time must be purchased by the day. Their sound engineer costs $28 per hour, and is needed for half the total recording time. If it will take 50 hours to complete, what is the average cost per hour over the entire course of recording?

(A) $31.60
(B) $34
(C) $44.50
(D) $48

20. What is the equation of the line that passes through the point (8, –3) and is perpendicular to the line $2x - 3y - 10 = 0$?

(A) $y = -\frac{3}{2}x + 9$

(B) $y = -\frac{2}{3}x + \frac{7}{3}$

(C) $y = -\frac{3}{2}x - 15$

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

21. In your search for a summer job, you are given the following offers.

Offer 1: At Timmy's Tacos, you will earn \$4.50 an hour. However, you will be required to purchase a uniform for \$45.00. You will be expected to work 20 hours each week.

Offer 2: At Kelly's Car Wash, you will earn \$3.50 an hour. No special attire is required. You must agree to work 20 hours each week.

Before deciding which job offer you wish to take, you consider the factors. Which conclusion below is NOT true?

(A) If I work 8 weeks at Kelly's Car Wash and save all my earnings, I'll be able to save \$560.

(B) If I take the job at Timmy's Tacos, I'll have to work 10 hours just to pay for purchasing my uniform.

(C) If I only plan to work for two weeks, I should choose the job at Kelly's Car Wash.

(D) The job at Timmy's Tacos pays more if I work more than forty hours.

22. The table below shows the number of words typed by the same student during five timed sessions. Which equation best models a line of best fit for this data?

Time (t) in minutes	Number of words Typed (w)
2	122
3	182
4	240
6	368
9	538

(A) $w = -117t + 102$

(B) $w = 102t - 117$

(C) $w = 60t + 3$

(D) $w = 3t + 60$

23.

Student	1st Test Score	2nd Test Score
Amy	25	50
Bill	30	90
Charlie	42	84
Danny	50	75

According to the table above, which two students had the same percent improvement in scores from the first to the second test?

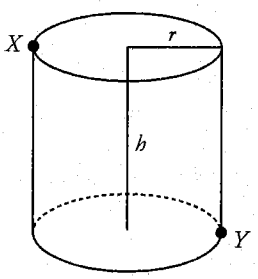
(A) Bill and Charlie

(B) Bill and Danny

(C) Amy and Dora

(D) Amy and Charlie

24.



A right circular cylinder has a height of 12 and a radius of 3. If X and Y are two points on the surface of the cylinder, what is the maximum possible length of $\overline{XY}$?

(A) $3\sqrt{17}$

(B) 6

(C) $6\sqrt{5}$

(D) $5\sqrt{6}$

25. Rebecca is flying from New York to San Francisco. The regular cost of a ticket is $378 plus a tax of 22%. She applies a frequent-flyer discount, which takes 10% off the price of airfare. In addition, there is a flat $25 charge for each checked bag under 50 pounds, and a fee of $2.50 per pound if the bag weighs more than 50 pounds. What is the total cost of the flight, in dollars, including bag fees, if she checks two bags that weigh 55 pounds and 62 pounds?

(A) $477.54
(B) $492.04
(C) $504.54
(D) $507.54

26. A train goes from Town A to Town B. If the train averages 50 miles per hour, then it will be 20 minutes late. If it averages 80 miles per hour, then it will be 10 minutes early. When will it arrive with respect to the scheduled arrival time if it goes 60 miles per hour?

(A) Early by 3 minutes.
(B) Early by $\frac{7}{3}$ minutes.
(C) Late by 10 minutes.
(D) Late by $\frac{20}{3}$ minutes.

27. If $x \neq 0$, $y \neq 0$, and $x \neq y$, then which of the following expressions is equivalent to $\frac{x^{-1} - y^{-1}}{x - y}$?

(A) $-\frac{1}{xy}$
(B) $\frac{1}{(x-y)^2}$
(C) $\frac{y^2 - x^2}{xy}$
(D) $\frac{x^2 - y^2}{xy}$

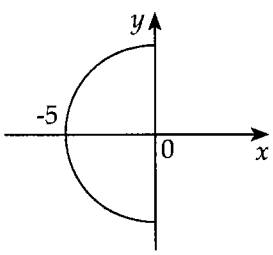
28. The expression $\frac{3 - 4i}{5 + 3i}$ is equivalent to

(A) $\frac{27 - 29i}{34}$
(B) $\frac{27 - 29i}{16}$
(C) $\frac{3 - 29i}{34}$
(D) $15 - 8i$

29. A segment of a circle has central angle 24° and arc length 8.4 cm. Find its area to the nearest square centimeter.

(A) 64 cm^2
(B) 72 cm^2
(C) 84 cm^2
(D) 96 cm^2

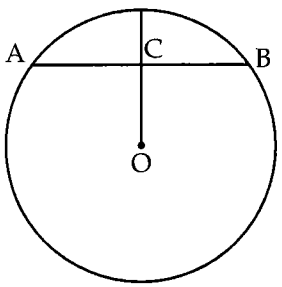
30.



In the semicircle above, the center is at (0, 0). Which of the following are the y-coordinates of two points on this semicircle whose x-coordinates are equal?

(A) $y = 0, -5$
(B) $y = 4, -4$
(C) $y = 1, -3$
(D) $y = 2, -4$

31.



A circle with center O has a radius of five units. The chord $\overline{AB}$ has a length of eight units and is perpendicular to the radius r. What is the length of $\overline{OC}$?

ANSWER: _____

32. Lauren has $80 in her savings account. When she receives her paycheck, she makes a deposit which brings the balance up to $120. By what percent does the total amount in her account increase as a result of this deposit?

ANSWER: _____

33. The oxygen saturation of a lake is calculated by dividing the amount of dissolved oxygen in a liter of lake water by the lake water's dissolved oxygen capacity, and then converting that number into a percentage. If the lake currently has 6.4 milligrams of dissolved oxygen per liter, and the dissolved oxygen capacity is 9.5 milligrams per liter, what is the oxygen saturation level of the lake, expressed as a percentage?

ANSWER: _____

34. The amount of interest earned on savings is directly proportional to the amount of money saved. If $104 in interest is earned on $1,300, how much in interest, in dollars, will be earned on $1,800 in the same period of time?

ANSWER: _____

35. A number, k, is increased by 10. If the fifth root of the resulting number equals 2, then k is

ANSWER: _____

36. The selling price of a coat is \$91 plus overhead and profit margin. If the overhead is 20% of the selling price and the profit is 10% of the selling price, what is the selling price? (Give you answer to the nearest dollar.)

ANSWER: _____

Questions 37 and 38 refer to the information below.

A shipping company needs to transport 25 containers. The company has a fleet of five trucks, and each truck can make the trip to the destination in two days. Each truck averages 10 mpg, and the cost of diesel fuel is \$2.50/gallon. Once the last container is delivered, trucks stay at their destination until dispatched to their next job.

37. **Part 1:**
What is the fuel cost associated with the job, to the nearest dollar, if the distance to the destination is 250 miles?

ANSWER: _____

38. **Part 2:**
The shipping company adds three trucks to its fleet. In terms of days, how much faster will it be able to complete the same job?

ANSWER: _____

SAT Practice Test 5: Answers & Explanations

Math Test

No Calculator Portion

1.	D	7.	D	13.	B	18.	*8*				
2.	A	8.	B	14.	A	19.	*37*				
3.	C	9.	B	15.	A	20.	*6*				
4.	D	10.	B	16.	*16*						
5.	C	11.	A	17.	$\frac{3}{5}$						
6.	D	12.	D								

Calculator Portion

1.	C	7.	A	13.	C	19.	B	25.	D	31.	*3*	37.	*2,813*		
2.	D	8.	B	14.	C	20.	A	26.	D	32.	*50*	38.	*4*		
3.	D	9.	C	15.	B	21.	D	27.	A	33.	*67.4*				
4.	A	10.	B	16.	D	22.	C	28.	C	34.	*144*				
5.	B	11.	B	17.	C	23.	D	29.	C	35.	*22*				
6.	C	12.	B	18.	C	24.	C	30.	B	36.	*130*				

No Calculator Portion

1) ➡ D

Students that did not select macaroni or breakfast sandwich

$$= 260 - \left(\frac{1}{5}\right)260 - (0.15)260 = 169$$

2) ➡ A

The graphs of functions $f(x)$ and $-f(x)$ are reflections of each other across the x-axis. The graph of function $g(x) = -x^2$ is the vertical reflection of the graph of function $f(x) = x^2$.

3) ➡ C

The caller is charged for 13 minutes:
First minute = 0.40
12 minutes = 0.20 per minute
Cost = 0.40 + 12(0.20) = 2.80

4) ➡ D

To verify I:
Calories = (13.2)(22) + 20.5 ≈ 311
I is true. The slope of the linear function is positive, so the relationship between calories and minutes is directly proportional; II is not true. The slope of the linear function is 13.2, which indicates that 13.2 calories are burned for each minute on the machine. III is true. The correct answer is choice (D).

5) ➡ C

$$S = \frac{11(n-2)}{5} \rightarrow n = \frac{5S}{11} + 2$$

6) ➡ D

The line $x = 3$ represents all points in the xy-plane at which the value of x is 3. This is a vertical line (parallel to the y-axis).

7) ➡ D

Solve for x:

$$x + 1 = \frac{20}{x} \rightarrow x^2 + x = 20 \rightarrow x^2 + x - 20 = 0$$

$$\rightarrow (x+5)(x-4) = 0 \rightarrow x = -5, 4$$

Both solutions satisfy the equation.

8) ➡ B

The y-intercept is the point (0, 4). For the line to pass through quadrant IV, it must slope downwards when $x > 0$. This implies that the slope, m, must be negative.

9) ➡ B

For the function $f(x)$, $f(2) = 4$. This implies that $f(x + 3) = 4$ when $x = -1$. We can conclude that the point (−1 , 4) is on the graph of $f(x + 3)$.

10) ➡ B

$$\frac{f(x+h)-f(x)}{h} = \frac{2(x+h)+1-(2x+1)}{h}$$

$$= \frac{2x+2h+1-2x-1}{h}$$

$$= \frac{2h}{h} = 2$$

11) ⟹ A

Let x be the length of the rectangle:

Width = $\left(\frac{3}{4}\right)x$

Area = $(x)\left(\frac{3}{4}x\right) \rightarrow \frac{3x^2}{4} = 192 \rightarrow x^2 = 256 \rightarrow x = 16$

Calculate width: $\left(\frac{3}{4}\right)(16) = 12$

12) ⟹ D

We can rewrite the function as: $f(x) = (x-2) \times \frac{1}{(2-x)}$

$f(x) = \frac{x-2}{2-x} = \frac{x-2}{-1(x-2)} = -1$ for $x \neq 2$

As $f(2)$ is not included in any of the Roman numerals, all values of the function listed are equal to each other and to –1.

13) ⟹ B

$$2^0 - \left(\frac{1}{2}\right)^{-2} + (4-1)^{-1}$$
$$= 1 - \frac{1}{\left(\frac{1}{2}\right)^2} + \frac{1}{4-1}$$
$$= 1 - 4 + \frac{1}{3}$$
$$= -\frac{8}{3}$$

14) ⟹ A

Let x be the number of cars and SUVs, and y be the number of trucks. Since he worked 48 hours:

$2x + 4y = 48$

As it takes 2 hours to service a car and 4 hours to service an SUV:

$2(14x) + 4(36y) = 1288 \rightarrow 28x + 144y = 1288$

Multiplying the first equation by 14 and subtracting from the second gives:

$$\begin{array}{r} 28x + 144y = 1288 \\ -)\,28x + 56y = 672 \\ \hline 88y = 616 \end{array}$$

$y = 7$

15) ⟹ A

For all acute angles (angles between 0° and 90°), the sine of the angle is equal to the cosine of the complementary angle.

16) ⟹ 16

Number of red balls = $\frac{1}{3}x$

Number of blue balls = $\frac{2}{7}x$

Number of green balls = $\frac{4}{7}x - 8$

$\frac{1}{3}x + \frac{2}{7}x + \left(\frac{4}{7}x - 8\right) = x \rightarrow \frac{25}{21}x - 8 = x$

$\frac{25}{21}x - x = 8 \rightarrow \frac{4}{21}x = 8 \rightarrow x = 42$

Number of green balls = $\frac{4}{7}(42) - 8 = 16$

17) ⟹ $\frac{3}{5}$

Multiplying the first equation by 2 and subtracting from the second equation gives:

$\frac{6}{y} - \left(-\frac{1}{y}\right) = 35 \rightarrow \frac{7}{y} = 35 \rightarrow y = \frac{1}{5}$

Substitute for y in the second equation:

$\frac{4}{x} - \frac{1}{\left(\frac{1}{5}\right)} = 7 \rightarrow \frac{4}{x} - 5 = 7 \rightarrow x = \frac{1}{3}$

Therefore,

$\frac{y}{x} = \frac{\left(\frac{1}{5}\right)}{\left(\frac{1}{3}\right)} = \frac{3}{5}$

18) ⟹ 8

$$\frac{16}{5} = a + \frac{1}{b + \frac{1}{c}}$$
$$16 = 5a + \frac{5}{b + \frac{1}{c}}$$

The fraction on the right side of the equation will be easy to manage if it can be set equal to 1. This can be accomplished if $a = 3$. Thus, $\frac{5}{b + \frac{1}{c}} = 1$.

By inspection, this equation is satisfied if $b = 4$ and $c = 1$. Therefore, $a + b + c = 8$

19) ➡ 37

Set up and complete the long division:

$$x+2\overline{)3x^4+0x^3-2x^2+0x-3}\quad\Rightarrow\quad 3x^3-6x^2+10x-20$$

$$-)3x^4+6x^3$$
$$-6x^3-2x^2$$
$$-)-6x^3-12x^2$$
$$10x^2+0x$$
$$-)10x^2+20x$$
$$-20x-3$$
$$-)-20x-40$$
$$37$$

We can write the quotient as:

$$\frac{3x^4-2x^2-3}{x+2}=3x^2-6x^2+10x-20+\frac{37}{x+2}$$

20) ➡ 6

As both the area and the arc length of the segment are proportional to central angle, we can set these proportions equal to each other:

$$\frac{6\pi}{\pi r^2}=\frac{2\pi}{2\pi r}$$
$$r=6$$

Calculator Portion

1) ➡ C

Convert the equation of the line into the slope-intercept form $y = mx + b$:

$2x - 5y = 10$

$2x - 10 = 5y$

$\frac{2}{5}x - 2 = y$

Therefore, $m = \frac{2}{5}$

2) ➡ D

$$\frac{2\times10^{-5}\,mg}{mL}=\frac{x}{3\times10^{8}\,mL}$$
$$x=\frac{\left(2\times10^{-5}mg\right)\left(3\times10^{8}mL\right)}{mL}$$
$$x=6\times10^{3}\,mg$$

3) ➡ D

Subtract the second equation of the system from the first:

$$x^2-y=-3$$
$$-)2x^2-y=-2$$
$$x^2=1$$
$$x=\pm1$$

If we substitute $x = -1$ into the first equation above:

$(-1)^2 - y = -3 \rightarrow y = 4$

We obtain the same value for y if $x = 1$.

4) ➡ A

The amount in Tom's bank account can be modeled as the following exponential function, where t is number of years that have passed since the initial deposit:

Amount in Tom's account = $100(1.05)^t$

The amount in Christine's bank account is modeled as a linear function, as the amount increases by the same amount each year:

Amount in Christine's account = $100 + 5t$

5) ➡ B

If x is the number of dimes, then the number of nickels is $x + 4$. The total amount in terms of coins can be written as:

$0.10x + 0.05(x + 4) = 1.25$

6) ➡ C

A solution to a system of equations must satisfy all equations. Only (6, 3) satisfies both equations.

7) ➡ A

Each score is 73 points higher than the previous score. The first time Tim plays the game, which corresponds to $n = 1$, he achieves a score of 4526. This is expressed in choice (A):

Points = $73n + 4{,}453$

8) ➡ B

Let r be the number of minutes spent running, and s be the number of minutes spent walking: $r + s = 60$

Calories burned are $15r + 10s = 700$

Multiply the first equation above by 10, and subtract from the second equation:

$$15r+10s=700$$
$$-)10r+10s=600$$
$$5r=100$$
$$r=20$$

9) ➡ C

Whale population =

$$\left(\frac{3\ whales}{hour}\right)\left(\frac{(24)(7)hours}{week}\right)(8\ weeks)$$

$$= (3)(24)(7)(8) \approx 4{,}000$$

10) ➡ B

If x is the cost of the meal, the tip is:

$0.08x \le tip \le 0.20x$

For $x = 15$,

$1.2 \le tip \le 3.0$

11) ➡ B

There are three sections in U.S. History: sections A, B, and C. The average number of students is:

$$Average = \frac{25+29+24}{3} = 26$$

12) ➡ B

There are 27 books in one set and 25 in the other, and 52 books in both sets. Only Period 3 has more than 52 students with 56 students.

13) ➡ C

Let x be the number of hot dogs, and y be the number of hamburgers:

$3x + 4y = 10$

The answer choices indicate that he bought *at most* 4 items in total. Thus, we can plug in the values 1 and 2 for x and y to determine which combination totals 10. The only combination that equals ten is:

$x = 2, y = 1$

14) ➡ C

For the inequality to be true, the numerator and denominator of the rational expression on the left must be either both positive or both negative. This is true when:

$x > 5$ (both positive) OR $x \le -2$ (both negative)

15) ➡ B

Percent herbaceous or evergreen

$$= \frac{Acres\ herbaceous\ and\ evergreen}{Total\ acres} = 100\%$$

$$= \frac{17+37}{146+17+37+25+3} \times 100\% = 24\%$$

16) ➡ D

The proportion of wildlife habitat that is barren land by state:

$$CA: \frac{16}{149.8} = 0.107$$

$$NV: \frac{44}{502.5} = 0.088$$

$$OR: \frac{2.9}{161.1} = 0.018$$

$$UT: \frac{25}{228} = 0.110$$

17) ➡ C

In 2012, there are 12,500,000 acres of shrubby habitat in Oregon. In ten years:

Shrubby habitat = 12,500,000 + (0.15)(720,000)
= 12.6 million

18) ➡ C

Developer's land = (0.03)(1,600,000 *acres*) = 48,000 *acres*

$$Profit\ per\ acre = \left(\frac{\$350}{acre}\right)(8.5) = \$2{,}975\ per\ acre$$

$$Profit = (48{,}000\ acres)\left(\frac{\$2{,}975}{acre}\right) = \$143\ million$$

19) ➡ B

$$Days\ of\ studio\ time = \frac{50\ hours}{12\frac{hour}{day}} = 4.2\ days$$

As studio time must be purchased by the day, the band must pay for 5 full days of studio time. The engineer is hired for half the recording time: 25 hours. The total cost of recording is:

$$Total\ cost = \left(\frac{\$200}{day}\right)(5\ days) + (25\ hours)\left(\frac{\$28}{hour}\right) =$$

\$ 1,700

The cost per hour over the course of recording is:

$$Cost\ Per\ hour = \left(\frac{\$1{,}700}{50\ hours}\right) = \$34\ per\ hour$$

20) ➡ A

Convert the equation into slope-intercept form:

$2x - 3y - 10 = 0$

$$y = \frac{2}{3}x - \frac{10}{3}$$

The slope m of the line perpendicular to this line is:

$$m\left(\frac{2}{3}\right) = -1$$

$$m = -\frac{3}{2}$$

Substitute the coordinates of the point (8, –3):

$$y=-\frac{3}{2}x+b$$

$$-3=-\frac{3}{2}(8)+b$$

$$b=9$$

The equation of the line perpendicular to the given

line is: $y=-\frac{3}{2}x+9$

21) ➡ D

If you work 40 hours at Timmy's Tacos, earnings are:

$$(40 \text{ hours})\left(\frac{\$4.50}{\text{hour}}\right)-\$45.00=\$135$$

If you work 40 hours at Kelly's Carwash, earnings are:

$$(40 \text{ hours})\left(\frac{\$3.50}{\text{hour}}\right)=\$140$$

22) ➡ C

The number of words typed increases with time spent typing, so the slope of the line of best fit is positive. When the time increases by one minute, from 2 minutes to 3 minutes, the number of words typed increases 60 words, from 122 to 182. When the time increases by one minute from 3 minutes to 4 minutes, the number of words typed increases 58 words. When the time increases two minutes, from 4 minutes to 6 minutes, the number of words typed increases 128 words, or 64 words per minute. We conclude that the slope of the line of best fit is approximately 60.

23) ➡ D

Amy and Charlie both doubled their first test score in the second test, an increase of 100%.

24) ➡ C

The length of $\overline{XY}$ is maximum when the points X and Y are 180° from each other on the circle. The cross-section of the cylinder with points X and Y at opposite ends of the circle is a right triangle with one side equal to the diameter of the base (6 units), one side equal to the height of the cylinder (12 units), and hypotenuse $\overline{XY}$:

$$\overline{XY}^2=12^2+6^2$$

$$\overline{XY}=\sqrt{180}=\sqrt{36\cdot 5}=6\sqrt{5}$$

25) ➡ D

Price of airfare = (378)(1.22)(0.9) = 415.04

Baggage fees = (25 + 5(2.5)) + (25 + 12(2.5)) = 92.50

Total cost = 415.04 + 92.50 = 507.54

26) ➡ D

Let x be the distance in miles from Town A to Town B, and y be the 'scheduled' time it takes, in hours, to travel the distance x. When traveling 50 miles per hour:

$$\frac{x}{50\frac{mile}{hour}}=y+\frac{1}{3}hour$$

When traveling 80 miles per hour:

$$\frac{x}{80\frac{mile}{hour}}=y-\frac{1}{6}hour$$

Solve for y:

$$50y+\frac{50}{3}=80y-\frac{80}{6}$$

$$30y=\frac{180}{6}$$

$$y=1$$

Solve for x:

$$x=50+\frac{50}{3}=\frac{200}{3}miles$$

At 60 miles per hour, the time it takes to travel x is:

$$\frac{\left(\frac{200}{3}miles\right)}{\left(60\frac{mile}{hour}\right)}=\frac{200}{180}hours=1\frac{1}{9}hours$$

We conclude that the train is $\frac{1}{9}$ hour late when traveling at 60 miles per hour. In minutes:

$$\left(\frac{1}{9}hour\right)\left(\frac{60\,minutes}{hour}\right)=\frac{20}{3}minutes$$

27) ➡ A

$$\frac{x^{-1}-y^{-1}}{x-y}=\frac{\left(\frac{1}{x}-\frac{1}{y}\right)}{x-y}=\frac{\left(\frac{y-x}{xy}\right)}{x-y}=\frac{-(x-y)}{xy(x-y)}=-\frac{1}{xy}$$

28) ➡ C

Rationalize the denominator (Note: $i^2=-1$):

$$\frac{3-4i}{5+3i}\cdot\frac{5-3i}{5-3i}=\frac{15-9i-20i+12i^2}{25-9i^2}$$

$$=\frac{15-29i+12(-1)}{25-9(-1)}=\frac{3-29i}{34}$$

29) ➡ C

The area and arc length of the segment are

proportional to the central angle:

$$\frac{24°}{360°} = \frac{arc\ length}{2\pi r} = \frac{area\ of\ segment}{\pi r^2}$$
$$\frac{1}{15} = \frac{arc\ length}{2\pi r} = \frac{area\ of\ segment}{\pi r^2}$$

Solve for r:

$$\frac{1}{15} = \frac{8.4}{2\pi r}$$
$$r = \frac{(15)(8.4)}{2\pi} = \frac{63}{\pi}\ cm$$

Solve for area of the segment:

$$\frac{1}{15} = \frac{area\ of\ segment}{\pi\left(\frac{63}{\pi}\right)^2}$$

$$area\ of\ segment = \frac{63^2}{15\pi} = 84\ cm^2$$

30) ➡ B

The circle has center (0, 0) and radius 5. The equation is: $x^2 + y^2 = 25$

From the equation, we see that when two points share the same x-coordinate. The y-coordinates of these points must be the same or related by a factor of −1.

31) ➡ 3

The radius perpendicular to a chord bisects the chord, so ΔOCB is a right triangle with hypotenuse equal to the radius (5 units) and side $\overline{CB} = 4$. This is a 3–4–5 right triangle, and $\overline{OC} = 3$.

32) ➡ 50

Increase = \$40

$$\%\ \text{increase} = \frac{\$40}{\$80} \times 100\% = 50\%$$

33) ➡ 67.4

$$\text{Oxygen saturation} = \frac{Dissolved\ oxygen}{Oxygen\ capacity} \times 100\%$$

$$\text{Oxygen saturation} = \frac{6.4\frac{mg\ O_2}{L}}{9.5\frac{mg\ O_2}{L}} \times 100\% = 67.4\%$$

34) ➡ 144

Let x be the interest, in dollars, earned on \$1800:

$$\frac{104}{1300} = \frac{x}{1800}$$

$x = 144$

35) ➡ 22

$$(k+10)^{\frac{1}{5}} = 2$$
$$k + 10 = 2^5$$
$$k + 10 = 32$$
$$k = 22$$

36) ➡ 130

Let x be the selling price, in dollars, of the coat:

$$x = 91 + 0.2x + 0.1x$$
$$0.7x = 91$$
$$x = 130$$

37) ➡ 2,813

The cost of one truck making a one-way trip is:

Cost of one trip

$$= \frac{250\ miles}{10\frac{miles}{gallon}} \times \frac{\$2.50}{gallon} = \$62.50$$

For five trucks to deliver 25 containers, they need to take a combined 45 trips (the fleet goes back and forth once to deliver 5 containers, amounting to 10 trips for 5 containers and 40 trips for 20 containers, but the trucks do not return after delivering the final 5 containers). The total cost to deliver all 25 containers is:

$$\text{Total cost} = 45\ trips \times \frac{\$62.50}{trip} \approx \$2{,}813$$

38) ➡ 4

It takes two days to make a one way trip, and four days to make a round trip.

With five trucks:

4 round trips = 16 days (20 containers)
1 one way trip = 2 days (5 containers)
Total time with 5 trucks = 18 days

With eight trucks:

3 round trips = 12 days (24 containers)
1 one way trip = 2 days (1 container)
Total time with 8 trucks = 14 days

It takes four days less to deliver the containers with eight trucks than it does with five.

KALLIS

SAT® Practice Test #6

IMPORTANT REMINDERS:

1. When you take the official SAT, you will need to use a No. 2 pencil. Do not use a pen or a mechanical pencil.

2. On the official SAT, sharing any of the question on the test violates the College Board's policies and may result in your scores being canceled.

(This cover is modeled after the cover you'll see when you take the official SAT.)

Math Test 6 – No Calculator

25 MINUTES, 20 QUESTIONS

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

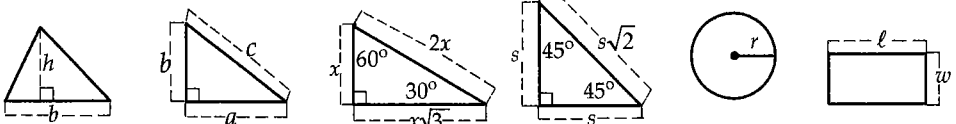
DIRECTIONS

For questions **1 – 15**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **16 – 20**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

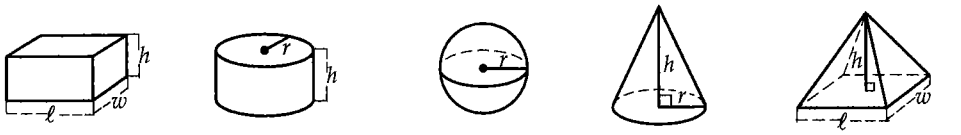
NOTES

1. The use of a calculator on any part of this section is forbidden.
2. Unless otherwise indicated, all variables and expressions used in this test represent real numbers.
3. Unless otherwise indicated, all figures used in this test are drawn to scale.
4. Unless otherwise indicated, all figures used in this test lie on a plane.
5. Unless specified otherwise, a given function, f, has the domain the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



$A = \frac{1}{2}bh$ $\quad c^2 = a^2 + b^2$ Special Right Triangles $\quad A = \pi r^2$, $C = 2\pi r$ $\quad A = \ell w$



$V = \ell wh$ $\quad V = \pi r^2 h$ $\quad V = \frac{4}{3}\pi r^3$ $\quad V = \frac{1}{3}\pi r^2 h$ $\quad V = \frac{1}{3}\ell wh$

The arc of a circle is 360 degrees or 2π radians.
A triangle has angles that sum to 180 degrees.

8

1. Find all values of x that satisfy following inequality:

$$\frac{x}{2} - 1 \leq 1 - \frac{x}{2}$$

(A) $x \leq -2$
(B) $x \leq 0$
(C) $x \leq 2$
(D) All real numbers

2. George is mailing Christmas gifts to his family. Three family members live in California, and eight live in New York. If the cost of sending a package to California, x, is three times the cost of sending a package to New York, which of the following represents the total cost of shipping?

(A) $\frac{11}{3}x$
(B) $\frac{17}{3}x$
(C) $9x$
(D) $11x$

3. If $f(x) = ax^2 + bx + c$ is concave downward, which of the following must be true?

(A) $a < 0$
(B) $a > 0$
(C) $b^2 - 4ac > 0$
(D) $b^2 - 4ac < 0$

4. It takes about 4 joules of energy to raise the temperature of 1 milliliter of water by one degree Celsius. How many joules of energy will it take to raise the temperature of 3 liters of water by 8 degrees Celsius?

(A) 9.6
(B) 960
(C) 9,600
(D) 96,000

5. Four consecutive integers are summed, and the total is assigned the variable x. What is the sum of the next four consecutive integers in terms of x?

(A) $x + 16$
(B) $x + 4$
(C) $4x + 4$
(D) $4x + 16$

6. Carol is catering an office Super Bowl party. She plans to serve macaroni and cheese as well as pizzas. She figures that one pizza will feed two people, and one pan of macaroni and cheese will feed six people. If she expects at least 30 and at most 60 attendees, and cannot exceed a ratio, in favor of either food, of 2 to 1, what is the maximum number of pizzas she can order?

(A) 4
(B) 6
(C) 12
(D) 15

7. Kim's Fruit Market prices fruit by the piece. A small bag of three apples and two pears costs \$1.85. A large bag of seven apples and five pears costs \$4.45. Which of the following must be true?

(A) An apple and a pear are the same price.
(B) A pear costs \$0.05 more than an apple.
(C) A pear costs \$0.10 more than an apple.
(D) An apple costs \$0.05 more than a pear.

8. The current population of a town is 10,000. If the population, P, increases by 20% each year, which equation could be used to find the population after t years?

(A) $P = 10{,}000(0.2)^t$
(B) $P = 10{,}000(1.2)^t$
(C) $P = 10{,}000(0.8)^t$
(D) $P = 10{,}000(1.8)^t$

9. Solve for x: $\frac{5}{x+1} \geq 1$

(A) $x \leq -4$ or $x > 1$
(B) $-1 < x \leq 4$
(C) $x \leq -1$ or $x > 4$
(D) $-4 < x \leq 1$

10. An opinion poll asked which of two candidates, A or B, would make a good mayor. Of respondents, 70% chose candidate A and 60% chose candidate B. Each person polled chose at least one candidate, and 900 of them chose both candidates. How many people were polled?

(A) 1,000
(B) 2,000
(C) 3,000
(D) 4,000

11. What is the range of $f(x) = \sqrt{4 - x^2}$?

(A) $y \geq 0$
(B) $y \geq 2$
(C) $-2 \leq y \leq 2$
(D) $0 \leq y \leq 2$

12. If a is any positive integer, then which of the following is NOT a true statement?

(A) $2a + 1$ is always an odd integer.
(B) $\sqrt{a}$ is always a real number.
(C) $\sqrt{-a}$ is always an imaginary number.
(D) a^3 is always an odd integer.

13. Which of the following is NOT true concerning the line containing the points (4, 3) and (–2, –6)?

(A) It has an x-intercept greater than its slope.
(B) It is parallel to the line $y = \frac{3}{2}x + 10$.
(C) It is perpendicular to $2x + 3y = 10$.
(D) It has y-intercept 3.

14. If x and $f(x)$ are given in the table below, and $f(f(x)) = 10$, then $x =$

x	3	5	7	8	10
$f(x)$	10	2	3	12	1

(A) 3
(B) 5
(C) 7
(D) 8

15. Three day laborers are tasked with loading trucks in a warehouse. The first worker is the fastest, and he works twice as quickly as the second laborer, who works twice as quickly as the third laborer. The three together can load a truck in three hours. How long, in hours, would it take the fastest laborer to load the truck alone?

(A) $1\frac{1}{3}$
(B) $4\frac{1}{2}$
(C) $5\frac{1}{4}$
(D) $10\frac{1}{2}$

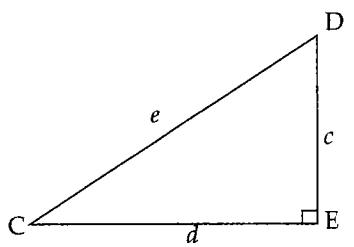
16. The sum of two numbers is $2\frac{1}{2}$. The sum of twice the first number plus three times the second number is seven. What is their product?

ANSWER: _____

17. The lines of $x + 2y = 7$ and $2x - ky = 5$ are perpendicular if the value of k is

ANSWER: _____

18.



NOTE: figure not drawn to scale

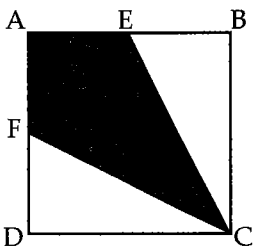
For the right triangle ΔCDE above, $\cos C = \frac{1}{2}$. If the hypotenuse is 10 centimeters long, what is the length of side d?

ANSWER: _____

19. If a rectangular prism has faces with areas of 8, 10, and 20 centimeters squared, then what is the volume of the prism in centimeters cubed?

ANSWER: _____

20.



In the figure, ABCD is a square with side of length 2. If E is the midpoint of line segment AB and F is the midpoint of line segment AD, the area of quadrilateral CFAE, in units squared, is

ANSWER: _____

4

Math Test 6 – 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**, find the solution to each problem and select the most appropriate answer from the choices provided. For questions **31 – 38**, find the solution to each problem and write your answer in the space provided. You may use the blank space in your test booklet for scratch work.

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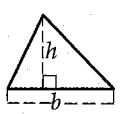
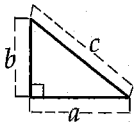
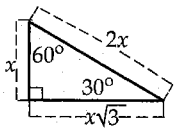
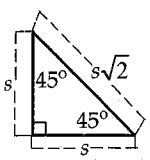


$A = \frac{1}{2}bh$

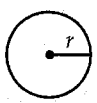


$c^2 = a^2 + b^2$



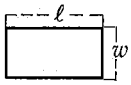


Special Right Triangles

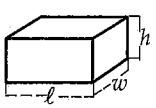


$A = \pi r^2$

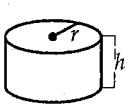
$C = 2\pi r$



$A = \ell w$

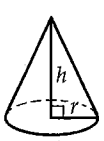


$V = \ell wh$

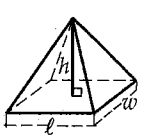


$V = \pi r^2 h$

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



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



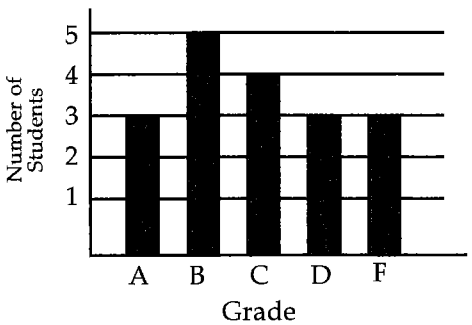
$V = \frac{1}{3}\ell wh$

The arc of a circle is 360 degrees or 2π radians.

A triangle has angles that sum to 180 degrees.

1. A band wants to distribute its music on CDs. The recording equipment costs \$250, and blank CDs cost \$5.90 for a package of 10. Which of the following represents the total, in dollars, it costs to produce n CDs, if n is a multiple of 10?

   (A) $(250 + 0.59)n$
   (B) $250 + 0.59n$
   (C) $(250 + 5.90)n$
   (D) $250n + 5.90$

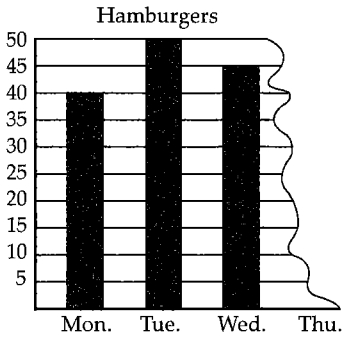
2. 

   The bar graph above shows the grades in a mathematics class for the last grading period. If A, B, C and D are satisfactory grades, what fraction of grades shown in the graph are satisfactory?

   (A) $\frac{1}{6}$
   (B) $\frac{2}{3}$
   (C) $\frac{3}{4}$
   (D) $\frac{5}{6}$

3. A man 5 feet 8 inches tall casts a shadow of 8 feet. What is the height, in feet, of a pole that casts a shadow of 96 feet? (1 foot = 12 inches)

   (A) $4\frac{1}{2}$
   (B) 13
   (C) 39
   (D) 68

4. 

   A bar graph above shows the number of hamburgers sold by a fast food chain over 4 days. However, the information on the hamburgers sold on Thursday was lost. If exactly 25% of the chain's hamburgers were sold on Wednesday, how many hamburgers were sold on Thursday?

   (A) 40
   (B) 45
   (C) 50
   (D) 55

5. Find the value of x if $\frac{x}{12} - \frac{x+2}{4} < 0$.

   (A) $x < -3$
   (B) $x > -3$
   (C) $x < 3$
   (D) $x > 3$

6. Which of the following is TRUE about the line whose equation is $4x - 2y - 10 = 0$?

   (A) The x-intercept is 4 and the y-intercept is -2.
   (B) The x-intercept is $\frac{5}{2}$ and the y-intercept is 5.
   (C) The x-intercept is $\frac{5}{2}$ and the y-intercept is -5.
   (D) The x-intercept is 5 and the y-intercept is $\frac{5}{2}$.

4

7. A problem from the Rhind papyrus (1650 BCE) states: "A quantity and its $\frac{1}{2}$, its $\frac{2}{3}$, and its $\frac{1}{7}$, added together, becomes 388." What is this quantity?

(A) 42
(B) 84
(C) 126
(D) 168

8. The function f is defined by $f(x) = x^2 + ax + a$ where a is a constant. What is $f(5)$ in terms of a?

(A) $25 + a$
(B) $25 + 2a$
(C) $5 + a^2$
(D) $25 + 6a$

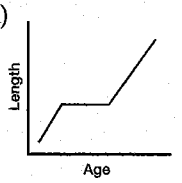
9. During 100 minutes of playing time, each of 5 teams plays each of the other 4 teams exactly once. Only 2 teams play at any given time. If the total playing time for each team is the same, what is the total number of minutes that each team plays?

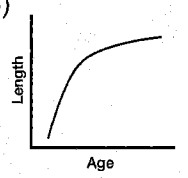
(A) 50
(B) 40
(C) 36
(D) 30

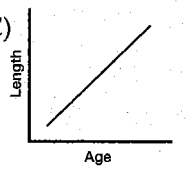
10.

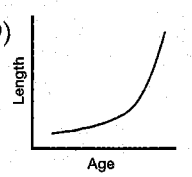
Age (in weeks)	2	3	4	5	6
Length (cm)	6	15	20	22	23

The measurements of a fish at different ages are given in the table above. Which of the following graphs could represent the information in the table?

(A)


(B)


(C)


(D)


11. Two classes were given a math test. The first class has 25 students and the average test score was 86%. The second class had 15 students and its average score was 94%. If the teacher combined the test scores of both classes, what is the average of both classes together?

(A) 88%
(B) 89%
(C) 90%
(D) 91%

12.

SALES OF WILDLIFE TOURS

Price of Tour	$5.00	$10.00	$20.00
Number of Purchased Tours	120,000	95,000	65,000

A wildlife company offered tours for three different prices during a single year. Based on the information above, how much more money did the company make when the price was $20.00 than when the price was $5.00?

(A) $35,000
(B) $70,000
(C) $350,000
(D) $700,000

13. Peter wants to purchase 2 dozen pencils and a pen. Those items cost $8.45, and he does not have enough money. Instead, he decides to purchase 8 fewer pencils and pays $6.05. How much does the pen cost?

(A) $0.33
(B) $1.15
(C) $1.25
(D) $1.65

14. A student is asked to add two numbers, A and B. However, the student accidentally subtracted B from A and got 4. This number differs from the correct answer by 12. Which of the following is A?

(A) 4
(B) 5
(C) 6
(D) 10

15. An electrician works for commission. He charges an average of $75 per job, and it takes him an average of 90 minutes to complete a job. If the electrician works 45 hours per week, what is the minimum commission rate, needed to make at least $950 per week?

(A) 22%
(B) 33%
(C) 42%
(D) 50%

Questions 16 – 18 refer to the following information.

Number of Poor in U.S, 1990 – 2010 (millions)

	Number of Poor				Total Population
	< 18	18 – 54	55 – 64	≥ 65	
1990	13.3	14.6	2.1	3.7	248.6
1995	14.4	16.5	2.2	3.3	263.7
2000	11.1	14.1	2.2	3.4	275.9
2005	12.3	18.0	2.7	3.6	293.1
2010	15.7	22.6	3.7	3.5	305.7

16. How many people in the United States were not poor in 2010?

(A) 22.6 million
(B) 48.5 million
(C) 260.2 million
(D) 305.7 million

17. Approximately what percentage of poor people in 1995 were 65 and older?

(A) 15%
(B) 9%
(C) 6%
(D) 1%

18. Which year represented in the table has the lowest poverty rate?

(A) 1995
(B) 2000
(C) 2005
(D) 2010

19. A tennis player needs to win 60% of her matches to qualify for a post-season tournament. She currently has 10 wins. If there are 30 matches in total, and the season is two-thirds over, what percentage of her remaining matches must she win in order to qualify for the post-season tournament?

(A) 15%
(B) 50%
(C) 80%
(D) 100%

20. What is the solution set of this system of equations?

$$y - x = 3$$
$$x^2 - 7y + 31 = 0$$

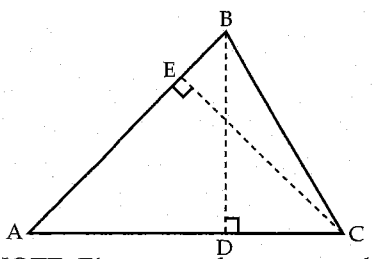
(A) {(2, 5), (5, 2)}
(B) {(2, 5), (5, 8)}
(C) {(5, 8), (8, 5)}
(D) {(8, 5), (8, 8)}

21. Which quadrants contain the solutions to this system of inequalities?

$$y - 2x \leq -3$$
$$3y + x \geq -4$$

(A) Quadrants I and IV
(B) Quadrants II and III
(C) Quadrants III and IV
(D) Quadrants II, III, and IV

22.



NOTE: Figure not drawn to scale

In ΔABC above, BD is the altitude to side AC and CE is the altitude to side AB. If BD = 7, AB = 8, and CE = 9, what is the length of AC?

(A) $5\frac{1}{7}$
(B) $6\frac{2}{9}$
(C) $7\frac{7}{8}$
(D) $10\frac{2}{7}$

23. Connor wants to attend the town carnival. The price of admission to the carnival is $4.50, and each ride costs an additional 79 cents. If he can spend at most $16.00, which of the following inequalities can be used to represent the number of rides he can go on, r, and what is the maximum value of r?

(A) $0.79 + 4.50\,r \leq 16.00$; 3 rides
(B) $0.79 + 4.50\,r \leq 16.00$; 4 rides
(C) $4.50 + 0.79\,r \leq 16.00$; 14 rides
(D) $4.50 + 0.79\,r \leq 16.00$; 15 rides

24. Some banks charge a fee on savings accounts that are left inactive for an extended period of time. The equation $y = 5000(0.98)^x$ represents the value, y, of one account that was left inactive for a period of x years. What is the y-intercept of this equation and what does it represent?

(A) 0.98; the percent of money in the account initially
(B) 0.98; the percent of money in the account after x years
(C) 5000; the amount of money in the account initially
(D) 5000; the amount of money in the account after x years

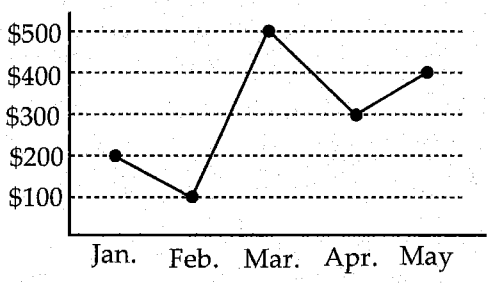
25. Pat can inspect a case of watches in 5 hours. James can inspect the same case of watches in 3 hours. After inspecting a case of watches alone for one hour, Pat stops for lunch. After lunch, Pat and James work together to inspect the remaining watches. How long do Pat and James work together after lunch to complete the job?

(A) 1 hour, 30 minutes
(B) 1 hour, 45 minutes
(C) 2 hours
(D) 2 hours, 15 minutes

26. Ansel throws a basketball whose path can be modeled by the equation $y = -4x^2 + 16x + 6$, where x represents time and y represents the height of the basketball. Which of the following is the maximum height of the ball?

(A) 18
(B) 20
(C) 22
(D) 24

27. Checking Account Activity for Peter



According to the chart, what was the difference in Peter's account from the beginning of the 5–month period to the end of the 5–month period?

(A) –$200
(B) –$100
(C) $200
(D) $300

28. Two companies produce equivalent e-readers at the same production cost. They sell the same number of units in each 6-month period at the current selling price of $100. The first company plans to reduce its selling price by 5% at the end of each 6-month period, and the second company plans to reduce its price by 11% after each year. What will be the difference in their prices five years from now?

(A) $4.03
(B) $6.07
(C) $21.53
(D) $30.13

29. An open box was formed from a square sheet of metal by cutting smaller squares with sides measuring 4 centimeters from each of the corners of the sheet and folding up the edges. The volume of the box was 576 cubic centimeters. What is the area, in square centimeters, of the original sheet?

(A) 80
(B) 144
(C) 256
(D) 400

30. If $\cos \frac{\pi}{3} = x - 1$, then $x =$

(A) $\frac{1}{2}$
(B) $\frac{3}{2}$
(C) $\frac{\pi}{3} + 1$
(D) x has two values.

31. If $f(x) = x^2 + 1$, then $f(f(4))$

ANSWER: _____

32. A cube has edges 3 units long. If P and Q are points on its surface, what is the maximum straight-line distance from P to Q?

ANSWER: _____

33. Line l passes through the origin and is parallel to the line $y = \frac{2}{3}x - 6$. If line l intersects the line $y = \frac{1}{2}x - 4$ at the point (x, y), what is the value of the product xy?

ANSWER: _____

34. If $2\sqrt{x} - \sqrt{2x+1} - 1 = 0$, then what is the value of x?

ANSWER: _____

35. The probability that it will snow tomorrow is 23%, and the probability that it will snow the day after tomorrow is 20%. These probabilities are independent of each other. What is the probability that it will snow tomorrow but not the day after tomorrow?

ANSWER: _____

36. Peter found a battery-powered drill for 25% off the original price. At the checkout counter, the clerk enters the sale price, adds a 5% sales tax, and then tells Peter he owes $189. What was the original (pre-sale) price of the drill, in dollars?

ANSWER: _____

Questions 37 and 38 refer to the following information below.

A shoe company produces batches of leather shoes and boots. Each batch is made from a starting material of 2000 square feet of leather. A pair of boots requires 10 square feet of leather to produce, and a pair of shoes requires 3 square feet.

37. **PART 1**
The company needs to produce a batch of exactly 500 pairs. How many pairs of boots are in this batch?

ANSWER: _____

38. **PART 2**
A consultant is brought in to assess the production process, and he suggest an adjustment based on market analysis. The demand for boots is on the rise, and a single pair can now be sold for $300, whereas a pair of shoes sells for $75. Assuming all other production costs are the same, how many pairs of boots should be produced in order to maximize profits?

ANSWER: _____

SAT Practice Test 6: Answers & Explanations

Math Test

No Calculator Portion

1.	C	7.	B	13.	D	19.	40												
2.	B	8.	B	14.	C	20.	2												
3.	A	9.	B	15.	C														
4.	D	10.	C	16.	1														
5.	A	11.	D	17.	1														
6.	C	12.	D	18.	5														

Calculator Portion

1.	B	7.	D	13.	C	19.	C	25.	A	31.	290	37.	71						
2.	D	8.	D	14.	D	20.	B	26.	C	32.	5.20	38.	160						
3.	D	9.	B	15.	C	21.	A	27.	C	33.	384								
4.	B	10.	B	16.	C	22.	D	28.	A	34.	4								
5.	B	11.	B	17.	B	23.	C	29.	D	35.	0.184								
6.	C	12.	D	18.	B	24.	C	30.	B	36.	240								

No Calculator Portion

1) ➡ C

$\frac{x}{2}-1\le 1-\frac{x}{2} \rightarrow \frac{x}{2}+\frac{x}{2}\le 1+1 \rightarrow x\le 2$

2) ➡ B

Cost of shipping to CA = x

Cost of shipping to NY = $\frac{x}{3}$

Total cost = $3x+8\left(\frac{x}{3}\right)=\frac{17x}{3}$

3) ➡ A

A value of $a < 0$ for a general quadratic function $f(x) = ax^2 + bx + c$ indicates that the graph of the function is a parabola that opens downward. NOTE: choices (C) and (D) are the discriminant; (C) indicates that the function has real number solutions, and (D) indicates that the function has no real number solutions.

4) ➡ D

Energy = $3L\times\frac{1000\,mL}{L}\times\frac{4\,J}{ml\cdot{}^{\circ}C}\times 8^{\circ}C$

$= (3)(1000)(4)(8)\,J$

$= 96{,}000\,J$

5) ➡ A

Let a, b, c, and d represent four consecutive integers. The next four integers can be represented as $a + 4$, $b + 4$, $c + 4$, and $d + 4$. If the sum

$a + b + c + d = x$,

then

$(a + 4) + (b + 4) + (c + 4) + (d + 4)$

$= (a + b + c + d) + 16 = x + 16$

6) ➡ C

Let x be the number of pizzas that Carol orders, and y be the number of pans of macaroni and cheese:

$30 \le 2x + 6y \le 60$

Because the ratio of one food to another cannot exceed 2 to 1, the most pizzas that Carol can order is: $\frac{x}{y} \le 2$, $y \ge \frac{x}{2}$

Substitute this relation into the inequality above:

$30 \le 2x + 6\left(\frac{x}{2}\right) \le 60$

$30 \le 5x \le 60$

$6 \le x \le 12$

7) ➡ B

Let a be the cost of one apple, and p be the cost of one pear. The costs of a small bag and large bag, respectively, are:

$3a + 2p = 1.85$

$7a + 5p = 4.45$

Multiply the equation for the small bag by factor $\frac{5}{2}$:

$\frac{5}{2}(3a + 2p) = (1.85)\frac{5}{2}$

$\frac{15a}{2} + 5p = 4.625$

Subtracting the equation for the large bag from this equation gives:

$\frac{1}{2}a = 0.175$

$a = 0.35$

To calculate the price of one pear:

$$p = \frac{4.45 - 7a}{5} = \frac{4.45 - 7(0.35)}{5} = 0.4$$

8) ➡ B

A population increase of 20% is equivalent to multiplying the current population by a factor of 1.2. As a function of the number of years, t, then, the population is: $P(t) = 10{,}000(1.2)^t$

9) ➡ B

$$\frac{5}{x+1} \geq 1$$

$5 \geq x + 1$

$x \leq 4$

$x + 1$ must be a positive number, so,

$x + 1 > 0$

$x > -1$

10) ➡ C

The participants of a poll must total 100%.

70% for A + 60% for B = 130%, so 30% of those polled must have voted for both. Thus, the numbers of people who chose each or both candidates are:

Candidate A only = 30%
Candidate B only = 40%
Candidate A and B = 30%

Let x be the total number of people that were polled:

$0.3x = 900$

$x = 3000$

11) ➡ D

The restrictions on the range of the function are:

1. The value of the function must be positive because it is a square root.
2. The value of the function must be less than or equal to 2 because the radicand $(4 - x^2)$ must be less than or equal to 4.

This implies that the range of the function is $0 \leq y \leq 2$.

12) ➡ D

Choice (D) is not a true statement, as a^3 will always be an odd number if a is an odd integer and an even number if a is an even integer. Choices (A), (B), and (C) are all necessary consequences of the fact that a is a positive integer.

13) ➡ D

Calculate the slope of the line: $m = \frac{-6-3}{-2-4} = \frac{3}{2}$

Because the slope is the same as that in (B), (B) is true and therefore incorrect. Because the slope above is the opposite reciprocal of that in (C), (C) is true and therefore incorrect.

Calculate the y-intercept using the point (–2, –6):

$y = \frac{3}{2}x + b$

$-6 = \frac{3}{2}(-2) + b$

$b = -3$

Choice (D) is not true, and is the correct answer.

To confirm that choice (A) is incorrect:

$y = \frac{3}{2}x - 3$

$0 = \frac{3}{2}x - 3$

$\frac{3}{2}x = 3$

$x = 2$

The x-intercept is $x = 2$, which is greater than the slope.

14) ➡ C

Since $f(f(x)) = 10$, from the table we determine that $f(x) = 3$. From the table, $f(7) = 3$. Therefore, $x = 7$.

15) ➡ C

Three laborers together complete one-third of the job in one hour. We represent the work done by each laborer in one hour as:

1st laborer (fastest) = $\frac{4}{x}$

2nd laborer = $\frac{2}{x}$

3rd laborer = $\frac{1}{x}$

The work done in one hour by three laborers together is:

$$\frac{4}{x}+\frac{2}{x}+\frac{1}{x}=\frac{1}{3}$$
$$\frac{7}{x}=\frac{1}{3}$$
$$x=21$$

The work done by the fastest laborer in one hour is $\frac{4}{21}$ of the job. To complete the entire job alone, it takes the fastest laborer:

$$\frac{4}{21}t=1$$
$$t=\frac{21}{4}=5\frac{1}{4}\ hours$$

16) ➡ 1

Represent the first number as x, and the second number as y:

Their sum is: $x+y=\frac{5}{2}$

This is equivalent to: $2x+2y=5$

The second relation is: $2x+3y=7$

Subtract the last two equations to give: $y=2$

Therefore,

$$x=\frac{1}{2}\ \rightarrow\ xy=1$$

17) ➡ 1

Rewrite the equation of the first line in slope-intercept form:

$$x+2y=7$$
$$2y=7-x$$
$$y=\frac{7}{2}-\frac{x}{2}$$

The slope of this line is $-\frac{1}{2}$, and the line perpendicular to this line will have slope $m=2$. Rewrite the second equation in slope-intercept form:

$$2x-ky=5$$
$$ky=2x-5$$
$$y=\frac{2}{k}x-\frac{5}{k}$$

For $m=2$ for this line, $k=1$.

18) ➡ 5

$$\cos C=\frac{adjacent\ side}{hypotenuse}$$
$$\cos C=\frac{1}{2}=\frac{d}{e}=\frac{d}{10}$$
$$d=5$$

19) ➡ 40

The solid is a rectangular prism with dimensions $5\ cm \times 4\ cm \times 2\ cm$.

$$Volume = 5\ cm \times 4\ cm \times 2\ cm = 40\ cm^3$$

20) ➡ 2

The length of $\overline{EB}$ is 1. The triangle ΔEBC has a base of 1 unit, a height of 2 units, and an area equal to $\frac{1}{2}\cdot 2\cdot 1=1$

The same is true of ΔCDF. The area of the shaded region is:

Area of CFAE
= Area of ABCD − (Area of ΔEBC + Area of ΔCDF)
$= 4-(1+1)=2$

Calculator Portion

1) ➡ B

The cost to produce CDs can be written as a linear function, with the y-intercept being cost of recording equipment and the slope being the cost per CD:

The cost per CD is \$0.59.

$$Cost = 250 + 0.59n$$

2) ➡ D

A, B, C, and D are considered satisfactory grades:

$$\frac{Number\ of\ satisfactory\ grades}{Total\ number\ of\ grades}$$
$$=\frac{3+5+4+3}{3+5+4+3+3}=\frac{15}{18}=\frac{5}{6}$$

3) ➡ D

At the same time of day, the ratio of the height of the man to the length of his shadow will be the same as the height of the pole to the length of its shadow. The ratio of the man's height to his shadow in inches is:

$$\frac{5\ feet\ 8\ inches}{8\ feet}=\frac{68\ inches}{96\ inches}$$

Conveniently, this is the same ratio we encounter

with the pole:

$$\frac{68\ inches}{96\ inches} = \frac{height\ of\ pole}{96\ feet}$$

$$height\ of\ pole = 68\ feet$$

4) ➡ B

Let the total number of burgers sold be x. On Wednesday, 45 burgers, or 25% of burgers were sold:

$0.25x = 45$

$x = 180$

The number of burgers sold on Thursday is:

Burgers sold on Thursday

= 180 – *(burgers sold on Monday, Tuesday, and Wednesday)*

$= 180 - (40 + 50 + 45) = 45$

5) ➡ B

$$\frac{x}{12} - \frac{x+2}{4} < 0$$

$$\frac{x-(3x+6)}{12} < 0$$

$$\frac{-2x-6}{12} < 0$$

The denominator is always positive, so,

$-2x - 6 < 0 \rightarrow -2x < 6 \rightarrow x > -3$

6) ➡ C

Convert the equation of the line to slope-intercept form:

$4x - 2y - 10 = 0 \rightarrow 2y = 4x - 10 \rightarrow y = 2x - 5$

Only choice (C) has the correct value for the y-intercept.

7) ➡ D

$$x + \frac{1}{2}x + \frac{2}{3}x + \frac{1}{7}x = 388$$

$$\frac{42x + 21x + 28x + 6x}{42} = 388$$

$$\frac{97x}{42} = 388$$

$x = 168$

8) ➡ D

$f(x) = x^2 + ax + a$

$f(5) = 5^2 + 5a + a = 25 + 6a$

9) ➡ B

If each of the five teams plays every other team once, there are ten matches total:

–Team A plays Teams B, C, D, and E : 4 matches

–Team B plays Teams C, D, and E : 3 matches

–Team C plays Teams D and E : 2 matches

–Team D plays Team E : 1 match

The time per match is:

$$Time\ per\ match = \frac{100\ minutes}{10\ matches} = 10\ minutes\ per\ match$$

As each team plays four matches, each team plays for 40 minutes.

10) ➡ B

As age increases, the growth per week decreases and length approaches a plateau.

11) ➡ B

Combined average

$$= \frac{Sum\ of\ scores\ in\ A + Sum\ of\ scores\ in\ B}{Total\ number\ of\ students}$$

$$= \frac{(25)(86) + (15)(94)}{40} = \frac{3,560}{40} = 89$$

12) ➡ D

$$\text{Revenue at \$20} = \left(\frac{\$20}{tour}\right)(65{,}000\ tours) = \$1{,}300{,}000$$

$$\text{Revenue at \$5} = \left(\frac{\$5}{tour}\right)(120{,}000\ tours) = \$600{,}000$$

The difference is \$700,000.

13) ➡ C

The cost of 8 pencils is the difference between the totals:

Cost of 8 pencils = 8.45 – 6.05 = 2.40

Cost of 1 pencil = 0.30

Let y be the cost of the pen:

$y = 6.05 - 16(0.30) = 1.25$

14) ➡ D

$A - B = 4$, $A + B = 16$

Adding these two equations g ives:

$2A = 20$

$A = 10$

15) ➡ C

The electrician works 45 hours at 90 minutes per job:

$$\frac{45\ hours}{1.5\frac{hours}{job}} = 30\ jobs$$

The minimum commission x is:

$(30)(75)x = 950$

$x = \frac{950}{2250} = 0.42$

16) ➡ C

In 2010:

Not poor = Total population − Number of poor

$= 305.7 - (15.7 + 22.6 + 3.7 + 3.5) = 260.2$ *million*

17) ➡ B

In 1995:

% of poor 65 and over:

$= \frac{\textit{Number of poor 65 and over}}{\textit{Total number of poor}} \times 100\%$

$= \frac{3.3}{14.4 + 16.5 + 2.2 + 3.3} \times 100\% = 9\%$

18) ➡ B

$\textit{Proportion poor} = \frac{\textit{Number of poor}}{\textit{Total population}}$

In 1995:

$\textit{Proportion poor} = \frac{14.4 + 16.5 + 2.2 + 3.3}{263.7} = 0.138$

In 2000:

$\textit{Proportion poor} = \frac{11.1 + 14.1 + 2.2 + 3.4}{275.9} = 0.112$

In 2005:

$\textit{Proportion poor} = \frac{12.3 + 18.0 + 2.7 + 3.7}{293.1} = 0.125$

In 2010:

$\textit{Proportion poor} = \frac{15.7 + 22.6 + 3.7 + 3.5}{305.7} = 0.149$

19) ➡ C

The total number of wins needed to qualify is:

Total wins needed = (0.6)(30 *games*) = 18 *wins*

The season is two-thirds over. The number of games that have been played is:

$\textit{Games played} = \left(\frac{2}{3}\right)(30) = 20$ *games*

With 10 games remaining, the player must win:

$\frac{8\ \textit{wins}}{10\ \textit{games}} \times 100\% = 80\%$

20) ➡ B

Write the first equation in terms of x:

$y - x = 3$

$y = x + 3$

Substitute this equation into the quadratic:

$x^2 - 7(3 + x) + 31 = 0$

$x^2 - 21 - 7x + 31 = 0$

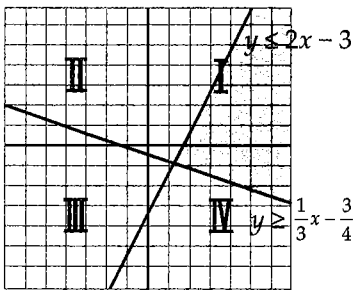
$x^2 - 7x + 10 = 0$

$(x - 5)(x - 2) = 0 \rightarrow x = 5, 2$

When $x = 5$, $y = 3 + 5 = 8$, and when $x = 2$, $y = 5$

21) ➡ A

Write the inequalities in slope-intercept form and sketch them on a coordinate plane:



22) ➡ D

Area of $\Delta ABC = \frac{1}{2} \times base \times height$

$\frac{1}{2}(AC)(BD) = \frac{1}{2}(AB)(CE)$

$(AC)(7) = (8)(9)$

$AC = \frac{72}{7} = 10\frac{2}{7}$

23) ➡ C

The number of rides Connor can ride can be modeled as a linear inequality, with constant 4.50 (the price of admission), slope 0.79 (the price per ride), and y the maximum amount that can be spent:

$4.50 + 0.79r \le y$

$4.50 + 0.79r \le 16$

To find the maximum value for r, solve the inequality:

$4.50 + 0.79r \le 16$

$0.79r \le 11.5$

$r \le 14.6$

The maximum number of rides is 14.

24) ➡ C

The y-intercept is the value of the function when $x = 0$:

$y = (5000)\ (0.98)^0 = 5000$

This is the amount in the account before any time has passed.

25) ⟹ A

Pat can inspect $\frac{1}{5}$ of a case in one hour, and James can inspect $\frac{1}{3}$ of a case in one hour. After Pat works alone for one hour, there is $\frac{4}{5}$ of the case remaining. If x is the number of hours it takes Pat and James, working together, to inspect the remaining portion of the case:

$$x\left(\frac{1}{5}+\frac{1}{3}\right)=\frac{4}{5}$$

$$x\left(\frac{8}{15}\right)=\frac{4}{5}$$

$$x=\frac{3}{2} \text{ or } 1.5 \text{ hours}$$

26) ⟹ C

Convert the quadratic equation to vertex form:

$y = -4x^2 + 16x + 6$

$y = -4x^2 + 16x - 16 + 6 + 16$

$y = -4(x^2 - 4x + 4) + 22$

$y = -4(x - 2)^2 + 22$

The vertex is (2, 22). The maximum value for y is 22.

27) ⟹ C

In January, Peter has \$200 in his account. In May, he has \$400, a positive change of \$200.

28) ⟹ A

For the first company:

Price = $100(0.95)^t$,

where t is the number of 6-month periods in 5 years.

For 5 years, t =10:

Price after 5 years = $100(0.95)^{10} = 100(.5987) = 59.87$

For the second company:

Price = $100(0.89)^t$,

Where t is the number of years.

For $t = 5$:

Price = $100(0.89)^5 = 100(.5584) = 55.84$

The difference is:

Price difference = 59.87 – 55.84 = 4.03

29) ⟹ D

Let x be the length of the sides of the original square sheet. The volume of the box is the product of the length, height, and width:

Volume = $4(x - 8)(x - 8)$

$576 = 4(x - 8)^2$

$144 = (x - 8)^2 \rightarrow x - 8 = \pm 12 \rightarrow x = 20, -4$

The length of the sides is 20 centimeters.

Area = (20cm)(20cm) = 400 cm^2

30) ⟹ B

$$\cos\frac{\pi}{3}=\frac{1}{2}$$

$$x-1=\frac{1}{2}$$

$$x=\frac{3}{2}$$

31) ⟹ 290

$f(x) = x^2 + 1$

$f(4) = 4^2 + 1 = 17$

$f(f(4)) = f(17) = 17^2 + 1 = 290$

32) ⟹ 5.20

$\overline{PQ}$ is longest when it is the hypotenuse of a triangle with one leg the diagonal of the face of the cube and the other leg an adjacent edge. The length of the diagonal d is: $d^2 = 3^2 + 3^2 = 18$

The length of $\overline{PQ}$ is:

$\overline{PQ}^2 = d^2 + 3^2$

$\overline{PQ}^2 = 18 + 9$

$\overline{PQ}^2 = 27$

$\overline{PQ} = \sqrt{27} \approx 5.20$

33) ⟹ 384

The slope of line l is $\frac{2}{3}$ and the y-intercept is 0 because the line passes through the origin. The equation for line l is:

$$y=\frac{2}{3}x$$

Line l intersects the line $y=\frac{1}{2}x-4$ when:

$$\frac{2}{3}x=\frac{1}{2}x-4$$

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

$$x=-24$$

$$y=\frac{2}{3}(-24)=-16$$

Therefore, $xy = 384$

34) ⟹ 4

This question can be answered quickly by inspection and substituting small square numbers. We can also determine the answer by manipulation:

$$2\sqrt{x}-\sqrt{2x+1}-1=0$$
$$2\sqrt{x}-1=\sqrt{2x+1}$$

Square both sides:

$$4x-4\sqrt{x}+1=2x+1$$
$$2x-4\sqrt{x}=0$$
$$2(x-2\sqrt{x})=0$$

Therefore,

$$x-2\sqrt{x}=0$$
$$x=2\sqrt{x}$$
$$x^2=4x \rightarrow x=4$$

35) ⟹ 0.184

Let $P(A)$ be the probability that it snows tomorrow:

$$P(A)=0.23$$

Let $P(B)$ be the probability that it snows the day after tomorrow. Then the probability that it will not snow the day after tomorrow is:

$$P(\text{not } B)=1-P(B)=1-0.2=0.8$$

Therefore,

$$P(A)\cdot P(\text{not } B)=(0.23)(0.8)=0.184$$

36) ⟹ 240

Let x be the pre–sale price:

$$[(0.75)x]1.05=189$$
$$x=\frac{189}{(0.75)(1.05)}$$
$$x=240$$

37) ⟹ 71

Let x be the number of pairs of boots and y be the number of pairs of shoes:

$$x+y=500$$
$$10x+3y=2000$$

Substitute the first equation into the second:

$$10x+3(500-x)=2000$$
$$7x=500$$
$$x=71.4$$

To determine precisely how many pairs of boots can be made, 71 or 72, test these numbers in the original equations:

$x=71$, $y=429$

$$10x+3y=10(71)+3(429)=1997$$

If $x=72$, $y=428$

$$10x+3y=10(72)+3(428)=2004$$

The number of pairs of boots is 71.

38) ⟹ 160

Boots are sold for \$300 per pair, and require 10 square feet per pair. The returns per pair are:

$$\text{Return per pair of boots}=\frac{\$30}{feet^2}$$

Shoes are sold for \$75 per pair, and require 3 square feet per pair. The returns per pair are:

$$\text{Return per pair of boots}=\frac{\$25}{feet^2}$$

Boots and shoes should be produced according to the ratio:

$$\frac{x}{y}=\frac{6}{5}$$

Substitute this equation into the following equation to determine the number of pairs of boots:

$$10x+3y=2000$$
$$10x+3\left(\frac{5}{6}x\right)=2000$$
$$12.5x=2000$$
$$x=160$$