



# Math Test – No Calculator

25 MINUTES, 20 QUESTIONS

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

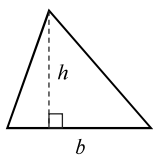
## DIRECTIONS

Questions **1-15** ask you to solve a problem, select the best answer among four choices, and fill in the corresponding circle on your answer sheet. Questions **16-20** ask you to solve a problem and enter your answer in a grid provided on your answer sheet. There are detailed instructions on entering answers into the grid before question 16. You may use your test booklet for scratch work.

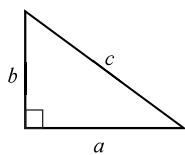
## NOTES

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3. Figures are drawn to scale unless stated otherwise.
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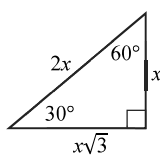
## REFERENCE



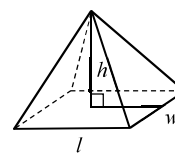
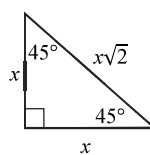
$$A = \frac{1}{2}bh$$



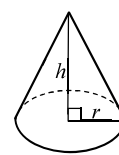
$$a^2 + b^2 = c^2$$



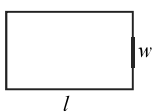
Special Triangles



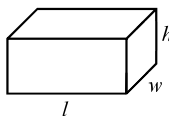
$$V = \frac{1}{3}lwh$$



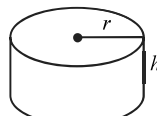
$$V = \frac{1}{3}\pi r^2 h$$



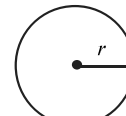
$$A = lw$$



$$V = lwh$$

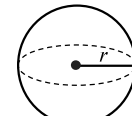


$$V = \pi r^2 h$$



$$A = \pi r^2$$

$$C = 2\pi r$$



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

There are  $360^\circ$  in a circle.

The sum of the angles in a triangle is  $180^\circ$ .

The number of radians of arc in a circle is  $2\pi$ .

CONTINUE

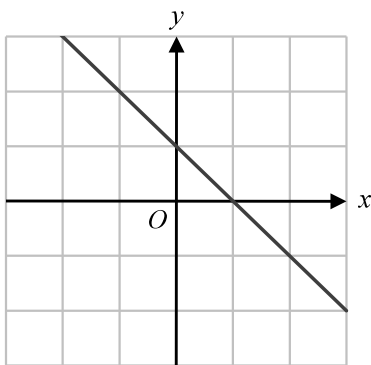


1

If  $p = 5.5$ , what is the value of  $|p| - |1 - p|$ ?

- A) 1.5
- B) 1
- C) 5.5
- D) 9.5

2



Which of the following equations best describes the function in the figure above?

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

3

If  $(3x + 2)(5x + 1) = ax^2 + bx + 2$ , what is the value of  $a - b$ ?

- A) 2
- B) 8
- C) 22
- D) 28

4

Leo is manufacturing 1 meter rulers. If the ruler differs from the expected length by more than 1 mm, he needs to throw it away. If  $x$  is the length of the ruler in meters, what absolute value inequality represents the rulers that Leo does NOT throw away?

- A)  $|x - 1| \leq 0.01$
- B)  $|x - 1| \leq 0.001$
- C)  $|x - 1| \geq 0.01$
- D)  $|x - 1| \geq 0.001$

5

If  $x^2 = 0.1$ , what is the value of  $x^{-4}$ ?

- A) 1
- B) 10
- C) 100
- D) 1000

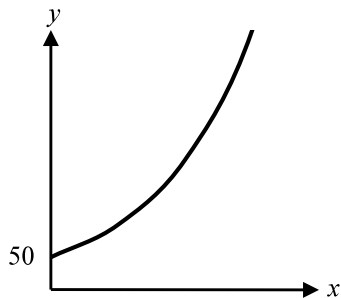


6

If  $4n(n + 8) = 36$ , what is the product of the two solutions to this equation?

- A)  $-12$
- B)  $-9$
- C)  $0$
- D)  $9$

7



Every year, the population of Dwarf lop rabbits doubles in a certain country, as shown in the graph above. If there were 50 Dwarf lop rabbits last year, how many Dwarf lop rabbits will there be 4 years from now?

- A) 200
- B) 250
- C) 800
- D) 1600

8

Which of the following represents the solution set to the inequality  $2x + 1 \geq 9$ ?

- A)
- B)
- C)
- D)

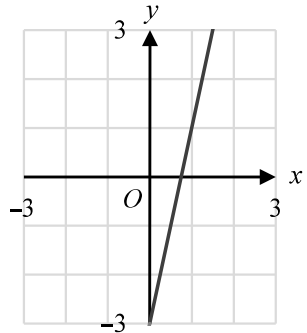
9

$f(x) = 2x - 1$ , and  $g(x)$  is a linear function that is perpendicular to  $f(x)$ . If  $(0, 4)$  is a point of  $g(x)$ , at what point do  $f(x)$  and  $g(x)$  intersect?

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



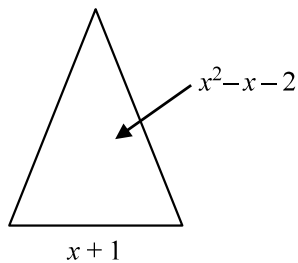
10



The graph shown above represents  $f(x) = 4x - 3$ . If  $f(a + 4) = 5$ , what is the value of  $a$ ?

- A) -2
- B) -1
- C) 1
- D) 4

11



The triangle above has an area of  $x^2 - x - 2$  and a base of  $x + 1$ . What is the height of the triangle?

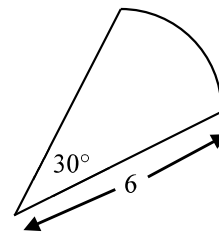
- A)  $\frac{1}{2}(x - 2)$
- B)  $x - 2$
- C)  $2(x - 2)$
- D)  $(x - 2)(x + 1)^2$

12

Which of the following is equal to  $6x^2 - 11x - 7$ ?

- A)  $(6x - 1)(x + 7)$
- B)  $(6x + 1)(x - 7)$
- C)  $(2x - 1)(3x + 7)$
- D)  $(2x + 1)(3x - 7)$

13



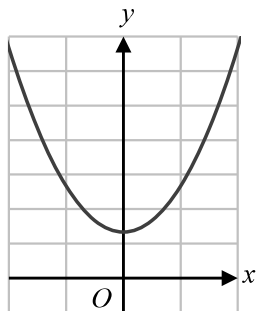
Note: figure is not drawn to scale.

What is the arc length of the figure above?

- A) 180
- B) 90
- C)  $\pi$
- D)  $2\pi$



14



Which of the following equations could represent an expression for the function in the figure above?

- A)  $f(x) = x^2 + 4$
- B)  $f(x) = x^2 - 4$
- C)  $f(x) = (x - 4)^2$
- D)  $f(x) = (x + 4)^2$

15

Which of the following expressions is equivalent

to  $\frac{15x^2 - 27x - 6}{x - 2}$  ?

- A)  $(5x + 1)$
- B)  $3(5x + 1)$
- C)  $15x^2 - 28x - 4$
- D)  $15x - 35$



16

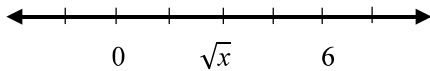
What is a value of  $y$  that satisfies the inequality  $|y - 5| \leq 1$ ?

19

$$\frac{n^2 + 1}{-2n + 8} = -13$$

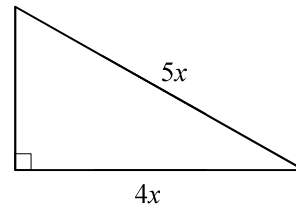
What is a value of  $n$  that satisfies the equation above?

17



What is the value of  $x$  in the number line above?

20



If the perimeter of the above triangle is 72, what is the value of  $x$ ?

18

A psychological research study at a local university pays participants \$15 if they are students and \$10 if they are non-students. If the research study pays 10 participants a total cost of \$120, how many of the participants were students?

# STOP

**If you complete this section before the end of your allotted time, check your work on this section only. Do NOT use the time to work on another section.**



# Math Test – Calculator

55 MINUTES, 38 QUESTIONS

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

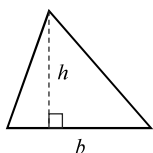
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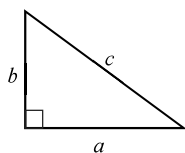
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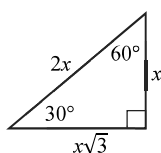
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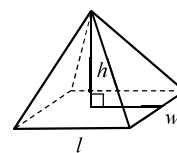
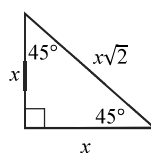
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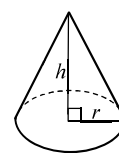
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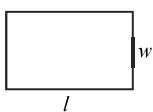
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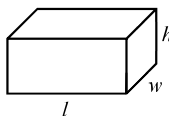
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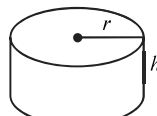
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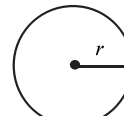
$$A = lw$$



$$V = lwh$$

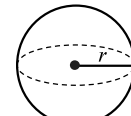


$$V = \pi r^2 h$$



$$A = \pi r^2$$

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

There are  $360^\circ$  in a circle.

The sum of the angles in a triangle is  $180^\circ$ .

The number of radians of arc in a circle is  $2\pi$ .

CONTINUE



1

If  $f(x) = 2x + 1$  and  $g(x) = 4x - 4$ , what is  $f(0) \times g(0)$ ?

- A)  $-5$
- B)  $-4$
- C)  $4$
- D)  $8$

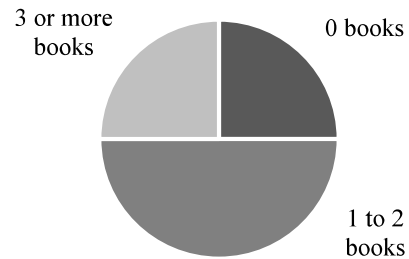
2

If  $y:z$  is equal to  $1:3$ , and  $z:a$  is equal to  $2:3$ , what ratio is equal to  $y:a$ ?

- A)  $2:9$
- B)  $1:3$
- C)  $1:2$
- D)  $2:3$

3

Books Read Per Month



A group of people are surveyed about the number of books they read each month, and the results are graphed above. If the sample accurately represents the 420,000 people in the city of Omaha, how many people in Omaha can we expect to read 3 or more books per month?

- A) 84,000
- B) 105,000
- C) 189,000
- D) 218,000

4

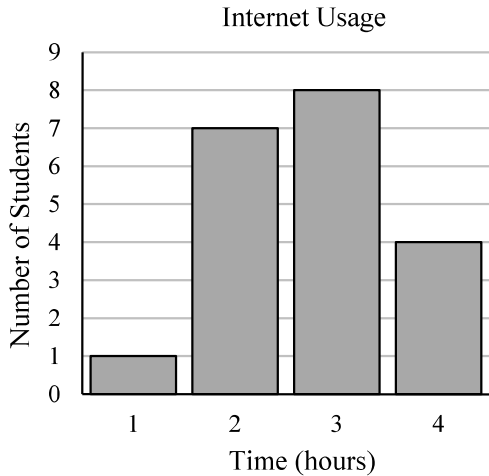
A printer can print at a rate of 5 pages per minute. How many hours will it take to print 300 pages?

- A) 0.5
- B) 1
- C) 1.5
- D) 3





5



Administrators at Washington High School have noticed that students are downloading and watching movies while in class. They want to determine whether it is only a few kids who are using the internet for long periods of time at school. The above graph is the result of an anonymous student survey, representing the number of hours spent on the internet per day by students at Washington High School. Which of the following statements is INCORRECT?

- A) The mode of this data set is 3 hours.
- B) The range of this data set is 3 hours.
- C) 60% of the students surveyed use the internet 3 or 4 hours per day.
- D) The median is smaller than the mean for this set of data.

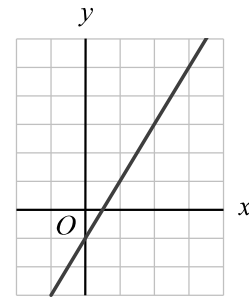
6

$$\sqrt{x+1} = 6$$

Which of the following is a value of  $x$  for the equation above?

- A) 6
- B) 34
- C) 35
- D) 36

7



Which of the following equations could represent the linear equation above?

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



8

If  $f(x)$  is a linear function that passes through the points  $(4, 3)$  and  $(-4, -9)$ , what is the  $y$ -intercept of  $f(x)$ ?

- A)  $(0, 2)$
- B)  $(2, 0)$
- C)  $(0, -3)$
- D)  $(-3, 0)$

9

Which of the following equations represents the function  $f(x) = 2x - 1$  shifted 2 units to the left on the  $xy$ -plane?

- A)  $g(x) = 2x - 5$
- B)  $g - 3x = 2x$
- C)  $g(x) = 2x + 1$
- D)  $g(x) = 2x + 3$

10

What is the average of  $2x + 4$ ,  $5x - 1$ , and  $-x + 3$ ?

- A)  $x + 2$
- B)  $x - 2$
- C)  $2x + 2$
- D)  $2x - 2$

11

University Students' Sleep Habits		
Hours of Sleep	University A	University B
Average	6	8
Median	4	7
Mode	5	7
Standard Deviation	3	1

A random sample of students in two different universities were surveyed for their sleep habits. The results are shown in the table above. Which of the following statements is supported by the information in this table?

- A) The hours of sleep per night varies more among students at University A than students at University B.
- B) More students attend University B than University A.
- C) More than half of the students at University B get 7 hours of sleep per night.
- D) Half of the students at University A get 6 hours of sleep per night.

12

Logan bought 36 pieces of bubble gum, which was 40% of the store's stock. How much bubble gum is remaining in the store?

- A) 54
- B) 72
- C) 80
- D) 90



13

Year	Number of Colonies
1992	41,402
1993	43,783
1994	46,164
1995	48,545

The table above shows the number of fire ant colonies found in Greenville from 1992 to 1995. Which of the following graphs best represents the number of fire ant colonies in Greenville?

- A)
- B)
- C)
- D)

14

For the inequality  $2x + y > 15$ , when  $x = 3$ , which of the following CANNOT be a possible value of  $y$ ?

- A) 9  
B) 10  
C) 11  
D) 12

15

The sum of the digits in a two digit number is 8. If 18 is subtracted from this number, the numbers' digits are reversed. Which of the following could be the original number?

- A) 32  
B) 53  
C) 62  
D) 71

16

If  $x^2 + ax + b = (x - 9)(x + 9)$ , what is the value of  $ab$ ?

- A) -81  
B) 0  
C) 81  
D) 1458



17

$$\frac{2}{x} + \frac{3}{y} + \frac{5}{xy} = \frac{A}{xy}$$

What is the expression for  $A$ ?

- A)  $2x + 3y + 5xy$
- B)  $2y + 3x + 5$
- C)  $2x + 2y + 5$
- D)  $10xy$

18

A company polls a group of 1,067 people randomly selected to represent New York City. The company determines that 10% of the sample group does not like cheese, while the remaining 90% does like cheese. The poll is true with a 3% margin of error 19 times out of 20. If there are 8.5 million people in New York City, what is the best estimate for the number who do not like cheese?

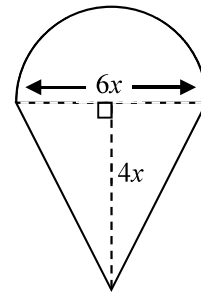
- A) 850,000 people
- B) Between 425,000 and 1,275,000 people
- C) Between 595,000 and 1,105,000 people
- D) Between 722,500 and 977,500 people

19

$f(2) = 3$  and  $f(-6) = -13$ . If  $f(x)$  is a linear function, what is the  $y$ -intercept of  $f(x)$ ?

- A)  $-1$
- B)  $0$
- C)  $1$
- D)  $2$

20



What is the perimeter of the figure outlined by the solid line, in terms of  $x$ ?

- A)  $5x + 3\pi x$
- B)  $5x + 6\pi x$
- C)  $10x + 3\pi x$
- D)  $10x + 6\pi x$

CONTINUE



21

If  $5^{x+4} = 25^{x+3}$ , what is the value of  $x$ ?

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

22

Sam can run 4 miles in 48 minutes. If Ahn can run twice as fast as Sam, how many minutes does it take Ahn to run 6 miles?

- A) 24
- B) 30
- C) 36
- D) 48

23

Drink Sales for July		
Drink Flavor	16 oz.	24 oz.
Vanilla	1525	3200
Mocha	$m$	175
Espresso	$s$	4500
Total	3000	7875

A beverage company offers three different flavors of energy drinks. Each flavor is also offered in two different sizes. The table above shows the number of cans sold in each category during the month of July. If 16 oz. cans represented 20% of the total Espresso cans sold, how many 16 oz. cans of Mocha,  $m$ , did the company sell?

- A) 1125
- B) 575
- C) 465
- D) 350

24

If  $(x + 2)^2 = 4$ , what is a solution for  $x$ ?

- A) -4
- B) -2
- C) 2
- D) 8

CONTINUE



**Questions 25 and 26 refer to the following information.**

Scientists study a group of large dogs, allocating each of them 1600 calories per day.  $\frac{1}{2}$  of these calories come from carbohydrates, and  $\frac{1}{4}$  of these calories come from fats.

25

How many more carbohydrate calories than fat calories is each dog allocated per day?

- A) 150
- B) 250
- C) 400
- D) 800

26

When the dogs are active, the scientists increase the dogs' daily caloric intake by 25%. Of these calories, 1,000 are from carbohydrates. What percentage of the remaining calories come from other, non-carbohydrate sources?

- A) 25
- B) 50
- C) 60
- D) 75

27

$$\begin{aligned} 5x + 3y &= 3c \\ 2y &= c - 4x \end{aligned}$$

If  $x + y = 6$ , what is the value of  $c$  for the system of equations above?

- A) 2
- B) 3
- C) 4
- D) 5

28

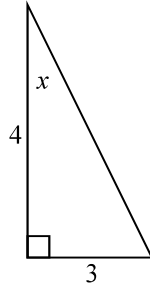
Hours of Exercise Per Week		
	Number of Students	
Hours Per Week	Class A	Class B
0	0	3
1	4	0
2	2	5
3	4	1

The table above shows the number of hours spent exercising per week by students in Class A and Class B. Which statement best describes the relationship of the median and mean of the hours of weekly exercise between the two classes?

- A) Class A has a higher median than Class B and Class B has a higher mean than Class A.
- B) Class B has a higher median than Class A and Class B has a higher mean than Class A.
- C) Class A and B have the same median, and Class B has a lower mean than Class A.
- D) Class A and B have the same median, and Class A has a lower mean than Class B.



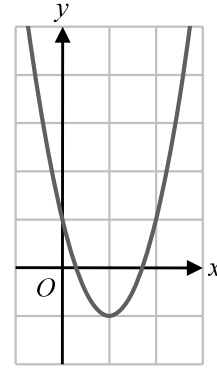
29



In the figure above, what is the value of  $\sin(x)$ ?

- A)  $\frac{3}{5}$
- B)  $\frac{3}{4}$
- C)  $\frac{4}{5}$
- D)  $\frac{5}{3}$

30



The function  $f(x) = ax^2 + bx + c$  is graphed above. Which of the following must be positive?

- A)  $ab$
- B)  $b - a$
- C)  $-c$
- D)  $ac$



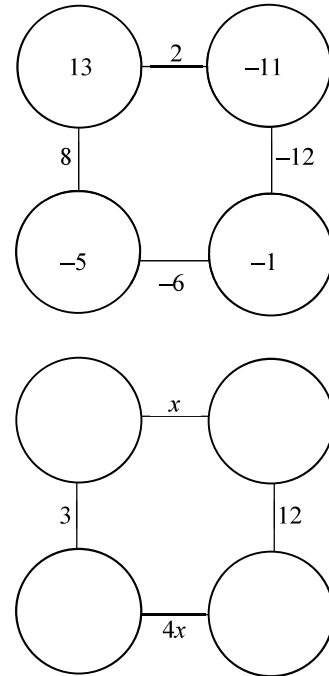
31

Linda works 6 hours a day on Monday and Wednesday, 8 hours a day on Thursday and Friday, and 5 hours on Sunday. If she is paid \$495 at the end of the week, what is Linda's hourly wage?

32

If the ratio of  $A$  to  $B$  is 2:3 and the ratio of  $A$  to  $C$  is 5:6, what is  $\frac{B}{C}$ ?

33



The figure above is an example of a completed bubble square. The numbers next to the line connecting the two adjacent circles is the sum of the numbers inside each of the two circles. What is the value of  $x$ ?

CONTINUE





34

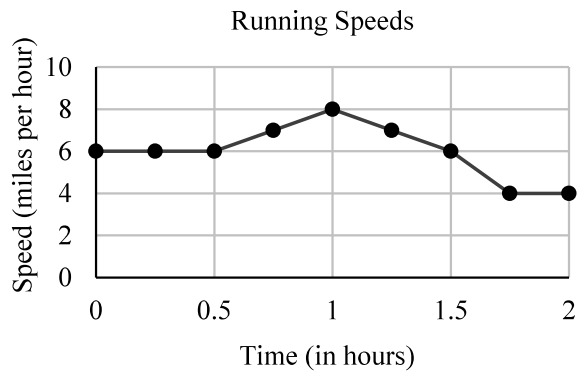
$$\frac{5}{x^2 + 6x + 8} = \frac{A}{x + 2} + \frac{B}{x + 4}$$

In the above equation, what is the value of  $A + B$ ?

36

If a sector of a circle with an angle of  $60^\circ$  has an area of  $24\pi$ , what radius of the circle?

35



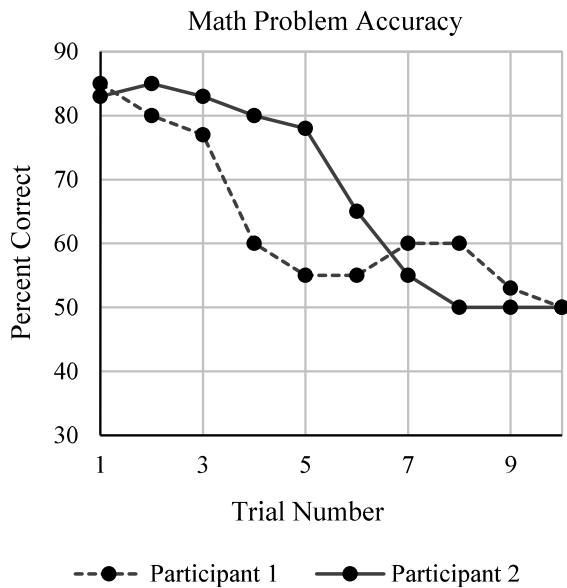
The graph above shows Rebecca's running speeds during a 2 hour run. What is the total distance, in miles, that Rebecca ran during the first hour of her run?

CONTINUE



**Questions 37 and 38 refer to the following information.**

In a psychology experiment, participants are asked to solve simple math problems presented on a computer screen. The data is analyzed by calculating what percentage of the questions that the participant answers correctly during one trial. The trials are presented back to back with no breaks in between. The results are shown below.



37

The duration of the experiment is 50 minutes and consists of 10 trials each lasting 5 minutes. If a new math problem is presented every 6 seconds, how many math problems are presented during one trial?

38

Trials 6 through 8 focus on spatial reasoning problems in math. The lab wants to determine whether the average accuracy is greater for Participant 1 or for Participant 2 during these trials. The percent of math problems correct for both participants during trials 6 through 8 is always divisible by 5. What is the difference between the average number of problems correct for Participant 1 and Participant 2 during trials 6 through 8? (Round your answer to the nearest integer.)

# STOP

**If you complete this section before the end of your allotted time, check your work on this section only. Do NOT use the time to work on another section.**