SECTION 2
Time – 25 minutes
**20 Questions**

| Turn to Section 2 of your answer sheet to answer the questions in this section. |
| --- |

Notes

1. Choose the best answer choice of those provided. Be sure to fill in the corresponding circle on your answer sheet.
2. You may NOT use a calculator on this section.
3. If a problem includes a figure and does not state that the figure is NOT to scale, you may assume the figure provides a correct representation of the information in the problem.
4. The domain of any function f is the set of all real numbers x for which $f(x)$ is a real number, unless otherwise stated.
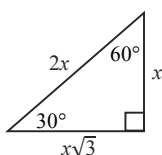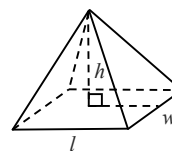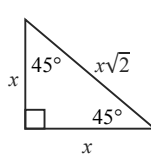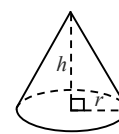
Reference
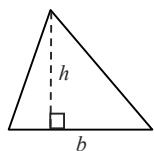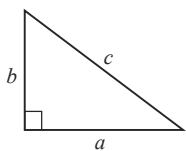
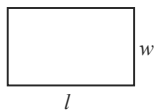$A = \frac{1}{2}bh$ $a^2 + b^2 = c^2$ Special Triangles $V = \frac{1}{3}lwh$ $V = \frac{1}{3}\pi r^2 h$
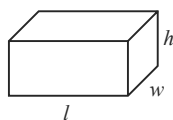
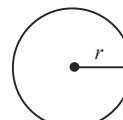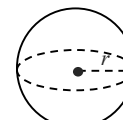$A = lw$ $V = lwh$ $V = \pi r^2 h$ $A = \pi r^2$ $V = \frac{4}{3}\pi r^3$
                                                                $C = 2\pi r$

There are 360° in a circle.
The sum of the angles in a triangle is 180°.
The number of radians of arc in a circle is 2π.

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

(A) 1.5
(B) 1
(C) 5.5
(D) 9.5
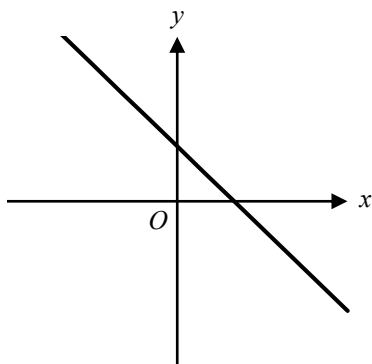
2. Which of the following equations best describes the function in the figure above?

(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

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6. If $4n(n + 8) = 36$, what is the product of the two solutions to this equation?
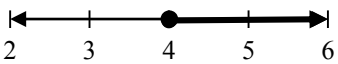
(A) -12
(B) -9
(C) 0
(D) 9
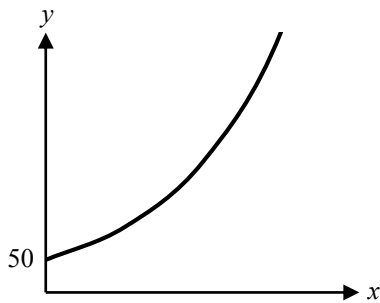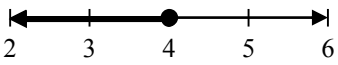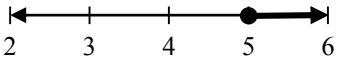
7. Every year, the population of Dwarf lop rabbits doubles in a certain country, as shown in the graph above. If there were 50 Dwarf lop rabbits last year, how many Dwarf lop rabbits will there be 4 years from now?
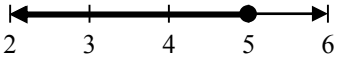
(A) 200
(B) 250
(C) 800
(D) 1600

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) $(3, 2)$

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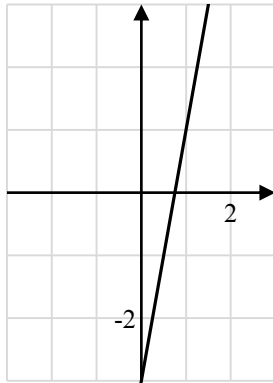
10. The graph shown above represents $f(x) = 4x - 3$. If $f(a + 4) = 5$, what is the value of a?

(A) -2
(B) -1
(C) 1
(D) 4
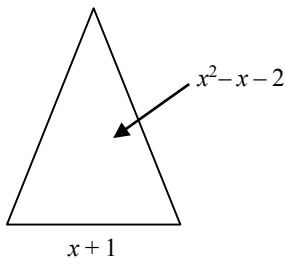
11. The triangle above has an area of $x^2 - x - 2$ and a base of $x + 1$. What is the height of the triangle?

(A) $\dfrac{1}{2}(x - 2)$

(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) $(2x + 1)(3x - 7)$
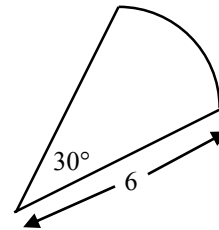
13. What is the arc length of the figure above?

(A) 180
(B) 90
(C) π
(D) 2π

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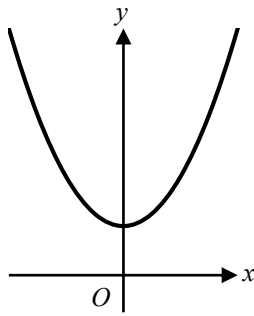
14. Which of the following equations could represent an expression for the function in the figure above?

(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 $\dfrac{15x^2 - 27x - 6}{x - 2}$?

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

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Directions: For questions 16-20, fill out your answers using the grids in Section 2 of your answer sheet.

You will need to enter your answers for the following questions in the grids provided in your answer sheet.

- Make sure to fill in bubbles completely.
- Mark no more than one circle in any column.
- Answers written in the boxes above the grid are *not* scored.
- You can write your answer into those boxes as a guide when you bubble in your answers, however, remember that you always need to bubble your answers as well!

Placement:

You can start your answer in any column as long as you can fit in the whole answer.

Reminders:

- Some grid-in problems have more than one correct answer. In those cases, you may grid in any of the possible answers as long as it fits in the grid.
- If you get a decimal answer with more digits than can fit in the grid, round your answer but make sure that it fills the entire grid.

Mixed Numbers:

There is no negative sign in the grid, so all answers will be positive numbers or zero. You can grid proper and improper fractions, but *not* mixed numbers. For example, the mixed number $3\frac{1}{4}$ must be written as 13/4 or 3.25. If you grid the answer as the mixed number 31/4, the machine will read it as $\frac{31}{4}$, which is incorrect.

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

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

19. What value of n satisfies the equation above?
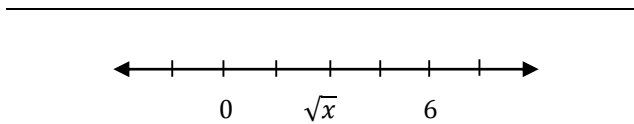
17. What is the value of x in the number line above?
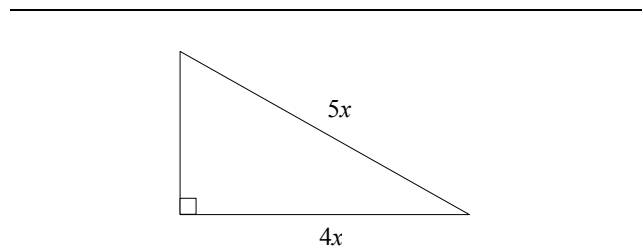
20. If the perimeter of the above triangle is 72, what is the value of x?

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 the problem set before time elapses, you may review your responses for this section.

Do not view or begin working on any other sections.

SECTION 4
Time – 55 minutes
38 Questions

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

Notes

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Reference
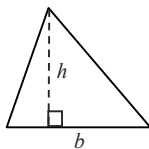
$A = \frac{1}{2}bh$
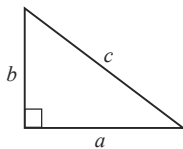
$a^2 + b^2 = c^2$
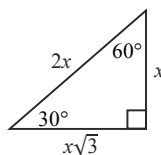
Special Triangles
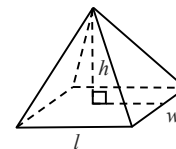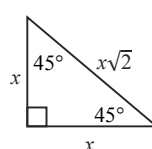
$V = \frac{1}{3}lwh$
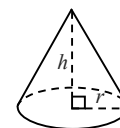
$V = \frac{1}{3}\pi r^2 h$
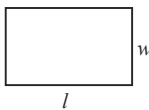
$A = lw$
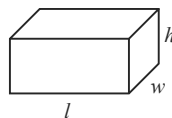
$V = lwh$
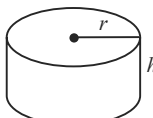
$V = \pi r^2 h$
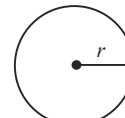
$A = \pi r^2$
$C = 2\pi r$
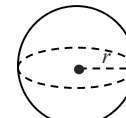
$V = \frac{4}{3}\pi r^3$

There are 360° in a circle.
The sum of the angles in a triangle is 180°.
The number of radians of arc in a circle is 2π.

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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

(E)
(F)
(G)
(H)

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

2 : 9
1 : 3
1 : 2
2 : 3

(A)
(B)
(C)
(D)

Books Read Per Month

3 or more books   0 books

1 to 2 books
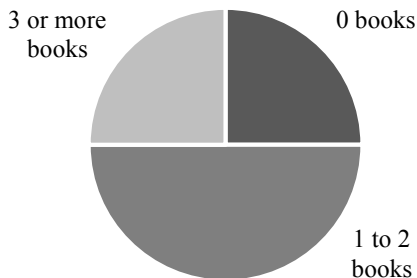
3. A group of people are surveyed about the number of books they read each month, and the results are graphed above. If the sample accurately represents the 420,000 people in the city of Omaha, how many people in Omaha can we expect to read 3 or more books per month?

(A)
(B)
(C)
(D)

84,000
105,000
189,000
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?

0.5
1
1.5
3

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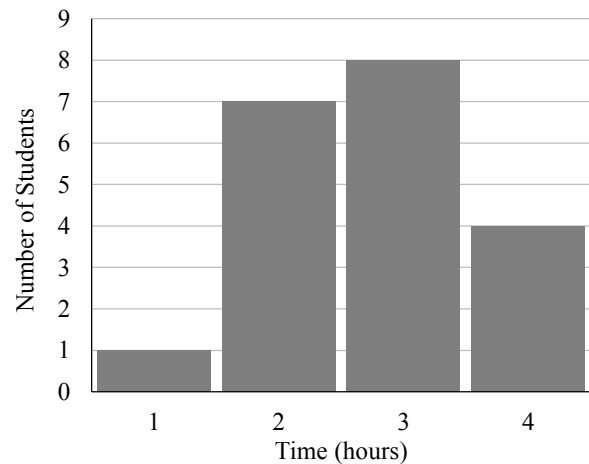
5. Administrators at Washington High School have noticed that students are downloading and watching movies while in class. They want to determine whether it is only a few kids who are using the internet for long periods of time at school. The above graph is the result of an anonymous student survey,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

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

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

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

6
34
35
36

(I)
(J)
(K)
(L)

(M)
(N)
(O)
(P)

y

O

x

(A)
(B)
(C)
(D)
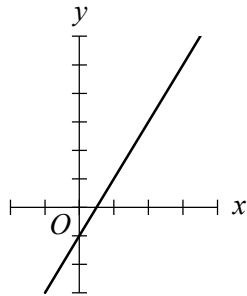
(A)
(B)
(C)
(D)

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

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

(Q)
(R)
(S)
(T)

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

$(0, 2)$
$(2, 0)$
$(0, -3)$
$(-3, 0)$

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

$g(x) = 2x - 5$
$g - 3x = 2x$
$g(x) = 2x + 1$
$g(x) = 2x + 3$

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

$x + 2$
$x - 2$
$2x + 2$
$2x - 2$

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

11. 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?

(U) 54
(V) 72
(W) 80
(X) 90

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

13. 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)
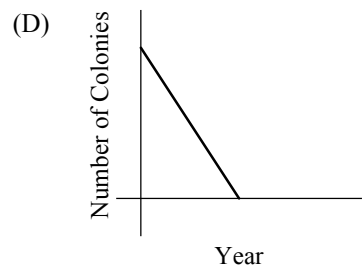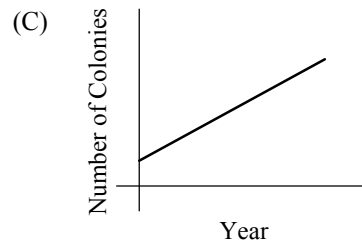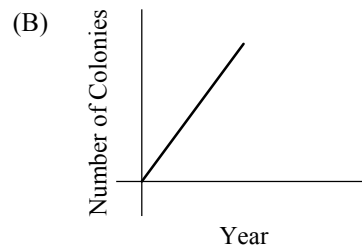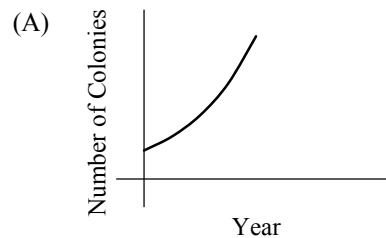
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14. For the inequality $2x + y > 15$, when $x = 3$, which of the following CANNOT be a possible value of y?

9
10
11
12

(Y)
(Z)
(AA)
(BB)

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

17. What is the expression for A?

$2x + 3y + 5xy$
$2y + 3x + 5$
$2x + 2y + 5$
$10xy$

(A)
(B)
(C)
(D)

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?

32
53
62
71

(CC)
(DD)
(EE)
(FF)

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?

850,000 people
Between 425,000 and 1,275,000 people
Between 595,000 and 1,105,000 people
Between 722,500 and 977,500 people

(KK)
(LL)
(MM)
(NN)

(GG)
(HH)
(II)
(JJ)

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

−81
0
81
1458

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

$$-1$$
$$0$$
$$1$$
$$2$$

(OO)
(PP)
(QQ)
(RR)

(SS)
(TT)
(UU)
(VV)
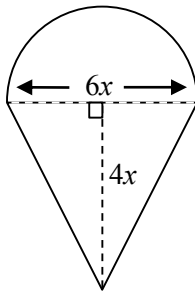
20. What is the perimeter of the figure outlined by the solid line, in terms of x?

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

(A)
(B)
(C)
(D)

(A)
(B)
(C)
(D)

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

$$-2$$
$$-1$$
$$0$$
$$1$$

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?

$$24$$
$$30$$
$$36$$
$$48$$

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

23. 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 16oz cans represented 20% of the total Espresso cans sold, how many 16 oz. cans of Mocha, m, did the company sell?

$$1125$$
$$575$$
$$465$$
$$350$$

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4 ☐ ☐ ☐ ☐ ☐ ☐ **4**

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

$$-4$$
$$-2$$
$$2$$
$$8$$

(WW)
(XX)
(YY)
(ZZ)

(A)
(B)
(D)

Questions 25 and 26 refer to the following information.

Scientists study a group of large dogs, allocating each of them 1600 calories per day. ½ of these calories come from carbohydrates, and ¼ 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?

(EEE)
(FFF)
(AAA)
(BBB)
(CCC)
(DDD)
(GGG)
(HHH)

$$25$$
$$50$$
$$60$$
$$75$$

$$5x + 3y = 3c$$
$$2y = c - 4x$$

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

$$2$$
$$3$$
$$4$$
$$5$$

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

28. 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?

Class A has a higher median than Class B and Class B has a higher mean than Class A.

Class B has a higher median than Class A and Class B has a higher mean than Class A.

Class A and B have the same median, and Class B has a lower mean than Class A.

Class A and B have the same median, and Class A has a lower mean than Class B.

GO ON TO THE NEXT PAGE
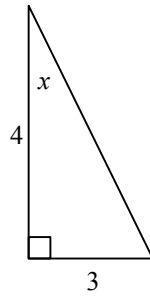
29. In the figure above, what is the value of $\sin(x)$?

(A) $\dfrac{3}{5}$

(B) $\dfrac{3}{4}$

(C) $\dfrac{4}{5}$

(D) $\dfrac{5}{3}$

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

ab
$b - a$
$-c$
ac

(A)
(B)
(C)
(D)

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Directions: For questions 31-37, fill out your answers using the grids in Section 4 of your answer sheet.
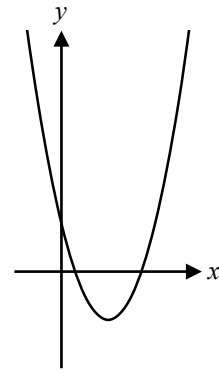
You will need to enter your answers for the following questions in the grids provided in your answer sheet.

- Make sure to fill in bubbles completely.
- Mark no more than one circle in any column.
- Answers written in the boxes above the grid are *not* scored.
- You can write your answer into those boxes as a guide when you bubble in your answers, however, remember that you always need to bubble your answers as well!

Placement:

You can start your answer in any column as long as you can fit in the whole answer.

Reminders:

- Some grid-in problems have more than one correct answer. In those cases, you may grid in any of the possible answers as long as it fits in the grid.
- If you get a decimal answer with more digits than can fit in the grid, round your answer but make sure that it fills the entire grid.

Mixed Numbers:

There is no negative sign in the grid, so all answers will be positive numbers or zero. You can grid proper and improper fractions, but *not* mixed numbers. For example, the mixed number $3\frac{1}{4}$ must be written as 13/4 or 3.25. If you grid the answer as the mixed number 31/4, the machine will read it as $\frac{31}{4}$, which is incorrect.
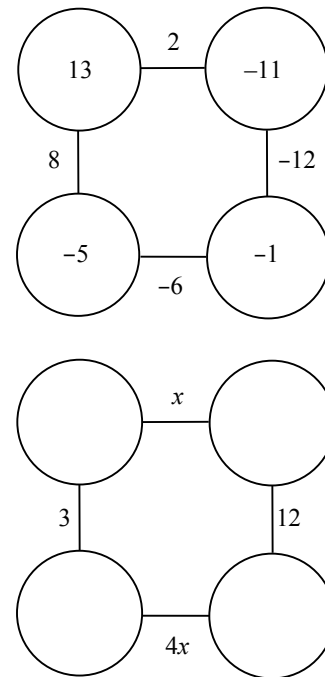

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31. Linda works 6 hours a day on Monday and Wednesday, 8 hours a day on Thursday and Friday, and 5 hours on Sunday. If she is paid $495 at the end of the week, what is Linda's hourly wage?

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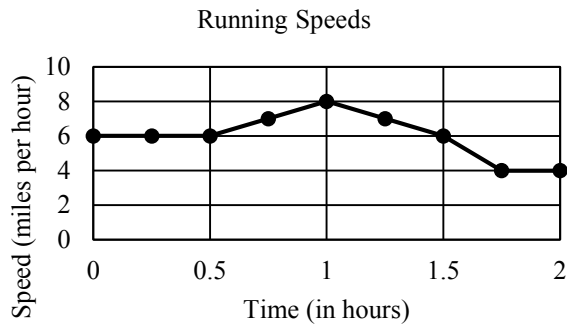

33. The figure above is an example of a completed bubble square. The numbers next to the line connecting the two adjacent circles is the sum of the numbers inside each of the two circles. What is the value of x?

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

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

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Running Speeds

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?

36. If a sector of a circle with an angle of 60° has an area of 24π, what radius of the circle?

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.

Math Problem Accuracy

- - ●- - Participant 1   ——●—— Participant 2
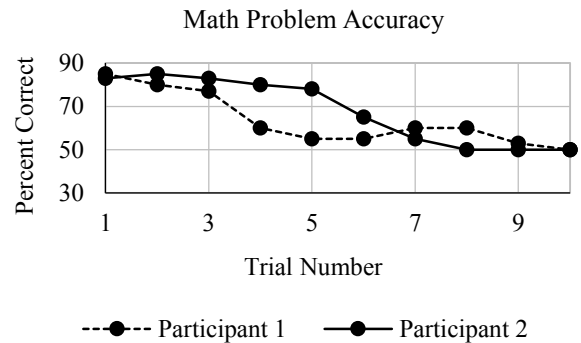
37. The duration of the experiment is 50 minutes and consists of 10 trials each lasting 5 minutes. If a new math problem is presented every 6 seconds, how many math problems are presented during one trial?

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.)

S T O P

If you complete the problem set before time elapses, you may review your responses for this section.

Do not view or begin working on any other sections.

Answers
Section 1

SECTION 1: Reading

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

SECTION 2: Math (no-calculator)

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

SECTION 3: WRITING

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

SECTION 4: MATH (CALCULATOR)

1. B	10. C	20. C	30. D
2. A	11. A	21. A	31. 15
3. B	12. A	22. C	32. 5/4
4. B	13. C	23. D	33. 3
5. D	14. A	24. A	34. 0
6. C	15. B	25. C	35. 6.5
7. C	16. B	26. B	36. 12
8. C	17. B	27. B	37. 50
9. D	18. C	28. C	38. 1
	19. A	29. A	

Download printable answer sheets, answer keys, and Excel scoring sheets from:

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