MATHEMATICAL REASONING PRACTICE TEST

You may use formulas from this sheet to answer questions on the test.

Area of a:		
square	$A = s^2$	
rectangle	$A = lw$	
parallelogram	$A = bh$	
triangle	$A = \frac{1}{2}bh$	
trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$	
circle	$A = \pi r^2$	
Perimeter of a:		
square	$P = 4s$	
rectangle	$P = 2l + 2w$	
triangle	$P = s_1 + s_2 + s_3$	
Circumference of a circle	$C = 2\pi r$ OR $C = \pi d$; $\pi \approx 3.14$	
Surface area and volume of a:		
rectangular/right prism	$SA = ph + 2B$	$V = Bh$
cylinder	$SA = 2\pi rh + 2\pi r^2$	$V = \pi r^2 h$
pyramid	$SA = \frac{1}{2}ps + B$	$V = \frac{1}{3}Bh$
cone	$SA = \pi rs + \pi r^2$	$V = \frac{1}{3}\pi r^2 h$
sphere	$SA = 4\pi r^2$	$V = \frac{4}{3}\pi r^3$
	(p = perimeter of base with area B; $\pi \approx 3.14$)	
Data		
mean	mean is equal to the total of the values of a data set, divided by the number of elements in the data set	
median	median is the middle value in an odd number of ordered values of a data set, or the mean of the two middle values in an even number of ordered values in a data set	
Algebra		
slope of a line	$m = \frac{y_2 - y_1}{x_2 - x_1}$	
slope-intercept form of the equation of a line	$y = mx + b$	
point-slope form of the equation of a line	$y - y_1 = m(x - x_1)$	
standard form of a quadratic equation	$y = ax^2 + bx + c$	
quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	
Pythagorean Theorem	$a^2 + b^2 = c^2$	
simple interest	$I = Prt$ (I = interest, P = principal, r = rate, t = time)	
distance formula	$d = rt$	
total cost	total cost = (number of units) × (price per unit)	

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Directions: Use 20 or fewer minutes to answer the following 5 questions. You may fill in the circles next to the correct answers or write your answers in boxes. Refer to the formula sheet on page 583 as needed. YOU MAY NOT USE YOUR CALCULATOR ON THIS SECTION.

1. Mike borrowed $400 from his brother for six months. He agreed to pay simple interest at the annual rate of 5%. Including interest and principal, how much will Mike have paid his brother at the end of the six months?

   ○ A. $10
   ○ B. $120
   ○ C. $410
   ○ D. $500

2. What is the value of the expression $3(2x - y) + (3 + x)^2$ when $x = 4$ and $y = 5$?

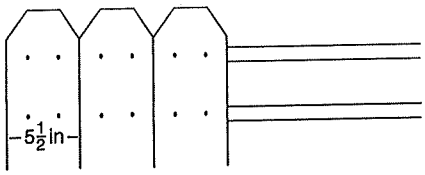
   ○ A. 49
   ○ B. 58
   ○ C. 61
   ○ D. 82

3. Which of the following is equal to the expression below?

   $(3x + 2y)(5x - 6y)$

   ○ A. $8x - 4y$
   ○ B. $15x^2 - 12y^2$
   ○ C. $15x^2 + 10xy - 12y^2$
   ○ D. $15x^2 - 8xy - 12y^2$

4. John needs to replace the boards on a 22-foot section of his fence. He plans to place the boards as shown below.



   If the boards are $5\frac{1}{2}$ inches wide, how many boards should he buy to cover the distance?

   ○ A. 4
   ○ B. 12
   ○ C. 48
   ○ D. 121

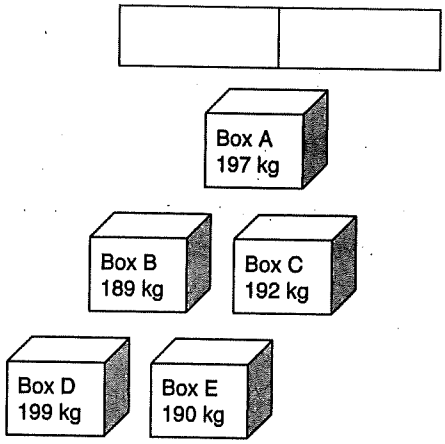
5. What is the value of this expression?

   $$-3 \times 5^2 + 2(4 - 18) + 3^3$$

   Write your answer in the box below.

Directions: Use a maximum of 1 hour and 35 minutes to answer 42 questions. You may fill in the circles next to the correct answers or write your answers in boxes. Refer to the formula sheet on page 583 as needed. YOU MAY USE YOUR CALCULATOR ON THIS SECTION.

6. A storage shelf has room for only two containers on the bottom shelf. The heaviest boxes should be placed on the bottom. Which two boxes should be placed on the bottom shelf? Write the letters of the boxes in the spaces below.



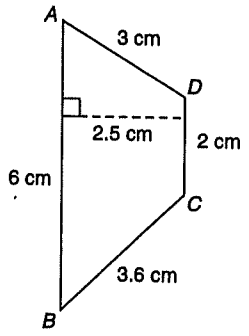
7. Brad's average golf score after six rounds was 81. For the first five rounds his scores were 78, 86, 82, 81, and 82. What was his score on the sixth round?

   Write your answer in the box below.

8. A kayaker spends 2 hours paddling up a stream from point A to point B, quickly turns her kayak around, and immediately heads back downstream. It takes her only 1 hour to float back down the stream from point B to point A. If points A and B are 6 miles apart, what was the kayaker's average rate of speed in miles per hour?

   ○ A. 12 mph
   ○ B. 6 mph
   ○ C. 4 mph
   ○ D. 2 mph

9. In quadrilateral *ABCD*, side *AB* is parallel to side *CD*. Sides *AD* and *BC* are not parallel. What is the area of the figure to the nearest square centimeter?



   Write your answer in the box below.

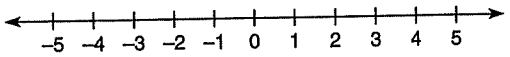
10. Simplify the following expression:
$2x^2 - 2xy + 4xy$

- ○ A. $x(x + y)$
- ○ B. $x(x - y)$
- ○ C. $2x(x - y)$
- ○ D. $2x(x + y)$

11. A scientist measures the outside temperature at noon each day over a 3-day period.

Day	Temperature at noon (°F)
Saturday	−1
Sunday	2
Monday	−4

What was the average temperature on these three days? Place an *X* on the number line below to represent your answer.



12. What is the value of 4^7?

Write your answer in the box below.

13.

	A	B	C
1	−2	−4	1
2	8	4	3
3	5	2	−1

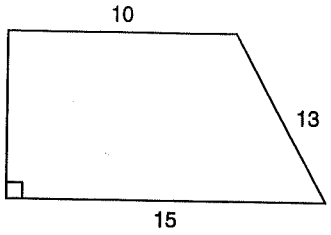
In the computer spreadsheet above, $-[A1-(C2-A3)+C2 * B1]$ is equal to which of the following? (*Hint: on a spreadsheet,* means multiplication*)

- ○ A. −22
- ○ B. −12
- ○ C. 12
- ○ D. 22

14. Simplify the expression:
$(6x^4 + 7x + 5x^3) - (4x^4 - 2x^3 + 3x)$

- A. $10x^4 + 7x^3 + 18x$
- B. $2x^4 + 7x^3 + 4x$
- C. $2x^4 + 7x^3 + 18x$
- D. $10x^4 + 3x^3 + 12x$

15. The perimeter of the trapezoid below is 50. What is its area?



- A. 12
- B. 60
- C. 120
- D. 150

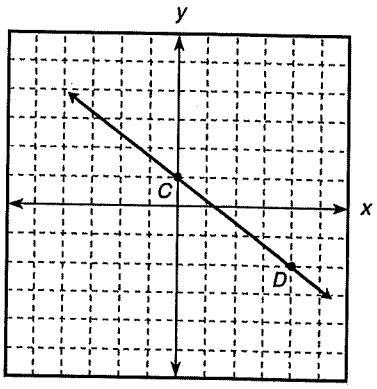
16. Risa wants to order business cards. A printing company determines the cost (C) to the customer using the following function, where b = the number of boxes of cards and n = the number of ink colors.

$$C = \$25.60b + \$14.00b(n - 1)$$

If Risa orders 4 boxes of cards printed in 3 colors, how much will the cards cost?

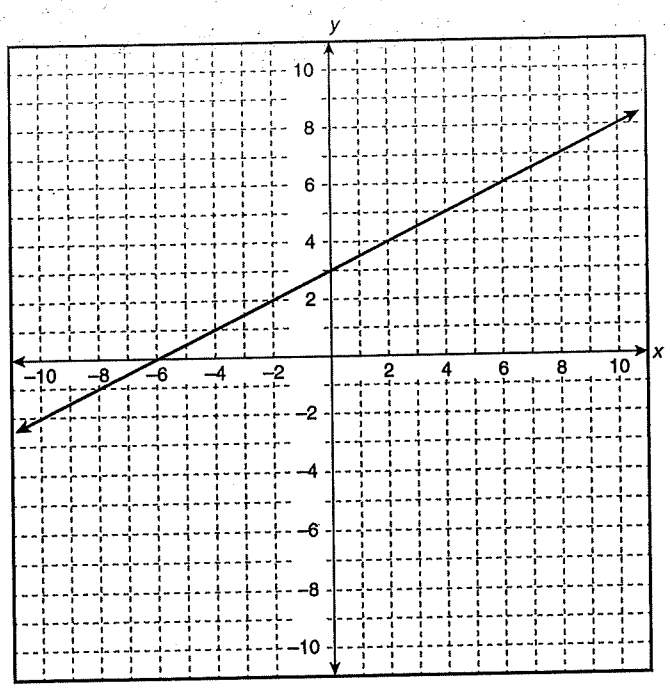
- A. $214.40
- B. $168.00
- C. $144.40
- D. $102.40

17. The graph of the equation $y = -\frac{3}{4}x + 1$ is a line that passes through points C and D on the coordinate plane. Which of the following points also lies on the graph of the equation?



- A. (3, 1)
- B. (8, −5)
- C. (5, 3)
- D. (10, 6)

18. Which of the following equations correctly describes the line on the graph?



○ A. $y = -\frac{1}{2}x - 6$

○ B. $y = 2x + 3$

○ C. $y = \frac{1}{2}x - 6$

○ D. $y = \frac{1}{2}x + 3$

19. What is the 6th term in the sequence below?

1, 3, 7, 15, 31, ___ , 127

○ A. 62
○ B. 63
○ C. 68
○ D. 77

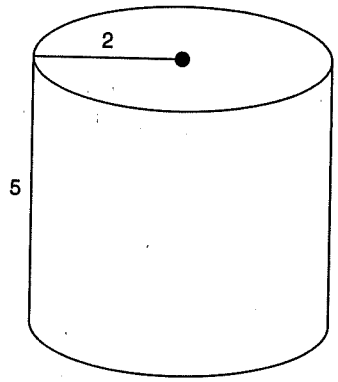
20. Evening tickets to a play are $24.50 each. Tickets for the afternoon show are $19 each. Janice wants to buy 6 tickets. Arrange terms from the options below to construct the expression Janice would use to determine how much less she would spend if she chooses an afternoon show instead of an evening show. (You do not need to use all of the terms offered as options. Use any term only once.)

+	$19
(	÷
)	$24.50
6	$\frac{1}{2}$
−	

21. In a certain state, the legislature has 100 seats. In 2010, Party X held 54 seats. In the 2012 election, the party gained two seats. If, in the 2014 election, Party X loses 6 seats, but gains 2 seats in the 2016 election, what will the absolute change in the number of seats held by Party X from 2010 to 2016 be?

Write your answer in the box below.

22. What is the surface area of the cylinder below?

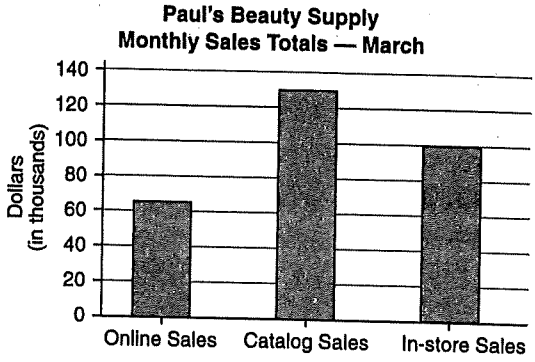


- A. 20π
- B. 28π
- C. 32π
- D. 50π

23. $\dfrac{2x^2 - 6x - 36}{2x - 12} =$

- A. $x - 6$
- B. $x - 3$
- C. $x + 3$
- D. $x^2 + 3x + 18$

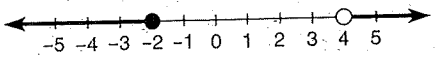
24. Customers of Paul's Beauty Supply can make purchases online, from a catalog, or in the store.

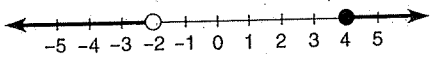


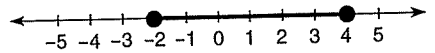
About how much more did the company make from catalog sales than from online sales in March?

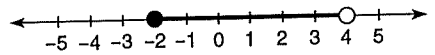
- A. $35,000
- B. $65,000
- C. $130,000
- D. $195,000

25. Which of the following is a graph of the inequality $-2 \leq x < 4$?

A. 

B. 

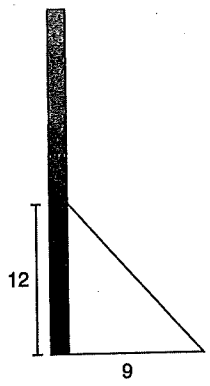
C. 

D. 

26. At what point does the line with the equation $y = 2x + 3$ intersect with the line with the equation $y = -\frac{1}{2}x - 7$?

- ○ A. $(-4, -5)$
- ○ B. $(0, -7)$
- ○ C. $(0, 3)$
- ○ D. $(2, 7)$

27. A pole is supported by a cable as shown. The cable is attached to the ground 9 feet from the base of the pole, and it is attached to the pole 12 feet above the ground.



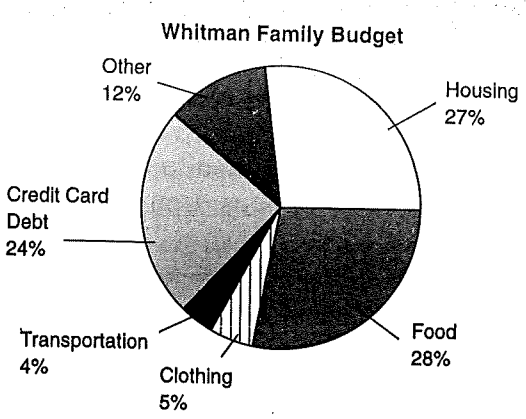
Which of the following expressions could be used to find the length of the cable?

- ○ A. $9^2 + 12^2$
- ○ B. $12^2 - 9^2$
- ○ C. $\sqrt{9^2 + 12^2}$
- ○ D. $\sqrt{12^2 - 9^2}$

28. Meg is an interior designer who is looking to place two chairs against an accent wall. She has four different chairs from which to choose, each a different color: yellow, red, green, and blue. How many different combinations of chairs can Meg use in her design?

Write your answer in the box below.

29. The Whitmans are trying to pay off their credit card debt, so they developed the following budget based on their monthly take-home pay.



If the Whitmans' monthly take-home pay is $2500, about how much do they plan to pay each month on their credit card debt?

- ○ A. $600
- ○ B. $450
- ○ C. $300
- ○ D. $240

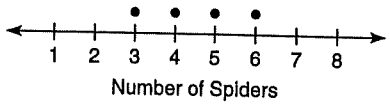
30. A market sells all varieties of pasta at a rate of 4 boxes for $5.00. Jennifer needs 3 boxes of ziti and 3 boxes of spaghetti. At this rate, how much will she spend for the pasta?

Write your answer in the box below.

31. Inge has been finding spiders in her apartment. In order to help her landlord understand the problem, she has kept track of how many spiders she found each week over an eight-week period. This is her record:

Week	Number of spiders found
1st	3
2nd	4
3rd	6
4th	5
5th	4
6th	4
7th	7
8th	2

The line plot below is based on the table Inge created, above. However, it is incomplete. Place additional dots on the line plot until it accurately reflects Inge's records over the eight week period.



32. If the area of circle O is 36π, what is its diameter?

- ○ A. 6
- ○ B. 6π
- ○ C. 12
- ○ D. 18

33. In 2011, Karen's base salary was $52,500, and she earned an end-of-year bonus of $6,250. In 2012, her base salary was raised to $56,300 and her end-of-year bonus was $4,100. What was the percent increase or decrease in her overall earnings from 2011 to 2012?

Write your answer in the box below. Round your answer to the nearest tenth of a percent.

34. Imtaez works as a server in a restaurant. On a certain night, he collected $157 in tips and paid y dollars to the food runner who helped him. The amount Imtaez had remaining after paying the runner was equal to $(\$101 + y)$.

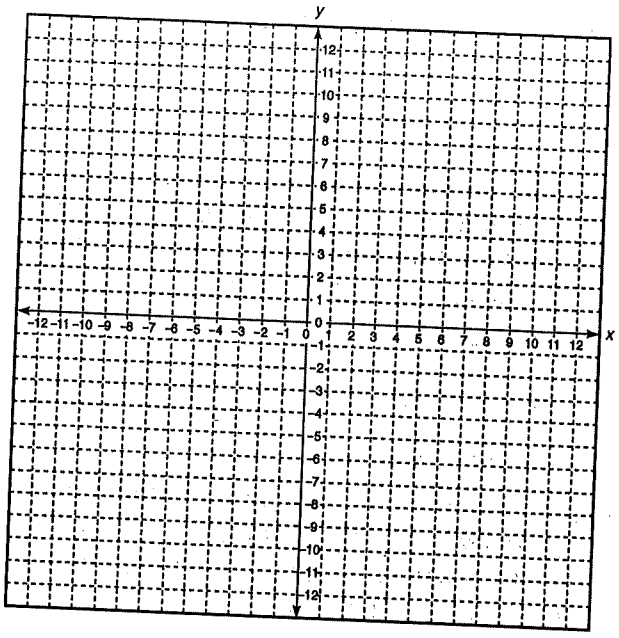
Arrange terms from the options below to construct the equation you would use to determine how much Imtaez paid to the food runner. (You may not need to use all of the terms offered as options. Use any term only once.)

$=$	$+y$
$\$101$	$\$157$
x	$\div$
$-y$	y^2

35. Place a dot on the coordinate plane below to represent the solution to the following system of equations:

$y = x + 4$

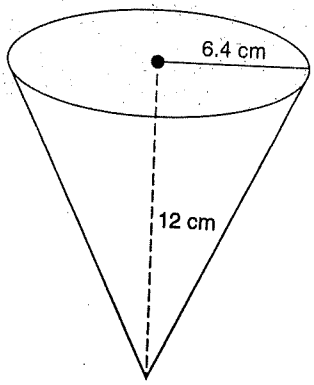
$2y + 4x = 44$



36. A bag contains 12 red, 3 blue, 6 green, and 4 yellow marbles. If a marble is drawn from the bag at random, what is the probability that the marble will be either blue or yellow?

- A. 7%
- B. 12%
- C. 25%
- D. 28%

37. The right cone shown below has a base with a radius of 6.4 cm.



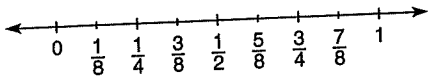
To the nearest cubic centimeter, what is the volume of the cone? (Use 3.14 for π.)

- A. 40
- B. 81
- C. 129
- D. 514

38. Ten artists have entered an art show. There are three prizes to be awarded in the art show: first prize, second prize, and third prize. How many possible ways could those prizes be awarded among the ten artists?

Write your answer in the box below.

39. Archie has made a huge pot of chili. He cannot eat it all himself, so he is going to share some with his neighbors and family. Archie will give 1/4 of the chili to his parents. He will give 1/8 of it to his neighbor Cecilia. He will give another 1/8 of it to his neighbor Chang. How much of the chili will Archie have left over? Place a dot on the number line below to reflect the correct answer.



40. At the end of baseball season, 5% of the children enrolled in a local youth baseball program will be chosen to play in the state tournament. If 12 children will be chosen to play in the tournament, how many children are enrolled in the program?

○ A. 60
○ B. 120
○ C. 240
○ D. 600

41. Fabio has his own computer repair business. He uses the following guidelines to estimate how long a project will take.

Install operating system: 1 hour
Replace motherboard: $1\frac{1}{2}$ hours
Reimage hard drive: 2 hours
Upgrade memory: 20 minutes
Install new hard drive: 45 minutes
Install sound card: 30 minutes
Install video card: 30 minutes

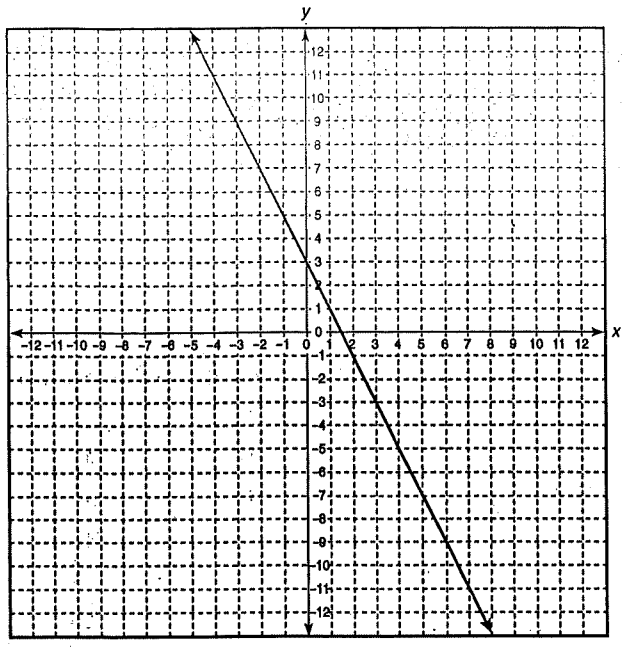
Fabio needs to install a new hard drive and an operating system for a customer. If Fabio charges $65 per hour, what will he charge the customer for his time?

○ A. $94.25
○ B. $105.00
○ C. $113.75
○ D. $146.25

42. There are approximately 1,335,000,000 cubic kilometers of water in Earth's oceans. Which of the following expresses that number in scientific notation?

○ A. $1.335 \times 100 \times 100$
○ B. 1.335×10^3
○ C. 1.335×10^6
○ D. 1.335×10^9

43. What is the slope of the line shown below?



Write your answer in the box below.

44. One number is 12 more than 3 times another number. The sum of the two numbers is −20. What are the numbers?

- A. 8 and 12
- B. 8 and −12
- C. −2 and −18
- D. −8 and −12

45. Which of the following pairs of numbers is a solution to the equation $3x^2 - 54 = -21x$?

- A. −6 and 3
- B. −2 and 9
- C. −3 and 6
- D. −9 and 2

46. Match the solutions to the equations.

Equation	Value of the variable
$x - 2 = 9$	
$\frac{a}{10} = 5$	
$3y = -21$	
$14 + m = 6$	

50
−8
−7
11

End of *Mathematical Reasoning* Test

Answers and explanations begin on page 708.