



Chapter 8
Practice Test 1



ACT MATHEMATICS TEST

60 Minutes—60 Questions

DIRECTIONS: Solve each problem, choose the correct answer, and then darken the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose, but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed:

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

1. A tree that had a diameter of 5 inches when it was first planted grows at a constant rate such that its diameter increases by 2 inches per year. From the time that the tree is planted, which of the following functions best represents the diameter of the tree, D , in inches y years after planting?

A. $D(y) = 5 + 2y$

B. $D(y) = 5y + 2$

C. $D(y) = 5y + 2y^2$

D. $D(y) = 7 + y$

E. $D(y) = 5 \left(\frac{1}{2} \right)^y$

2. For all real values of a , b , and c , which of the following expressions is equivalent to $\frac{a^{12}b^{10}c^{21}}{a^3b^5c^7}$?

F. $a^3b^2c^{14}$

G. $a^4b^2c^3$

H. $a^4b^5c^3$

J. $a^9b^2c^3$

K. $a^9b^5c^{14}$

3. What is the value of y in the equation $-2y + 14 = 4y - 10$?

A. -4

B. $-\frac{2}{3}$

C. $\frac{2}{3}$

D. 4

E. 12

DO YOUR FIGURING HERE.

GO ON TO THE NEXT PAGE.



4. Jin has a credit card that earns 2 bonus points for each dollar up to \$1,000 that he charges to the card in one month.

For each dollar over \$1,000 that he charges that month, Jin receives $2\frac{1}{2}$ times the bonus points that he receives for each dollar up to \$1,000. How many points does Jin earn if he charges \$1,250 in a given month?

- F. 2,500
G. 3,250
H. 3,500
J. 4,750
K. 6,250
5. A fourth grade class is having an end-of-the-year party. The teachers ordered 8 pizzas to feed the class. The girls in the class ate $1\frac{2}{3}$ pizzas, and the boys in the class ate $2\frac{1}{6}$ pizzas. How many pizzas were left for the teachers?
- A. $2\frac{1}{3}$
B. $3\frac{5}{6}$
C. $4\frac{1}{6}$
D. $5\frac{5}{6}$
E. $6\frac{1}{3}$
6. The height of a certain rectangle is 50 centimeters, and the length of the diagonal of the rectangle is 130 centimeters. What is the width, in centimeters, of the rectangle?
- F. 80
G. 90
H. 120
J. 140
K. 180

DO YOUR FIGURING HERE.

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7. In the geometric sequence below, the 1st term is $-1,296$. What is the 5th term in the sequence, if it can be determined?
 $-1,296, 432, -144, 48, \dots$

DO YOUR FIGURING HERE.

- A. -16
 B. -12
 C. 12
 D. 16
 E. Cannot be determined from the given information
8. How many *seconds* would it take a snail moving at a constant speed of 75 centimeters per minute to travel 240 centimeters?

(Note: There are 60 seconds in 1 minute.)

- F. 19
 G. 31
 H. 165
 J. 192
 K. 300
9. What is the value of $\frac{y^2}{x} + \frac{7}{z}$ for $x = 2$, $y = 4$, and $z = 9$?

- A. $\frac{23}{11}$
 B. $\frac{15}{9}$
 C. $\frac{16}{9}$
 D. $\frac{43}{9}$
 E. $\frac{79}{9}$
10. What is the least common denominator of the fractions below?

$$\frac{3}{10}, \frac{5}{18}, \frac{2}{27}$$

- F. 90
 G. 135
 H. 270
 J. 1,620
 K. 4,860

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11. The storeroom of a furniture retailer contains 300 chairs, 15% of which are recliners. Of the chairs that are NOT recliners, 52 are chairs that can swivel. How many of the chairs in the storeroom that are NOT recliners are non-swiveling chairs?

A. 203
 B. 230
 C. 233
 D. 248
 E. 255

12. A grocery store employee is creating a pyramid display of boxes at the end of an aisle. The display will have 9 tiers of boxes, and the top tier will contain 1 box. Each tier below the top tier will have 1 more box than the previous tier. How many boxes will the employee need to create the pyramid display?

F. 55
 G. 45
 H. 44
 J. 18
 K. 9

13. In the standard (x,y) coordinate plane, point F is located at $(-2,5)$. If point G is the reflection of point F across the x -axis, what are the coordinates of G ?

A. $(-2, -5)$
 B. $(2, -5)$
 C. $(2, 5)$
 D. $(-5, -2)$
 E. $(5, -2)$

14. For the equation $a^2 - 5a - 66 = 0$, what is the product of the solutions?

F. -66
 G. -6
 H. 0
 J. 5
 K. 11

15. The relationship between the measurement of temperature in number of degrees Fahrenheit, F , and the temperature in number of degrees Celsius, C , can be determined by the equation $C = \frac{5}{9}(F - 32)$. On a certain day, the temperature measures 10° Celsius. What is this temperature measurement in degrees Fahrenheit?

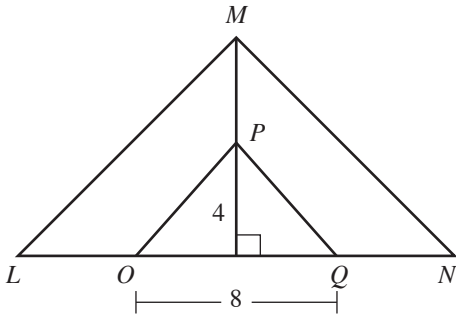
A. 18
 B. 34
 C. 42
 D. 50
 E. 82

DO YOUR FIGURING HERE.

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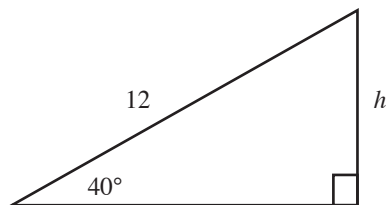
16. In the figure shown below, triangle OPQ has a height of 4 centimeters and a base of 8 centimeters, and $\overline{LO} \cong \overline{MP} \cong \overline{NQ}$. The area of triangle OPQ is one-fourth the area of triangle LMN . What is the length, in centimeters, of \overline{MP} ?



- F. 2
 G. 3.2
 H. 4
 J. 6.4
 K. 8
17. If $x = 6.2 \times 10^4$, what is 16% of x ?
- A. 3,875
 B. 9,920
 C. 38,750
 D. 99,200
 E. 992,000

18. In the figure below, the side lengths of the triangle are given in inches. Which of the following expressions can be used to represent h ?

- F. $12 \sin 40^\circ$
 G. $\cos 40^\circ$
 H. $\tan 40^\circ$
 J. $\frac{1}{12} \cos 40^\circ$
 K. $\frac{1}{12} \tan 40^\circ$



DO YOUR FIGURING HERE.

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19. If the perimeter of a given square is 48 feet, what is the area of the square, in square feet?

A. 12
 B. 24
 C. 36
 D. 144
 E. 192

DO YOUR FIGURING HERE.

20. $\frac{d}{1} \times \frac{4}{2} \times \frac{5}{3} \times \frac{6}{4} \times \frac{7}{5} \times \frac{8}{6} \times \frac{9}{7} \times \frac{10}{8} =$

F. $\frac{19d}{6}$

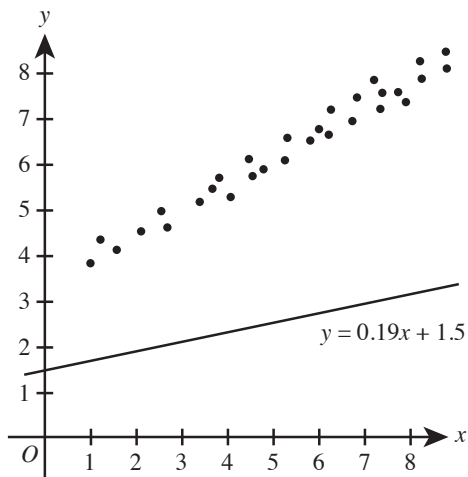
G. $\frac{10d}{3}$

H. 15

J. d

K. $15d$

21. A business analyst predicted the costs of a certain project and then plotted the actual data related to the costs in a scatterplot in the standard (x,y) coordinate plane. His initial prediction for the line of best fit was $y = 0.19x + 1.5$. The line for the predicted equation and the scatterplot of the actual costs are shown below.



The analyst wants to alter the equation to better fit the actual data for the project. To change the given best fit line equation to better match the actual data, he *must*:

- A. decrease the y -intercept and decrease the slope.
 B. decrease the y -intercept and increase the slope.
 C. not change the y -intercept but increase the slope.
 D. increase the y -intercept and decrease the slope.
 E. increase the y -intercept and increase the slope.

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22. There is a probability of 0.3 that Occurrence X will happen, and there is a probability of 0.5 that Occurrence Y will happen. What is the probability that both Occurrence X and Occurrence Y will happen?

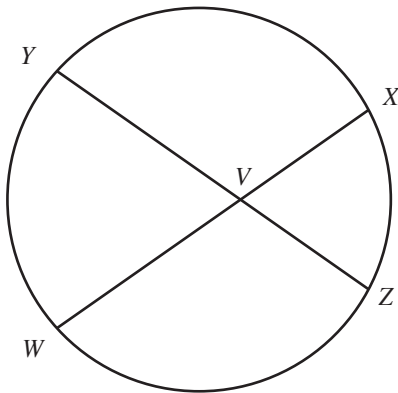
F. 0.15
 G. 0.2
 H. 0.5
 J. 0.6
 K. 0.8

DO YOUR FIGURING HERE.

23. A band director is using stickers as a reward for her students. She has 42 students this year and has enough stickers so that all the students can receive the same number of stickers with none left over. If there are 198 stickers on each sheet, which of the following integers could NOT be the number of sheets of stickers the band director has?

A. 7
 B. 21
 C. 42
 D. 57
 E. 63

24. The circle below contains points W, X, Y, and Z on its circumference. Minor arc \widehat{WY} measures 86° , and minor arc \widehat{XZ} measures 54° . Chords \overline{WX} and \overline{YZ} meet at point V such that $\overline{VW} \cong \overline{VY}$ and $\overline{VX} \cong \overline{VZ}$. What is the measure of minor arc \widehat{WZ} ?



F. 32°
 G. 64°
 H. 70°
 J. 110°
 K. 115°

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Use the following information to answer questions 25–28.

DO YOUR FIGURING HERE.

The National Basketball Association (NBA) is a men’s professional basketball association in North America founded in 1946. The table below gives some information about the 14 NBA players with the highest scores in a single game.

Player	Date of Highest Score	Points Scored
Joe Fulks	2-10-1949	63
Elgin Baylor	11-15-1960	71
Jerry West	1-17-1962	63
Wilt Chamberlain	3-2-1962	100
Rick Barry	3-26-1974	64
Pete Maravich	2-25-1977	68
David Thompson	4-9-1978	73
George Gervin	4-9-1978	
Michael Jordan	3-28-1990	69
David Robinson	4-24-1994	
Tracy McGrady	3-10-2004	62
Kobe Bryant	1-22-2006	81
Carmelo Anthony	1-24-2014	62
Devin Booker	3-24-2017	70

25. A sports statistician will select one of the players on the list at random to write an analysis of his high scoring game. What is the probability that the player she chooses has a last name that starts with the letter B, given that the player earned his highest score after 1970 ?
- A. $\frac{3}{4}$
- B. $\frac{3}{10}$
- C. $\frac{4}{10}$
- D. $\frac{4}{14}$
- E. $\frac{10}{14}$
26. For Devin Booker’s high scoring game in 2017, he scored 60% of his total points for the game in the first three of four quarters. Which of the following is the number of points he scored in the fourth quarter?
- F. 10
- G. 14
- H. 28
- J. 35
- K. 42

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27. David Robinson's high score was 8 points higher than George Gervin's. The sum of George Gervin's high score and two times David Robinson's high score is 2 points less than three times Michael Jordan's high score. What is the sum of the high scores earned by David Robinson and George Gervin?

A. 117
 B. 129
 C. 134
 D. 181
 E. 205

28. What is the median number of points scored by the 12 players whose high scores are included in the table?

F. 68
 G. 68.5
 H. 69
 J. 70
 K. 70.5

29. For angle θ with measure $0 < \theta < \frac{\pi}{2}$, the value of $\tan \theta$ is $\frac{24}{7}$. What is the value of $\sin \theta$?

A. $-\frac{24}{25}$
 B. $-\frac{7}{24}$
 C. $\frac{7}{24}$
 D. $\frac{25}{24}$
 E. $\frac{24}{25}$

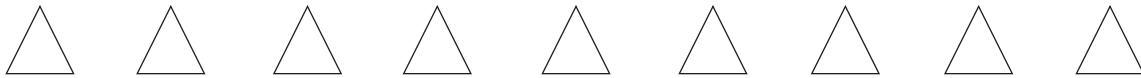
30. Given that the equation $\frac{2}{5} = \frac{a+3b}{4a+b}$ is true, what is the value

of $\frac{b}{a}$?

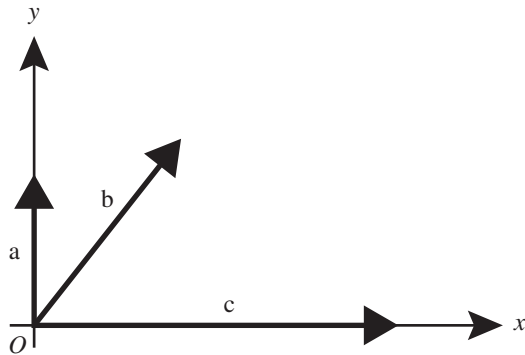
F. $\frac{3}{13}$
 G. $\frac{5}{13}$
 H. $\frac{2}{5}$
 J. $\frac{3}{7}$
 K. $\frac{3}{2}$

DO YOUR FIGURING HERE.

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31. The vectors \mathbf{a} , \mathbf{b} , and \mathbf{c} are represented in the standard (x,y) coordinate plane below.



DO YOUR FIGURING HERE.

In what general direction will the vector $\mathbf{a} + \mathbf{b} - \mathbf{c}$ point?

- A. To the left but neither up nor down
 B. Down and to the right
 C. Down and to the left
 D. Up and to the right
 E. Up and to the left
32. For matrices X and Y , given below, which of the following matrices is $X + Y$?

$$X = \begin{bmatrix} -2 & 3 \\ -1 & 8 \end{bmatrix} \quad Y = \begin{bmatrix} -5 & -2 \\ 7 & -3 \end{bmatrix}$$

F. $\begin{bmatrix} -7 & 6 \\ 1 & 5 \end{bmatrix}$

G. $\begin{bmatrix} -7 & 1 \\ 6 & 5 \end{bmatrix}$

H. $\begin{bmatrix} -3 & -1 \\ -6 & -5 \end{bmatrix}$

J. $\begin{bmatrix} -3 & 5 \\ 8 & 11 \end{bmatrix}$

K. $\begin{bmatrix} 3 & -8 \\ 5 & 11 \end{bmatrix}$

33. Each year, approximately 742,650 liters of blood are needed for medical patients in the United States and Canada. If the average blood donation is 500 milliliters and a person can donate no more than 6 times per year, what is the minimum number of donors needed each year to meet this demand?
- A. 24,755
 B. 123,775
 C. 247,550
 D. 371,325
 E. 371,325,000

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34. Which of the following numbers has the least value?

F. 0.727

G. $0.\overline{722}$

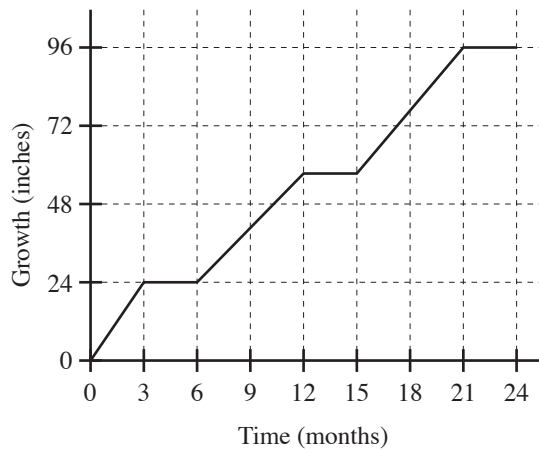
H. $0.\overline{727}$

J. $\frac{72}{99}$

K. $\frac{720}{1,001}$

DO YOUR FIGURING HERE.

35. A botanist affects the growth of a tree in a lab by decreasing the temperature, creating periods of dormancy. She maintains dormancy conditions for a whole number of months each time. The graph below shows the relationship between time, in months, since the experiment began and growth, in inches, of the tree above its initial height. Which of the following is the average growth of the tree, in inches per month, during the parts of the experiment that the tree was growing?

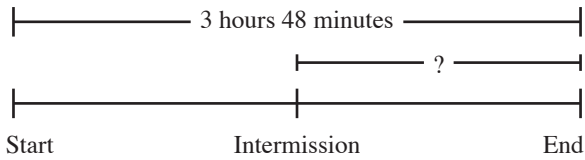


- A. 4.0
 B. 4.6
 C. 6.4
 D. 7.2
 E. 10.7

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36. As shown below, a movie with a runtime of 3 hours and 48 minutes will be paused halfway through for an intermission. What is the length, to the nearest minute, of each half of the movie?



- F. 1 hour and 30 minutes
 G. 1 hour and 36 minutes
 H. 1 hour and 42 minutes
 J. 1 hour and 54 minutes
 K. 2 hours and 12 minutes
37. For the general quadratic expression in x shown below, which of the following are the linear factors?

$$afx^2 - (ag + bf)x + bg$$

- A. $(af + g)$ and $(fx - b)$
 B. $(ax + b)$ and $(fx - g)$
 C. $(ax + b)$ and $(fx + g)$
 D. $(ax - b)$ and $(fx + g)$
 E. $(ax - b)$ and $(fx - g)$
38. Given the function below, what is $g(8)$?

$$g(x) = \begin{cases} \frac{3}{4}x + 5; & x \leq 8 \\ -x - 2; & x > 8 \end{cases}$$

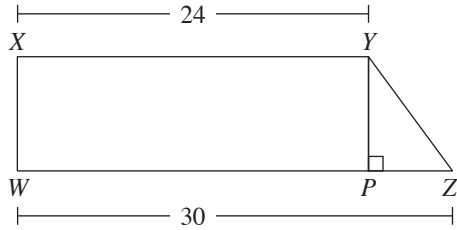
- F. -10
 G. $-\frac{3}{4}$
 H. 1
 J. 11
 K. 21

DO YOUR FIGURING HERE.

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39. Trapezoid $WXYZ$ shown below is formed from a rectangle and a triangle, with the lengths of sides \overline{XY} and \overline{WZ} marked in inches. If P is on \overline{WZ} , what is the ratio of the area of $\triangle PYZ$ to the area of $WXYZ$?



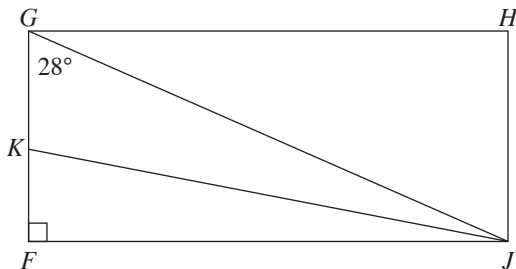
- A. 1:3
 B. 1:6
 C. 1:9
 D. 1:10
 E. 1:18

DO YOUR FIGURING HERE.

40. For $h(x) = \frac{x^2}{2}$ and $j(x) = 2x + 4$, which of the following expressions gives $h(j(x))$ for all values of x ?

- F. $x^2 + 4$
 G. $x^3 + 2x^2$
 H. $2x^2 + 4x + 8$
 J. $2x^2 + 8x + 8$
 K. $2x^3 + 2$

41. In rectangle $FGHJ$ below, K is on \overline{FG} , \overline{JK} bisects $\angle FJG$, and the measure of $\angle FGJ$ is 28° . What is the measure of $\angle FKJ$?



- A. 56°
 B. 59°
 C. 62°
 D. 90°
 E. 118°

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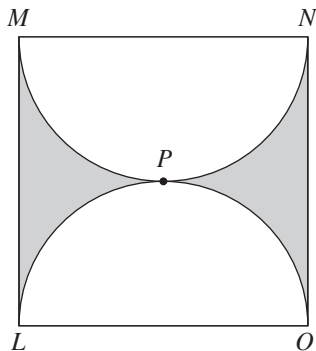


42. Which of the following expressions is NOT equivalent to

$\cos \theta$ for all real values of x such that $0 < \theta < \frac{\pi}{2}$?

- F. $(\sin \theta)(\cot \theta)$
- G. $\frac{1}{\sec \theta}$
- H. $\frac{\sin \theta}{\tan \theta}$
- J. $\frac{\cot \theta}{\csc \theta}$
- K. $\frac{\csc \theta}{\tan \theta}$
43. While playing a video game, Everett has 97.5 points, which is 25% more than the number of points James has. How many more points than James does Everett have?
- A. 0.78
- B. 3.9
- C. 19.5
- D. 24.375
- E. 72.5
44. What real value of a satisfies the equation $3a = \log_2(8^3)$?
- F. 2
- G. 3
- H. 9
- J. 16
- K. 27

45. In the figure below, point P is on semicircles MPN and LPO inside square $LMNO$. Semicircle MPN has its diameter on side MN , and semicircle LPO has its diameter on side LO . Both semicircles have a radius of 1 inch. What is the area, in square inches, of the shaded region?



- A. $4 - \frac{\pi}{2}$
- B. $4 - \pi$
- C. $4 - 2\pi$
- D. $8 - \pi$
- E. $8 - 2\pi$

DO YOUR FIGURING HERE.

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46. Tanja is a volunteer for a music booster club. A raffle will be held to award prizes to 3 of the 30 volunteers who helped with a recent event. The names of each volunteer who helped will be written on a ticket, and the tickets will be placed in a bowl. At a concert, the club president will randomly pull 3 tickets from the bowl without replacing any of the tickets. What is the probability that Tanja will NOT win a prize?

- F. $\frac{1}{10}$
 G. $\frac{9}{10}$
 H. $\frac{13}{15}$
 J. $\frac{1}{30}$
 K. $\frac{29}{30}$

DO YOUR FIGURING HERE.

47. The table below shows the number of students in a class that have a given number of first cousins.

Number of first cousins	Number of students
0	3
1	1
2	6
3	4
4	5
5	2
6	3
7	0
8 or more	1

If only one student is chosen and each student has the same probability of being chosen, which of the following is the probability that the chosen student has exactly 2 first cousins?

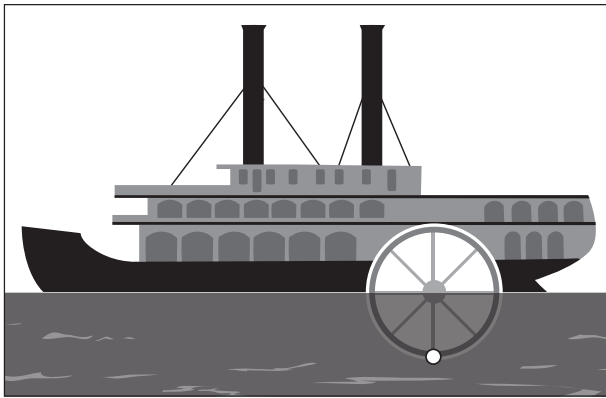
- A. 0.08
 B. 0.12
 C. 0.15
 D. 0.20
 E. 0.24

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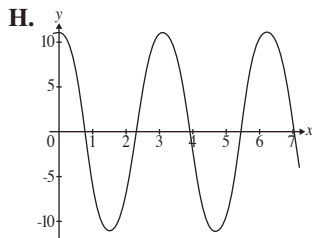
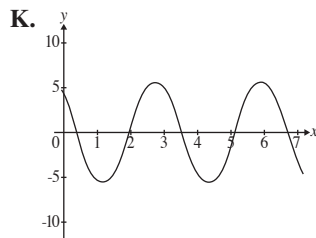
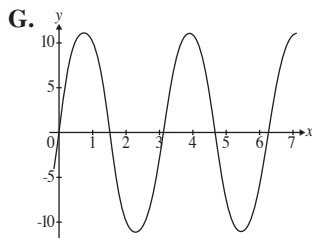
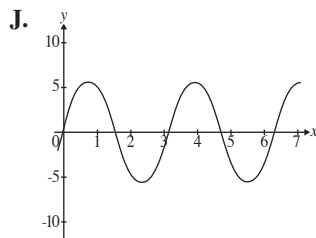
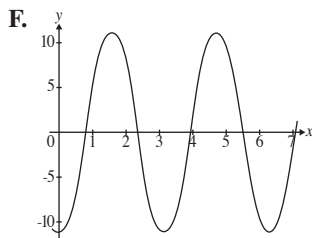


48. The paddle steamer shown below has a paddle with a diameter of 22 feet, and the midline of the paddle is level with the water surface of the river.

DO YOUR FIGURING HERE.



The paddle moves at a constant rate of one full revolution every 3.15 seconds. The variable x can be defined as the number of seconds since the paddle began moving from its starting position, which is shown above. The variable y can be defined as the distance that the point marked on the rim at the bottom of the wheel is below or above the surface of the water. Which of the following graphs in the standard (x,y) coordinate plane shows the distance, y , as a function of time, x ?



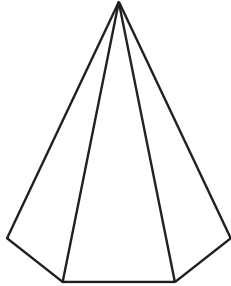
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Use the following information to answer questions 49–50.

DO YOUR FIGURING HERE.

A toy manufacturer produces a series of geometric blocks. The most popular one is in the shape of a *hexagonal pyramid*. A hexagonal pyramid is a solid that has a base that is a regular hexagon and 6 congruent faces, each of which is an isosceles triangle, for a total of 7 faces. Each edge is shared by two faces, and each vertex of the hexagonal base is shared by 2 triangular faces. The vertex shown at top in the image below shares all 6 triangular faces, 3 of which are visible in the image.



49. How many *edges* does the geometric block have?
- A. 7
B. 12
C. 14
D. 21
E. 24
50. For each triangular face of the geometric block, the short edge is 1.4 inches and the long edges are each 2.5 inches. What is the area, in square inches, of 1 triangular face of the block?
- F. 0.84
G. 1.4
H. 1.68
J. 2.4
K. 3.36
-
51. In a reality show competition, there are 16 contestants. For a certain challenge, 4 distinct contestants will be chosen to receive the same advantage over the remaining contestants. Which of the following expressions gives the maximum number of possible groupings for the contestants with the advantage?
- A. 16^4
B. $16(4)$
C. $16(15)(14)(13)$
D. $16(15)(14)(13)(4)(3)(2)(1)$
E. $\frac{16(15)(14)(13)}{4(3)(2)(1)}$

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52. Amy and Rachel began their current jobs as project managers at the same time some years ago. Amy has now spent $\frac{2}{3}$ of her professional career in her current job, and Rachel has spent $\frac{5}{7}$ of her professional career in her current job. Which of the following represents the length of Amy's professional career in terms of R , the length of Rachel's professional career?

- F. $\frac{10}{21}R$
- G. $\frac{5}{7}R$
- H. $\frac{14}{15}R$
- J. $\frac{15}{14}R$
- K. $\frac{7}{5}R$
53. A 5K event included both runners and walkers in heats throughout the day. The 64 participants who ran in the first heat had an average time of 31 minutes. The 48 participants who walked in the first heat had an average time of 59 minutes. What was the average time, in minutes, for all the participants in the first heat?
- A. 31
- B. 38
- C. 43
- D. 45
- E. 59

54. Bob keeps track of some data regarding his score in the first 3 bowling games of the league season, as shown in the table below.

Data	Score
Mean	207
Minimum	178
Median	218

What is the maximum score Bob has received in his first 3 bowling games, if it can be determined?

- F. 198
- G. 207
- H. 215
- J. 225
- K. Cannot be determined from the given information

DO YOUR FIGURING HERE.

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55. A carnival game consists of 48 rubber ducks in a row on a narrow shelf and a water blaster to spray the ducks. Alex chooses an integer, n . Counting from the first duck on the left, Alex goes down the row and sprays every n th duck, knocking it over. She continues until she reaches the end of the row, then continues counting with the first duck in the row, counting each duck whether it has been knocked over or not. She goes down the line spraying the ducks over and over, until she has knocked over every duck on the shelf. Which of the following could be Alex's value for the integer n ?

- A. 2
B. 3
C. 4
D. 5
E. 6

56. What is the digit in the ones place when 18^{55} is multiplied out?

- F. 0
G. 2
H. 4
J. 6
K. 8

57. An ellipse is inscribed in rectangle $FGHJ$ as shown below.

When the figure is drawn in the standard (x,y) coordinate plane,

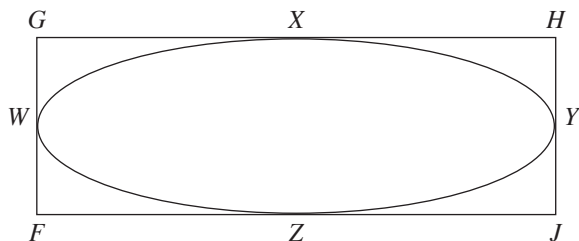
the ellipse can be described by the equation $\frac{(x+2)^2}{25} + \frac{y^2}{4} = 1$.

Points W , X , Y , and Z are the midpoints of the sides of $FGHJ$,

the line connecting points X and Z is the minor axis, and the

line connecting points W and Y is the major axis. What will

be the coordinates of points F and J ?



- | | point F | point J |
|----|-----------|-----------|
| A. | (0, 2) | (2, 5) |
| B. | (-7, -2) | (3, -2) |
| C. | (3, 1) | (3, -2) |
| D. | (-5, -2) | (5, -2) |
| E. | (-3, -2) | (7, -2) |

DO YOUR FIGURING HERE.

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58. For all positive values of a and b , which of the following radi-

cal forms is equivalent to $a^{\frac{7}{5}}b^{\frac{1}{2}}$?

F. $a^{10}\sqrt[4]{b^5}$

G. $ab^{10}\sqrt[7]{a^7b^7}$

H. $\sqrt[10]{ab^7}$

J. $\sqrt[10]{a^5b^2}$

K. $\sqrt[10]{a^7b^7}$

DO YOUR FIGURING HERE.

59. A salesclerk in a shoe store must stack 48 shoe boxes on a shelf. Each box is 13.5 centimeters tall, and each stack cannot have a combined height of more than 72 centimeters. No box will be in more than one stack, and the clerk will place the maximum number of shoeboxes into a stack before starting a new stack. What is the combined height, in centimeters, of the boxes that are in the short stack?

- A. 3.0
- B. 9.0
- C. 28.2
- D. 40.5
- E. 67.5

60. Which of the following expressions is equivalent to

$$\frac{5}{x^2 + 9x + 20} - \frac{2}{x^2 + 6x + 8} ?$$

F. $\frac{3}{3x + 12}$

G. $\frac{3}{(x + 2)(x + 4)(x + 5)}$

H. $\frac{x}{(x + 1)(x + 2)(x + 3)}$

J. $\frac{3x}{(x + 2)(x + 4)(x + 5)}$

K. $\frac{3x + 20}{(x + 2)^2(x + 5)}$

**END OF TEST.
STOP! DO NOT TURN THE PAGE UNTIL TOLD TO DO SO.**