



# Chapter 11

# Math Practice Test 1

**2****2****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. Bob's Burgers charges \$8 dollars for a hamburger and \$5 for an order of French fries. Last month,  $h$  hamburgers and  $f$  orders of fries were purchased. Which of the following expressions gives the total amount of money, in dollars, Bob's Burgers earned on hamburgers and fries last month?

- A.  $5h + 8f$
- B.  $8h + 5f$
- C.  $13(h + f)$
- D.  $40(h + f)$
- E.  $8(h + f) + 5f$

2. If  $a = 8$ ,  $b = -2$ , and  $c = 3$ , what does  $(a - b + c)(b + c)$  equal?

- F. -65
- G. -13
- H. 9
- J. 13
- K. 65

3. An artist at the State Fair paints 40 portraits per day. A second artist paints 50 portraits per day. The second artist opens for business three days after the first. Both remain open until the Fair closes, which is 11 days after the first artist began. Together, the two artists have painted how many portraits?

- A. 400
- B. 440
- C. 720
- D. 840
- E. 900

4. Josh has been a professional baseball player for four years. His home run totals each year have been 30, 39, 51, and 44, respectively. In order to maintain his current average number of home runs per season, how many home runs must Josh hit next year?

- F. 31
- G. 39
- H. 41
- J. 44
- H. 51

**DO YOUR FIGURING HERE.****GO ON TO THE NEXT PAGE.**

**2****2**

5. A craftswoman is paid \$9.00 per necklace for making up to 30 necklaces per week. For each necklace over 30 that she is asked to make in a week, she is paid 1.5 times her regular pay. How much does she earn in a week in which she is asked to make 34 necklaces?

- A. \$162
- B. \$270
- C. \$306
- D. \$324
- E. \$459

6. Which of the following mathematical expressions is equivalent to the verbal expression “The square root of a number,  $n$ , is 19 less than the value of 5 divided by  $n$ ”?

- F.  $n^2 = \frac{5}{n} - 19$
- G.  $n^2 = \frac{n}{5} - 19$
- H.  $\sqrt{n} = 19 - \frac{n}{5}$
- J.  $\sqrt{n} = \frac{y}{n} - 19$
- K.  $\sqrt{n} = \frac{5}{n} - 19$

7. If  $12(y - 3) = -7$ , then  $y = ?$

- A.  $-\frac{43}{12}$
- B.  $-\frac{10}{12}$
- C.  $-\frac{7}{12}$
- D.  $\frac{29}{12}$
- E.  $\frac{43}{12}$

8. At a department store, purses sell for \$12 each during a one-day sale. Rita spent \$84 on purses during the sale, \$38.50 less than if she had bought the purses at the regular price. How much do purses cost at the regular price?

- F. \$ 5.50
- G. \$15.50
- H. \$16.00
- J. \$17.50
- K. \$20.00

**DO YOUR FIGURING HERE.****GO ON TO THE NEXT PAGE.**



**DO YOUR FIGURING HERE.**

9.  $(2a - 5b^2)(2a + 5b^2) =$

- A.  $4a^2 - 25b^4$
- B.  $4a^2 - 10b^4$
- C.  $4a^2 + 25b^4$
- D.  $2a^2 - 25b^4$
- E.  $2a^2 - 10b^4$

10. A rectangle's perimeter is 18 feet, and its area is 18 square feet. What is the length of the longest side of the rectangle?

- F. 10
- G. 8
- H. 6
- J. 3
- K. 2

11. In  $\triangle XYZ$ ,  $\angle X$  is  $64^\circ$ . What is the sum of  $\angle Y$  and  $\angle Z$ ?

- A.  $26^\circ$
- B.  $64^\circ$
- C.  $116^\circ$
- D.  $126^\circ$
- E.  $128^\circ$

12. Each morning, a glee club member chooses her outfit among 4 plaid skirts, 5 pairs of argyle socks, 3 sweaters, and 4 headbands. How many different outfits are possible for her to put together on any given morning consisting of one skirt, one pair of socks, one sweater, and one headband?

- F. 4
- G. 15
- H. 16
- J. 120
- K. 240

13. Positive integers  $x$ ,  $y$ , and  $z$  are consecutive such that  $x < y < z$ .

The sum of  $x$ ,  $2y$ , and  $\frac{z}{2}$  is 59. What are the values of  $x$ ,  $y$ , and  $z$ , respectively?

- A. 10, 11, 12
- B. 11, 12, 13
- C. 14, 15, 16
- D. 16, 17, 18
- E. 18, 19, 20

14. A function  $h(x)$  is defined as  $h(x) = -5x^3$ . What is  $h(-2)$ ?

- F. -1,000
- G. -40
- H. 30
- J. 40
- K. 1,000

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## DO YOUR FIGURING HERE.

15. If  $z = \sqrt[4]{97}$ , then which of the following must be true?

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

16. What is the greatest common factor of 96, 108, and 144?

- F. 12
- G. 18
- H. 24
- J. 36
- K. 48

17. Cowan Cola is holding a contest to develop a new, more environmentally efficient can for its soft drink. The winning can is a cylinder ten inches tall, with a volume of  $40\pi$  in.<sup>3</sup>. What is the radius, in inches, of the can?

- A. 1
- B. 2
- C. 4
- D. 5
- E. 8

18. A clock has 12 numbered points. Four points  $W, X, Y, Z$  lie on the clock representing certain numbers.  $W$  represents 3:00.  $X$  is 4 units clockwise from  $W$ .  $Y$  is 9 units counterclockwise from  $W$ .  $Z$  is 5 units counterclockwise from  $W$  and 7 units clockwise from  $W$ . What is the order of points, starting with  $W$  and working clockwise around the circle?

- F.  $W, X, Y, Z$
- G.  $W, X, Z, Y$
- H.  $W, Y, X, Z$
- J.  $W, Y, Z, X$
- K.  $W, Z, Y, X$

19. Tribbles reproduce at a rate described by the function  $f(a) = 12(3)^a$ , where  $a$  represents the number of days and  $f(a)$  represents the number of tribbles. At this rate, how many tribbles will there be at the end of Day Four?

- A. 48
- B. 96
- C. 240
- D. 972
- E. 1,296

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20. The height of a triangle is half the height of a larger triangle. The two triangles have the same base. The area of the larger triangle is  $Y$  square feet. The area of the smaller triangle is  $xY$  square units. Which of the following is the value of  $x$ ?

F.  $\frac{1}{4}$

G.  $\frac{1}{2}$

H. 1

J. 2

K. 4

**DO YOUR FIGURING HERE.**

21.  $(2x + 3y + 4z) - (6x - 7y + 8z)$  is equivalent to:

A.  $-4x + 10y - 4z$

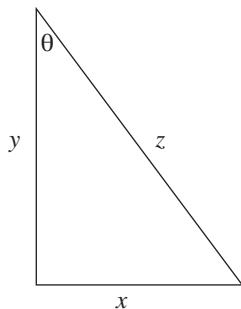
B.  $-4x + 10y + 12z$

C.  $-4x - 4y - 4z$

D.  $-8x + 10y + 12z$

E.  $-8x - 4y + 12z$

22. The right triangle shown below has lengths measured in inches. What is  $\cos \theta$ ?



F.  $\frac{x}{y}$

G.  $\frac{x}{z}$

H.  $\frac{y}{x}$

J.  $\frac{y}{z}$

K.  $\frac{z}{y}$

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**2****2**

23. On a dead-end street, 8 houses are evenly spaced around a circular cul-de-sac. A newspaper delivery person bikes around the cul-de-sac and tosses the newspapers onto the driveway of each house. The delivery person bikes rapidly enough that the person can only toss to every third house. On which lap around the cul-de-sac will the delivery person have delivered newspapers to all 8 houses on the street?

- A. 2nd
- B. 3rd
- C. 4th
- D. 8th
- E. 11th

24. Lines  $q$  and  $m$  are in the standard  $(x,y)$  coordinate plane. The equation for line  $q$  is  $y = 23x + 500$ . The  $y$ -intercept of line  $m$  is 10 less than the  $y$ -intercept of line  $q$ . What is the  $y$ -intercept of line  $m$ ?

- F. 2.3
- G. 13
- H. 50
- J. 490
- K. 510

25. The expression  $-9a^5(8a^7 - 4a^3)$  is equivalent to:

- A.  $-36a^9$
- B.  $-72a^{12} + 36a^8$
- C.  $-72a^{12} - 36a^8$
- D.  $-72a^{35} + 36a^{15}$
- E.  $-72a^{35} - 36a^{15}$

26.  $-4|-9 + 2| = ?$

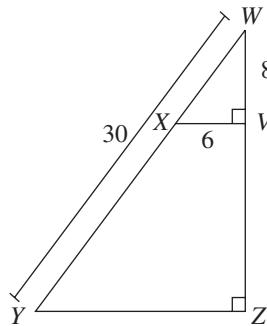
- F. -44
- G. -28
- H. 3
- J. 28
- K. 44

**DO YOUR FIGURING HERE.**

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27. In right triangle  $\Delta WYZ$  shown below,  $\overline{XV}$  is perpendicular to  $\overline{WZ}$  at point  $V$  and is parallel to  $\overline{YZ}$ . Line segments  $\overline{WY}$ ,  $\overline{XV}$ , and  $\overline{WV}$  measure 30 inches, 6 inches, and 8 inches, respectively. What is the measurement, in inches, of  $\overline{YZ}$ ?



**DO YOUR FIGURING HERE.**

A. 15  
 B. 18  
 C. 20  
 D. 24  
 E. 27

28. As an experiment in botany class, students tracked a plant growing at a constant rate upward, perpendicular to the ground. As shown in the table below, they measured the height,  $h$  inches, of the plant at 1-week intervals from  $w = 0$  weeks to  $w = 4$  weeks.

$w$	0	1	2	3	4
$h$	7	10	13	16	19

Which of the following equations expresses this data?

F.  $h = w + 7$   
 G.  $h = 3w + 4$   
 H.  $h = 3w + 7$   
 J.  $h = 7w + 3$   
 K.  $h = 10w$

29. The inequality  $4(n - 3) < 5(n + 2)$  is equivalent to which of the following inequalities?

A.  $n > -22$   
 B.  $n > -14$   
 C.  $n > -13$   
 D.  $n > -2$   
 E.  $n > 2$

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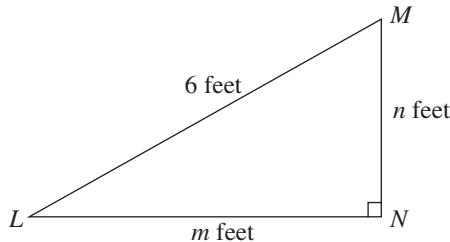
**2****2**

30. The sides of an equilateral triangle are 4 inches long. One vertex of the triangle is at  $(1,1)$  on a coordinate graph labeled in inch units. Which of the following could give the coordinates of another vertex of the triangle?

- F.  $(-4, 1)$
- G.  $(0, 1)$
- H.  $(2, 3)$
- J.  $(1, -3)$
- K.  $(5, -3)$

**DO YOUR FIGURING HERE.**

31. For  $\triangle LMN$ , shown below, which of the following expresses the value of  $m$  in terms of  $n$ ?



- A.  $6 - n$
- B.  $\sqrt{6 - n}$
- C.  $\sqrt{12 + n^2}$
- D.  $\sqrt{36 - n^2}$
- E.  $\sqrt{36 + n^2}$

32. A jar holds 10 pear jellybeans, 16 cherry jellybeans, and 19 watermelon jellybeans. How many extra pear jellybeans must be added to the 45 jellybeans currently in the jar so that the probability of randomly selecting a pear jellybean is  $\frac{3}{8}$ ?

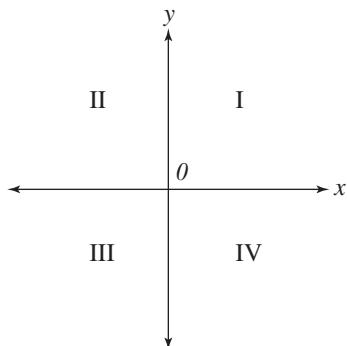
- F. 9
- G. 11
- H. 21
- J. 35
- K. 45

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33. The graph of the equation  $6x + 3y = 12$  is found in which quadrants of the standard  $(x,y)$  coordinate plane below?

**DO YOUR FIGURING HERE.**



- A. II and IV only
- B. I, II, and III only
- C. I, II, and IV only
- D. I, III, and IV only
- E. II, III, and IV only

34. The graph of  $y = -2x^2 + 10$  contains the point  $(3, 4n)$  in the standard  $(x,y)$  coordinate plane. What is the value of  $n$ ?

- F. 7
- G. 1
- H. -2
- J. -4
- K. -8

35. Jennifer, Kelly, and Meredith split their apartment rent.

Jennifer paid  $\frac{2}{3}$  of the rent, Kelly paid  $\frac{1}{4}$  of the rent, and Meredith paid the rest. What is the ratio of Jennifer's contribution to Kelly's contribution to Meredith's contribution?

- A. 1:3:8
- B. 3:8:1
- C. 3:1:8
- D. 8:3:1
- E. 8:1:3

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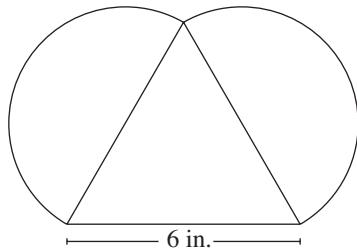


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36. In the standard  $(x, y)$  coordinate plane, a circle has an equation of  $x^2 + (y + 4)^2 = 28$ . Which of the following gives the center and radius of the circle, in coordinate units?

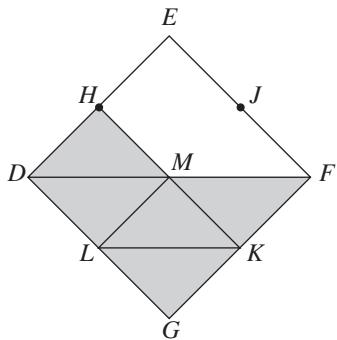
<u>Center</u>	<u>Radius</u>
F. $(0, -4)$	$\sqrt{28}$
G. $(0, -4)$	14
H. $(0, -4)$	28
J. $(0, 4)$	$\sqrt{28}$
K. $(0, 4)$	14

37. An equilateral triangle and 2 semicircles have dimensions as shown in the figure below. What is the perimeter, in inches, of the figure?



A.  $3 + 3\pi$   
 B.  $6 + 6\pi$   
 C.  $6 + 12\pi$   
 D.  $18 + 6\pi$   
 E.  $18 + 12\pi$

38. In the figure below, points  $H$ ,  $J$ ,  $K$ , and  $L$  bisect the sides of rhombus  $DEFG$ , and point  $M$  is the intersection of  $\overline{HK}$  and  $\overline{JL}$ . The area enclosed by  $DEFG$  except the area enclosed by  $HEFM$  is shaded. What is the ratio of the area of  $HEFM$  to the area of the shaded area?



F. 1:2  
 G. 3:4  
 H. 3:5  
 J. 3:8  
 K. Cannot be determined from the given information

DO YOUR FIGURING HERE.

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39. In the standard  $(x,y)$  coordinate plane, the endpoints of  $\overline{FG}$  lie on the coordinates  $(-6,10)$  and  $(8,-2)$ . What is the  $y$ -coordinate of the midpoint of  $\overline{FG}$ ?

- A. 1
- B. 2
- C. 4
- D. 6
- E. 8

**DO YOUR FIGURING HERE.**

40. What is the volume, in cubic feet, of a cube with a side of length 9 feet?

- F. 729
- G. 486
- J. 243
- H. 81
- K. 27

41. The system below has linear equations, in which  $r$ ,  $s$ ,  $t$ , and  $v$  are positive integers.

$$rx + sy = t$$

$$rx + sy = v$$

Which of the following best describes a possible graph of such a system of equations in the standard  $(x,y)$  coordinate plane?

- I. 2 lines intersecting at only 1 point
- II. 1 single line
- III. 2 parallel lines

- A. I only
- B. III only
- C. I and II only
- D. II and III only
- E. I and III only

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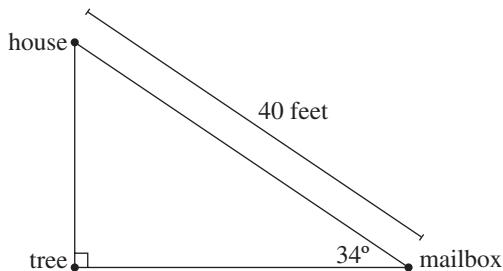
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42. Given the dimensions in the figure below, which of the following expresses the distance, in feet, from the tree to the house?

DO YOUR FIGURING HERE.



F.  $40 \sin 34^\circ$   
 G.  $40 \cos 34^\circ$   
 H.  $40 \tan 34^\circ$   
 J.  $\frac{40}{\sin 34^\circ}$   
 K.  $\frac{40}{\cos 34^\circ}$

43. The chart below shows the percentage of students, by grade, enrolled in a school. A student is picked randomly in a lottery to win a new graphing calculator. What are the odds (in the grade:not in the grade) that the winning student is in Grade 6?

Grade	5	6	7	8	9
Percentage of total number of students	12	22	25	27	14

A. 1:4  
 B. 1:5  
 C. 7:25  
 D. 11:39  
 E. 11:50

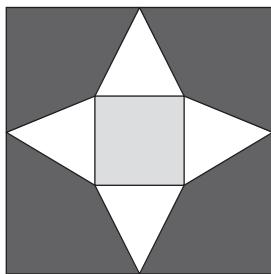
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**DO YOUR FIGURING HERE.**

Use the following information to answer questions 44–46.

The figure below shows the pattern of a square tile mosaic to decorate the wall of Chelsea’s Mexican Café. Grout fills the small spaces between individual tile pieces. All white triangular tiles are equilateral and share a vertex with each adjacent triangular piece. A green square piece is at the center of the mosaic. The length of the mosaic is 3 meters.



44. How many lines of symmetry in the plane does the pattern of the tile mosaic have?

F. 2  
G. 3  
H. 4  
J. 8  
K. Infinitely many

45. What is the length of the diagonal of the mosaic, to the nearest 0.1 meters?

A. 2.4  
B. 3.0  
C. 3.4  
D. 4.2  
E. 5.7

46. Joe wants to put a tile mosaic on the wall of his office. The pattern of the mosaic will be identical to that in the restaurant. The length of the office wall is 20% shorter than the length of the mosaic. The office wall is how many meters long?

F. 0.6  
G. 2.4  
H. 2.8  
J. 3.6  
K. 6.0

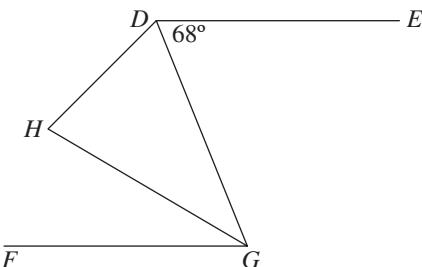
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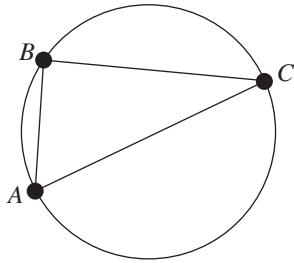
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47. In the figure below,  $\overline{DE} \parallel \overline{FG}$ ,  $\overline{DG}$  bisects  $\angle HDE$ , and  $\overline{HG}$  bisects  $\angle FGD$ . If the measure of  $\angle EDG$  is  $68^\circ$ , what is the measure of  $\angle DHG$ ?



- A.  $68^\circ$
- B.  $78^\circ$
- C.  $80^\circ$
- D.  $82^\circ$
- E. Cannot be determined from the given information

48. In the figure shown below, points  $A$ ,  $B$ , and  $C$  lie on the circle with an area of  $16\pi$  square meters and center  $O$  (not shown).  $\overline{AC}$  is the longest chord in the circle, and the measure of  $\overline{AB}$  is 4 meters. What is the degree measure of minor arc  $BC$ ?



- F.  $60^\circ$
- G.  $90^\circ$
- H.  $120^\circ$
- J.  $145^\circ$
- K. Cannot be determined from the given information

49. For which of the following values of  $b$  would the system of equations below have no solutions?

$$12x + 8y = 16$$

$$3x + by = 2$$

- A. 2
- B. 4
- C. 8
- D. 16
- E. 32

DO YOUR FIGURING HERE.

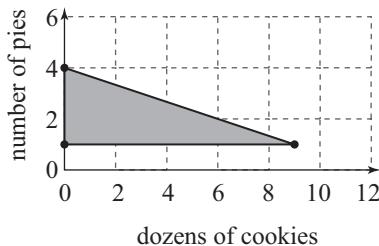
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**2****2**

Use the following information to answer questions 50–52.

**DO YOUR FIGURING HERE.**

Rebecca and Scott make and sell pies and cookies for school bake sales. It takes them 1 hour to make a dozen cookies and 3 hours to make a pie. The shaded triangular region shown below is the graph of a system of inequalities representing weekly constraints Rebecca and Scott have on their baking. For making and selling  $d$  dozen cookies and  $p$  pies, they make a profit of  $12d + 25p$  dollars. They sell all the goods they bake.



50. The constraint represented by the horizontal line segment containing  $(9,1)$  means that each school-week, Rebecca and Scott make a minimum of:

- F. 1 pie
- G. 9 pies
- H. 1 dozen cookies
- J. 9 dozen cookies
- K. 10 dozen cookies

51. What is the maximum profit Rebecca and Scott can earn from the baking they do in 1 school-week?

- A. \$100
- B. \$109
- C. \$122
- D. \$133
- E. \$237

52. During the third week of October each year, school is closed for Fall Break, and Rebecca and Scott have more time than usual to bake. During that week, for every hour that they spend baking, they donate \$2 to the school's fund for after-school reading programs. This year, they baked 5 pies and 3 dozen cookies during Fall Break. Which of the following is closest to the percent of that week's profit they donated to the reading program fund?

- F. 5%
- G. 9%
- H. 15%
- J. 18%
- K. 22%

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DO YOUR FIGURING HERE.

53. The *determinant* of a matrix  $\begin{bmatrix} a & c \\ b & d \end{bmatrix}$  equals  $ad - bc$ . What must be the value of  $w$  for the matrix  $\begin{bmatrix} w & w \\ w & 10 \end{bmatrix}$  to have a determinant of 25?

A. 5  
 B.  $\frac{10}{3}$   
 C.  $\frac{5}{2}$   
 D.  $-\frac{5}{3}$   
 E. -5

54. Henry discovers that the population of the bacterial colony in his lab can be calculated using the equation  $x = B(1 + 0.2g)^n$ , where  $x$  is the current population,  $B$  is the original number of bacteria,  $g$  is a growth rate constant for that species, and  $n$  is the number of days elapsed. Which of the following is an expression for  $B$  in terms of  $g$ ,  $n$ , and  $x$ ?

F.  $x - 0.2g^n$   
 G.  $x + 0.2g^n$   
 H.  $\left(\frac{x}{1+0.2g}\right)^n$   
 J.  $\frac{x}{(1-0.2g)^n}$   
 K.  $\frac{x}{(1+0.2g)^n}$

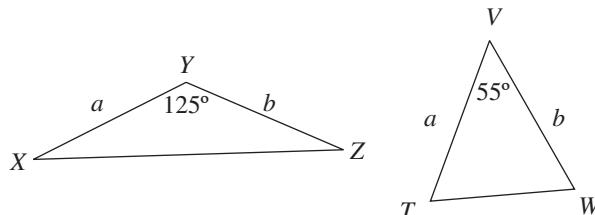
55. If  $m$  and  $n$  are real numbers such that  $m < -1$  and  $n > 1$ , then which of the following inequalities *must* be true?

A.  $\frac{n}{m} > 1$   
 B.  $|n|^2 > |m|$   
 C.  $\frac{n}{7} + 2 > \frac{m}{7} + 2$   
 D.  $n^2 + 1 > m^2 + 1$   
 E.  $n^{-2} > m^{-2}$

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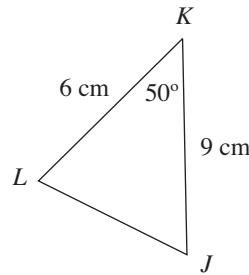
56. Triangles  $TVW$  and  $XYZ$  are shown below. The given side lengths are in inches. The area of  $\triangle TVW$  is 45 square inches. What is the area of  $\triangle XYZ$  in square inches?



F. 22.5  
G. 27  
H. 30  
J. 45  
K. 50

57. Triangle  $JKL$  is shown in the figure below. The measure of  $\angle K$  is  $50^\circ$ ,  $JK = 9$  cm, and  $KL = 6$  cm. Which of the following is the lengths, in centimeters, of  $LJ$ ?

(Note: For a triangle with sides of length  $a$ ,  $b$ , and  $c$  opposite angles  $\angle A$ ,  $\angle B$ , and  $\angle C$ , respectively, the Law of Sines states  $\frac{\sin \angle A}{a} = \frac{\sin \angle B}{b} = \frac{\sin \angle C}{c}$ , and the Law of Cosines states  $c^2 = a^2 + b^2 - 2ab \cos \angle C$ .)



A.  $9 \sin 50^\circ$   
B.  $6 \sin 50^\circ$   
C.  $\sqrt{9^2 - 6^2}$   
D.  $\sqrt{9^2 + 6}$   
E.  $\sqrt{9^2 + 6^2 - 2(9)(6)\cos 50^\circ}$

58. What is the sum of the first 3 terms of the arithmetic sequence in which the 7th term is 13.5, and the 11th term is 18.3?

F. 15.9  
G. 22.5  
H. 25.5  
J. 32.4  
K. 43.5

**DO YOUR FIGURING HERE.**

**GO ON TO THE NEXT PAGE.**

**2****2**

59. In the equation  $w^2 - pw + q = 0$ ,  $p$  and  $q$  are integers. The *only* possible value for  $w$  is 8. What is the value of  $p$ ?

- A. -16
- B. -8
- C. 8
- D. 16
- E. 64

**DO YOUR FIGURING HERE.**

60. The solution set of which of the following equations is the set of real numbers that are 4 units from -1?

- F.  $|x + 1| = 4$
- G.  $|x - 1| = 4$
- H.  $|x + 4| = 1$
- J.  $|x - 4| = 1$
- K.  $|x + 4| = -1$

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