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**est**

EGYPTIAN  
SCHOLASTIC  
TEST

# EST II MATH LEVEL 1

LEVEL  
**UP**

2025 EDITION

TESTS





## Practice Test 1

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1. If  $a = 2b - 10$  and  $b = 3a - 5$ , then  $a =$
- (A) 3
  - (B) 4
  - (C) 7
  - (D)  $-4$
  - (E)  $-3$
2.  $\sqrt{\sin^2 9\theta + \cos^2 9\theta} =$
- (A)  $-1$
  - (B)  $\sin 3\theta + \cos 3\theta$
  - (C)  $\sin 9\theta + \cos 9\theta$
  - (D) 1
  - (E)  $\sec 3\theta$
3. A fax machine sends  $n$  pages per minute. In terms of  $n$ , how many minutes will it take to fax a 25-page document?
- (A)  $\frac{n}{25}$
  - (B)  $25 - n$
  - (C)  $\frac{25}{n}$
  - (D)  $25n$
  - (E)  $n$
4. It is possible to have a triangle with all of the following sets of sides EXCEPT
- (A) 1, 1, 1
  - (B) 1, 2, 2
  - (C) 3, 4, 5
  - (D) 9, 9, 18
  - (E) 7, 10, 16
5. If  $x > 0$ , then  $\frac{x^{\frac{3}{4}}}{x^{-\frac{1}{4}}} =$
- (A)  $x^{\frac{1}{2}}$
  - (B) 1
  - (C)  $x$
  - (D)  $-x$
  - (E)  $x^{-1}$

6. In Figure 1,  $\overline{XY} \parallel \overline{WZ}$ . What is  $c$  in terms of  $a$  and  $b$ ?
- (A)  $a + b$   
 (B)  $a - b$   
 (C)  $b - a$   
 (D)  $180 - a - b$   
 (E)  $180 - a + b$
7. What is the slope of the line parallel to the line segment with endpoints  $(0, -4)$  and  $(2, 4)$ ?
- (A) 4  
 (B)  $\frac{1}{4}$   
 (C)  $-\frac{1}{4}$   
 (D) -4  
 (E) 0
8. In Figure 2,  $m\angle ABC = 29^\circ$  and  $\overline{AB} = 12$ . What is the length of  $AC$ ?
- (A) 10.5  
 (B) 6.7  
 (C) 24.8  
 (D) 5.8  
 (E) 0.49
9. If  $g(f(x)) = 2x + 1$  and  $f(x) = \frac{1}{4}x - 1$ , then  $g(x) =$
- (A)  $-\frac{8}{7}$   
 (B)  $8x + 9$   
 (C)  $\frac{1}{4}(2x + 1)$   
 (D)  $8x - 8$   
 (E)  $8x$
10. If  $i^2 = -1$  and  $7 - xi = x + y + 2i$ , then  $y =$
- (A)  $9 - 2i$   
 (B)  $2 + 2i$   
 (C) 7  
 (D) 5  
 (E) 9
11. If  $|x - 8| < 5$ , then
- (A)  $0 < x < 14$   
 (B)  $x > 3$   
 (C)  $0 < x < 13$   
 (D)  $x < 13$   
 (E)  $3 < x < 13$

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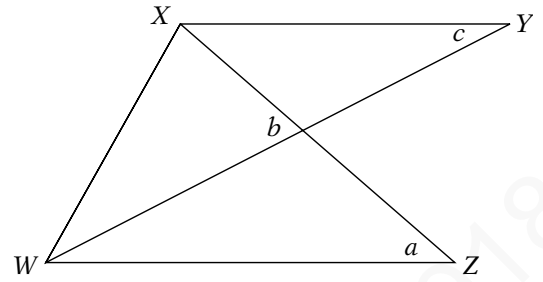


Figure 1

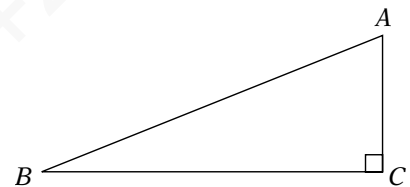


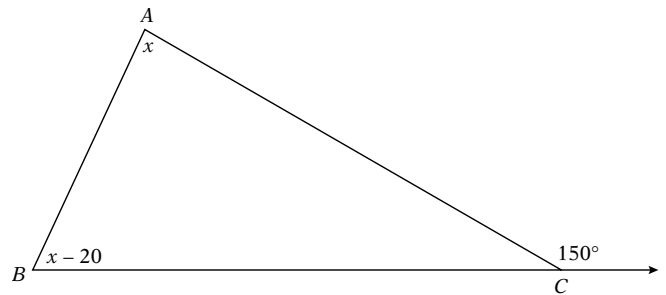
Figure 2

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12. What is the area of the base of a triangular pyramid with a volume of  $88 \text{ cm}^3$  and a height of  $16 \text{ cm}$ ?
- (A)  $5.5 \text{ cm}^2$   
(B)  $11 \text{ cm}^2$   
(C)  $8 \text{ cm}^2$   
(D)  $16.5 \text{ cm}^2$   
(E)  $22 \text{ cm}^2$
13. Which of the following is the  $y$ -intercept of the line determined by the equation  $6x + 7y - 15 = 0$ ?
- (A)  $\frac{15}{7}$   
(B)  $\frac{5}{2}$   
(C)  $-\frac{15}{7}$   
(D)  $-\frac{5}{2}$   
(E)  $15$
14. In which of the following quadrants could the point  $(a, |b|)$  lie?
- (A) I only  
(B) I or II  
(C) II only  
(D) II or III  
(E) III or IV
15.  $\frac{\sqrt{a+b}}{\sqrt{a-b}} =$
- (A)  $1$   
(B)  $\frac{\sqrt{a^2+b^2}}{a-b}$   
(C)  $\frac{\sqrt{a^2-b^2}}{a-b}$   
(D)  $\sqrt{a-b}$   
(E)  $-1$
16.  $|-7.5| + |-8.6| - |5.2| =$
- (A)  $10.9$   
(B)  $-21.3$   
(C)  $16.1$   
(D)  $21.3$   
(E)  $-6.3$

17. The cost of 2 candy bars and 4 sodas is \$6.00. If the cost of 3 sodas is \$3.30, then what is the cost of 1 candy bar?
- (A) \$1.10  
(B) \$2.70  
(C) \$1.35  
(D) \$0.80  
(E) \$1.60
18. If each exterior angle of a regular polygon measures  $40^\circ$ , how many sides does it have?
- (A) 1,260  
(B) 10  
(C) 18  
(D) 9  
(E) 8
19. John spends 25 percent of his monthly salary on rent and puts 25 percent of the remaining amount into a savings account. If he puts \$420 a month into his savings account, how much is his monthly salary?
- (A) \$6,720  
(B) \$2,240  
(C) \$840  
(D) \$560  
(E) \$2,420
20. The cube root of twice a number,  $n$ , is  $\frac{3}{4}$ .  $n =$
- (A) 0.422  
(B) 0.211  
(C) 0.909  
(D) 0.454  
(E) 0.563
21. A cube with an edge of 3 cm has the same volume as a sphere with a radius of what length?
- (A) 1.86 cm  
(B) 6.45 cm  
(C) 2.25 cm  
(D) 1.29 cm  
(E) 11.46 cm
22. The perimeter of a rectangle is 48 cm. If the ratio of its width to length is 1:3, then what is its length?
- (A) 6  
(B) 16  
(C) 8  
(D) 18  
(E) 12

23. If  $\log_x y = n$ , then which of the following is true?
- (A)  $x^n = y$   
 (B)  $y^x = n$   
 (C)  $n^x = y$   
 (D)  $y^x = n$   
 (E)  $x^y = n$
24. If a circle has a radius of 5 and is tangent to both the  $x$ - and  $y$ -axis, then which of the following is a possible equation for the circle?
- (A)  $x^2 + y^2 = 25$   
 (B)  $x^2 + y^2 = 5$   
 (C)  $x^2 + (y - 5)^2 = 5$   
 (D)  $(x + 5)^2 + y^2 = 25$   
 (E)  $(x - 5)^2 + (y - 5)^2 = 25$
25. What is the axis of symmetry of the graph of  $y = -5(x + 1)^2 + 9$ ?
- (A)  $y = -1$   
 (B)  $x = -1$   
 (C)  $y = 9$   
 (D)  $x = 9$   
 (E)  $x = 1$
26. Which of the following is the solution set of  $8x^3 + 8x^2 - 16x = 0$ ?
- (A)  $\{-2, 1\}$   
 (B)  $\{-2, 0, 1\}$   
 (C)  $\{-2, 0, -1\}$   
 (D)  $\{8, 1\}$   
 (E)  $\{-2, 1, 8\}$
27. What is the measure of  $\angle ABC$  in Figure 3?
- (A)  $30^\circ$   
 (B)  $85^\circ$   
 (C)  $65^\circ$   
 (D)  $75^\circ$   
 (E)  $80^\circ$
28. What is the area, in square units, of a triangle with vertices  $(-1, 1)$ ,  $(5, 1)$ , and  $(8, 8)$ ?
- (A) 42  
 (B) 21  
 (C) 48  
 (D) 24  
 (E) 14



**Figure 3**

29. If the distance from  $A(1, 6)$  to  $B(x, -2)$  is 10, then what is a possible value for  $x$ ?

- (A) 11
- (B) -5
- (C) -7
- (D) 8
- (E) 6

30. In Figure 4,  $\overline{WX} = \overline{WZ}$  and  $\overline{XY} = \overline{ZY}$ .  $n =$

- (A)  $50^\circ$
- (B)  $142^\circ$
- (C)  $25^\circ$
- (D)  $26^\circ$
- (E)  $168^\circ$

31. What is the maximum value of  $f(x) = -x^2 + 3x - 11$ ?

- (A)  $\frac{3}{2}$
- (B) -11
- (C)  $-\frac{35}{4}$
- (D)  $-\frac{3}{2}$
- (E)  $-\frac{53}{4}$

32. The diagonal of a square is 12. What is the length of a side?

- (A)  $\frac{12}{\sqrt{3}}$
- (B) 14.1
- (C) 8.5
- (D) 6.9
- (E) 17

33. In Figure 5, what is the length of  $\overline{OQ}$ ?

- (A) 3
- (B) 5
- (C) 4
- (D) 9
- (E) 8

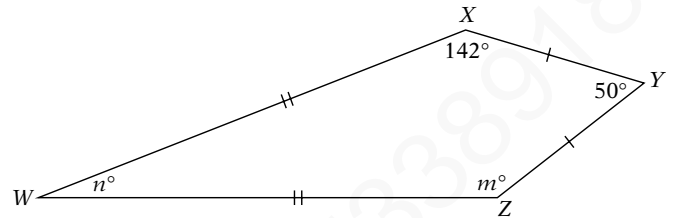


Figure 4

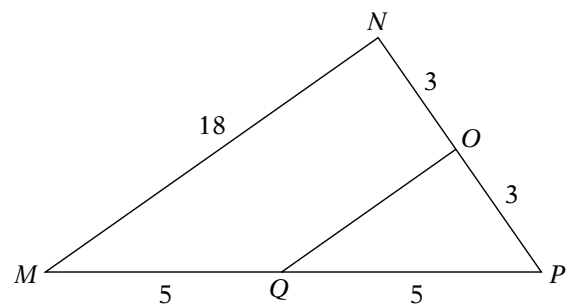
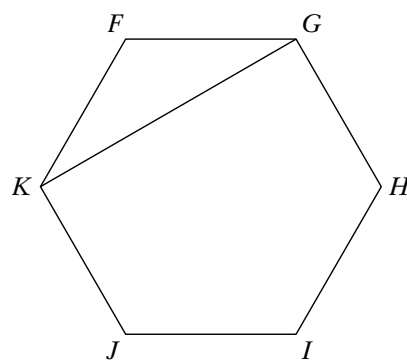


Figure 5

34. When  $f(x)$  is divided by  $2x + 1$ , the quotient is  $x^2 - x + 4$  and the remainder is 6. What is  $f(x)$ ?
- (A)  $2x^3 - x^2 + 9x + 6$   
(B)  $2x^3 - 2x^2 + 8x + 6$   
(C)  $x^2 - x + 10$   
(D)  $2x^3 - x^2 + 7x + 4$   
(E)  $2x^3 - x^2 + 7x + 10$
35. If  $f(x) = x^2 + 1$ , then  $f(f(x)) =$
- (A)  $x^4 + 1$   
(B)  $x^4 + 2x^2 + 1$   
(C)  $x^4 + 2x^2 + 2$   
(D)  $x^4 + x^2 + 1$   
(E)  $x^4 + 2$
36. If  $\frac{4^n}{4^3} = 2^{10}$ , then  $n =$
- (A) 13  
(B) 8  
(C) 7  
(D) 5  
(E) 2
37. If  $xy = 7$ , then which of the following must be true statements?
- I.  $x$  and  $y$  cannot both be integers.  
II.  $x$  and  $y$  have the same sign.  
III.  $y \neq 0$
- (A) II only  
(B) III only  
(C) I and III only  
(D) II and III only  
(E) I, II, and III
38. In Figure 6,  $FGHIJK$  is a regular hexagon with a perimeter of 36. What is the length of  $\overline{KG}$ ?
- (A) 10.4  
(B) 8.5  
(C) 6  
(D) 5.2  
(E) 7.1



**Figure 6**

39. Which of the following is NOT a true statement?
- (A)  $3^2(3^3) = 3^5$
  - (B)  $2^3(3^3) = 6^3$
  - (C)  $(64)^{\frac{1}{2}} = 8$
  - (D)  $2^2 + 2^3 = 2^5$
  - (E)  $2^2(2^{-3}) = \frac{1}{2}$
40. A jar contains 4 red, 1 green, and 3 yellow marbles. If 2 marbles are drawn from the jar without replacement, what is the probability that both will be yellow?
- (A)  $\frac{3}{8}$
  - (B)  $\frac{3}{28}$
  - (C)  $\frac{1}{4}$
  - (D)  $\frac{3}{56}$
  - (E)  $\frac{5}{56}$
41. If  $f(x) = \sqrt{4x^2 - 9}$ , then what is the domain of the function?
- (A) All  $x$  such that  $x \geq 0$
  - (B) All  $x$  such that  $x \geq \frac{3}{2}$
  - (C) All  $x$  such that  $-\frac{3}{2} \leq x \leq \frac{3}{2}$
  - (D) All  $x$  such that  $x \leq -\frac{3}{2}$  or  $x \geq \frac{3}{2}$
  - (E) All real numbers
42. The width of a rectangular prism is doubled, its length is tripled, and its height is cut in half. If the volume of the original prism was  $V$ , what is its new volume?
- (A)  $2V$
  - (B)  $4V$
  - (C)  $16V$
  - (D)  $6V$
  - (E)  $3V$
43. If  $\cos x^\circ = 0.788$ , then  $\cos (x + 0.5)^\circ =$
- (A) 0.623
  - (B) 1.29
  - (C) 0.793
  - (D) 38
  - (E) 0.783

44. The probability that Claire passes chemistry is 0.75, and the probability that she passes history is 0.88. If passing one course is independent of passing the other, what is the probability that she does not pass chemistry and passes history?
- (A) 0.22  
(B) 0.66  
(C) 0.13  
(D) 0.25  
(E) 0.03
45. A comedian has rehearsed 10 different jokes. During a given act, he performs any 5 of these jokes. How many different acts can he perform assuming the order of the jokes in an act is not important?
- (A) 10  
(B) 252  
(C) 42  
(D) 84  
(E) 126
46. What is the maximum value of the function  $y = 3 + 2(\sin \pi x)$ ?
- (A) 3  
(B) 2  
(C) 5  
(D) 1  
(E) 6
47. If  $f(x) = \frac{|x|}{x}$ , then what is the range of the function?
- (A)  $y > 0$   
(B) All real numbers except  $y = 0$   
(C)  $y = -1$  or  $y = 1$   
(D)  $y = 1$   
(E) All real numbers
48. Assuming each factor has only real coefficients, which of the following is the completely factored form of  $2x^4 - 18$ ?
- (A)  $2(x^4 - 9)$   
(B)  $2(x^2 + 3)(x^2 - 3)$   
(C)  $(2x + 6)(x - \sqrt{3})(x + \sqrt{3})$   
(D)  $2(x^2 + 3)(x - 3)(x + 3)$   
(E)  $2(x^2 + 3)(x - \sqrt{3})(x + \sqrt{3})$

49. If  $n$  = the number of the term, the  $n$ th term of the sequence 1, 0, 1, 4, 9, . . . is which of the following?

- (A)  $n - 1$
- (B)  $n^2$
- (C)  $(n - 1)^2$
- (D)  $(n - 2)^2$
- (E)  $n^2 - 1$

50. 
$$\frac{\left(\frac{-6 + 2x}{x - 3}\right)}{\left(\frac{x^2 + 6x + 9}{x^2 - 9}\right)} =$$

- (A)  $\frac{2(x - 3)}{x + 3}$
- (B)  $\frac{2x}{x + 3}$
- (C)  $-\frac{2(x - 3)}{x + 3}$
- (D) 2
- (E)  $\frac{-6 + 2x}{x - 3}$

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## ANSWER KEY

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

## ANSWERS AND SOLUTIONS

1. **B** Substitute  $b = 3a - 5$  into the equation for  $a$ .

$$a = 2(3a - 5) - 10$$

$$a = 6a - 10 - 10$$

$$a = 6a - 20$$

$$20 = 5a$$

$$a = 4$$

2. **D** Remember the trigonometric identity  $\sin^2 x + \cos^2 x = 1$ . Here  $x = 9\theta$ , so

$$\sqrt{\sin^2 9\theta + \cos^2 9\theta} = \sqrt{1} = 1$$

3. **C** Since the fax machine sends  $n$  pages per minute, divide 25 by  $n$ . It will take  $\frac{25}{n}$  minutes to send the entire 25-page document.

4. **D** The Triangle Inequality Theorem states that the sum of the length of any two sides of a triangle must be greater than the length of the third side.  $9 + 9$  is not greater than 18, so sides in Answer D cannot create a triangle.

5. **C** The base in the numerator and denominator is the same, so subtract the denominator's exponent from that of the numerator.

$$\frac{x^{\frac{3}{4}}}{x^{-\frac{1}{4}}} = x^{\left(\frac{3}{4} - \left(-\frac{1}{4}\right)\right)} = x^1 = x$$

6. **C** Since  $\overline{XY} \parallel \overline{WZ}$ ,  $\angle WZX$  and  $\angle YXZ$  are alternate interior angles and are, therefore congruent.  $m\angle YXZ = a$ .  $b$  is an exterior angle to the triangle containing the angles  $a$  and  $c$ , so  $b$  equals the sum of the two remote interior angles.

$$b = a + c$$

$$c = b - a$$

7. **A** The slope of the line segment is

$$\frac{-4 - 4}{0 - 2} = \frac{-8}{-2} = 4$$

Any line parallel to the segment must have the same slope, so 4 is the correct answer.

8. **D** You're trying to determine the length of the side opposite  $\angle ABC$  and you know the length of the hypotenuse. Use sine to get

$$\sin 29^\circ = \frac{\overline{AC}}{12}$$

$$12(\sin 29^\circ) \approx 5.8$$

9. **B** The composition of the two functions,  $g$  and  $f$ , is  $2x + 1$ . Since  $f(x) = \frac{1}{4}x - 1$ , you know

$$g\left(\frac{1}{4}x - 1\right) = 2x + 1$$

The function  $g$  is a rule that will result in an output of  $2x + 1$  when the input equals  $\frac{1}{4}x - 1$ .

$$8\left(\frac{1}{4}x - 1\right) + 9 = 2x - 8 + 9 = 2x + 1$$

10. **E** If  $a + bi = c + di$ , then  $a = c$  and  $b = d$ . In this example:

$$-xi = 2i$$

$$-x = 2$$

$$x = -2$$

Now, look at the real parts of the expressions:

$$7 = x + y$$

Letting  $x = -2$  results in

$$7 = -2 + y$$

$$y = 9$$

11. **E** Since  $|x - 8| < 5$ , then

$$-5 < x - 8 < 5$$

$$-5 < x - 8 \quad \text{and} \quad x - 8 < 5$$

$$3 < x \quad \quad \quad x < 13$$

$$3 < x < 13$$

12. **D**

$$V = \frac{1}{3}BH \text{ where } B \text{ equals the area of the base.}$$

$$88 = \frac{1}{3}B(16)$$

$$\frac{88(3)}{16} = B$$

$$B = 16.5 \text{ cm}^2$$

13. **A** To find the  $y$ -intercept, let  $x = 0$  and solve for  $y$ .

$$6(0) + 7y - 15 = 0$$

$$7y = 15$$

$$y = \frac{15}{7}$$

14. **B** Since the absolute value of  $b$  must result in a positive number, the  $y$ -coordinate of the point must be positive.  $a$  could be a positive or negative value, so the point could lie in either quadrant I (where both the  $x$ - and  $y$ -coordinates are positive) or quadrant II (where the  $x$ -coordinate is negative and the  $y$ -coordinate is positive).

15. **C** To rationalize the denominator, multiply the fraction by

$$\begin{aligned} & \frac{\sqrt{a-b}}{\sqrt{a-b}} \\ & \frac{\sqrt{a+b}}{\sqrt{a-b}} \times \frac{\sqrt{a-b}}{\sqrt{a-b}} \\ & = \frac{\sqrt{(a+b)(a-b)}}{a-b} \\ & = \frac{\sqrt{a^2 - b^2}}{a-b} \end{aligned}$$

16. **A**

$$\begin{aligned} & |-7.5| + |-8.6| - |5.2| \\ & = 7.5 + 8.6 - 5.2 \\ & = 16.1 - 5.2 \\ & = 10.9 \end{aligned}$$

17. **D** Let  $c$  = the cost of a candy bar and  $s$  = the cost of a soda.

$$2c + 4s = 6.00 \quad \text{and} \quad 3s = 3.30$$

Solving for  $s$  in the second equation gives you  $s = \$1.10$ . Then substitute this value of  $s$  into the first equation:

$$2c + 4(1.10) = 6.00$$

$$2c = 1.60$$

$$c = 0.80$$

18. **D** The sum of the exterior angles of any polygon is  $360^\circ$ . If each exterior angle measures  $40^\circ$ , then the polygon has

$$\frac{360}{40} = 9 \text{ sides}$$

19. **B** Since 25 percent of John's monthly salary is spent on rent, he has 75 percent remaining. Let  $m =$  John's monthly salary.

$$0.25(0.75m) = 420$$

$$0.1875m = 420$$

$$m = \frac{420}{0.1875} = \$2,240$$

20. **B**

$$\sqrt[3]{2n} = \frac{3}{4}$$

$$2n = \left(\frac{3}{4}\right)^3$$

$$2n = (0.75)^3 \approx 0.4219$$

$$n \approx 0.2109$$

21. **A** The volume of the cube is  $e^3$  or  $3^3 = 27 \text{ cm}^3$ . Remember that the formula for the volume of a sphere is given in the Reference Information.

$$\text{Volume} = \frac{4}{3}\pi r^3 = 27$$

$$r^3 = \frac{27(0.75)}{\pi} = 6.44318$$

$$r = (6.44318)^{\frac{1}{3}} = 1.86 \text{ cm}$$

22. **D** Let the width =  $x$  and the length =  $3x$ . The perimeter, therefore, equals

$$x + 3x + x + 3x = 48$$

$$8x = 48$$

$$x = 6 \text{ cm}$$

The length is  $3(6)$  cm or 18 cm.

23. **A** By the definition of a logarithm,  $\log_x y = n$  is equivalent to  $x^n = y$ . For example,  $\log_2 8 = 3$  is equivalent to  $2^3 = 8$ .

24. **E** Radii of the circle will be perpendicular to both the  $x$ - and  $y$ -axis at the points of tangency. The center of the circle cannot be on either the  $x$ - or  $y$ -axis or the circle will intersect the axes at more than one point. The only possible solution, therefore, is  $(x - 5)^2 + (y - 5)^2 = 25$ , a circle with center  $(5, 5)$  and radius of 5.

25. **B** The graph of the equation  $y = -5(x + 1)^2 + 9$  is a parabola. It is concave down and has a vertex of  $(-1, 9)$ . The axis of symmetry is the vertical line passing through the vertex, making  $x = -1$  the correct answer.

26. **B**

$$8x^3 + 8x^2 - 16x = 0$$

$$8x(x^2 + x - 2) = 0$$

$$8x(x + 2)(x - 1) = 0$$

$$8x = 0 \text{ or } (x + 2) = 0 \text{ or } (x - 1) = 0$$

$$x = 0 \text{ or } x = -2 \text{ or } x = 1$$

$$\{-2, 0, 1\}$$

27. **C** The measure of the exterior angle of a triangle equals the sum of the two remote interior angles.

$$150 = x + x - 20$$

$$170 = 2x$$

$$x = 85^\circ$$

$$\text{The measure of } \angle ABC = 85 - 20 = 65^\circ.$$

28. **B** The base of the triangle measures  $|-1 - 5| = 6$  units and the height measures  $|8 - 1| = 7$  units. The area of the triangle is

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

$$A = \frac{1}{2}(6)(7) = 21 \text{ units}^2$$

29. **B** Use the distance formula to solve for  $x$ .

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = 10$$

$$\sqrt{(1 - x)^2 + (6 - (-2))^2} = 10$$

$$\sqrt{(1 - x)^2 + (8)^2} = 10$$

$$(1 - x)^2 + (8)^2 = 10^2$$

$$(1 - x)^2 = 100 - 64 = 36$$

$$1 - x = \pm 6$$

$$1 - x = 6 \text{ or } 1 - x = -6$$

$$x = -5 \text{ or } x = 7$$

$x = -5$  is the only valid answer given in the problem.

As an alternative solution using geometry, sketch a right triangle with vertices  $A(1, 6)$ ,  $C(1, -2)$ , and  $B(x, -2)$ . The hypotenuse of the triangle must measure 10 units. One leg measures 8 units, so  $\overline{BC} = 6$ .  $x = 7$  or  $-5$ .

30. **D**  $WXYZ$  is a kite, so  $m\angle WZY = 142^\circ$  since the nonvertex angles of a kite are congruent. The sum of the four angles of the kite must add up to  $360^\circ$ .

$$n + 142 + 142 + 50 = 360$$

$$n = 26^\circ$$

31. **C** The graph of this function is a parabola that is concave down. The maximum value is the  $y$ -coordinate of its vertex. The  $x$ -coordinate of the vertex is found by

$$x = -\frac{b}{2a}$$

$$x = -\frac{3}{2(-1)} = \frac{3}{2}$$

$$f\left(\frac{3}{2}\right) = -\left(\frac{3}{2}\right)^2 + 3\left(\frac{3}{2}\right) - 11$$

$$= -\frac{9}{4} + \frac{9}{2} - 11$$

$$= \frac{9}{4} - \frac{44}{4} = -\frac{35}{4}$$

32. **C** The diagonal of a square splits it into two  $45^\circ$ - $45^\circ$ - $90^\circ$  right triangles. The hypotenuse of each triangle is 12, so each leg measures

$$\frac{12}{\sqrt{2}} \approx 8.5 \text{ units}$$

33. **D**  $\overline{OQ}$  is a midsegment of  $\triangle NPM$ , since it connects the midpoint of  $\overline{NP}$  to the midpoint of  $\overline{MP}$ . Midsegments are parallel to the third side of the triangle and half their length, so  $OQ = \frac{1}{2}(18) = 9$ .

34. **E** Using the given quotient and remainder, you know that

$$f(x) = (2x + 1)(x^2 - x + 4) + 6$$

$$f(x) = 2x^3 - 2x^2 + 8x + x^2 - x + 4 + 6$$

$$f(x) = 2x^3 - x^2 + 7x + 10$$

35. **C**

$$f(f(x)) = f(x^2 + 1)$$

$$= (x^2 + 1)^2 + 1$$

$$= x^4 + 2x^2 + 1 + 1$$

$$= x^4 + 2x^2 + 2$$

36. **B**

$$\frac{4^n}{4^3} = \frac{2^{2n}}{2^{2(3)}} = 2^{10}$$

$$\frac{2^{2n}}{2^6} = 2^{10}$$

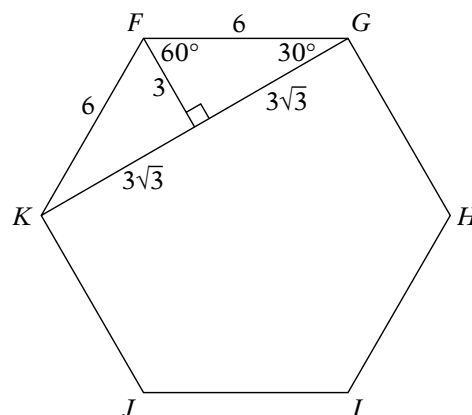
$$2n - 6 = 10$$

$$2n = 16$$

$$n = 8$$

37. **D** Neither  $x$  nor  $y$  can equal zero for their product to equal a nonzero number, so III is a true statement.  $x$  and  $y$  can be integers, i.e.,  $(7)(1) = 7$ , so I is not true.  $x$  and  $y$  must both be positive or both be negative to result in a positive 7 product. Both II and III are true statements.

38. **A**  $\triangle KFG$  is an isosceles triangle with two sides measuring 6. Each angle of a regular hexagon measures  $120^\circ$ , so  $\angle F = 120^\circ$ . Draw the altitude from  $\angle F$  to create two congruent  $30^\circ$ - $60^\circ$ - $90^\circ$  right triangles. Since the side opposite the  $90^\circ$  angle is 6, the side opposite the  $30^\circ$  angle must measure 3 units. The sides opposite the  $60^\circ$  angles in both triangles measure  $3\sqrt{3}$ .



$$KG = 3\sqrt{3} + 3\sqrt{3} = 6\sqrt{3} \approx 10.4$$

39. **D**  $2^2 + 2^3 = 4 + 8 = 12$ , which is not equal to  $2^5$ , so D is NOT a true statement. The other four answers are true statements.

$$(A) 3^2(3^3) = 3^{2+3} = 3^5$$

$$(B) 2^3(3^3) = (2 \cdot 3)^3 = 6^3$$

$$(C) (64)^{\frac{1}{2}} = \sqrt{64} = 8$$

$$(D) 2^2(2^{-3}) = 2^{-1} = \frac{1}{2}$$

40. **B** There are eight marbles in the jar. The probability of choosing the first yellow marble is  $\frac{3}{8}$ . The probability that your second marble will also be yellow is  $\frac{2}{7}$ . The probability that both will be yellow is therefore

$$\frac{3}{8} \times \frac{2}{7} = \frac{6}{56} = \frac{3}{28}$$

41. **D**

$4x^2 - 9$  must be positive or equal to zero.

$$4x^2 - 9 \geq 0$$

$$4x^2 \geq 9$$

$$x^2 \geq \frac{9}{4}$$

$$x \leq -\frac{3}{2} \text{ or } x \geq \frac{3}{2}$$

42. **E** The volume of the original prism was

$$V = \ell \times w \times h$$

The volume of the new prism is

$$V = 2\ell \times 3w \times \frac{1}{2}h$$

$$= 3\ell \times w \times h$$

$$= 3V$$

43. **E**

$$\cos^{-1}(0.788) = 38^\circ, \text{ so } x = 38.$$

$$\cos(x + 0.5)^\circ = \cos(38 + 0.5)^\circ$$

$$= \cos(38.5)^\circ = 0.783$$

44. **A** The probability that Claire does NOT pass chemistry is

$$1 - 0.75 = 0.25$$

The probability that she does NOT pass chemistry and she does pass history is then

$$0.25(0.88) = 0.22$$

45. **B** The order that he performs the jokes does not matter in this problem. Set up a combination for "10 choose 5" jokes.

$$\frac{10!}{5!}(10-5)! = \frac{10!}{5!5!}$$

$$= \frac{6(7)(8)(9)(10)}{1(2)(3)(4)(5)}$$

$$= 7(2)(9)(2)$$

$$= 252$$

46. **C**

$$y = 3 + 2(\sin \pi x)$$

The maximum value of  $2(\sin \pi x)$  is  $2(1)$  or  $2$ . The  $3$  shifts the sine curve upward  $3$  units, so the maximum value for  $y$  is  $5$ .

47. **C** Since the numerator of the function is an absolute value expression, the function can be written as two distinct expressions—one for when  $x > 0$  and one for when  $x < 0$ . (The function is undefined when  $x = 0$ .)

When  $x > 0$ ,

$$f(x) = \frac{x}{x} = 1$$

When  $x < 0$ ,

$$f(x) = \frac{-x}{x} = -1$$

48. **E**

$$2x^4 - 18$$

$$= 2(x^4 - 9)$$

$$= 2(x^2 + 3)(x^2 - 3)$$

$$= 2(x^2 + 3)(x - \sqrt{3})(x + \sqrt{3})$$

49. **D** The sequence:  $1, 0, 1, 4, 9, \dots$  is equivalent to  $(-1)^2, 0^2, 1^2, 2^2, 3^2, \dots$ . Since  $n$  is the number of the term, this translates to:  $(1-2)^2, (2-2)^2, (3-2)^2, (4-2)^2, (5-2)^2, \dots$ , so the  $n$ th term is  $(n-2)^2$ .

50. **A**

$$\left(\frac{-6+2x}{x-3}\right) \times \frac{x^2-9}{x^2-9}$$

$$= \frac{(-6+2x)(x+3)}{x^2+6x+9}$$

$$= \frac{2(x-3)(x+3)}{(x+3)^2}$$

$$= \frac{2(x-3)}{(x+3)}$$









# **PRACTICE TEST 2**

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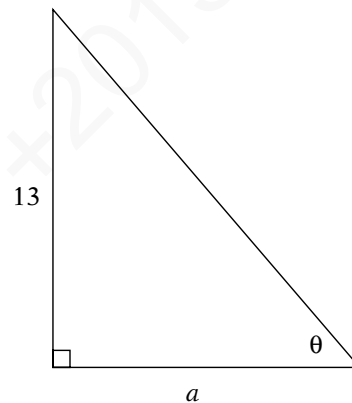




1. The cost to rent a DVD is \$4.50 for the first five days, with a \$2.50 late fee for each succeeding day. Which of the following represents the cost of renting the DVD for  $d$  days if  $d$  is greater than 5?
- (A)  $4.50d + 2.50d$   
(B)  $4.50 + 2.50(d - 5)$   
(C)  $7d$   
(D)  $4.50 + 2.50d$   
(E)  $4.50 + (2.50d - 5)$
2. If  $x \neq 0$ , then  $\frac{1}{2x^{-\frac{3}{2}}} =$
- (A)  $-\frac{1}{2x^{\frac{3}{2}}}$   
(B)  $2x^{\frac{3}{2}}$   
(C)  $\frac{x^{\frac{2}{3}}}{2}$   
(D)  $\frac{x^{\frac{3}{2}}}{2}$   
(E)  $x^3$
3. What are all values of  $x$  for which  $x - 3 > 9 - x^2$ ?
- (A)  $x > 3$   
(B)  $x < -3$   
(C)  $x < -4$  or  $x > 3$   
(D)  $x < -4$   
(E)  $-4 < x < 3$
4. What is the distance between the points (5, 6) and (-3, 0)?
- (A) 9  
(B) 100  
(C) 10  
(D) 6  
(E) 8
5. At what point does the graph of  $4x - 6y = -1$  intersect the  $x$ -axis?
- (A) 4  
(B) 6  
(C)  $\frac{2}{3}$   
(D)  $\frac{1}{6}$   
(E)  $-\frac{1}{4}$

6. If  $4x^3 = -64$ , then  $x =$
- (A)  $-1$
  - (B)  $1$
  - (C)  $-2\sqrt[3]{2}$
  - (D)  $2\sqrt[3]{2}$
  - (E)  $4$
7. If the fourth root of the square of a number is 2, then what is the number?
- (A)  $2$
  - (B)  $4$
  - (C)  $8$
  - (D)  $16$
  - (E)  $32$
8. If a line is perpendicular to the line  $2x + 6y = 18$ , what is its slope?
- (A)  $-\frac{1}{3}$
  - (B)  $\frac{1}{3}$
  - (C)  $-3$
  - (D)  $3$
  - (E)  $\frac{1}{2}$
9. If  $x - y = 8$  and  $2x + 3y = 16$ , then  $x =$
- (A)  $8$
  - (B)  $0$
  - (C)  $10$
  - (D)  $4$
  - (E)  $-8$
10. If  $f(x) = \frac{x^2 - 16}{x - 4}$  and  $h(x) = x + 4$ , which of the following is true about their graphs?
- (A) They are the same.
  - (B) They are the line  $x - y = 4$ .
  - (C) They are the same except when  $x = 4$ .
  - (D) They are the same except when  $x = -4$ .
  - (E) They do not share any points.
11.  $(2^2 \times 2^3)^4 =$
- (A)  $2^5$
  - (B)  $2^9$
  - (C)  $2^{20}$
  - (D)  $2^{24}$
  - (E)  $2^{96}$

12. If the lines  $\ell_1$  and  $\ell_2$  are parallel and are intersected by a transversal  $t$ , then what is the sum of the exterior angles on the same side of  $t$ ?
- (A)  $45^\circ$   
(B)  $90^\circ$   
(C)  $180^\circ$   
(D)  $360^\circ$   
(E) Cannot be determined
13. Of the following, which has the greater value?
- (A)  $2^8$   
(B)  $2^5 \times 2^2$   
(C)  $\frac{2^{10}}{2^2}$   
(D)  $(2^5)^2$   
(E)  $2^8 + 2^4$
14. In Figure 1, if  $\theta = 48^\circ$ , then what is the value of  $a$ ?
- (A) 14.4  
(B) 17.5  
(C) 19.4  
(D) 9.7  
(E) 11.7
15. Line  $\ell_1$  has a negative slope and a positive  $y$ -intercept. If  $\ell_2$  is perpendicular to  $\ell_1$  and has a positive  $y$ -intercept, then which of the following must be true of the  $x$ -intercepts of the two lines?
- (A) Both are negative.  
(B) Both are positive.  
(C) They are equal.  
(D) The  $x$ -intercept of  $\ell_1$  is greater than the  $x$ -intercept of  $\ell_2$ .  
(E) The  $x$ -intercept of  $\ell_1$  is less than the  $x$ -intercept of  $\ell_2$ .
16. In a given high school, 60 percent of the teachers reported an annual salary greater than or equal to \$50,000 a year. Which of the following must be greater than or equal to \$50,000?
- (A) The mean salary  
(B) The median salary  
(C) The mode of their salaries  
(D) The mean and the median of their salaries  
(E) Neither the mean, median, nor mode



**Figure 1**

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17. If  $2x^2 + 15x + k = 0$  has  $\frac{1}{2}$  as one of its solutions, what is the value of  $k$ ?
- (A)  $-8$   
(B)  $8$   
(C)  $\frac{1}{2}$   
(D)  $-\frac{1}{2}$   
(E)  $6$

18. Assuming you are factoring over the real numbers, which of the following is the completely factored form of  $x^4 - 16$ ?
- (A)  $(x^2 - 4)(x^2 + 4)$   
(B)  $(x - 2)(x + 2)(x^2 + 4)$   
(C)  $(x^2 - 4)^2$   
(D)  $(x - 2)^2(x^2 + 4)$   
(E)  $(x^2 - 8)(x^2 + 2)$

19. In Figure 2,  $\triangle ABE$  is similar to  $\triangle ACD$ . What is the value of  $x$ ?
- (A)  $3$   
(B)  $3.5$   
(C)  $3.75$   
(D)  $4$   
(E)  $13.75$

20. If the supplement of an angle is four times the measure of its complement, then the measure of the angle's complement is
- (A)  $30^\circ$   
(B)  $60^\circ$   
(C)  $20^\circ$   
(D)  $120^\circ$   
(E)  $150^\circ$

21. If  $f(x) = \frac{4x - 1}{2}$ , then  $f^{-1}(x) =$
- (A)  $\frac{4x - 1}{2}$   
(B)  $\frac{2}{4x - 1}$   
(C)  $2x + 1$   
(D)  $\frac{2x + 1}{4}$   
(E)  $2\left(\frac{1}{4x + 1}\right)$

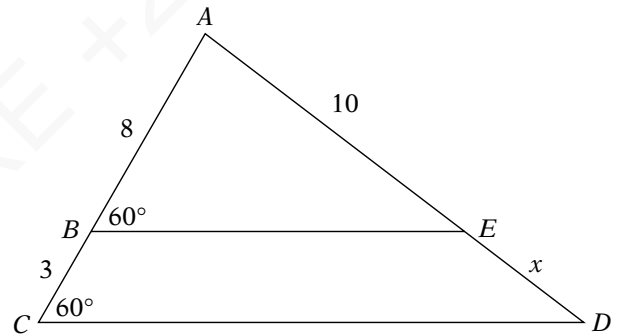


Figure 2

22. If the triangle in Figure 3 is reflected across the  $x$ -axis, what will be the coordinates of the reflection of vertex  $A$ ?

- (A)  $(-1, 1)$
- (B)  $(1, 1)$
- (C)  $(-1, -1)$
- (D)  $(1, 0)$
- (E)  $(0, -1)$

23. What is the measure of each exterior angle of a regular pentagon?

- (A)  $90^\circ$
- (B)  $60^\circ$
- (C)  $120^\circ$
- (D)  $108^\circ$
- (E)  $72^\circ$

24. The triangle in Figure 4 has sides measuring 3, 4, and 5 units. What is the measure of  $\theta$ ?

- (A)  $45^\circ$
- (B)  $30^\circ$
- (C)  $60^\circ$
- (D)  $36.9^\circ$
- (E)  $53.1^\circ$

25. How many lines of symmetry does a rhombus have?

- (A) 0
- (B) 1
- (C) 2
- (D) 3
- (E) 4

26.  $\sin 30^\circ =$

- (A)  $\cos 60^\circ$
- (B)  $\sin 60^\circ$
- (C)  $\cos 30^\circ$
- (D)  $\tan 60^\circ$
- (E)  $\csc 30^\circ$

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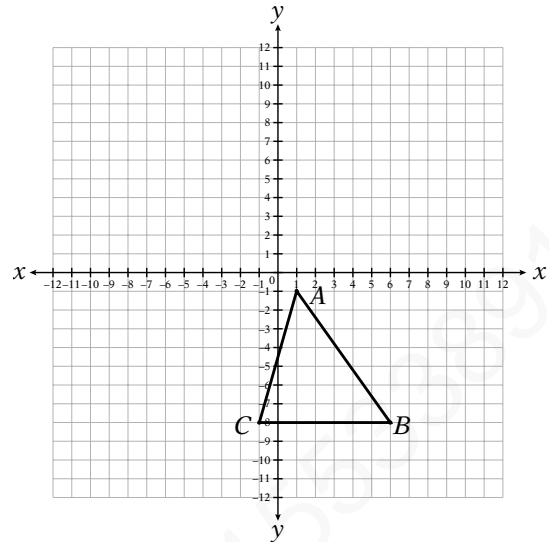


Figure 3

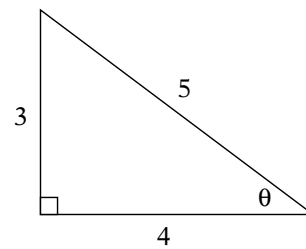


Figure 4

27.  $(\cos^2 \theta + \sin^2 \theta - 2)^3 =$
- (A) 1  
 (B) -1  
 (C) 0  
 (D) 2  
 (E) -8
28. If the equation of a circle is  $x^2 + y^2 = 12$ , then which of the following is a  $y$ -intercept?
- (A) 12  
 (B) -12  
 (C)  $-2\sqrt{3}$   
 (D) 0  
 (E) Cannot be determined
29. If  $f(x) = 5x + 3$  and  $g(x) = \frac{x+1}{2}$ , then what is  $g(f(4))$ ?
- (A) 12  
 (B) 11  
 (C) 23  
 (D) 15.5  
 (E) 23.5
30. Figure 5 is a right hexagonal prism whose bases are regular polygons. Which of the following points lies in the plane determined by points  $E$ ,  $K$ , and  $B$ ?
- (A)  $H$   
 (B)  $A$   
 (C)  $G$   
 (D)  $C$   
 (E)  $D$
31. If  $f(x) = \frac{1}{x}$  and  $-1 < x < 0$ , then what is the range of the function?
- (A) All real numbers  
 (B)  $y > -1$   
 (C)  $y < -1$   
 (D)  $-1 < y < 0$   
 (E)  $y < 0$

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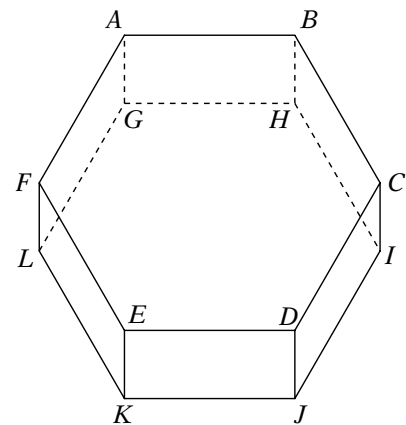


Figure 5

32. Assuming both  $a$  and  $b$  are positive, if  $ab = 16$  and  $\frac{a}{b} = 4$ , then what is the average of  $a$  and  $b$ ?

- (A) 10
- (B) 6
- (C) 5
- (D) 4
- (E) 3

33. If  $i = \sqrt{-1}$ , then  $(4 - i)(4 + i) =$

- (A) 17
- (B) 15
- (C)  $16 + 8i$
- (D)  $16 - i$
- (E) 16

34. What is the equation of the graph in Figure 6?

- (A)  $f(x) = |x - 4|$
- (B)  $f(x) = -|x - 4|$
- (C)  $f(x) = |x + 4|$
- (D)  $f(x) = -|x + 4|$
- (E)  $f(x) = -|x| - 4$

35. What is the range of the function  $f(x) = \frac{1}{2}\sin 2x$ ?

- (A)  $-2 \leq y \leq 2$
- (B)  $2 \leq y \leq 2$
- (C)  $-1 \leq y \leq 1$
- (D)  $-\frac{1}{2} \leq y \leq \frac{1}{2}$
- (E)  $-\frac{1}{2} \leq y \leq 0$

36. If  $f(x) = x^3 + 2x$ , then  $f(-2) + 2f(-1) =$

- (A) -6
- (B) 10
- (C) -15
- (D) 9
- (E) -18

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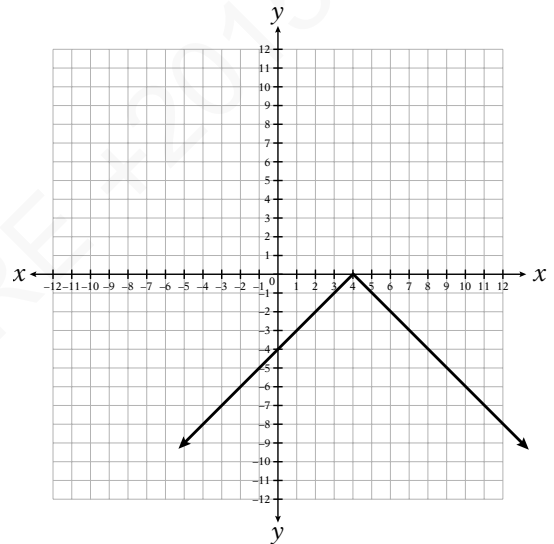


Figure 6

37. In how many ways can the letters of the word GOLDEN be arranged using all of the letters?
- (A) 16  
(B) 24  
(C) 120  
(D) 720  
(E) 5,040
38. The operation  $\hat{\cup}$  is defined as:  $n \hat{\cup} m = \frac{2n}{m}$ . If  $n$  and  $m$  do not equal zero, then for all of the following values  $n \hat{\cup} m = m \hat{\cup} n$  EXCEPT
- (A)  $n = m$   
(B)  $n = -m$   
(C)  $m = -n$   
(D)  $n = 1$  and  $m = 1$   
(E)  $n = 2$  and  $m = \frac{1}{2}$
39. The top face of a rectangular prism has an area of  $32 \text{ cm}^2$ . The front face has an area of  $16 \text{ cm}^2$  and the side face has an area of  $8 \text{ cm}^2$ . What is the volume of the prism?
- (A)  $32 \text{ cm}^3$   
(B)  $64 \text{ cm}^3$   
(C)  $128 \text{ cm}^3$   
(D)  $256 \text{ cm}^3$   
(E)  $4,096 \text{ cm}^3$
40. If  $x - 4$ ,  $x$ , and  $x + 4$  are the first three terms of an arithmetic sequence, then what is the fifth term of the sequence?
- (A)  $x$   
(B)  $x - 4$   
(C)  $x + 8$   
(D)  $x + 12$   
(E) 4
41. Claire can complete spring-cleaning in a house in 5 hours. Ruth can complete spring-cleaning in the same house in 7 hours. If Claire works for 1 hour alone and then Ruth joins her to finish the cleaning, what is the total time it takes to complete spring-cleaning?
- (A) 2 hours, 30 minutes  
(B) 2 hours, 20 minutes  
(C) 3 hours, 20 minutes  
(D) 3 hours  
(E) 2 hours, 33 minutes

42. What is the area of the quadrilateral in Figure 7?

- (A) 80
- (B) 70
- (C) 140
- (D) 60
- (E) 105

43. If  $\frac{n}{x^2 - 36} = \frac{1}{x - 6} + \frac{1}{x + 6}$ , then  $n =$

- (A)  $x$
- (B)  $2x$
- (C)  $2(x + 6)$
- (D)  $2(x - 6)$
- (E) 2

44. What is the lateral surface area of a right circular cone whose radius is 3 cm and whose slant height is 12 cm?

- (A)  $36 \text{ cm}^2$
- (B)  $18 \text{ cm}^2$
- (C)  $18\pi \text{ cm}^2$
- (D)  $36\pi \text{ cm}^2$
- (E)  $72\pi \text{ cm}^2$

45. If the measure of one angle of a rhombus is  $120^\circ$  and its perimeter is 16 cm, then what is the length of its longer diagonal?

- (A) 4
- (B)  $2\sqrt{3}$
- (C)  $2\sqrt{2}$
- (D)  $4\sqrt{2}$
- (E)  $4\sqrt{3}$

46.  $a$  and  $b$  are positive.  $a$  is even and  $b$  is odd. Which of the following must also be odd?

- (A)  $ab$
- (B)  $\frac{a}{b}$
- (C)  $a + 2b$
- (D)  $b^a$
- (E)  $(ab)^a$

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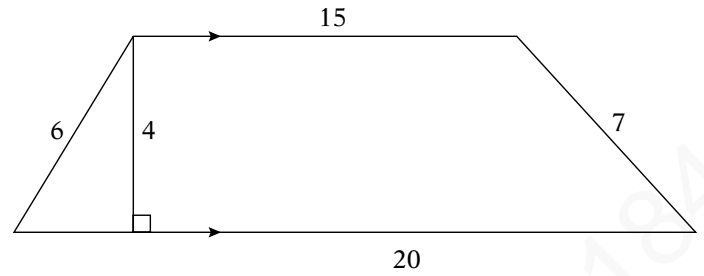


Figure 7

47. In Figure 8,  $\overline{RS} = \overline{RT} = \overline{TU}$ . If  $m\angle RTS = 50^\circ$ , then what is the measure of  $\angle TRU$ ?

- (A)  $25^\circ$
- (B)  $50^\circ$
- (C)  $10^\circ$
- (D)  $80^\circ$
- (E)  $40^\circ$

48. All of the following statements are true EXCEPT

- (A) All circles are similar.
- (B) All squares are similar.
- (C) All cubes are similar.
- (D) All spheres are similar.
- (E) All cones are similar.

49. Given the parallelogram  $ABCD$  in Figure 9, what is the measure of  $\angle DCB$ ?

- (A)  $34^\circ$
- (B)  $44^\circ$
- (C)  $102^\circ$
- (D)  $30^\circ$
- (E)  $40^\circ$

50. An equilateral triangle with sides of length 12 is inscribed in the circle shown in Figure 10. What is the area of the shaded region?

- (A)  $36\sqrt{3}$
- (B)  $144\pi - 36$
- (C)  $108\pi - 36\sqrt{3}$
- (D)  $192\pi - 144\sqrt{3}$
- (E)  $48\pi - 36\sqrt{3}$

USE THIS SPACE AS SCRATCH PAPER

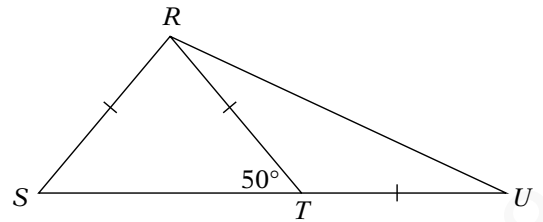


Figure 8

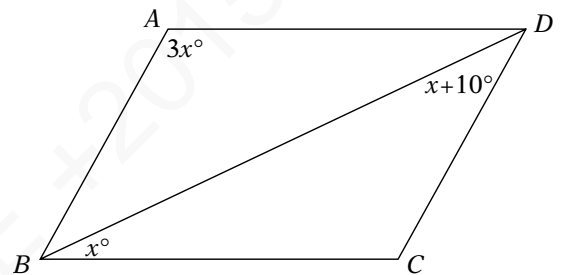


Figure 9

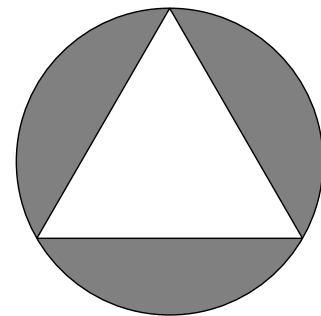


Figure 10

## ANSWER KEY

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

## ANSWERS AND SOLUTIONS

1. **B** Since  $d > 5$ , the cost is \$4.50 for the first 5 days and \$2.50 for the remaining  $d - 5$  days. The cost is  $4.50 + 2.50(d - 5)$ .

2. **D**

$$x^{-\frac{3}{2}} = \frac{1}{x^{\frac{3}{2}}} \text{ so } \frac{1}{2x^{\frac{-3}{2}}} = \frac{1}{\left(\frac{2}{x^{\frac{3}{2}}}\right)} = \frac{x^{\frac{3}{2}}}{2}$$

3. **C**

$$\begin{aligned} x - 3 &> 9 - x^2 \\ x - 3 &> (3 - x)(3 + x) \\ x - 3 &> -(x - 3)(x + 3) \\ x - 3 + (x - 3)(x + 3) &> 0 \\ (x - 3)[1 + (x + 3)] &> 0 \\ (x - 3)(x + 4) &> 0 \\ x < -4 \text{ or } x > 3 \end{aligned}$$

4. **C**

$$\begin{aligned} d &= \sqrt{(x_2 + x_1)^2 + (y_2 - y_1)^2} \\ d &= \sqrt{(5 - -3)^2 + (6 - 0)^2} \\ d &= \sqrt{8^2 + 6^2} = \sqrt{100} = 10 \end{aligned}$$

5. **E**

Let  $y = 0$  and solve for the  $x$ -intercept.

$$4x - 6(0) = -1$$

$$4x = -1$$

$$x = -\frac{1}{4}$$

6. **C**

$$4x^3 = -64$$

$$x^3 = -16$$

$$x = \sqrt[3]{-16} = -2\sqrt[3]{2}$$

7. **B**

$$\sqrt[4]{x^2} = 2$$

$$x^{\frac{1}{2}} = 2$$

$$x = 4$$

8. **D** The slope of the given line  $2x + 6y = 18$  is  $-\frac{1}{3}$ . Perpendicular lines have slopes that are negative reciprocals of each other, so the slope of the line perpendicular to the given line is 3.

9. **A** Set up a system and solve using linear combinations. Start by multiplying the first equation by 3.

$$\begin{array}{r} 3x - 3y = 3(8) \\ + 2x + 3y = 16 \\ \hline 5x + 0y = 40 \end{array}$$

$$x = 8$$

10. **C** Notice that the function  $f(x) = \frac{x^2 - 16}{x - 4}$  is undefined when  $x = 4$ , since you cannot divide by zero. Both graphs look like the line  $x - y = -4$ , but  $f(x)$  is undefined at  $x = 4$ . You can check your answer by graphing the two functions and checking the Table on your graphing calculator to find "Error" for the  $y$ -coordinate of  $f(x)$  when  $x = 4$ .

11. **C**

$$\begin{aligned} (2^2 \times 2^3)^4 &= (2^{2+3})^4 \\ &= (2^5)^4 = 2^{5(4)} = 2^{20} \end{aligned}$$

12. **C** Parallel lines cut by a transversal form eight angles. The exterior angles on the same side of the transversal are supplementary, so  $180^\circ$  is the correct answer.

13. **D**  $2^{10}$  is the greatest value. The other answers simplify to  $2^8$ ,  $2^7$ ,  $2^8$ , and  $(256 + 16)$ , respectively.

14. **E**

$$\begin{aligned} \tan \theta &= \frac{\text{opposite}}{\text{adjacent}} = \frac{13}{a} \\ a &= \frac{13}{\tan 48^\circ} \approx 11.7 \end{aligned}$$

15. **D** Since  $\ell_2$  is perpendicular to  $\ell_1$  and has a positive  $y$ -intercept, its  $x$ -intercept must be negative.  $\ell_1$  has a positive  $x$ -intercept, so the  $x$ -intercept of  $\ell_1$  must be greater than the  $x$ -intercept of  $\ell_2$ .

16. **B** Since more than half of the teachers have salaries greater than or equal to \$50,000, the median (middle value) salary must also be above \$50,000. You do not know enough information to determine the mean and mode.

17. **A**

Substitute  $x = \frac{1}{2}$  into the equation to get

$$2\left(\frac{1}{2}\right)^2 + 15\left(\frac{1}{2}\right) + k = 0$$

$$\frac{1}{2} + \frac{15}{2} + k = 0$$

$$8 + k = 0$$

$$k = -8$$

18. **B**  $x^4 - 16$  is the difference of perfect squares. It can be factored as  $(x^2 - 4)(x^2 + 4)$ , but  $x^2 - 4$  is also the difference of perfect squares and can be further factored to

$$(x - 2)(x + 2)(x^2 + 4)$$

19. **C**

$$\frac{8}{(8 + 3)} = \frac{10}{(10 + x)}$$

$$8(10 + x) = 110$$

$$80 + 8x = 110$$

$$8x = 30$$

$$x = 3.75$$

20. **A** Let  $x$  = the measure of the angle. Then its complement measures  $90 - x$  and its supplement measures  $180 - x$ .

$$180 - x = 4(90 - x)$$

$$180 - x = 360 - 4x$$

$$3x = 180$$

$$x = 60^\circ$$

Remember that  $x$  equals the measure of the original angle, so its complement is  $90 - 60 = 30^\circ$ .

21. **D** Interchange the  $x$  and  $y$  values in the function

$$f(x) = \frac{4x-1}{2}, \text{ and solve for } y.$$

$$y = \frac{4x-1}{2}$$

$$x = \frac{4y-1}{2}$$

$$2x = 4y - 1$$

$$\frac{2x+1}{4} = f(x)^{-1}$$

Check your answer by graphing  $f(x) = 2x - \frac{1}{2}$  and

$f(x)^{-1} = \frac{1}{2}x + \frac{1}{4}$  to see that the inverse function is the original function reflected across the line  $y = x$ .

22. **B** The triangle is reflected above the  $x$ -axis, so the  $x$ - and  $y$ -coordinates of the reflection of point  $A$  will be positive.  $(1, 1)$  is the correct answer.

23. **E** The sum of the exterior angles of any polygon is  $360^\circ$ , so each exterior angle of a *regular* pentagon must measure

$$\frac{360}{5} = 72^\circ$$

24. **D** One way to solve for  $\theta$  is to use the arctangent function to solve for the angle whose tangent is  $\frac{3}{4}$ .

$$\tan^{-1}\left(\frac{3}{4}\right) = \theta$$

$$\theta = 36.9^\circ$$

25. **C** The line containing each diagonal of a rhombus is a line of symmetry, so a rhombus has 2 lines of symmetry.

26. **A**

$$\sin 30^\circ = \cos (90^\circ - 30^\circ)$$

$$\sin 30^\circ = \cos 60^\circ$$

27. **B** Remember  $\cos^2 \theta + \sin^2 \theta = 1$ . Substituting 1 into the expression results in

$$(1 - 2)^3 = (-1)^3 = -1$$

28. **C** This is a circle centered at the origin with a radius of  $\sqrt{12}$  or  $2\sqrt{3}$  units. The  $y$ -intercepts are the

points  $(0, 2\sqrt{3})$  and  $(0, -2\sqrt{3})$ .

29. **A**

$$f(4) = 5(4) + 3 = 23$$

$$g(23) = \frac{23+1}{2} = \frac{24}{2} = 12$$

30. **A** The plane determined by the three vertices  $E$ ,  $K$ , and  $B$  must contain the edges  $\overline{EK}$  and  $\overline{BH}$ . Vertex  $H$  is, therefore, the correct answer.

31. **C** The range of  $f(x) = \frac{1}{x}$  is all real numbers except  $y = 0$ . The domain of the function is restricted, however, so the range is the set of all  $y$  values that result when  $x$  is between  $-1$  and  $0$ , exclusive. Check the graph on your graphing calculator to verify that  $y < -1$  is the correct answer.

32. **C** Since  $\frac{a}{b} = 4$ ,  $a = 4b$ . Substitute  $4b$  for  $a$  in the first equation to get

$$4b(b) = 16$$

$$b^2 = 4$$

$$b = 2 \text{ (Remember } b \text{ must be positive)}$$

$$2a = 16, \text{ so } a = 8. \text{ The average of } 2 \text{ and } 8 \text{ is } \frac{2+8}{2} = 5.$$

33. **A** Use the FOIL method to multiply the binomials:

$$(4 - i)(4 + i) = 16 + 4i - 4i - i^2$$

Since  $i = \sqrt{-1}$ ,  $i^2 = (\sqrt{-1})^2 = -1$ . Substituting  $-1$  into the product above results in

$$16 - (-1) = 17$$

34. **B** This is the graph of  $f(x) = |x|$  reflected over the  $x$ -axis and shifted 4 units to the right, so  $f(x) = -|x - 4|$  is the correct answer. You can check this by graphing the function on your calculator.

35. **D** The graph of the function  $f(x) = \frac{1}{2} \sin 2x$  is the graph of  $y = \sin 2x$  "shrunk" by a factor of  $\frac{1}{2}$ . To check

the range, graph  $y = \frac{1}{2} \sin 2x$  on your calculator and check the  $y$  values under Table.

36. **E**

$$\begin{aligned} f(-2) + 2f(-1) &= (-2)^3 + 2(-2) + 2[(-1)^3 + 2(-1)] \\ &= -8 - 4 + 2(-1 - 2) \\ &= -12 + 2(-3) = -18 \end{aligned}$$

37. **D** Find the number of permutations of six letters taken six at a time.

$$6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$$

38. **E** If  $n \hat{=} m = m \hat{=} n$ , then:

$$\begin{aligned} \frac{2n}{m} &= \frac{2m}{n} \\ 2n^2 &= 2m^2 \\ n^2 &= m^2 \end{aligned}$$

Answers A through D are all true statements. Answer

E is not true since  $\frac{2\left(\frac{2}{1}\right)}{\left(\frac{1}{2}\right)} \neq \frac{2\left(\frac{1}{2}\right)}{2}$ .

39. **B** The volume of the prism is found using  $V = \ell wh$ . Using the three given areas, you know

$$\begin{aligned} \ell w &= 32 \\ wh &= 8 \\ h\ell &= 16 \end{aligned}$$

One way to solve for the volume is to solve for  $h$  in the second and third equations above and set those values equal to each other.

$$h = \frac{8}{w} = \frac{16}{\ell}$$

$$8\ell = 16w \text{ so } \ell = 2w$$

Substituting  $2w$  for  $\ell$  in the first equation results in

$$\begin{aligned} 2w(w) &= 32 \\ 2w^2 &= 32 \\ w^2 &= 16 \\ w &= 4 \end{aligned}$$

If  $w = 4$ , then  $8 = h(4)$ , so  $h = 2$ .  $\ell(4) = 32$ , so  $\ell = 8$ .

$$V = \ell wh = 8(4)(2) = 64 \text{ cm}^3$$

40. **D** Since  $x - 4$ ,  $x$ , and  $x + 4$  are the first three terms of the sequence, the common difference between terms is 4. The fourth term of the sequence is

$$x + 4 + 4 = x + 8$$

The fifth term of the sequence must be

$$x + 8 + 4 = x + 12$$

41. **C** Let  $t$  = the number of hours Claire and Ruth work together.

$$\frac{t+1}{5} + \frac{t}{7} = 1$$

$$7(t+1) + 5t = 35$$

$$12t = 28$$

$$t = 2.33$$

Since the problem asks for the total time, add the 1 hour that Claire worked alone to get 3.33 hours, or 3 hours and 20 minutes.

42. **B** Recognize that the quadrilateral is a trapezoid. Its area is given by the formula:

$$A = \frac{1}{2}(b_1 + b_2)h$$

$$A = \frac{1}{2}(15 + 20)4 = 35(2) = 70$$

43. **B** Multiply both sides of the equation by the LCD,  $(x + 6)(x - 6)$ , to get

$$n = (x + 6) + (x - 6)$$

$$n = 2x$$

44. **D** The formula for the lateral surface area of a cone is given in the Reference Information.

$$\text{Lateral Area} = \frac{1}{2}c\ell$$

$$\begin{aligned}\text{Lateral Area} &= \frac{1}{2}(2\pi r)\ell = \frac{1}{2}(2\pi)(3)(12) \\ &= 36\pi \text{ cm}^2\end{aligned}$$

45. **E** One way to solve for the length of the diagonal is to use special right triangles. The longer diagonal splits the rhombus into two congruent triangles with angles measuring  $30^\circ$ ,  $30^\circ$ , and  $120^\circ$ . From one of the  $120^\circ$  angles, draw an altitude creating two  $30^\circ$ - $60^\circ$ - $90^\circ$  triangles. The side opposite the  $90^\circ$  angle measures 4 ( $16/4$ ), so the side opposite the  $60^\circ$  angle measures  $2\sqrt{3}$ . This represents half of the diagonal's length. The entire length of the diagonal is

$$2(2\sqrt{3}) = 4\sqrt{3} \text{ cm}$$

46. **D** An odd number raised to an even power equals an even number. Take  $3^2 = 9$ , for example.  $b^a$  is the correct answer.

47. **A**  $\angle RTU$  is a linear pair with  $\angle RTS$ , so it must measure  $130^\circ$ . Since  $\triangle RTU$  is isosceles, its base angles are congruent.  $m\angle TRU = m\angle TUR$ .

$$m\angle TRU = \frac{180 - 130}{2} = 25^\circ$$

48. **E** Since Answer E does not specify a type of cone (i.e., a right circular cone or an oblique cone), it is not true. A right circular cone is obviously not similar in shape to an oblique cone.

49. **C**  $m\angle ABD = x + 10^\circ$ , since  $\angle ABD$  and  $\angle BDC$  are alternate interior angles. Consecutive angles of a parallelogram are supplementary, so:

$$x + x + 10 + 3x = 180^\circ$$

$$5x = 170$$

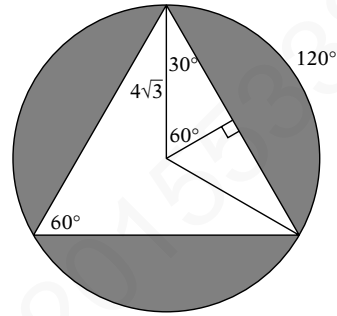
$$x = 34^\circ$$

The question asks for the measure of  $\angle DCB$ . Opposite angles of a parallelogram are congruent, so you know

$$m\angle DBC = 3x = 3(34) = 102^\circ$$

50. **E** Since the triangle is equilateral its area is

$$\text{simply } A = s^2 \frac{\sqrt{3}}{4} = 12^2 \frac{\sqrt{3}}{4} = 36\sqrt{3}.$$



You need to find the length of the radius in order to determine the area of the circle. Draw the two radii that intercept one of the  $120^\circ$  arcs of the circle to make an isosceles triangle. Then draw the altitude from the  $120^\circ$  central angle. Two  $30^\circ$ - $60^\circ$ - $90^\circ$  triangles are created as shown.

The side opposite the  $90^\circ$  angle measures  $\frac{12}{\sqrt{3}}$ , or  $4\sqrt{3}$ . This is the radius of the circle, so the circle's area is  $A = \pi r^2 = \pi(4\sqrt{3})^2 = 48\pi$ .

The area of the shaded region equals the area of the circle minus the area of the triangle:

$$48\pi - 36\sqrt{3}$$









# **PRACTICE TEST 3**

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1. If a car travels 300 miles in 6 hours, then assuming the car travels at the same rate, how long will it take to travel 360 miles?
- (A) 5 hours  
(B) 6 hours  
(C) 7 hours  
(D) 7 hours, 12 minutes  
(E) 7 hours, 20 minutes
2. A number  $n$  is decreased by 4. The square root of the result equals 0.8.  $n =$
- (A) 23.04  
(B) 0.8  
(C) 0.64  
(D) 4.64  
(E) -3.36
3. If  $f(x) = x^4 - 2x^3 + 6x - 1$ , then  $f(-2) =$
- (A) -13  
(B) 19  
(C) 32  
(D) 11  
(E) 43
4. What is the midpoint of the segment with endpoints  $A(-3, -8)$  and  $B(4, 6)$ ?
- (A)  $\left(\frac{1}{2}, -1\right)$   
(B)  $\left(-1, \frac{1}{2}\right)$   
(C)  $\left(-\frac{1}{2}, 1\right)$   
(D)  $(-7, -14)$   
(E)  $\left(-\frac{7}{2}, -7\right)$
5. What is  $\frac{1}{2}$  percent of 6?
- (A) 3  
(B) 0.06  
(C) 0.03  
(D) 12  
(E) 0.003

6. What are the  $x$ -intercept(s) of the graph of  $f(x) = x^2 - 9$ ?
- (A)  $(3, 0)$
  - (B)  $(0, 3)$
  - (C)  $(0, -9)$
  - (D)  $(-3, 0)$
  - (E)  $(\pm 3, 0)$
7. All of the following are equivalent to the equation of the line containing points  $(0, 1)$  and  $(4, 3)$  EXCEPT
- (A)  $y = \frac{1}{2}x + 1$
  - (B)  $x - 2y = -2$
  - (C)  $(y - 3) = \frac{1}{2}(x - 4)$
  - (D)  $2x - y + 1 = 0$
  - (E)  $(y - 1) = \frac{1}{2}x$
8. What are all the values of  $x$  for which  $x^2 + 5x - 14 \leq 0$ ?
- (A)  $x \leq -7$  or  $x \geq 2$
  - (B)  $-7 \leq x \leq 2$
  - (C)  $x \geq 2$
  - (D)  $x \geq -7$
  - (E)  $x \leq 2$
9. If  $f(x) = x^3$  and  $f^{-1}$  is the inverse function of  $f$ , then  $f^{-1}(27) =$
- (A)  $27^3$
  - (B)  $3$
  - (C)  $-3$
  - (D)  $9$
  - (E)  $5.2$
10. What is the slope of the line containing the points  $(6, 0)$  and  $(6, 7)$ ?
- (A)  $7$
  - (B)  $0$
  - (C) Undefined
  - (D)  $\frac{1}{6}$
  - (E)  $-7$

11. The triangle in Figure 1 has sides measuring 6, 8, and 10 units. What is the measure of  $\theta$ ?

- (A)  $53.1^\circ$   
(B)  $36.9^\circ$   
(C)  $60^\circ$   
(D)  $30^\circ$   
(E)  $45^\circ$

12. How many total diagonals can be drawn from all of the vertices of a 15-gon?

- (A) 13  
(B) 12  
(C) 180  
(D) 90  
(E) 77

13.  $\frac{2 - \sqrt{3}}{2 + \sqrt{3}} =$

- (A) 0  
(B) -1  
(C)  $\frac{1}{7 + 4\sqrt{3}}$   
(D)  $7 - 4\sqrt{3}$   
(E)  $1 - 4\sqrt{3}$

14.  $(a^2 - 1)(a^2 - 4) =$

- (A)  $(a - 1)(a + 1)(a - 2)(a + 2)$   
(B)  $a^2 + 4$   
(C)  $a^4 + 5a^2 + 4$   
(D)  $a^4 - 5a^2 - 4$   
(E)  $(a - 1)(a - 4)$

15. In Figure 2,  $\ell_1 \parallel \ell_2$ . What is the value of  $x$ ?

- (A)  $140^\circ$   
(B)  $70^\circ$   
(C)  $110^\circ$   
(D)  $40^\circ$   
(E)  $35^\circ$

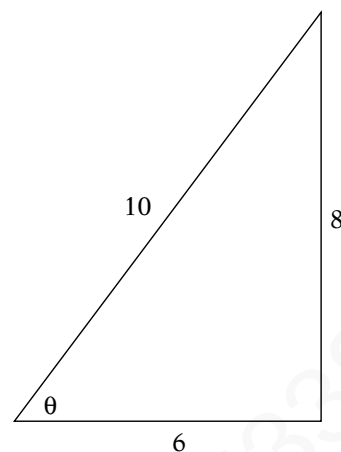


Figure 1

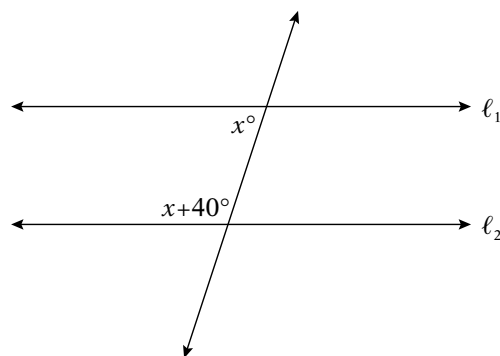


Figure 2

16. If  $\triangle ABC$  is congruent to  $\triangle JKL$ , then all of the following parts are congruent by CPCTC EXCEPT

- (A)  $\overline{AB} \cong \overline{JK}$
- (B)  $\overline{CA} \cong \overline{KL}$
- (C)  $\angle B \cong \angle K$
- (D)  $\overline{CB} \cong \overline{LJ}$
- (E)  $\angle C \cong \angle L$

17. What is the measure of  $y$  in Figure 3?

- (A)  $18^\circ$
- (B)  $72^\circ$
- (C)  $90^\circ$
- (D)  $108^\circ$
- (E)  $162^\circ$

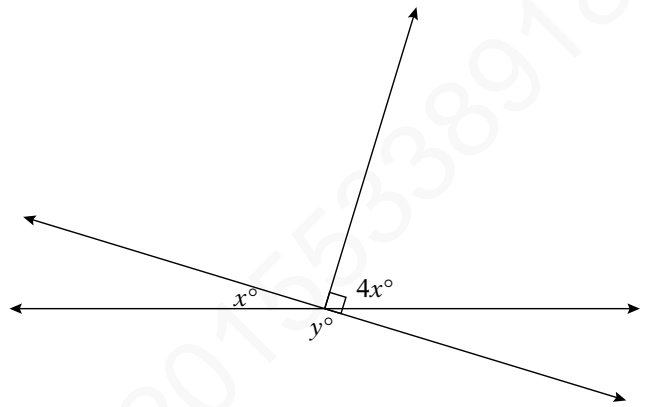


Figure 3

18. If the sides of a cube are doubled, then its volume is increased by what factor?

- (A) 2
- (B) 3
- (C) 4
- (D) 8
- (E) 16

19. In Figure 4, the length of  $\overline{XZ}$  is 16 and  $\overline{XY}$  is one-third the length of  $\overline{YZ}$ . What is the length of  $\overline{XY}$ ?

- (A) 3
- (B) 4
- (C) 5.3
- (D) 12
- (E) 21.3



Figure 4

20. What is the length of the altitude of  $\triangle ABC$  in Figure 5 given that the measure of  $\angle ABC$  is  $35^\circ$ ?

- (A) 5.6
- (B) 10
- (C) 4.6
- (D) 6
- (E) 6.6

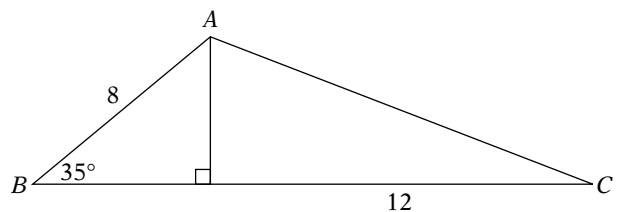


Figure 5

21. All of the following statements are true regarding the graph of  $y = x^2$  EXCEPT
- (A) It is concave up.
  - (B) Its vertex is the origin.
  - (C) Its directrix is the line  $y = -\frac{1}{4}$ .
  - (D) It does not represent a function.
  - (E) It is symmetric with respect to the  $y$ -axis.
22. What is the domain of the function  $f(x) = \sqrt{x^2 - 10}$  ?
- (A)  $x \geq 0$
  - (B)  $x \leq -\sqrt{10}$  or  $x \geq \sqrt{10}$
  - (C)  $-\sqrt{10} \leq x \leq \sqrt{10}$
  - (D)  $-10 \leq x \leq 10$
  - (E)  $x \geq \sqrt{10}$
23. Which of the following shapes has exactly four lines of symmetry?
- (A) Square
  - (B) Rhombus
  - (C) Parallelogram
  - (D) Rectangle
  - (E) Circle
24. Sarah wants to purchase a new car. At the car dealership, there are 4 different models to choose from in her price range. For each model, there are 5 different colors (black, silver, green, navy, and red) and 2 different engine types (4-cylinder or 6-cylinder). How many combinations of model-color-engine type are there?
- (A) 11
  - (B) 20
  - (C) 40
  - (D) 8
  - (E) 10
25. If  $\log_n 18 - \log_n x = \log_n 6$ , then  $x =$
- (A) 3
  - (B) 0.48
  - (C) 12
  - (D) 6
  - (E) 108

26. If the sum of two numbers is 40, then what is their greatest possible product?
- (A) 391
  - (B) 396
  - (C) 400
  - (D) 399
  - (E) 420
27. If  $i = \sqrt{-1}$ , then  $\frac{5-i}{5+i} =$
- (A)  $-1$
  - (B)  $\frac{13}{12} - \frac{5}{12}i$
  - (C)  $\frac{12}{13} - \frac{5}{13}i$
  - (D)  $24 - 10i$
  - (E)  $\frac{3}{2}$
28. Mark received a 92 percent and a 78 percent on the first two math tests. What grade must he receive on the third test to have an average of 84 percent?
- (A) 80%
  - (B) 82%
  - (C) 84%
  - (D) 85%
  - (E) 86%
29. All of the following triplets could be the lengths of the sides of a right triangle EXCEPT
- (A) 6, 8, 10
  - (B) 15, 20, 25
  - (C) 7, 24, 25
  - (D)  $\sqrt{3}, \sqrt{4}, \sqrt{5}$
  - (E) 1, 2,  $\sqrt{5}$
30. A cone-shaped cup has a height of 10 units and a radius of 3 units. The cup is filled with water and the height of the water is 6 units. What is radius of the surface of the water?
- (A) 1.5 units
  - (B) 1.8 units
  - (C) 2 units
  - (D) 3 units
  - (E) 5 units

31. How many degrees does the hour hand of a clock rotate in 20 minutes?

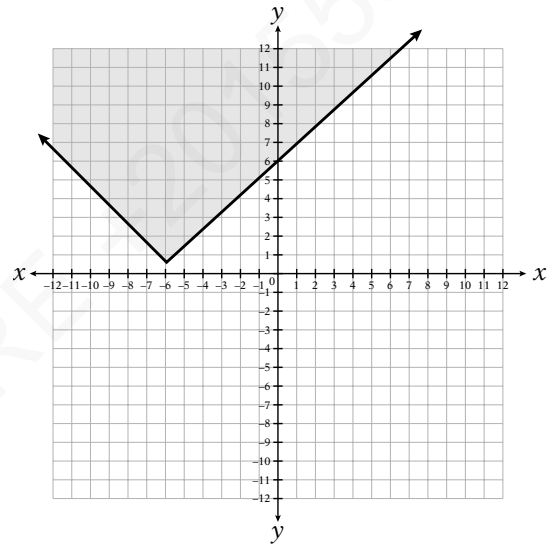
- (A)  $30^\circ$
- (B)  $10^\circ$
- (C)  $6^\circ$
- (D)  $15^\circ$
- (E)  $7.5^\circ$

32.  $(6\sin x)(3\sin x) - (9\cos x)(-2\cos x) =$

- (A) 1
- (B) -18
- (C) 18
- (D) -1
- (E)  $18\sin^2x - 18\cos^2x$

33. Figure 6 is the graph of which of the following?

- (A)  $y \geq |x + 6|$
- (B)  $y \leq |x + 6|$
- (C)  $y \geq |x - 6|$
- (D)  $y < |x - 6|$
- (E)  $y = |x - 6|$



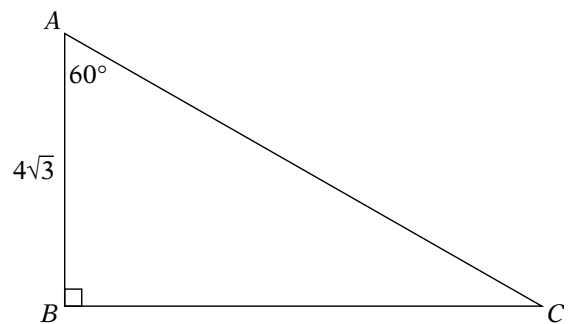
**Figure 6**

34. What is the minimum value of the function  $f(x) = x^4 + 2x^2 + 1$ ?

- (A) 0
- (B) 1
- (C) -1
- (D) 2
- (E) 4

35. In  $\triangle ABC$  in Figure 7,  $m\angle CAB = 60^\circ$  and  $\overline{AB} = 4\sqrt{3}$ . What is the length of  $\overline{BC}$ ?

- (A)  $2\sqrt{3}$
- (B)  $8\sqrt{3}$
- (C) 24
- (D) 12
- (E) 8



**Figure 7**

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36. If  $f(x) = x + 1$  and  $g(x) = x^2 - 1$ , then what is  $g(f(x))$ ?
- (A)  $x^2 + 1$   
(B)  $x^2 - 1$   
(C)  $x^2 + 2x - 1$   
(D)  $x^2 + 2x + 1$   
(E)  $x^2 + 2x$
37. In rectangle  $ABCD$ ,  $\overline{AB} = 3$  cm and  $\overline{AD} = 3\sqrt{3}$ . If a square has the same area as the area of  $ABCD$ , what is the length of a side of the square?
- (A) 3  
(B)  $3\sqrt{3}$   
(C) 5.2  
(D) 3.9  
(E) 7.8
38. Solve  $(x - 3)^{\frac{3}{5}} = 8$ .
- (A) 32  
(B) 35  
(C) 19  
(D) 67  
(E) 29
39. Assuming each dimension must be an integer, how many different rectangular prisms with a volume of  $18 \text{ cm}^3$  are there?
- (A) 2  
(B) 3  
(C) 4  
(D) 5  
(E) 6
40. What is the range of the function  $f(x) = 6^x$ ?
- (A) All real numbers  
(B)  $y \geq 1$   
(C)  $y \geq 0$   
(D)  $y > 0$   
(E) All real numbers except  $y = 0$
41. How many points may be contained in the intersection of two distinct circles?
- I. 0 points  
II. 1 point  
III. 2 points  
IV. 3 points
- (A) III only  
(B) II or III only  
(C) III or IV only  
(D) I, II, or III only  
(E) I, II, III, or IV

42. How many different chords can be drawn from 8 distinct points on a circle?
- (A) 48  
(B) 7  
(C) 8  
(D) 16  
(E) 28
43. Assuming  $a > 1$ , which of the following expressions represents the greatest value?
- (A)  $\frac{a+1}{a+1}$   
(B)  $\frac{a}{a+1}$   
(C)  $\frac{a}{a-1}$   
(D)  $\frac{a-1}{a-2}$   
(E)  $\frac{a+1}{a-1}$
44. If  $4n + 1$ ,  $6n$ , and  $7n + 2$  are the first three terms of an arithmetic sequence, what is the value of  $n$ ?
- (A)  $\frac{3}{2}$   
(B) 2  
(C) 3  
(D) 1  
(E) 6
45. All of the following are equivalent to the expression  $(4x - 8)(x + 1)$  EXCEPT
- (A)  $4(x - 2)(x + 1)$   
(B)  $-4(2 - x)(x + 1)$   
(C)  $4(x^2 - x - 2)$   
(D)  $(1 + x)(8 - 4x)$   
(E)  $4x^2 - 4x - 8$
46.  $\sqrt{4 + 4x^2} + \sqrt{9x^2 + 9} =$
- (A)  $\sqrt{13x^2 + 13}$   
(B)  $5x + 5$   
(C)  $5\sqrt{x^2 + 1}$   
(D)  $\sqrt{13(x^2 + 1)}$   
(E)  $6x + 6$

47. A ball is dropped from a height of 8 feet. If it always rebounds  $\frac{2}{3}$  the distance it has fallen, how high will it reach after it hits the ground for the third time?
- (A) 5.33  
(B) 3.56  
(C) 2.37  
(D) 1.58  
(E) 2.73
48. The solution set of  $8x^2 - 16x - 24 = 0$  is which of the following?
- (A)  $\{-1, 3\}$   
(B)  $\{-3, 1\}$   
(C)  $\{-1, 3, 8\}$   
(D)  $\{-1, -3\}$   
(E)  $\{1, 3\}$
49. If  $x^2 - 5x + 1 = (x - a)^2 + c$ , then what is the value of  $c$ ?
- (A)  $-\frac{29}{4}$   
(B)  $-\frac{21}{4}$   
(C)  $-\frac{5}{2}$   
(D)  $-\frac{25}{4}$   
(E) 1
50. Solve  $3x - 5\sqrt{x} - 2 = 0$
- (A)  $\left\{\frac{1}{9}, 4\right\}$   
(B)  $\left\{\frac{1}{9}\right\}$   
(C)  $\{4\}$   
(D)  $\left\{-\frac{1}{9}, -4\right\}$   
(E)  $\{-4\}$

## ANSWER KEY

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

## ANSWERS AND SOLUTIONS

1. **D**

$$\frac{300}{6} = \frac{360}{t}$$

$$t = \frac{6(360)}{300} = 7.2 \text{ hours}$$

7.2 hours is equivalent to 7 hours and 12 minutes.

2. **D**

$$\sqrt{n-4} = 0.8$$

$$n-4 = 0.64$$

$$n = 4.64$$

3. **B**

$$f(-2) = (-2)^4 - 2(-2)^3 + 6(-2) - 1$$

$$= 16 + 16 - 12 - 1$$

$$= 19$$

4. **A**

The midpoint is given by  $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$$\text{The } x\text{-coordinate is } \left(\frac{-3 + 4}{2}\right) = \frac{1}{2}.$$

$$\text{The } y\text{-coordinate is } \frac{(-8 + 6)}{2} = -1.$$

5. **C**

$$a = \frac{1}{2}\% \text{ of } 6$$

$$a = 0.005(6)$$

$$a = 0.03$$

6. **E** Set  $y = 0$  and solve for  $x$ .

$$0 = x^2 - 9$$

$$9 = x^2$$

$$x = \pm 3$$

The  $x$ -intercepts are the two points  $(3, 0)$  and  $(-3, 0)$ .

7. **D** The slope of the line containing  $(0, 1)$  and  $(4, 3)$  equals  $\frac{2}{4}$  or  $\frac{1}{2}$ . Answer D cannot be correct because the slope of the line is 2.

8. **B**

$$x^2 + 5x - 14 \leq 0$$

$$(x + 7)(x - 2) \leq 0$$

The critical points of the graph are  $x = -7$  and  $x = 2$ . Test the inequality when  $x = 0$  to see that  $0^2 + 5(0) - 14 \leq 0$  is a true statement. The interval between  $-7$  and  $2$ , inclusive, satisfies the inequality.

9. **B** The inverse function of  $f(x) = x^3$  is  $f^{-1} = \sqrt[3]{x}$ .

$$f^{-1} = \sqrt[3]{27} = 3$$

10. **C**

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{7 - 0}{6 - 6} = \frac{7}{0} = \text{undefined}$$

11. **A**

$$\sin \theta = \frac{8}{10}, \text{ so}$$

$$\theta = \sin^{-1}(0.8) = 53.1^\circ$$

12. **D** Recall that  $\frac{n(n-3)}{2}$  is the total number of diagonals in a polygon, assuming  $n$  = the number of sides. (The number of diagonals that can be drawn from one vertex is  $n - 3$ .)

$$\frac{n(n-3)}{2} = \frac{15(12)}{2} = 90$$

13. **D**

$$\begin{aligned} \frac{2 - \sqrt{3}}{2 + \sqrt{3}} &= \frac{2 - \sqrt{3}}{2 + \sqrt{3}} \times \frac{2 - \sqrt{3}}{2 - \sqrt{3}} \\ &= \frac{4 - 4\sqrt{3} + 3}{4 - 3} = 7 - 4\sqrt{3} \end{aligned}$$

14. **A** Recognize that both binomials are the difference of perfect squares which can be factored as:

$$(a - 1)(a + 1)(a - 2)(a + 2)$$

15. **B**

$$x + x + 40 = 180^\circ$$

$$2x = 140$$

$$x = 70^\circ$$

16. **D**  $\overline{CB}$  is congruent to  $\overline{LK}$ , not  $\overline{LJ}$ . Answer D is not a true statement.

17. **E** The smaller angle adjacent to the angle measuring  $4x$  is a vertical angle to the angle measuring  $x$ . Therefore, it must also measure  $x^\circ$ .

$$4x + x = 90$$

$$5x = 90$$

$$x = 18^\circ$$

$$y = 180 - 18 = 162^\circ$$

18. **D** If the original cube has sides of length  $e$ , its volume is  $e^3$ . Doubling the sides of the cube results in a volume of  $(2e)^3 = 8e^3$ . The volume is increased by a factor of  $2^3$  or 8.

19. **B**

$$\text{Let } YZ = x.$$

$$\frac{1}{3}x + x = 16$$

$$\frac{4}{3}x = 16$$

$$x = \frac{16(3)}{4} = 12$$

$$XY = \frac{1}{3}(YZ) = \frac{1}{3}(12) = 4$$

20. **C**

$$\sin 35^\circ = \frac{h}{8}$$

$$h = 8(\sin 35^\circ) \approx 4.6$$

21. **D** Parabolas in the form  $y = x^2$  represent a function. You can check this by graphing the equation on your calculator and seeing that the graph passes the vertical line test. Parabolas in the form  $x = y^2$  are not functions, however. D is the correct answer.

22. **B**

$$x^2 - 10 \geq 0$$

$$= x^2 \geq 10$$

$-\sqrt{10}$  and  $\sqrt{10}$  are the critical points. Test  $x = 0$  to see that the interval between  $-\sqrt{10}$  and  $\sqrt{10}$  does not

satisfy the equation. The correct answer is  $x \leq -\sqrt{10}$  or  $x \geq \sqrt{10}$ .

23. **A** A square has exactly 4 lines of symmetry: the lines containing each diagonal and the lines connecting the midpoints of opposite sides. (Since a square is a special parallelogram, *some*, but not all, parallelograms have 4 lines of symmetry.)

24. **C** Using the Fundamental Counting Principle, there are  $4 \times 5 \times 2 = 40$  possible combinations.

25. **A**

$$\log_n 18 - \log_n x = \log_n 6$$

$$\frac{18}{x} = 6$$

$$x = 3$$

26. **C** Let  $x =$  one number and  $40 - x =$  the second number. The product of the two numbers is given by the function:

$$P(x) = x(40 - x)$$

$$P(x) = 40x - x^2$$

The maximum value occurs when

$$x = -\frac{b}{2a} = -\frac{40}{2(-1)} = 20$$

When  $x = 20$ , the maximum product of the two numbers is:

$$P(x) = 20(40 - 20) = 20(20) = 400$$

27. **C** Multiply the numerator and the denominator by  $5 - i$ , the conjugate of  $5 + i$ . (Recall that  $i^2 = -1$ .)

$$\begin{aligned} \frac{5-i}{5+i} \times \frac{5-i}{5-i} &= \frac{(5-i)(5-i)}{(5+i)(5-i)} \\ &= \frac{25 - 10i + i^2}{25 - i^2} \\ &= \frac{24 - 10i}{26} = \frac{12}{13} - \frac{5}{13}i \end{aligned}$$

28. **B** Let  $t =$  Mark's grade on the third test.

$$\frac{92 + 78 + t}{3} = 84$$

$$170 + t = 3(84)$$

$$t = 252 - 170 = 82$$

29. **D** Substitute the lengths of the sides of the triangle into the Pythagorean Theorem to see if they satisfy the equation.

$$\sqrt{3^2} + \sqrt{4^2} = \sqrt{5^2}$$

$$3 + 4 \neq 5$$

It is impossible to have a right triangle with sides of lengths  $\sqrt{3} + \sqrt{4}$  and  $\sqrt{5}$ .

30. **B** Filling the cone-shaped cup with water creates a cone similar to the cup itself. The radii and heights of the two cones are proportional. Let  $r =$  the radius of the surface of the water.

$$\frac{6}{10} = \frac{r}{3}$$

$$18 = 10r$$

$$1.8 = r$$

31. **B** Between two consecutive numbers on a clock, there are  $\frac{360}{12}$  or  $30^\circ$ . In 20 minutes, the hour hand moves

$$\frac{20}{60}(30) = 10^\circ$$

32. **C**

$$(6\sin x)(3\sin x) - (9\cos x)(-2\cos x)$$

$$= 18\sin^2x + 18\cos^2x$$

$$= 18(\sin^2x + \cos^2x)$$

$$= 18(1) = 18$$

33. **A** The graph represents the absolute value of an expression since it is "V-shaped." It is shifted 6 units to the left of the origin because of the  $(x + 6)$  term. Since the graph is shaded above the "V-shaped" lines and the lines are solid (not dashed), it represents a "greater than or equal to" expression.  $y \geq |x + 6|$  is the only possible answer. You can check this by graphing the expression using the Inequal application on your TI graphing calculator.

34. **B** The minimum value of the function is the  $y$ -coordinate of its vertex. Graph the function  $f(x) = x^4 + 2x^2 + 1$  on your graphing calculator to find its vertex  $(0, 1)$ . The minimum value is 1.

35. **D**  $\triangle ABC$  is a  $30^\circ$ - $60^\circ$ - $90^\circ$  right triangle. Since the side opposite the  $30^\circ$  angle measures  $4\sqrt{3}$ ,  $\overline{BC}$  (the side opposite the  $60^\circ$ ) must measure

$$4\sqrt{3}(\sqrt{3}) = 12$$

36. **E**

$$g(f(x)) = g(x + 1) = (x + 1)^2 - 1$$

$$= x^2 + 2x + 1 - 1$$

$$= x^2 + 2x$$

37. **D** The area of the rectangle is  $3(3\sqrt{3}) = 9\sqrt{3} = 15.59 \text{ cm}^2$ . One side of the square must be equal to the square root of 15.59.

$$\sqrt{15.59} \approx 3.9 \text{ cm}$$

38. **B**

$$(x - 3)^{\frac{3}{5}} = 8$$

$$\left[ (x - 3)^{\frac{3}{5}} \right]^{\frac{5}{3}} = 8^{\frac{5}{3}}$$

$$(x - 3) = (2^3)^{\frac{5}{3}}$$

$$(x - 3) = 2^5 = 32$$

$$x = 32 + 3 = 35$$

39. **C** The volume of a rectangular prism is given by the formula  $V = \ell \times w \times h$ , so you need to find three integers whose product is 18. There are four possibilities:

$$1 \times 1 \times 18$$

$$1 \times 2 \times 9$$

$$1 \times 3 \times 6$$

$$2 \times 3 \times 3$$

40. **D** Notice that as  $x$  increases without bound, the value of  $f(x) = 6^x$  gets larger. As  $x$  decreases without bound, the value of the function approaches zero.  $6^x$  will never equal zero and will never be negative, however, so  $y > 0$  is the correct answer.

41. **D** Tangent circles intersect in one point. Of course, if distinct circles did not intersect, their intersection would contain zero points, and two non-tangent, intersecting circles intersect in two points. I, II, and III are possible answers.

42. **E** 7 different chords can be drawn from the first point. 6 additional chords can be drawn from the second point, since the chords must be distinct and one has already been drawn. 5 additional chords can be drawn from the third point, since you cannot count the 2 already drawn. Continue this pattern to get

$$7 + 6 + 5 + 4 + 3 + 2 + 1 = 28 \text{ chords}$$

43. **E** Answer A equals 1 and Answer B is less than 1, so both can be eliminated. Since C and E have the same denominator and  $a < a + 1$ , C will always be less than E. It can also be eliminated as a possible answer choice. Substitute a few values of  $a$  into answers D and E to compare the expressions.

$$\text{If } a = 7, \frac{6}{5} < \frac{8}{6}$$

$$\text{If } a = 10, \frac{9}{8} < \frac{11}{9}$$

Answer E will always result in a greater value.

44. **C** Since the expressions represent the terms of an arithmetic sequence, there must be a common difference between consecutive terms.

$$6n - (4n + 1) = 7n + 2 - 6n$$

$$2n - 1 = n + 2$$

$$n = 3$$

45. **D** The expression  $-(1 + x)(8 - 4x)$  is equivalent to the given expression, but  $(1 + x)(8 - 4x)$  is not. By the Commutative Property of Addition,  $1 + x$  is equivalent to  $x + 1$ .  $8 - 4x$  is not equivalent to  $4x - 8$ , however.

46. **C**

$$\begin{aligned} & \sqrt{4 + 4x^2} + \sqrt{9x^2 + 9} \\ &= \sqrt{4(1 + x^2)} + \sqrt{9(x^2 + 1)} \\ &= 2\sqrt{1 + x^2} + 3\sqrt{x^2 + 1} \\ &= 5\sqrt{1 + x^2} \end{aligned}$$

47. **C** Recognize that the heights of the bouncing ball form a geometric sequence with a common ratio of  $\frac{2}{3}$  and an initial term of 8. After hitting the ground for the first time, the ball will reach a height of  $(8)\left(\frac{2}{3}\right) = 5.33$ . After the second bounce, the ball will reach a height of  $(8)\left(\frac{2}{3}\right)^2 = 3.56$ . After the third bounce, the ball will reach a height of  $(8)\left(\frac{2}{3}\right)^3 = 2.37$  feet.

48. **A**

$$8x^2 - 16x - 24 = 0$$

$$8(x^2 - 2x - 3) = 0$$

$$8(x - 3)(x + 1) = 0$$

$$x = 3 \text{ or } x = -1$$

49. **B** Complete the square to get a perfect binomial squared plus a constant.

$$x^2 - 5x + 1$$

$$= \left[ x^2 + 5x + \left(\frac{5}{2}\right)^2 \right] - \left(\frac{5}{2}\right)^2 + 1$$

$$= \left(x - \frac{5}{2}\right)^2 - \frac{25}{4} + \frac{4}{4}$$

$$= \left(x - \frac{5}{2}\right)^2 - \frac{21}{4}, \text{ so } c = -\frac{21}{4}$$

50. **C** Isolate the radical expression and square both sides to solve for  $x$ .

$$3x - 5\sqrt{x} - 2 = 0$$

$$3x - 2 = 5\sqrt{x}$$

$$(3x - 2)^2 = (5\sqrt{x})^2$$

$$9x^2 - 12x + 4 = 25x$$

$$9x^2 - 37x + 4 = 0$$

$$(9x - 1)(x - 4) = 0$$

$$x = \frac{1}{9} \text{ or } x = 4$$

Remember to check for extraneous roots by substituting both solutions into the original equation.  $\frac{1}{9}$  is

an extraneous root since  $3\left(\frac{1}{9}\right) - 5\sqrt{\frac{1}{9}} - 2 \neq 0$ . The only solution is  $x = 4$ .









# PRACTICE TEST 4

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1. If  $3x = 7$ , then  $9x =$
- (A)  $\frac{7}{3}$
  - (B) 18
  - (C) 14
  - (D) 21
  - (E) 63
2. If  $\frac{3}{10} = \frac{5}{x}$ , then  $x =$
- (A)  $\frac{50}{3}$
  - (B)  $\frac{3}{50}$
  - (C) 16
  - (D) 12
  - (E) 17
3.  $9\sin^2 x + 9\cos^2 x =$
- (A) 1
  - (B) -1
  - (C) 9
  - (D) -9
  - (E) 0
4. If the supplement of twice an angle is  $124^\circ$ , then what is the measure of the angle?
- (A)  $60^\circ$
  - (B)  $30^\circ$
  - (C)  $56^\circ$
  - (D)  $28^\circ$
  - (E)  $27^\circ$
5. Two times a number  $k$  is decreased by 1. If the cube root of that result is  $-2$ , then  $k =$
- (A)  $-7$
  - (B)  $-3.5$
  - (C)  $-8$
  - (D)  $-3$
  - (E)  $-4.5$
6. All of the following triplets could be the lengths of the sides of a triangle EXCEPT
- (A) 3, 4, 5
  - (B) 3, 3, 5
  - (C) 1, 1, 2
  - (D) 6, 8, 10
  - (E) 7, 5, 11

7. Valerie drives 10 miles due east, then drives 20 miles due north, and finally drives 5 miles due west. Which of the following represents the straight-line distance Valerie is from her starting point?
- (A) 24 miles
  - (B) 22.4 miles
  - (C) 25 miles
  - (D) 35 miles
  - (E) 20.6 miles
8. The measures of the angles of a quadrilateral are  $x$ ,  $2x + 7$ ,  $3x$ , and  $5x + 1$ . What is the measure of the largest angle?
- (A)  $33^\circ$
  - (B)  $32^\circ$
  - (C)  $161^\circ$
  - (D)  $166^\circ$
  - (E)  $168^\circ$
9. How many sides does a regular polygon have if each interior angle measures  $140^\circ$ ?
- (A) 6
  - (B) 7
  - (C) 8
  - (D) 9
  - (E) 10
10. What is the solution to the system below?
- $$\begin{cases} 2x + y = \frac{5}{2} \\ x - 2y = 5 \end{cases}$$
- (A)  $\left(2, \frac{3}{2}\right)$
  - (B)  $\left(2, -\frac{3}{2}\right)$
  - (C)  $\left(0, -\frac{5}{2}\right)$
  - (D)  $\left(\frac{10}{3}, -\frac{5}{6}\right)$
  - (E)  $\left(0, \frac{5}{2}\right)$

11. Which of the following is NOT an irrational number?
- (A)  $\pi$
  - (B)  $\sqrt{2}$
  - (C)  $e$
  - (D)  $1.666\dots$
  - (E)  $\frac{\sqrt{3}}{2}$
12. What is the distance between the points with coordinates  $(-2, 6)$  and  $(2, -3)$ ?
- (A) 9.85
  - (B) 97
  - (C) 65
  - (D) 8.06
  - (E) 3
13. Which of the following best describes the figure with vertices  $P(-2, 3)$ ,  $Q(3, 3)$ ,  $R(3, -1)$ , and  $S(-2, -1)$ ?
- (A) Square
  - (B) Rectangle
  - (C) Parallelogram
  - (D) Trapezoid
  - (E) Rhombus
14. Which of the following are solutions to the equation  $30x^2 + 49x - 11 = 0$ ?
- (A)  $\left\{-\frac{1}{5}, \frac{11}{6}\right\}$
  - (B)  $\left\{-\frac{1}{30}, -11\right\}$
  - (C)  $\left\{\frac{1}{5}, -\frac{11}{6}\right\}$
  - (D)  $\left\{\frac{1}{30}, 11\right\}$
  - (E)  $\left\{-\frac{11}{15}, -\frac{1}{2}\right\}$
15. The points  $(4, -2)$  and  $(x, y)$  are symmetric to each other with respect to the origin.  $(x, y) =$
- (A)  $(-2, 4)$
  - (B)  $(2, -4)$
  - (C)  $(4, 2)$
  - (D)  $(-4, -2)$
  - (E)  $(-4, 2)$

16. Each of the following is equivalent to  $4\sqrt{2}$  EXCEPT

(A)  $2\sqrt{2} + 2\sqrt{2}$

(B)  $\sqrt{32}$

(C)  $\sqrt{8}(\sqrt{4})$

(D)  $\frac{\sqrt{64}}{\sqrt{2}}$

(E)  $\sqrt{20} + \sqrt{12}$

17. In  $\triangle ABC$  in Figure 1,  $\overline{AB} = 4$  and  $\overline{AC} = 4$ . What is the length of  $\overline{BC}$ ?

(A) 4

(B)  $4\sqrt{2}$

(C)  $4\sqrt{3}$

(D) 8

(E) 5

18. A local newspaper company prints 520 pages of the newspaper every 30 minutes. How many pages will it print in 5 hours?

(A) 2,600 pages

(B) 86.7 pages

(C) 5,200 pages

(D) 10,400 pages

(E) 1,300 pages

19. When  $n$  is divided by 3, the remainder is 1, and when  $m$  is divided by 3, the remainder is 2. What is the remainder when the product  $nm$  is divided by 3?

(A) 0

(B) 1

(C) 2

(D) 3

(E) Cannot be determined

20. If  $a$  is positive and  $\log_{3a} 36 = 2$ , then  $a =$

(A) 2

(B) 3

(C) 6

(D)  $2\sqrt{3}$

(E) 9

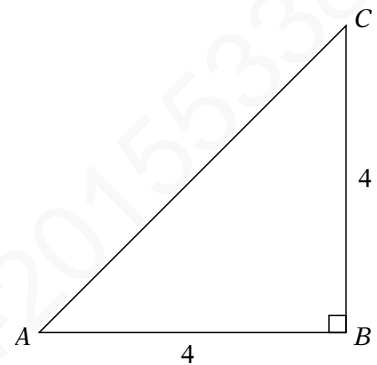


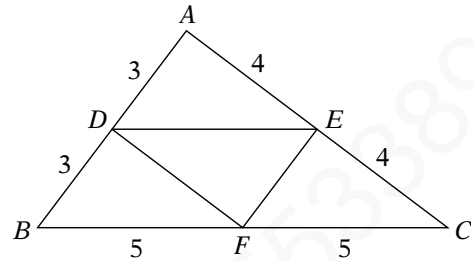
Figure 1

21. What is the radius of the circle represented by the equation  $x^2 - 2x + y^2 + 6y + 6 = 0$ ?

- (A) 2
- (B) 4
- (C) 1
- (D) 3
- (E) 16

22. What is the perimeter of  $\triangle DEF$  in Figure 2?

- (A) 48
- (B) 6
- (C) 8
- (D) 12
- (E) 24



**Figure 2**

23. If  $f(x) = x^2 + 3x$ , then  $f(3x) =$

- (A)  $3(x^2 + 3x)$
- (B)  $9(x + 1)$
- (C)  $9x^2 + 9x$
- (D)  $3x^2 + 9x$
- (E)  $9x^2 + 6x$

24. If the graph of  $\frac{x^2}{a} + \frac{y^2}{b} = 1$  contains the point  $(0, 1)$ , then which of the following must be a true statement?

- (A)  $a = b$
- (B)  $b = 0$
- (C)  $b = 1$
- (D)  $b = -1$
- (E)  $a = 1$

25. If  $f(x) = x^2 + 5$  and  $g(x) = -\sqrt{x}$ , then  $f(g(7)) =$

- (A) 7.6
- (B) -2
- (C) 54
- (D) 9
- (E) 12

26. If 20 percent of a given number is 11, then what is 55 percent of the same number?

- (A) 55
- (B) 30.25
- (C) 100
- (D) 36
- (E) 27.5

27. All of the following are properties of a parallelogram EXCEPT

- (A) The diagonals are perpendicular.
- (B) Opposite sides are congruent.
- (C) Consecutive angles are supplementary.
- (D) A diagonal forms two congruent triangles.
- (E) The diagonals bisect each other.

28. Standing 20 feet away from a flagpole, the angle of elevation of the top of the pole is  $42^\circ$ . Assuming the flagpole is perpendicular to the ground, what is its height?

- (A) 18
- (B) 22
- (C) 13
- (D) 15
- (E) 16

29. Which equation describes the graph in Figure 3?

- (A)  $y = (x + 2)^2$
- (B)  $x^2 + y^2 = 4$
- (C)  $|x| = 4$
- (D)  $x^2 = 4$
- (E)  $y = \frac{2}{x}$

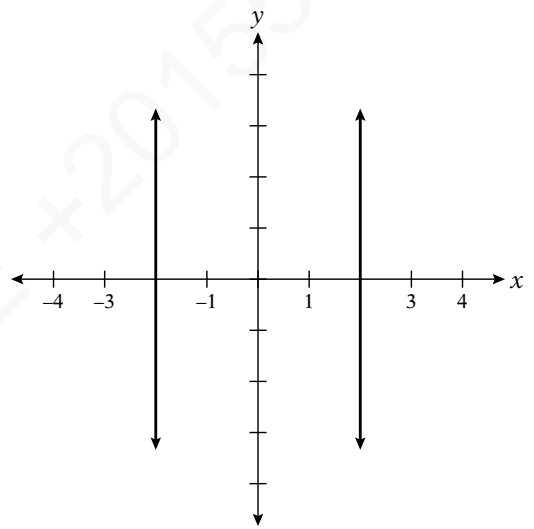


Figure 3

30. What is the volume of the right triangular prism in Figure 4?

- (A)  $650 \text{ cm}^3$
- (B)  $600 \text{ cm}^3$
- (C)  $300 \text{ cm}^3$
- (D)  $325 \text{ cm}^3$
- (E)  $780 \text{ cm}^3$

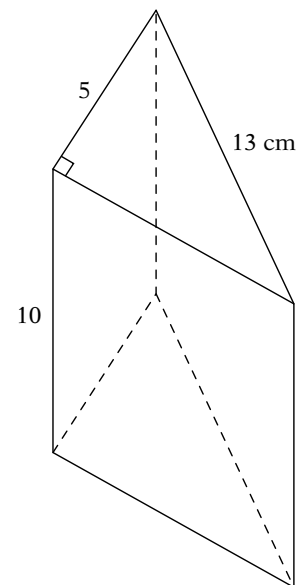


Figure 4

31. What is the maximum value of  $f(x) = 4 - (x + 1)^2$ ?
- (A) -1  
 (B) 4  
 (C) 1  
 (D) -4  
 (E) -5
32. In circle  $R$  in Figure 5, the measure of arc  $UT$  is  $100^\circ$ . What is the measure of  $\angle STU$ ?
- (A)  $50^\circ$   
 (B)  $40^\circ$   
 (C)  $100^\circ$   
 (D)  $30^\circ$   
 (E)  $45^\circ$
33. A rectangular prism has a length of 15 cm, a width of 9 cm, and a height of 6 cm. If each dimension is divided by 3, what is the ratio of the volume of the original prism to the second prism?
- (A) 1:9  
 (B) 3:1  
 (C) 9:1  
 (D) 27:1  
 (E) 81:1
34. If  $f(x) = x^2 + 3$  for  $-1 \leq x \leq 3$ , then what is the range of  $f$ ?
- (A)  $y \geq 0$   
 (B)  $y \geq 3$   
 (C)  $-1 \leq y \leq 3$   
 (D)  $4 \leq y \leq 12$   
 (E)  $3 \leq y \leq 12$
35. What is the domain of the function  $f(x) = \frac{x}{x + 6}$ ?
- (A) All real numbers.  
 (B) All real numbers except 0.  
 (C) All real numbers except 6.  
 (D) All real numbers except -6.  
 (E) All real numbers greater than or equal to -6.
36. If three numbers  $x$ ,  $y$ , and  $z$  are added in pairs, their sums are 3, 9, and 28. What is the smallest of the three numbers?
- (A) 3  
 (B) 17  
 (C) -3  
 (D) -8  
 (E) 9

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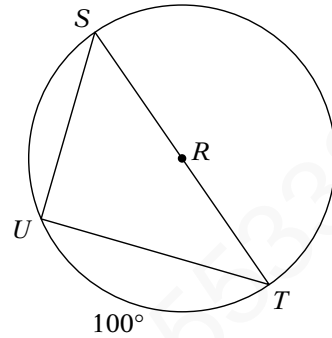


Figure 5

37. Given the three points  $A(1, 2)$ ,  $B(6, 2)$ , and  $C(6, 5)$ , what is the tangent of  $\angle CAB$ ?

- (A)  $\frac{3}{5}$
- (B)  $\frac{5}{3}$
- (C)  $\frac{3}{4}$
- (D)  $\frac{3\sqrt{34}}{34}$
- (E)  $\frac{1}{2}$

38. In Figure 6,  $\overline{VW}$  and  $\overline{XY}$  are parallel. The measure of  $\angle ZXY$  is  $75^\circ$  and the measure of  $\angle ZYX$  is  $25^\circ$ . What is the measure of  $\angle VZY$ ?

- (A)  $75^\circ$
- (B)  $80^\circ$
- (C)  $155^\circ$
- (D)  $165^\circ$
- (E)  $105^\circ$

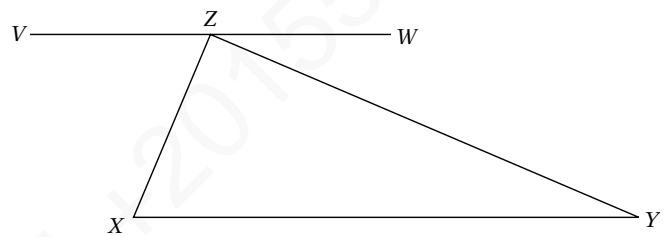


Figure 6

39. In Figure 7,  $\overline{AB}$  is congruent to  $\overline{DC}$ ,  $\overline{DB} = 10$  units, and  $m\angle DBC = 40^\circ$ . What is the perimeter of quadrilateral  $ABCD$ ?

- (A) 40
- (B) 28.2
- (C) 20
- (D) 26
- (E) 21.6

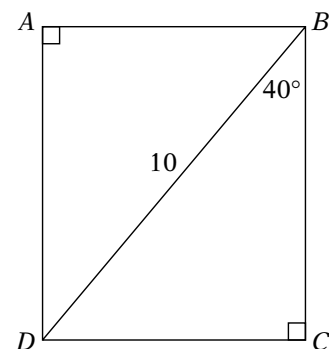


Figure 7

40. What real values of  $a$  and  $b$  satisfy the equation  $a + b + 9i = 6 + (2a - b)i$ ?

- (A)  $a = 5, b = -1$
- (B)  $a = 5, b = 1$
- (C)  $a = 6, b = 0$
- (D)  $a = 4, b = 2$
- (E)  $a = 1, b = 5$

41. What is the length of the edge of a cube having the same total surface area as a rectangular prism measuring 3 cm by 4 cm by 8 cm?
- (A) 22.7 cm  
(B) 4.8 cm  
(C) 136 cm  
(D) 5.8 cm  
(E) 11.7 cm
42. What are the  $x$ -intercepts of the graph  $f(x) = -25 - 5x^2$ ?
- (A)  $\pm\sqrt{5}$   
(B)  $\pm 5$   
(C) 0  
(D)  $-25$   
(E) None
43. The number of tails showing when a pair of coins was tossed 10 times was  $\{0, 1, 2, 2, 1, 1, 0, 2, 0, 1\}$ . What is the mean of the data?
- (A) 0  
(B) 0.5  
(C) 1  
(D) 1.5  
(E) 2
44. Christine's average score on the first three math tests of the term is 89 percent. If she earns an 81 percent on the fourth test, what will her new average be?
- (A) 87%  
(B) 85%  
(C) 86.8%  
(D) 88%  
(E) 85.5%
45. The diagonals of a rhombus measure 24 and 10 inches. What is the measure of the larger angle of the rhombus?
- (A)  $45.2^\circ$   
(B)  $150^\circ$   
(C)  $145^\circ$   
(D)  $120^\circ$   
(E)  $134.8^\circ$

46. Eighteen students took an 8-question quiz. The graph in Figure 8 shows the number of students who earned each possible score from 0 to 8. What is the median for the quiz scores?

(A) 5.3  
(B) 5  
(C) 4  
(D) 6  
(E) 5.5

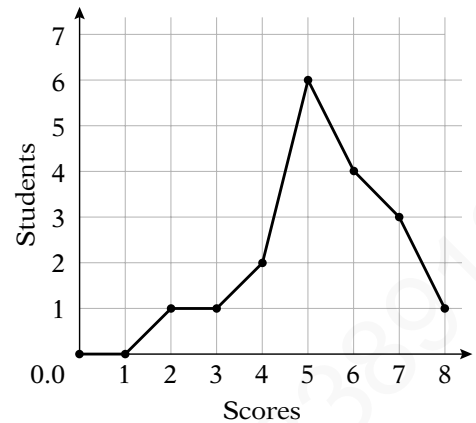


Figure 8

47. If  $f(x) = 3x + 1$  and  $g(x) = x^2 - 2x + 1$ , then  $(f + g)(2) =$

(A) 7  
(B) 1  
(C) 8  
(D) 6  
(E) 15

48.  $(2x - 3)^3 =$

(A)  $8x^3 - 27$   
(B)  $8x^3 - 36x^2 + 54x - 27$   
(C)  $(2x - 3)(4x^2 + 12x + 9)$   
(D)  $8x^3 - 18x^2 + 54x - 27$   
(E)  $2x^3 - 36x^2 - 54x - 27$

49. If  $(x, y)$  is a point on the graph of a function, then which of the following must be a point on the graph of the inverse of the function?

(A)  $(y, x)$   
(B)  $(-x, -y)$   
(C)  $(-y, -x)$   
(D)  $(x, -y)$   
(E)  $(-x, y)$

50. If the length of a rectangle is 7 feet more than its width and if its area is 18 square feet, then what are the dimensions of the rectangle?

(A)  $-9 \times -2$  feet  
(B)  $1 \times 18$  feet  
(C)  $3 \times 6$  feet  
(D)  $2 \times 9$  feet  
(E)  $1 \times 8$  feet

## ANSWER KEY

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

## ANSWERS AND SOLUTIONS

1. **D** Tripling both sides of the equation  $3x = 7$  results in  $9x = 3(7) = 21$ .

2. **A**

$$\frac{3}{10} = \frac{5}{x}$$

$$3x = 50$$

$$x = \frac{50}{3}$$

3. **C**

$$\begin{aligned} &9\sin^2 x + 9\cos^2 x \\ &= 9(\sin^2 x + \cos^2 x) \\ &= 9(1) = 9 \end{aligned}$$

4. **D** Let  $x$  = the measure of the angle. The supplement of twice the angle is  $180 - 2x$ .

$$180 - 2x = 124$$

$$-2x = -56$$

$$x = 28^\circ$$

5. **B**

$$\sqrt[3]{2k - 1} = -2$$

$$2k - 1 = (-2)^3 = -8$$

$$2k = -7$$

$$k = -\frac{7}{2} = -3.5$$

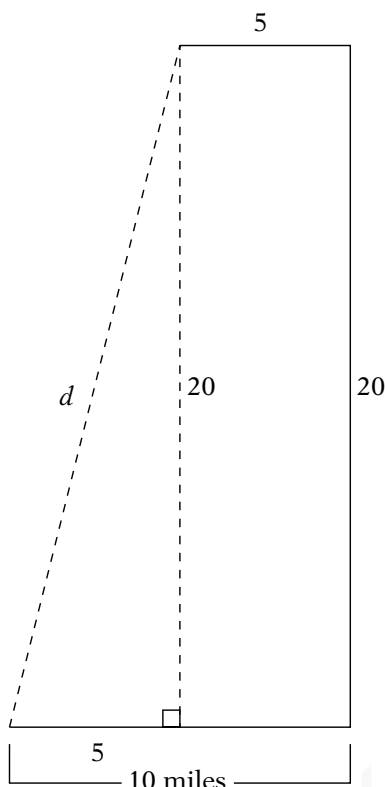
6. **C** The Triangle Inequality Theorem states that the sum of the lengths of two sides of a triangle must be greater than the length of the third side. It is impossible to have a triangle with sides measuring 1, 1, and 2 units, since  $1 + 1$  is not greater than 2.

7. **E** Use the Pythagorean Theorem to solve for the length of the hypotenuse of the right triangle below.

$$5^2 + 20^2 = d^2$$

$$\sqrt{425} = d$$

$$d \approx 20.6 \text{ miles}$$



8. **C**

$$x + 2x + 7 + 3x + 5x + 1 = 360$$

$$11x + 8 = 360$$

$$11x = 352$$

$$x = 32$$

The largest angle measures  $5(32) + 1 = 161^\circ$ .

9. **D**

Let  $n$  = the number of sides of the polygon.

$$\frac{180(n-2)}{n} = 140$$

$$180(n-2) = 140n$$

$$180n - 360 = 140n$$

$$40n = 360$$

$$n = 9$$

10. **B** Multiply the first equation by a factor of 2 to eliminate  $y$  and then solve for  $x$ .

$$4x + 2y = 5$$

$$+ \quad x - 2y = 5$$


---


$$5x + 0y = 10$$

$$x = 2$$

Substituting  $x = 2$  into the second equation results in:

$$2 - 2y = 5$$

$$y = -\frac{3}{2}$$

11. **D** Irrational numbers are nonterminating and nonrepeating.  $1.666\dots$  is not irrational, since it is a repeating decimal.

12. **A**

$$d = \sqrt{(-2-2)^2 + (6-3)^2}$$

$$d = \sqrt{(-4)^2 + (9)^2}$$

$$d = \sqrt{16 + 81}$$

$$d = \sqrt{97} \approx 9.85$$

13. **B**  $PQ = SR = 5$  units.  $PS = QR = 4$  units. Since opposite sides are congruent and consecutive sides are perpendicular, the figure is a rectangle.

14. **C**

$$30x^2 + 49x - 11 = 0$$

$$(5x - 1)(6x + 11) = 0$$

$$x = \frac{1}{5} \text{ or } x = -\frac{11}{6}$$

15. **E** Reflecting the point  $(4, -2)$  about the origin results in the point  $(-4, 2)$ . In other words, the origin is the midpoint of the segment with endpoints  $(4, -2)$  and  $(-4, 2)$ .

16. **E**

$$\sqrt{20} + \sqrt{12} \neq \sqrt{32}, \text{ so it is not equivalent to}$$

$$4\sqrt{2} \cdot \sqrt{20} + \sqrt{12} = 2\sqrt{5} + 2\sqrt{3}.$$

17. **B** Recognize that  $\triangle ABC$  is a  $45^\circ$ - $45^\circ$ - $90^\circ$  right triangle. If each leg measures 4 units, the hypotenuse is a factor of  $\sqrt{2}$  larger than 4.  $4\sqrt{2}$  is the correct answer.

18. **C** Let  $p$  = the number of pages printed in 5 hours. Set up a proportion to solve for  $p$ , remembering to use consistent units for time (either minutes or hours). Let's change 30 minutes to 0.5 hours.

$$\frac{520}{0.5} = \frac{p}{5}$$

$$5(520) = 0.5p$$

$$10(520) = p$$

$$p = 5,200 \text{ pages}$$

19. **C**

$$\text{Let } n = 3x + 1 \text{ and } m = 3x + 2.$$

$$nm = (3x + 1)(3x + 2)$$

$$nm = 9x^2 + 9x + 2$$

Both  $9x^2$  and  $9x$  are divisible by 3, so the constant 2 is the remainder. Try substituting values for  $n$  and  $m$  to see what happens to their product. If  $n = 4$  and  $m = 5$ ,  $nm = 20$ .  $20 \div 3 = 6$  remainder 2.

20. **A**

$$\text{Since } \log_{3a} 36 = 2, (3a)^2 = 36.$$

$$9a^2 = 36$$

$$a^2 = 4$$

$$a = 2 \text{ (} a \neq -2 \text{ because the problem states } a \text{ is positive.)}$$

21. **A** Write the equation of the circle in standard form by completing the square for  $x$  and  $y$ .

$$x^2 - 2x + y^2 + 6y + 6 = 0$$

$$(x^2 - 2x) + (y^2 + 6y) = -6$$

$$(x^2 - 2x + 1) + (y^2 + 6y + 9) = -6 + 1 + 9$$

$$(x - 1)^2 + (y + 3)^2 = 4$$

The center of the circle is  $(1, -3)$ , and its radius has a length of  $\sqrt{4} = 2$  units.

22. **D** The three sides of  $\triangle DEF$  are the midsegments of  $\triangle ABC$ . Each midsegment connects the midpoint of two sides of  $\triangle ABC$  and is half the length of the third side. The perimeter of  $\triangle DEF$  is

$$3 + 4 + 5 = 12 \text{ units}$$

23. **C**

$$\text{Given } f(x) = x^2 + 3x,$$

$$f(3x) = (3x)^2 + 3(3x)$$

$$f(3x) = 9x^2 + 9x$$

24. **C** The equation  $\frac{x^2}{a} = \frac{y^2}{b} = 1$  represents an ellipse with center  $(0, 0)$ . Since the graph contains the point  $(0, 1)$ ,

$$\frac{0^2}{a} + \frac{1^2}{b} = 1$$

$$\frac{1}{b} = 1$$

$$b = 1$$

Answers A and E *may* also be true, but the question asks which statements *must* be true. Answer B can be immediately eliminated, since you cannot divide by zero.

25. **E**

Apply the inside function,  $g(7)$ , first.

$$g(7) = -\sqrt{7}$$

$$f(g(7)) = (-\sqrt{7})^2 + 5 = 7 + 5 = 12$$

26. **B**

Let  $x$  = the given number.

$$0.20x = 11$$

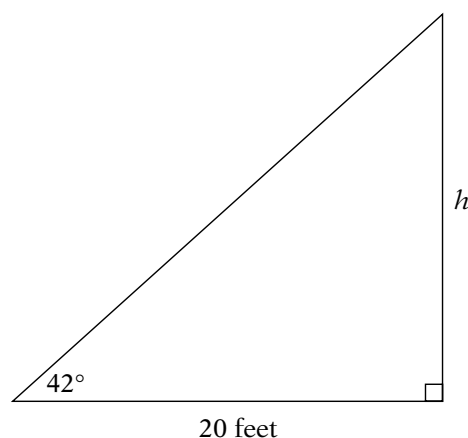
$$x = 55$$

$$0.55(55) = 30.25$$

27. **A** The diagonals of a rhombus (and, therefore, a square) are perpendicular. The diagonals of a parallelogram are not, so A is not a true statement.

28. **A**

Let  $h$  = the height of the flagpole.



$$\tan 42^\circ = \frac{h}{20}$$

$$h = 20(\tan 42^\circ) \approx 18 \text{ feet}$$

29. **D** The graph shows two vertical lines: one at  $x=2$  and one at  $x=-2$ . The equation  $x^2 = 4$  is true when  $x = 2$  or  $x = -2$ , so the graph describes the equation in Answer D.

30. **C** Volume is given by the formula  $V = Bh$ , where  $B$  is the area of the base. The area of the base of the right triangular prism is

$$B = \frac{1}{2}(12)5 = 30 \text{ cm}^2$$

The volume of the prism is then

$$V = Bh = 30(10) = 300 \text{ cm}^3$$

31. **B** The maximum value of the function is the  $y$ -coordinate of the parabola's vertex. For the function  $f(x) = 4 - (x + 1)^2$ , the vertex is  $(-1, 4)$ . (You can check this by graphing the parabola on your graphing calculator.) The maximum value is, therefore, 4.

An alternate way of solving for the maximum is to find the  $y$  value when  $x = -\frac{b}{2a}$ . In this case,

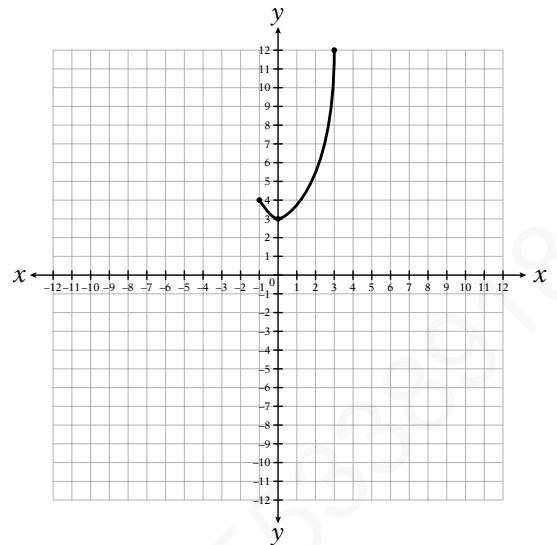
$$x = -\frac{(-2)}{2(-1)} = -1, \text{ so } y = 4 - (-1 + 1)^2 = 4.$$

32. **B**  $m\angle SUT = 90^\circ$ , since the angle intercepts a semicircle. An inscribed angle measures half of its intercepted arc, so  $m\angle UST = \frac{1}{2}(100) = 50^\circ$ .

In  $\Delta UST$ , one angle measures  $90^\circ$  and one measures  $50^\circ$ . The remaining angle,  $\angle STU$ , must measure  $180 - (90 + 50) = 40^\circ$ .

33. **D** The scale factor of the two similar prisms is 3:1. The ratio of their volumes is, therefore,  $3^3:1^3$  or 27:1.

34. **E** The graph of  $f(x) = x^2 + 3$  is a parabola with vertex  $(0, 3)$  and concave up. Since the domain is specified, the curve has a beginning and an ending point.



When  $x = -1$ ,  $y = 4$ , and when  $x = 3$ ,  $y = 12$ . The range is the set of all possible  $y$  values, so don't forget to include the vertex whose  $y$  value is less than 4. The range is  $3 \leq y \leq 12$ .

35. **D**

The function  $f(x) = \frac{x}{x+6}$  is undefined when the denominator is zero.

$$x + 6 = 0$$

$$x = -6$$

The function is defined for all real numbers except  $x = -6$ .

36. **D**

$$x + y = 3$$

$$x + z = 9$$

$$y + z = 28$$

Solving the first equation for  $y$  results in  $y = 3 - x$ .

$$(3 - x) + z = 28, \text{ so } -x + z = 25$$

Now set up a system using the two equations in  $x$  and  $z$ .

$$-x + z = 25$$

$$+x + z = 9$$

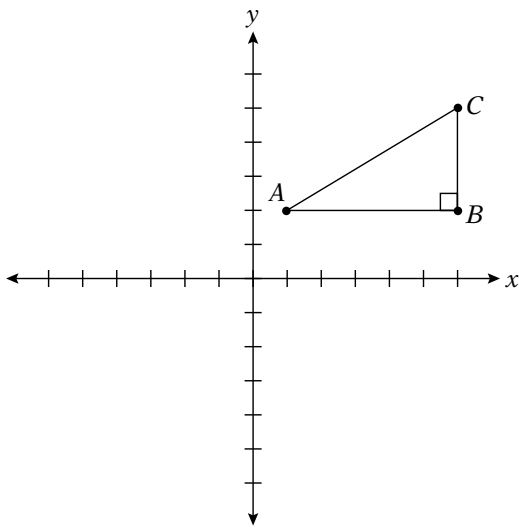
$$\hline 2z = 34$$

$$z = 17$$

Since  $y + z = 28$ ,  $y = 28 - 17 = 11$ . Since  $x + z = 9$ ,  $x = 9 - 17 = -8$ . The smallest of the three numbers is  $-8$ .

37. **A**

Graphing the points  $A$ ,  $B$ , and  $C$  results in a right triangle.



The tangent of  $\angle CAB$  is

$$\tan \angle CAB = \frac{\text{opposite}}{\text{adjacent}} = \frac{CB}{AB}$$

$$\tan \angle CAB = \frac{3}{5}$$

38. **C**

$\angle VZX$  and  $\angle ZXY$  are alternate interior angles and are, therefore, congruent.  $m\angle VZX = 75^\circ$ . Since  $m\angle ZYX = 25^\circ$  and  $m\angle VZX = 75^\circ$ , the remaining angle in  $\triangle ZYX$  must measure  $180 - (75 + 25) = 80^\circ$ .

$$m\angle VZY = 75 + 80 = 155^\circ$$

39. **B**

Let  $x = DC$  and  $y = BC$ .

$$\begin{aligned} \sin 40^\circ &= \frac{x}{10} & \cos 40^\circ &= \frac{y}{10} \\ x &= 6.428 & y &= 7.660 \end{aligned}$$

Since  $AB = DC$ ,  $DB$  divides the quadrilateral into two congruent triangles.  $AD$  must equal  $BC$ . The perimeter of the quadrilateral is therefore

$$2(6.428) + 2(7.660) = 28.2 \text{ units}$$

40. **B**

Since  $a + b + 9i = 6 + (2a - b)i$ ,  $a + b = 6$  and  $2a - b = 9$ . Set up a system and use the linear combination method to solve for  $a$  and  $b$ .

$$\begin{array}{r} a + b = 6 \\ + 2a - b = 9 \\ \hline 3a + 0b = 15 \end{array}$$

$$a = 5$$

$$5 + b = 6, \text{ so } b = 1$$

41. **B**

The surface area of the prism is

$$SA = 2(3)(4) + 2(3)(8) + 2(4)(8) = 136 \text{ cm}^2$$

The surface area of the cube is given by the formula  $SA = 6e^2$ , where  $e$  = the length of an edge of the cube.

$$136 = 6e^2$$

$$22.67 = e^2$$

$$e = 4.8 \text{ cm}$$

42. **E**

Let  $y = 0$  and solve for  $x$ .

$$f(x) = -25 - 5x^2$$

$$0 = -25 - 5x^2$$

$$25 = -5x^2$$

$$-5 = x^2$$

No real solution for  $x$ .

43. **C** The mean is the sum of the data divided by the number of terms.

$$\frac{0 + 1 + 2 + 2 + 1 + 1 + 0 + 2 + 0 + 1}{10} = \frac{10}{10} = 1$$

44. **A**

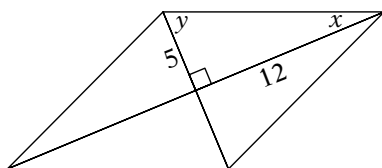
Let  $s$  = the sum of the scores on Christine's first three tests.

$$\frac{s}{3} = 89$$

$$s = 267$$

$$\text{Christine's new average is } \frac{267 + 81}{4} = 87\%$$

45. **E** Recall that the diagonals of a rhombus are perpendicular, bisect each other, and bisect the vertex angles of the rhombus. Let  $x$  and  $y$  equal the measures of the angles as shown below.



$$\tan x = \frac{5}{12}$$

$$x = \tan^{-1} \frac{5}{12} = 22.6^\circ$$

$$\tan y = \frac{12}{5}$$

$$y = \tan^{-1} \frac{12}{5} = 67.4^\circ$$

One angle of the rhombus measures  $2(22.6) \approx 45.2^\circ$ , while the other angle measures  $2(67.4) \approx 134.8^\circ$ . Since the problem asks for the greater of the two angles,  $134.8^\circ$  is the correct answer.

46. **B** The graph shows the set of scores as:

$\{2, 3, 4, 4, 5, 5, 5, 5, 5, 5, 6, 6, 6, 6, 7, 7, 7, 8\}$ . Since the scores are in order from lowest to highest, simply count over to the middle value to determine the median. The median is the average of the ninth and tenth terms. In this example, both the ninth and tenth terms are 5, so the median is 5.

47. **C**

$$\begin{aligned} (f+g)(2) &= f(2) + g(2) \\ &= 3(2) + 1 + (2)^2 - 2(2) + 1 \\ &= 7 + 1 = 8 \end{aligned}$$

48. **B** The binomial expansion of  $(x+y)^3$

$$= 1x^3 + 3x^2y + 3xy^2 + y^3.$$

Substitute  $x = 2x$  and  $y = -3$  to get:

$$\begin{aligned} 1(2x)^3 + 3(2x)^2(-3) + 3(2x)(-3)^2 + (-3)^3 \\ = 8x^3 - 36x^2 + 54x - 27 \end{aligned}$$

Of course, you could multiply  $(2x-3)(2x-3)(2x-3)$  and get the same product, but remembering the Binomial Theorem will save time.

49. **A** The graph of the inverse of a function is the graph of the function reflected over the line  $y = x$ . If  $(x, y)$  is a point on  $f$ , then  $(y, x)$ , the reflection of the point over the line  $y = x$ , is on the graph of  $f^{-1}$ .

50. **D**

Let  $w$  = the width of the rectangle. Its length is then  $w + 7$ .

$$\text{Area} = w(w + 7) = 18$$

$$w^2 + 7w - 18 = 0$$

$$(w + 9)(w - 2) = 18$$

$$w = -9 \text{ or } w = 2$$

The solution  $-9$  is a root, however, since the width of the rectangle cannot be negative. The dimensions of the rectangle are  $2 \times (2 + 7)$  or  $2 \times 9$  feet.







# **PRACTICE TEST 5**

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1. If  $a = b^3$  and  $b = 4k$ , then what is the value of  $a$  when

$$k = -\frac{1}{2}?$$

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

2. If  $\frac{3}{8} = \frac{1}{4x-1}$ , then  $x =$

- (A)  $\frac{3}{4}$
- (B)  $\frac{9}{4}$
- (C) 11
- (D)  $\frac{11}{12}$
- (E)  $\frac{5}{12}$

3. If  $4 - 3(5 - x) = 2(x + 5) - 1$ , then  $x =$

- (A) -2
- (B) 20
- (C) -15
- (D) 4
- (E) 21

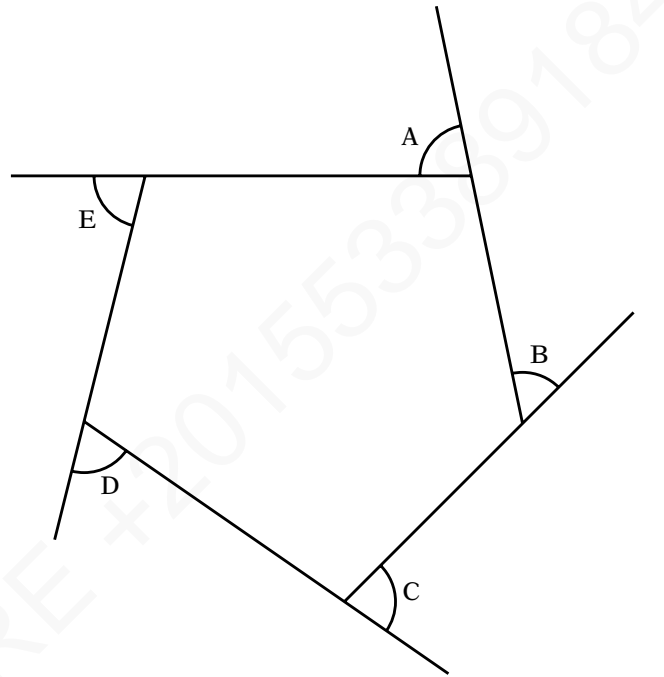
4.  $\frac{1}{2}$  percent of 50 percent of 1,000 is

- (A)  $\frac{5}{2}$
- (B) 5
- (C) 0.25
- (D) 25
- (E) 250

5. What is the least positive integer divisible by 2, 6, and 27?

- (A) 108
- (B) 54
- (C) 18
- (D) 324
- (E) 162

6. If the area of a square is  $100 \text{ cm}^2$ , then its perimeter is
- (A) 10 cm  
 (B) 20 cm  
 (C) 40 cm  
 (D) 200 cm  
 (E) 100 cm
7. The sides of pentagon  $ABCDE$  in Figure 1 are extended. What is the sum of the measures of the five marked angles?
- (A)  $180^\circ$   
 (B)  $270^\circ$   
 (C)  $360^\circ$   
 (D)  $540^\circ$   
 (E)  $720^\circ$



**Figure 1**

8. What is the y-intercept of the line  $y - 1 = -\frac{1}{2}(x + 8)$ ?
- (A) 8  
 (B) -4  
 (C) -5  
 (D) -3  
 (E)  $-\frac{1}{2}$
9. If  $4x - y = 6z + w$ , then what does the expression  $12 - 4x + y$  equal in terms of  $z$  and  $w$ ?
- (A)  $12 - w$   
 (B)  $12 - 6z$   
 (C)  $12 + 6z + w$   
 (D)  $12 - 6z + w$   
 (E)  $12 - 6z - w$
10. For all  $x$  except  $x = 9$ ,  $\frac{3x^2 - 28x + 9}{9 - x} =$
- (A)  $-2x + 28$   
 (B)  $3x - 1$   
 (C)  $-3x + 1$   
 (D)  $3x + 3$   
 (E)  $3x^2 - 28$

11. In Figure 2, if the length of  $\overline{DF} = 4x + 2$  and the length of  $\overline{EF}$  is  $\frac{3}{4}x + 1$ , what is the length of  $\overline{DE}$ ?

- (A)  $\frac{13}{4}x + 3$
- (B)  $\frac{13}{4}x + 1$
- (C)  $x + 1$
- (D)  $\frac{19}{4}x + 3$
- (E)  $3x + 1$

12. What are three consecutive even integers whose sum is 48?

- (A) 12, 14, 16
- (B) 16, 18, 20
- (C) 13, 15, 17
- (D) 15, 16, 17
- (E) 14, 16, 18

13.  $\left| -4 - |(-2)^3| \right| =$

- (A) 4
- (B) -4
- (C) 8
- (D) 0
- (E) 2

14. If  $x + y = -1$  and  $x - y = 6$ , then  $\frac{x}{y} =$

- (A)  $\frac{5}{2}$
- (B)  $-\frac{7}{2}$
- (C)  $-\frac{5}{7}$
- (D)  $-\frac{7}{9}$
- (E)  $-\frac{7}{5}$

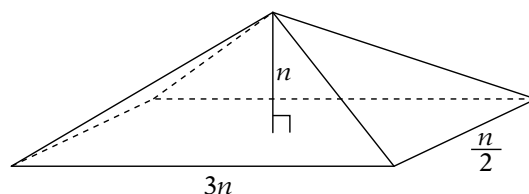
15. If  $f(x) = \frac{16}{x^5}$  and  $x \neq 0$ , then  $f(-2) =$

- (A)  $-\frac{1}{2}$
- (B)  $\frac{1}{2}$
- (C)  $\frac{1}{4}$
- (D) 1
- (E) -1



Figure 2

16. How many diagonals can be drawn from one vertex of a 20-gon?
- (A) 15  
(B) 16  
(C) 17  
(D) 18  
(E) 170
17. Which of the following lines is perpendicular to the line  $y = -3x + 1$ ?
- (A)  $y = -3x + 4$   
(B)  $y = 3x$   
(C)  $y = \frac{1}{3}x + 1$   
(D)  $y = -\frac{1}{3}x - 1$   
(E)  $y = -3x - 1$
18. If the point  $(-1, 2)$  is on a graph that is symmetric with respect to the  $y$ -axis, then which of the following points must also be on the graph?
- (A)  $(1, 2)$   
(B)  $(-1, -2)$   
(C)  $(1, -2)$   
(D)  $(-2, 1)$   
(E)  $(2, -1)$
19.  $-9\cos^2 \theta - 9\sin^2 \theta =$
- (A) 0  
(B) 1  
(C) -1  
(D) 9  
(E) -9
20. The midpoint of  $\overline{AB}$  is  $(5, -6)$  and the coordinates of endpoint  $A$  are  $(-1, 2)$ . What are the coordinates of  $B$ ?
- (A)  $(-7, 10)$   
(B)  $(11, -14)$   
(C)  $(2, -2)$   
(D)  $(-2, 2)$   
(E)  $(-1, 4)$
21. What is the volume of the rectangular pyramid in Figure 3?
- (A)  $\frac{3n^2}{2}$   
(B)  $\frac{3n^3}{4}$   
(C)  $\frac{3n^3}{2}$   
(D)  $\frac{n^3}{2}$   
(E)  $n^3$



**Figure 3**

22.  $2x^3 + 9x^2 + 3x - 4$  divided by  $(x + 1) =$
- (A)  $2x^2 + 11x + 14$
  - (B)  $(2x - 1)(x - 4)$
  - (C)  $2x^2 + 7x + 10$
  - (D)  $2x^2 + 7x - 4$
  - (E)  $2x^3 + 7x^2 - 4x$
23. In the triangle shown in Figure 4, what is the value of  $c$ ?
- (A)  $\sqrt{3}$
  - (B)  $3\sqrt{3}$
  - (C)  $6\sqrt{3}$
  - (D)  $9\sqrt{3}$
  - (E)  $9\sqrt{2}$
24. Which one of the following is a counterexample to the statement "If two angles are supplementary, then they are right angles?"
- (A) If two angles are complementary, then they are not right angles.
  - (B) If two angles are right angles, then they are supplementary.
  - (C) If two angles are not supplementary, then they are not right angles.
  - (D) If two angles are supplementary, then one could measure  $100^\circ$  and one could measure  $80^\circ$ .
  - (E) If two angles are not right angles, then they are not supplementary.
25. What is the domain of the function  $f(x) = \sqrt{36 - x^2}$
- (A)  $x \leq -6$  or  $x \geq 6$
  - (B)  $x \geq \pm 6$
  - (C)  $x \neq \pm 6$
  - (D)  $x \leq 6$
  - (E)  $-6 \leq x \leq 6$
26. What is the maximum value of the function  $f(x) = \frac{1}{x}$  over the interval  $\frac{1}{2} \leq x \leq \frac{3}{2}$ ?
- (A)  $\frac{1}{2}$
  - (B)  $\frac{3}{2}$
  - (C) 2
  - (D)  $\frac{2}{3}$
  - (E) Infinity

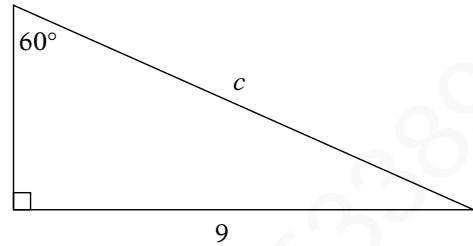
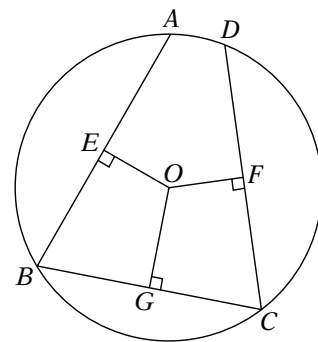


Figure 4

27. If  $a = \frac{n+1}{n^4}$  and  $b = \frac{1-n}{n^4}$ , then, for  $n \neq 0$ ,  $a - b =$
- (A)  $\frac{2}{n^4}$   
(B)  $\frac{2}{n^3}$   
(C) 0  
(D)  $2n$   
(E)  $\frac{2n-2}{n^4}$
28. What is the volume of a sphere whose surface area is  $100\pi$  square units?
- (A)  $\frac{100}{3}\pi$  cubic units or units<sup>3</sup>  
(B)  $\frac{500}{3}\pi$  units<sup>3</sup>  
(C)  $160\pi$  units<sup>3</sup>  
(D)  $\frac{375}{4}\pi$  units<sup>3</sup>  
(E)  $520$  units<sup>3</sup>
29. What is the circumference of a circle whose area is  $64\pi$  cm<sup>2</sup>?
- (A) 16  
(B)  $8\pi$   
(C) 8  
(D)  $128\pi$   
(E)  $16\pi$
30. Which of the following is the solution of  $|2x-4| < 1$ ?
- (A)  $\frac{3}{2} < x < \frac{5}{2}$   
(B)  $x < \frac{5}{2}$   
(C)  $x < \frac{3}{2}$  or  $x > \frac{5}{2}$   
(D)  $x > 0$   
(E)  $x \leq \frac{3}{2}$  or  $x \geq \frac{5}{2}$
31. Which of the following is the equation of a circle with center  $(-1, 7)$  and a radius of length 3?
- (A)  $(x+1)^2 - (y+7)^2 = 9$   
(B)  $(x+1)^2 + (y-7)^2 = 3$   
(C)  $(x-1)^2 + (y+7)^2 = 3$   
(D)  $(x+1)^2 + (y-7)^2 = 9$   
(E)  $(x-1)^2 + (y+7)^2 = 9$

32. An equation of the line parallel to  $8x - 2y = 5$  and containing the point  $(-2, 2)$  is
- (A)  $y - 2 = 4(x - 2)$   
 (B)  $y = 4x + \frac{5}{2}$   
 (C)  $y = 4x - \frac{5}{2}$   
 (D)  $y + 2 = 4(x - 2)$   
 (E)  $y = 4x + 10$
33. If the letters of the word PROBLEMS are written on cards and put in a hat, what is the probability of randomly drawing either "E" or "S"?
- (A)  $\frac{1}{8}$   
 (B)  $\frac{1}{56}$   
 (C)  $\frac{1}{4}$   
 (D)  $\frac{1}{64}$   
 (E)  $\frac{1}{16}$
34. If  $\tan 10^\circ = \cot \theta$ , then  $\theta =$
- (A)  $10^\circ$   
 (B)  $80^\circ$   
 (C)  $70^\circ$   
 (D)  $-10^\circ$   
 (E)  $90^\circ$
35. In circle  $O$  in Figure 5,  $\overline{OE} = 3$ ,  $\overline{OF} = 2$ , and  $\overline{OG} = 4$ . Which of the following lists the three chords in order from longest to shortest?
- (A)  $OG, OE, OF$   
 (B)  $DF, CG, BE$   
 (C)  $BC, AB, DC$   
 (D)  $DC, AB, BC$   
 (E)  $DC, BC, AB$
36. If  $\cos (45 + 2x)^\circ = \sin (3x)^\circ$ , then  $x =$
- (A)  $18^\circ$   
 (B)  $27^\circ$   
 (C)  $45^\circ$   
 (D)  $22.5^\circ$   
 (E)  $9^\circ$



**Figure 5**

37. If  $2^3(2^{3n})(2) = \frac{1}{4}$ , then  $n =$

- (A)  $-\frac{5}{3}$
- (B)  $-2$
- (C)  $-\frac{2}{9}$
- (D)  $-\frac{2}{3}$
- (E)  $-\frac{1}{3}$

38. If  $f(x) = \frac{3}{2}x + \sqrt{x}$ , then  $f(f(4)) =$

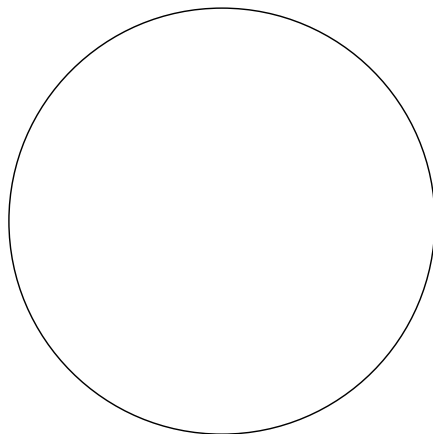
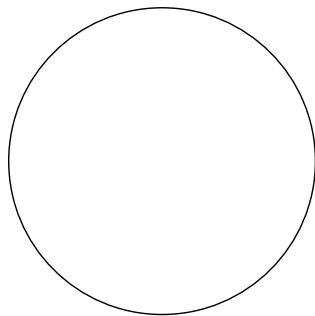
- (A)  $12 + 2\sqrt{2}$
- (B) 20
- (C)  $14\sqrt{2}$
- (D) 8
- (E) 16

39. The operation  $\spadesuit$  is defined for all real numbers  $a$  and  $b$  as  $a \spadesuit b = b^{2a}$ . If  $n \spadesuit 5 = 125$ , then  $n =$

- (A) 1
- (B) 2
- (C) 3
- (D)  $\frac{3}{2}$
- (E)  $\frac{1}{2}$

40. How many common tangents can be drawn to the two circles in Figure 6?

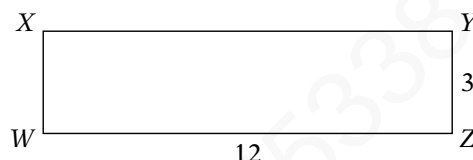
- (A) 0
- (B) 1
- (C) 2
- (D) 3
- (E) 4



**Figure 6**

41. The boys' basketball team scored an average of 54 points per game in their first 5 games of the season. The girls' basketball team scored an average of 59 points per game in their first 6 games. What was the average of points scored in all 11 games?
- (A) 56.5  
 (B) 56.7  
 (C) 56.0  
 (D) 57.1  
 (E) 62.4

42. The rectangle in Figure 7 is rotated about side  $\overline{WZ}$ . What is the volume of the resulting solid?
- (A) 432  
 (B)  $108\pi$   
 (C)  $432\pi$   
 (D)  $72\pi$   
 (E) 330



**Figure 7**

43. If  $i = \sqrt{-1}$ , then all of the following expressions are equivalent EXCEPT
- (A)  $i^4$   
 (B)  $(i^4)^4$   
 (C)  $i^8$   
 (D)  $i^{20}$   
 (E)  $i^4 + i^4$

44. For  $x \neq -1$  and  $x \neq \frac{1}{3}$ , if  $f(x) = 1 - 3x$  and  $g(x) = 3x^2 + 2x - 1$ , then  $\left(\frac{f}{g}\right)(x) =$

- (A)  $\frac{1}{3}x^2 - \frac{3}{2}x$   
 (B)  $\frac{-1}{x+1}$   
 (C)  $\frac{1}{x+1}$   
 (D)  $\frac{-1}{x-1}$   
 (E)  $3x^2 + 5x - 2$
45. If  $\sin x = \frac{7}{25}$ , then  $\tan x =$

- (A)  $\frac{7}{20}$   
 (B)  $\frac{24}{25}$   
 (C)  $\frac{7}{24}$   
 (D)  $\frac{24}{7}$   
 (E)  $\frac{8}{24}$

46. Kate needs to complete 5 more courses—calculus, English, French, computer science, and history—in order to graduate from high school. She plans to schedule the courses during the first 5 periods of the school day, and all 5 courses are offered during each of the 5 periods. How many different schedules are possible?
- (A) 25  
(B) 24  
(C) 240  
(D) 120  
(E) 60
47. If the pattern of the terms  $3\sqrt{3}$ ,  $27$ ,  $81\sqrt{3}$ , ... continues, which of the following would be the sixth term of the sequence?
- (A)  $(3\sqrt{3})^6$   
(B)  $(\sqrt{3})^6$   
(C)  $3^6$   
(D)  $(3\sqrt{3})^5$   
(E)  $3^7$
48. The quotient from dividing the sum of the measures of the interior angles of a regular polygon by the number of its sides is  $157.5^\circ$ . How many sides does the polygon have?
- (A) 14  
(B) 15  
(C) 16  
(D) 17  
(E) 18
49. What is the value of  $k$  if
- $$\frac{1}{(x-2)(x+4)} = \frac{h}{(x-2)} + \frac{k}{(x+4)}?$$
- (A) 2  
(B) -4  
(C)  $-\frac{1}{6}$   
(D)  $\frac{1}{6}$   
(E) -2
50. What is the perimeter of the regular hexagon shown in Figure 8 if the apothem,  $XO$ , measures  $2\sqrt{3}$  units?
- (A) 12  
(B)  $12\sqrt{3}$   
(C) 24  
(D)  $24\sqrt{3}$   
(E) 36

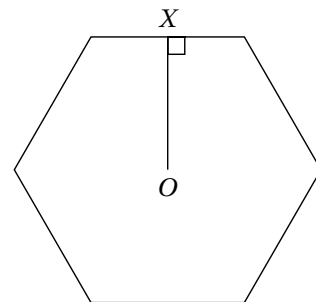


Figure 8

## ANSWER KEY

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

## ANSWERS AND SOLUTIONS

1. **B** When  $k = -\frac{1}{2}$ ,  $b = 4\left(-\frac{1}{2}\right) = -2$ .

$$a = (-2)^3 = -8$$

2. **D**

$$\frac{3}{8} = \frac{1}{4x-1}$$

$$3(4x-1) = 8$$

$$12x - 3 = 8$$

$$12x = 11$$

$$x = \frac{11}{12}$$

3. **B**

$$4 - 3(5 - x) = 2(x + 5) - 1$$

$$4 - 15 + 3x = 2x + 10 - 1$$

$$3x - 11 = 2x + 9$$

$$x = 9 + 11 = 20$$

4. **A**

$$\frac{1}{2}\% \text{ of } 50\% \text{ of } 1,000 = \frac{1}{2} \left( \frac{50}{100} \right) (1,000)$$

$$= \frac{1}{2} (500)$$

$$= \frac{1}{2} (5)$$

$$= \frac{5}{2}$$

5. **B** Take the prime factorization of each of the three numbers.

2 is prime.

$$6 = 2(3)$$

$$27 = 3^3$$

The least integer divisible by all three numbers equals  $2(3^3) = 2(27) = 54$ .

6. **C** The area of a square is given by the formula  $A = s^2$  where  $s$  = the length of its side.

$$100 = s^2$$

$$s = 10$$

The square's perimeter is  $4(10) = 40$  cm.

7. **C** The five marked angles are the five exterior angles of pentagon  $ABCDE$ . The sum of the exterior angles of any polygon is  $360^\circ$ , so **C** is the correct answer.

8. **D** Rewrite the equation of the line in slope-intercept form,  $y = mx + b$  where  $b$  is the  $y$ -intercept.

$$y - 1 = -\frac{1}{2}(x + 8)$$

$$y - 1 = -\frac{1}{2}x - 4$$

$$y = -\frac{1}{2}x - 3$$

The  $y$ -intercept is  $-3$ .

9. **E**

$$12 - 4x + y = 12 - (4x - y)$$

$$= 12 - (6z + w)$$

$$= 12 - 6z - w$$

10. **C**

$$\frac{3x^2 - 28x + 9}{9 - x}$$

$$= \frac{(3x - 1)(x - 9)}{-(x - 9)}$$

$$= -(3x - 1) = -3x + 1$$

11. **B**

$$DE = DF - EF$$

$$DE = 4x + 2 - \left(\frac{3}{4}x + 1\right)$$

$$DE = \frac{13}{4}x + 1$$

12. **E** Let  $x$  = the first even integer,  $x + 2$  = the second even integer, and  $x + 4$  = the third.

$$x + x + 2 + x + 4 = 48$$

$$3x + 6 = 48$$

$$3x = 42$$

$$x = 14$$

If 14 is the first even integer, 16 and 18 are the other two.

13. **A**

$|-4| = 4$  and  $|(-2)^3| = |-8| = 8$ , so the given expression becomes

$$||-4| - |(-2)^3|| = |4 - 8| = |-4| = 4$$

14. **C** Set up a system and use the linear combination method to solve for  $x$ .

$$\begin{array}{r} x + y = -1 \\ + x - y = 6 \\ \hline 2x = 5 \end{array}$$

$$x = \frac{5}{2}$$

Since  $x + y = -1$ ,  $\frac{5}{2} + y = -1$ , so  $y = -\frac{7}{2}$ .

$$\frac{x}{y} = \frac{\frac{5}{2}}{-\frac{7}{2}} = -\frac{5}{7}$$

15. **A**

Since  $f(x) = \frac{16}{x^5}$ ,

$$f(-2) = \frac{16}{(-2)^5} = \frac{16}{(-32)} = -\frac{1}{2}$$

16. **C**  $n - 3$  diagonals can be drawn from *one* vertex of any polygon, assuming  $n$  = the number of sides of the polygon.  $20 - 3 = 17$  diagonals.

17. **C** Perpendicular lines have slopes that are negative reciprocals. The slope of the given lines is  $m = -3$ .

The negative reciprocal of  $-3$  is  $\frac{1}{3}$ , and Answer **C** is the only answer in which  $m = \frac{1}{3}$ .

18. **A** If  $(a, b)$  is a point on a graph symmetric with respect to the  $y$ -axis, then  $(-a, b)$  is also on the graph.  $(1, 2)$  is the reflection of the point  $(-1, 2)$  over the  $y$ -axis.

19. **E**

$$\begin{aligned} & -9\cos^2 \theta - 9\sin^2 \theta \\ & = -9(\cos^2 \theta + \sin^2 \theta) \\ & = -9(1) = -9 \end{aligned}$$

20. **B** Let point  $B$  have coordinates  $(x, y)$ . Since you know the coordinates of the midpoint, use the midpoint formula to solve for  $x$  and  $y$ .

$$\begin{aligned} \frac{-1+x}{2} &= 5 & \frac{2+y}{2} &= -6 \\ -1+x &= 10 & 2+y &= -12 \\ x &= 11 & y &= -14 \end{aligned}$$

21. **D**

$V = \frac{1}{3}Bh$  where  $B$  is the area of the base and  $h$  is the height.

$$\begin{aligned} V &= \frac{1}{3}(3n)\left(\frac{n}{2}\right)(n) \\ &= \frac{n^3}{2} \end{aligned}$$

22. **D**  $2x^3 + 9x^2 + 3x - 4$  divided by  $(x + 1)$  can be simplified using either long division or synthetic division.

$$\begin{array}{r|rrrr} -1 & 2 & 9 & 3 & -4 \\ & & 2 & 7 & -4 & 0 \end{array}$$

The remainder is zero.  $-4$  is the constant term.  $7$  is the coefficient of the first-degree term, and  $2$  is the coefficient of the second-degree term. The quotient is

$$2x^2 + 7x - 4$$

23. **C** The triangle is a  $30^\circ$ - $60^\circ$ - $90^\circ$  special right triangle. Since the side opposite the  $60^\circ$  angle measures  $9$ , the side opposite the  $30^\circ$  angle measures:

$$\frac{9}{\sqrt{3}} = \frac{9\sqrt{3}}{3} = 3\sqrt{3}$$

The side opposite the  $90^\circ$  angle,  $c$ , is, therefore,  $2(3\sqrt{3})$  or  $6\sqrt{3}$  units.

24. **D** A counterexample is an example that proves a statement to be false. Answer  $D$  shows one example where angles are supplementary but are not right angles, since one measures  $100^\circ$  and the other measures  $80^\circ$ .

25. **E** The radicand must be greater than or equal to zero, so

$$\begin{aligned} 36 - x^2 &\geq 0 \\ -x^2 &\geq -36 \\ x^2 &\leq 36 \\ -6 &\leq x \leq 6 \end{aligned}$$

26. **C** The graph of the function  $f(x) = \frac{1}{x}$  has asymptotes of the  $y$ - and  $x$ -axes. As  $x$  approaches zero, the value of the function approaches infinity. Since the domain is restricted to the interval  $\frac{1}{2} \leq x \leq \frac{3}{2}$ , the maximum value of the function occurs when  $x = \frac{1}{2}$ .

$$f(x) = \frac{1}{\frac{1}{2}} = 2$$

27. **B**

$$\begin{aligned} a - b &= \frac{n+1}{n^4} - \frac{1-n}{n^4} \\ &= \frac{(n+1-1+n)}{n^4} \\ &= \frac{2n}{n^4} \\ &= \frac{2}{n^3} \end{aligned}$$

28. **B** The formula for the surface area of a sphere is  $SA = 4\pi r^2$ .

$$\begin{aligned} 100\pi &= 4\pi r^2 \\ 25 &= r^2 \\ 5 &= r \end{aligned}$$

The volume is, therefore,  $\frac{4}{3}\pi r^3 = \frac{4}{3}\pi(5)^3 = \frac{4}{3}\pi(125)$   
 $= \frac{500}{3}\pi$ .

29. **E**

$$A = \pi r^2$$

$$64\pi = \pi r^2$$

$$r = 8$$

The circumference of a circle is given by the formula  $C = 2\pi r$ , so  $C = 2\pi(8) = 16\pi$ .

30. **A**

$$|2x - 4| < 1$$

$$= -1 < 2x - 4 < 1$$

$$= 3 < 2x < 5$$

$$= \frac{3}{2} < x < \frac{5}{2}$$

31. **D** The general equation of a circle is

$(x - h)^2 + (y - k)^2 = r^2$  where  $(h, k)$  is the center and  $r$  is the length of the radius. The equation of a circle with center  $(-1, 7)$  and a radius of length 3 is

$$(x - (-1))^2 + (y - 7)^2 = 3^2$$

$$(x + 1)^2 + (y - 7)^2 = 9$$

32. **E** Write the equation of the line  $8x - 2y = 5$  in slope-intercept form to determine its slope.

$$-2y = -8x + 5$$

$$y = 4x - \frac{5}{2}$$

$$m = 4$$

The equation of the line parallel to it and passing through the point  $(-2, 2)$  is

$$y - 2 = 4(x - (-2))$$

$$y - 2 = 4x + 8$$

$$y = 4x + 10$$

33. **C** Drawing either "E" or "S" are mutually exclusive events. The probability of drawing an "E" is  $\frac{1}{8}$

and the probability of drawing "S" is  $\frac{1}{8}$ . The probability of drawing either "E" or "S" is

$$\frac{1}{8} + \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$$

34. **B**

$$\tan 10^\circ = \cot (90 - 10)^\circ$$

$$\tan 10^\circ = \cot 80^\circ$$

$$\theta = 80^\circ$$

35. **D** Recall that a chord is a segment that connects two points on a circle. The longer the chord, the closer it is to the center of the circle. The lengths of  $\overline{OE}$ ,  $\overline{OF}$ , and  $\overline{OG}$  are the distance the three chords are from the center  $O$ , since the segments are the perpendiculars from point  $O$  to each chord.  $\overline{OF}$  is the smallest length, so  $\overline{DC}$  is the longest chord.  $\overline{OE}$  is the middle length, so  $\overline{AB}$  is the next to longest chord.  $\overline{OG}$  is the largest length, so  $\overline{BC}$  is the shortest chord.

36. **E** Since  $\cos x = \sin (90 - x)$ , you know

$$\cos (45 + 2x) = \sin [90 - (45 + 2x)]$$

$$90 - (45 + 2x) = 3x$$

$$45 - 2x = 3x$$

$$45 = 5x$$

$$x = 9^\circ$$

37. **B**

$$2^3(2^{3n})(2) = \frac{1}{4}$$

$$2^{3+3n+1} = 2^{-2}$$

$$3n + 4 = -2$$

$$3n = -6$$

$$n = -2$$

38. **A**

$$\text{Since } f(x) = \frac{3}{2}x + \sqrt{x},$$

$$f(4) = \frac{3}{2}(4) + \sqrt{4} = 6 + 2 = 8$$

$$f(f(4)) = f(8) = \frac{3}{2}(8) + \sqrt{8} = 12 + 2\sqrt{2}$$

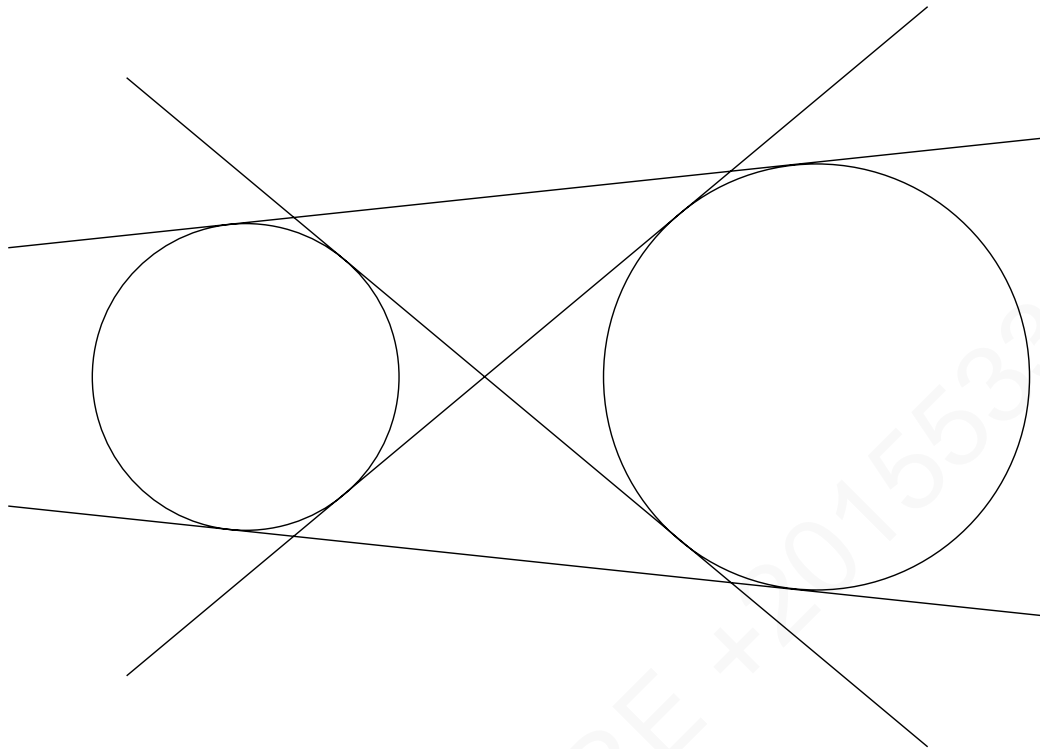
39. **D** Since  $n \spadesuit 5 = 125$ ,  $5^{2n} = 125$ .

$$5^3 = 125, \text{ so } 2n \text{ must equal } 3.$$

$$2n = 3$$

$$n = \frac{3}{2}$$

40. **E** Four common tangents can be drawn as shown:



41. **B** Since the boys' team scored a total of 5(54) or 270 points in their first 5 games and the girls' team scored a total of 6(59) or 354 points in their first 6 games, the average for all 11 games is

$$\frac{270 + 354}{11} = 56.7 \text{ points}$$

42. **B** Rotating the rectangle creates a cylinder of radius 3 and height 12. The volume of the cylinder is

$$V = \pi r^2 h = \pi(3^2)(12) = 108\pi$$

43. **E**  $i = \sqrt{-1}$ ,  $i^2 = -1$ ,  $i^3 = -i$ , and  $i^4 = 1$ . If  $i$  is raised to an exponent that is a multiple of 4, the expression simplifies to 1. All of the expressions simplify to 1, except Answer E.

$$i^4 = 1$$

$$(i^4)^4 = i^{16} = 1$$

$$i^8 = 1$$

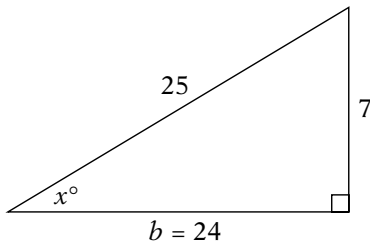
$$i^{20} = 1$$

$$i^4 + i^4 = 1 + 1 = 2$$

44. **B**

$$\begin{aligned} \left(\frac{f}{g}\right)(x) &= \frac{f(x)}{g(x)} \\ &= \frac{1 - 3x}{3x^2 + 2x - 1} \\ &= \frac{-(3x - 1)}{(x + 1)(3x - 1)} \\ &= \frac{-1}{x + 1} \end{aligned}$$

45. **C** Think of a right triangle with a hypotenuse of length 25 and a leg of length 7. The sine of one of the acute angles of the triangle would, therefore, be  $\frac{7}{25}$ .



Use the Pythagorean Theorem to find the length of the other leg.

$$7^2 + b^2 = 25^2$$

$$b = 24$$

$$\tan x = \frac{\text{opposite}}{\text{adjacent}} = \frac{7}{24}$$

46. **D** Kate chooses one course out of the five for her first-period class. She chooses one course out of the remaining four for her second period class. Then, she chooses one out of the remaining three for her third period class and one out of the remaining two for her fourth period class.

$$5 \times 4 \times 3 \times 2 \times 1 = 120$$

47. **A** The given sequence is a geometric sequence whose  $n$ th term is  $(3\sqrt{3})^n$ .

$$(3\sqrt{3})^1 = 3\sqrt{3}$$

$$(3\sqrt{3})^2 = 9(3) = 27$$

$$(3\sqrt{3})^3 = 3^3(\sqrt{3})^3 = 27(3\sqrt{3}) = 81\sqrt{3}$$

The sixth term is, therefore,  $(3\sqrt{3})^6$ .

48. **C** The sum of the interior angles of a polygon is given by the expression  $180(n - 2)$  where  $n$  = the number of sides of the polygon.

$$\frac{180(n - 2)}{n} = 157.5$$

$$180n - 360 = 157.5n$$

$$22.5n = 360$$

$$n = 16 \text{ sides}$$

49. **C** Start by multiplying both sides by the LCD:

$$\frac{1}{(x - 2)(x + 4)} = \frac{h}{x - 2} + \frac{k}{x + 4}$$

$$1 = h(x + 4) + k(x - 2)$$

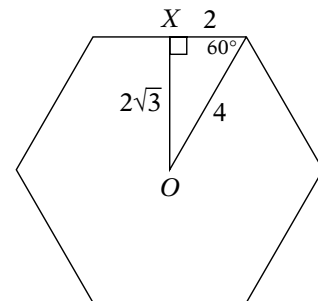
How to solve for  $k$  may not be immediately obvious. One way to solve for  $k$  is to substitute  $-4$  for  $x$ , so the  $h$  term cancels out.

$$1 = h(-4 + 4) + k(-4 - 2)$$

$$1 = k(-6)$$

$$k = -\frac{1}{6}$$

50. **C** Each angle of a regular hexagon measures  $120^\circ$ . Using  $XO$  as one leg, sketch a  $30^\circ$ - $60^\circ$ - $90^\circ$  right triangle as shown:



The side opposite the  $30^\circ$  angle measures 2 units. The regular hexagon can be broken into 12 right triangles that are congruent to the one shown in the diagram. The perimeter of the hexagon is, therefore,  $12(2)$  or 24 units.

