A Collection of SAT Math Problems

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Contents

1 General Strategies & Basic Equations

1. A piece of cloth is cut into 3 smaller pieces. The first piece has a length of x centimeters, the second piece has a length of $3x$ centimeters, and the third piece has a length of $5x$ centimeters. If the length of the original cloth is 171 centimeters, what is the difference in length, in centimeters, between the longest piece and the shortest piece?

2. If $-4 < 4x - 4 < 2$, which of the following could be the value of x?

   (A) 0 **(B)** 1 **(C)** 2 **(D)** 3

3. Erin began the day with p pencils. She gave $\frac{1}{3}$ of her pencils to her friend Joy during first period and $\frac{1}{4}$ of the remaining pencils to her friend Leslie during second period. In terms of p, how many pencils does Erin have left after second period?

   (A) $\frac{15p}{48}$ **(B)** $\frac{3p}{8}$ **(C)** $\frac{5p}{12}$ **(D)** $\frac{p}{2}$

4. Which of the following expressions is equivalent to $(4x - 3)^2 + 4(4x - 3)$?

   (A) $(4x - 3)(4x - 6)$ **(B)** $(8x + 1)(2x - 3)$ **(C)** $(4x - 3)(4x + 1)$ **(D)** $(16x - 1)(x + 3)$

5. If $\frac{2y+2}{4} + \frac{y}{3} = \frac{y-3}{12}$, what is the value of y?

6. If $6(x + 2) = 5(x + 2) + 23$, what is the value of $(x + 2)$?

7. Jamie bought 27 notebooks to give to the students in her class. The notebooks were all the same price, and Jamie used a coupon that gave her $55 dollars off her purchase. After Jamie used the coupon, the cost of the notebooks was $107. How much would 4 notebooks cost, in dollars, with no coupon?

8. If $-7 < 5x - 2 < 3$, which of the following could be the value of x?

   (A) -1 **(B)** 0 **(C)** 1 **(D)** 2

9. Hank is handing out flyers for an upcoming fundraiser. He begins the day with f flyers. After two hours, he has handed out $\frac{1}{3}$ of the flyers. After two more hours, he has handed out $\frac{2}{5}$ of the remaining flyers. He continues to hand out the flyers for one more hour, handing out $\frac{1}{4}$ of the remaining flyers. In terms of f, how many flyers did Hank hand out during this five-hour window?

   A. $\frac{5f}{12}$ B. $\frac{9f}{20}$ C. $\frac{7f}{10}$ D. $\frac{11f}{15}$

10. If $\frac{y+4}{5} + \frac{2y-3}{10} = \frac{y}{15}$, what is the value of y?

11. If $3(5t - 6) + 2t = 28 + 9t$, what is the value of $8t$?

12.
$$2(x - n) = 2x + 5$$

   If the equation above has an infinite number of solutions for x, what is the value of the constant n?

13. A lumberjack earned $300 on a day that he chopped down x number of Spruce trees and y number of Evergreen trees. The equation $5x + 7y = 300$ represents this situation. What is the best interpretation of the number 7 in this equation?

   (A) The lumberjack earned 7 dollars for each Evergreen tree he chopped down.
   (B) The lumberjack chopped down 7 Evergreen trees that day.
   (C) The lumberjack earned 7 dollars for each Spruce tree he chopped down.
   (D) The lumberjack chopped down 7 Spruce trees that day.

14. At the beginning of the week, the Sugar Shack had 2,000 goodies in inventory. Halfway through the week, 750 goodies were added to the inventory. At the end of the week, 490 goodies remained. On average, approximately how many goodies were sold each day?

15. The formula for the kinetic energy of an object is given as $KE = \frac{1}{2}mv^2$, where KE is its kinetic energy, m is its mass, and v is its velocity. Which of the following expressions gives the velocity of the object in terms of the other variables?

   (A) $v = \sqrt{\frac{KEm}{2}}$ (B) $v = \sqrt{\frac{2m}{KE}}$ (C) $v = \sqrt{\frac{2KE}{m}}$ (D) $v = \sqrt{2KEm}$

16.
$$x - 27 = a$$

   If a is a positive integer, what could be the value of x?

   I. 26
   II. 27
   III. 28

   (A) I only   (B) I and II   (C) II and III   (D) III only

17.
$$8P + 14Q = 80$$

   At an archery range, participants are awarded points based on how many times and where they hit the target. The equation above represents how one participant hit the outer part of the target P times and the inner part of the target Q times, for a total of 80 points. How many more points are awarded when you hit the inner part of the target than the outer part?

18. The sum of $6x$ and $9y$ is equal to the sum of $3z$ and 15. Which of the following expressions gives z in terms of other variables?

   (A) $2x + 3y - 5$ (B) $2x + 3y + 5$ (C) $3x + 2y - 5$ (D) $3x + 2y + 5$

19.
$$2(7x + 3) = 14x + 7$$

   How many solutions does the given equation have?

   (A) Exactly one   (B) Exactly two   (C) Infinitely many (D) Zero

20. Farmers Harry and Ron work together to milk 75 cows over the course of a day. Harry milks 15 more cows in the day than Ron does. If x is the number of cows that Ron milks, which equation represents the situation?

   (A) $x(x + 15) = 75$ (B) $x(x - 15) = 75$ (C) $x + (x + 15) = 75$ (D) $x + (x - 15) = 75$

21. Waiter John can carry a tray of food if the weight of the tray plus the weight of the plates of food is no more than 50 pounds. He will drop everything if he is carrying more than 50 pounds. If each plate of food weighs 3 pounds, and the tray weighs 7 pounds, how many plates could John carry without dropping everything?

   I. 13
   II. 14
   III. 15

   (A) I only   (B) I and II   (C) III only   (D) I, II, and III

22.
$$4a - a - a + 5 = 12 - 3a + a$$

   In the equation above, what is the value of a?

23. $8x$ is six more than three times the value of $2x$. What is the value of x?

24. Jenny can decorate cookies at an average rate of 14 cookies per hour. If Jenny continues at the same rate, which equation models the number of hours h it would take for her to decorate c cookies?

(A) $h = \frac{c}{14}$ **(B)** $h = 14c$ **(C)** $h = c + 14$ **(D)** $h = c - 14$

25. Alexandra begins the weekend with h homework problems to complete. On Friday, she completes $\frac{2}{5}$ of the problems. On Saturday morning, she completes $\frac{1}{4}$ of the remaining problems, and on Saturday night, she completes $\frac{2}{3}$ of the remaining problems. In terms of h, how many problems does Alexandra need to complete on Sunday to finish her homework?

(A) $\frac{h}{12}$ **(B)** $\frac{7h}{60}$ **(C)** $\frac{3h}{20}$ **(D)** $\frac{11h}{30}$

26.

$$\frac{3(m + 2)}{9} = \frac{5(m - 4)}{10}$$

In the equation above, what is the value of m?

27. If $\frac{4}{b+2} = \frac{12}{c}$, where $b \neq -2$ and $c \neq 0$, what is c in terms of b?

(A) $c = 3b + \frac{1}{2}$ **(B)** $c = 3b + 3$ **(C)** $c = 3b + 4$**(D)** $c = 3b + 6$

28. How many solutions does the equation $4(16 - 6) = -8(3 - 8x)$ have?

(A) Exactly one   **(B)** Exactly two   **(C)** Infinitely many   **(D)** Zero

29. Stephanie owns a pet grooming business. The equation $2c + 3.5d = 98$ describes the maximum number of cats, c, and the number of dogs, d, that she can groom in a week. If Stephanie is booked to groom 24 dogs this week, how many cats could she add to her schedule?

I. 7
II. 8
III. 9

(A) I only   **(B)** I and II   **(C)** II and III   **(D)** I, II, and III

30. An aquarium consists of a 10-gallon tank and a 260-gallon tank. The total number of fish in both tanks is 1,835. The equation $10x + 260y = 1,835$ represents this situation. Which of the following is the best interpretation of x in this context?

(A) The average number of fish per gallon in the 10-gallon tank
(B) The average number of fish per gallon in the 260-gallon tank
(C) The total number of fish in the 10-gallon tank
(D) The total number of fish in the 260-gallon tank

31.

$$-3(42x - 7) = -15 + k(8 - 13x)$$

If the solution of the given equations if -4, what is the value of the constant k?

32. The total cost of renting a boat for 14 days is given by the equation $t = 14f + 300$, where f is the daily fee, in dollars. What is the total cost to rent a boat for 14 days when the daily fee is \$125?

33. Jane rides her bike at a constant speed along a trail. The equation $d = 12t$ gives the distance d, in miles from her house, that Jane will be t hours after leaving her house. How many miles away will she be 1.5 hours after leaving her house?

34. In astrophysics, the formula used to determine the luminosity of a spherical object is given as $F = \frac{L}{4\pi r^2}$ where F is the flux density of the illuminated surface area of the sphere, L is the luminosity of the sphere and r is the radius of the sphere. Which of the following equations gives the radius of the sphere in terms of the other variables?

(A) $r = \sqrt{\frac{4\pi L}{F}}$ **(B)** $r = \sqrt{\frac{FL}{4\pi}}$ **(C)** $r = \sqrt{\frac{F}{4\pi L}}$ **(D)** $r = \sqrt{\frac{L}{4\pi F}}$

35. If $\frac{2z-2}{6} = \frac{x}{3}$, which of the following correctly expresses x in terms of z?

(A) $z - 1$ (B) $\frac{z-1}{2}$ (C) $\frac{6z-1}{3}$ (D) $6z - 6$

36. If $\frac{a}{9} + \frac{b}{3} = 30$, what is the value of $2a + 6b$?

37. An amusement park charges its attendees \$32 per hour for the first 4 hours, then \$18 per hour for each additional hour. Which expression reflects the total cost that an attendee is charged for h hours in the amusement park, where $h \geq 4$?

(A) $18h + 56$ (B) $32h - 128$ (C) $32h + 72$ (D) $18h + 128$

38. During a city council meeting, members voted on whether they wanted to have a pool built near the community center. It was reported afterwards that four times as many people voted in favor of the pool as people who voted against it. The city council released data that 828 more members voted for the pool than voted against it. Based on this situation, how many people voted for having the pool built?

39. Which of the following is equivalent to $(a + 2b)\left(\frac{b}{2a}\right)$?

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

40. If $\frac{2}{3}(x - 2) + \frac{3}{5}(x - 1) = x - \frac{3}{5}$, what is $\frac{x}{3}$?

41. In economics marginal revenue can be defined as $R' = P\left(1 + \frac{1}{Ed}\right)$, where R' is the marginal revenue, P is the price of the item and Ed is the price elasticity of demand for that item. Given this equation, which of the following identifies the price elasticity of demand in terms of the other variables?

(A) $Ed = \frac{R'}{P-1}$ (B) $Ed = \frac{P+1}{R'}$ (C) $Ed = \frac{P}{R'-P}$ (D) $Ed = \frac{R'}{P-R'}$

42. One gallon of gas is enough for a certain car to drive 26 miles. The car needs to drive n miles to reach its destination. Which equation represents the amount of gas G, in gallons, which allows the car to drive halfway to the destination?

(A) $G = 26n$ (B) $G = \frac{n}{26}$ (C) $G = 13n$ (D) $G = \frac{n}{52}$

Solutions

1. 76

2. B

3. D

4. C

5. -1

6. 23

7. 24

8. B

9. C

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

11. 46

12. $-\frac{5}{2}$

13. A

14. 323

15. C

16. D

17. 6

18. A

19. D

20. C

21. B

22. 7/4

23. 3

24. A

25. C

26. 16

27. D

28. C

29. A

30. A

31. 9

32. 2050

33. 18

34. D

35. A

36. 540

37. A

38. 276

39. B

40. $\frac{5}{3}$

41. C

42. D

2   Linear Equations and Algebra

1. Line l is defined by the equation $3y - 6x = 18$. Line m is perpendicular to line l in the xy-plane, what is the slope of line m?

2. A line with a slope of $\frac{3}{4}$ lies in the xy-plane. If k is a constant and the points $(4, 5)$ and $(k, -4)$ lie on the line, what is the value of k?

3. Given the equation $y = 8x - 96$, what is the x value of the x-intercept of the graph in the xy-plane?

4.
$$f(x) = -1.5x + 24$$

   Natalie used simple syrup to make a sweet tea. The function above shows the volume, in fluid ounces, of simple syrup that was left after Natalie made x cups of sweet tea. In this context, which statement is the best interpretation of the y-intercept of $y = f(x)$ in the xy-plane?

   (A) Natalie used 1.5 fluid ounces of simple syrup for each cup of sweet tea.
   (B) Natalie had 1.5 fluid ounces of simple syrup when she started making tea.
   (C) Natalie had 24 fluid ounces of simple syrup when she started making tea.
   (D) Natalie used 24 fluid ounces of simple syrup for each cup of tea.

5. The table below gives some values of a linear equation. Which equation defines y?

x	y
0	23
1	27
2	31

   (A) $y = 2x + 31$ **(B)** $y = 4x + 23$ **(C)** $23x + 27$ **(D)** $27x + 31$

6. What is the distance between the points $(-2, 4)$ and $(6, -17)$?

   (A) $\sqrt{285}$ **(B)** $\sqrt{233}$ **(C)** $\sqrt{377}$ **(D)** $\sqrt{505}$

7. In the standard xy-coordinate plane, line p passes through $(4, 2)$ and $(-2, 7)$. If line r is parallel to line p, which of the following is a possible equation for line r?

   (A) $y = \frac{6}{5}x - 4$ **(B)** $y = \frac{5}{6}x - 4$ **(C)** $y = -\frac{5}{6}x + 4$ **(D)** $y = -\frac{6}{5}x + 4$

8. In the standard xy-coordinate plane, line h passes through $(0, 2)$ and $(2, 3)$. If h is perpendicular to k, and line k passes through $(-2, 5)$, what is the y-intercept of line k?

   (A) $(0, 2)$ **(B)** $(0, 1)$ **(C)** $(0, 0)$ **(D)** $(2, 0)$

9. The function $g(k) = -0.12k + 108.9$ models approximately how many gallons of rocket fuel are left in a rocket after traveling k kilometers. According to the function, about how many gallons of fuel are used to travel each kilometer?

   (A) 0.12 **(B)** 9 **(C)** 12 **(D)** 108.9

x	-1	2		7
y	-5	$k + 3$		3

10. The table shows values of x and their corresponding values of y. If there is a linear relationship between x and y, what is the value of $k + 3$?

11. If $4x + 6y = 38$ and $y = 3x - 1$, what is the value of xy?

12. If $5a + 8b = 22$ and $a + 4b = 14$, which of the following ordered pairs (a, b) is the solution to this system of equations?

(A)$(-6, 5)$ **(B)** $(-2, 4)$ **(C)** $(2, 3)$ **(D)** $(5, -1)$

13.

$$4y - 5x = 24$$
$$kx = 2y + 4$$

In the given system of equations, k is a constant. If the system has no solution, what is the value of k?

14.

$$y \le 2x + 4$$
$$y \ge -\frac{1}{3}x - 2$$

Which point (x, y) is a solution to the given system of inequalities shown above?

(A) $(-8, 0)$ **(B)** $(0, -8)$ **(C)** $(0, 8)$ **(D)** $(8, 0)$

15.

$$3x - 4y = 7$$
$$5x + \frac{1}{2}y = 26$$

What is the value of x in the (x, y) solution to the system of equations above?

16. If Seya gives each of her classmates 2 pieces of candy, she'll have 5 pieces left over. If she wants to give each of her classmates 3 pieces of candy, she'll need 10 more pieces of candy. How many pieces of candy does Seya have?

17.

$$2x - 3y = 15$$
$$ax + 4y = c$$

In the system of linear equations above, a and c are constants such that the system has more than one solution. What is the value of a?

18.
$$y \le 8x - 10$$

In which table is every x and y pair a solution to the inequality above?

(A)

x	2	4	6
y	6	24	38

(B)

x	2	4	6
y	5	32	36

(C)

x	2	4	6
y	5	22	30

(D)

x	2	4	6
y	10	32	38

19. Line m has a slope of 3 and passes through the point $(1, -1)$. Which of the following is the equation for line m?

(**A**) $y = 3x - 2$ (**B**) $y = 3x + 4$ (**C**) $y = 3x - 4$ (**D**) $y = -\frac{1}{3}x - \frac{2}{3}$

20.

$$f(m) = 1570 + 55m$$

The function above models the amount of money in Jordan's bank account after m months. In this context, what is the best interpretation of the slope of the function?

(**A**) Jordan had \$1,570 in her bank account to begin with.
(**B**) Jordan adds \$1,570 to her bank account each month.
(**C**) Jordan had \$55 in her bank account to begin with.
(**D**) Jordan adds \$55 to her bank account each month.

x	3	6	9	12
$f(x)$	34	25	16	7

21. The table above shows 4 values of x and their corresponding values of $f(x)$. The linear function is defined by the equation $f(x) = hx + 43$. What is the value of h?

22.

$$4x - 3y = 18$$
$$3x + 2y = 5$$

Given the system of equations above, what is the value of $\frac{x}{y}$?

23. A line in the xy-plane passes through the origin and is perpendicular to a line that has a slope of $\frac{2}{7}$. Which of the following points must lie on this line?

(**A**) $(-14, 2)$ (**B**) $(4, -14)$ (**C**) $(4, 14)$ (**D**) $(2, -14)$

24. James earns money by mowing lawns and cleaning pools. He earns \$35 per lawn that he mows and \$50 per pool that he cleans. He needs to earn a minimum of \$500 per week to cover his expenses. Which of the following inequalities represents the possible number of lawns he mows, m, and the number of pools he cleans, p, each week to meet or exceed his budget requirement?

(**A**) $35m + 50p \geq 500$ (**B**) $35m + 50P > 500$ (**C**) $\frac{35}{m} + \frac{50}{p} \geq 500$ (**D**) $\frac{35}{m} + \frac{50}{p} > 500$

25.

$$2x + 3y = 15$$
$$ax - 7y = c$$

The system of equations above has no solution. What is the value of a?

26.

$$3y < 4$$
$$x < 6y + 3$$

For the system of inequalities shown above, which of the following points falls within the solution set?

(**A**) $(-2, 11)$ (**B**) $(1, 12)$ (**C**) $(-5, -1)$ (**D**) $(-10, -3)$

27. If $4x - 2y = 8$ and $2y = 4$, what is the value of x?

28. If line m is parallel to line n and the equation of line m is $y = \frac{2}{3}x + 1$, which of the following could be the equation of line n?

(**A**) $2x + 3y = 4$ (**B**) $3x + 2y = 5$ (**C**) $3x - 2y = 5$ (**D**) $2x - 3y = 5$

29. The average number of fish, f per aquarium at an indoor nature reserve can be estimated by the equation $f = 0.75m + 15$ where m represents the number of months since January of 2014 and $m \leq 11$. Which of the following statements best explains the function that the number 0.75 serves within the context of the problem?

    (A) It is the estimated average number of fish per aquarium in January of 2014.
    (B) It is the estimated monthly decrease in the average number of fish per aquarium.
    (C) It is the estimated monthly increase in the avearge number of fish per aquarium.
    (D) It is the estimated avearge number of fish per aquarium in December of 2014.

30. JT's fruit stand sells only peaches and oranges. Peaches sell for $4 per pound, and oranges sell for $1.50 per pound. To make a profit, JT must sell at least twice as many pounds of peaches as pounds of oranges and must have sales of no less than $100 per day. If x is the number of pounds of peaches he sells and y is the number of pounds of oranges he sells per day, which of the following systems of inequalities represents this situation?

    (A) $x \geq 2y$ $4x + 1.5y \leq 100$ **(B)** $x \geq 2y$ $4x + 1.5y \geq 100$ **(C)** $y \geq 2x$ $4x + 1.5y \geq 100$ **(D)** $y \geq 2x$ $4x + 1.5y \leq 100$

31.

$$3x - 4y = 14$$
$$x = -8y$$

    Based on the system of equations above, what is the value of xy?

32. Which of the following systems of linear equations has no solution?

    (A) $x = 4$ $y = 2x + 3$ **(B)** $y = 2x - 5$ $y = 2x + 3$ **(C)** $x = -5$ $y = 5$ **(D)** $y = 4x - 5$ $y = 2x - 5$

33. The minimum value of b is 8 less than 3 times another number c. Which inequality gives the possible values of b?

    (A) $b \geq 8 - 3c$ **(B)** $b \leq 8 - 3c$ **(C)** $b \leq 3c - 8$ **(D)** $b \geq 3c - 8$

34. Which of the following is a characteristic of the graph of the equation $y + x = k(x - y)$ if k is a constant greater than 1?

    I. It has a y-intercept of 1.
    II. It passes through the origin.
    III. It has a slope between 0 and 1.

    (A) II only   **(B)** III only   **(C)** I and III   **(D)** II and III

Solutions

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

2. -8

3. 12

4. C

5. B

6. D

7. C

8. B

9. A

10. -2

11. 10

12. B

13. 10/4

14. D

15. 5

16. 15

17. $-\frac{8}{3}$

18. C

19. C

20. D

21. -9

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

23. B

24. A

25. $-\frac{14}{3}$

26. C

27. 3

28. D

29. C

30. B

31. -2

32. B

33. D

34. D

3 Rates, Ratios, Percents, and Data Analysis

1. One unit used to measure atmospheric pressure is called a Pascal. If one pound per square inch is equivalent to 6,895 Pascals, how many pounds per square inch are equivalent to 38,612 Pascals?

2. The ratio of red to blue to orange fish in a tank is 7:5:8, respectively. If there are 100 fish in this tank, how many of the fish are red?

3. Last week, the local food pantry had 40 volunteers. This week, the local food pantry had 48 volunteers. What is the percent change in the number of volunteers at the local food pantry from last week to this week?

   (A) 15% **(B)** 16.7% **(C)** 20% **(D)** 22.5%

4. Of the juvenile and adult fish in a tank, forty-four percent are male. Twenty-five percent of the male fish and 50 percent of the female fish are juvenile. What percentage of all the fish are juvenile males?

   (A) 11% **(B)** 28% **(C)** 33% **(D)** 39%

5. The average number of 12 numbers is 7. When a number is added, the new average is 8. What is the value of the number that was added?

6. Quinn wants to purchase a sound system that retails at $\$p$. She has waited patiently for the store to reduce all items by 20%. She also has a coupon for an additional 10% off the sale price. The store is required to add a 5% tax by the state. If Quinn buys the sound system during this sale, what will be her final cost, in dollars, in terms of p?

   (A) $0.74p$ **(B)** $0.744p$ **(C)** $0.75p$ **(D)** $0.756p$

7. A cyclist is training to ride in the "Tour de France." He rides at an average speed of 14 miles per hour for 3 hours. If he consumes half a liter of water for every 15 miles he rides, approximately how many liters of water does he consume on this ride?

8. If a great white shark swims 9 miles in 28 minutes, what is its average speed, to the nearest tenth of a mile per hour?

9. At Freddie's Fish Store the ratio of tetras to danios is 3:4. Of the tetras the ratio of male to female is 1:4, and of the danios the ratio of male to female is 2:3. What fraction of the female fish are danios?

10. **Length, in cm**

1.5	1.5	1.6	1.8	1.8
2.3	2.4	2.4	2.5	2.5
2.5	2.5	2.6	2.6	2.6
2.7	2.9	2.9	3	3

The table above shows the length, in cm, of each of Andrew's guppies. WHich of the following gives the correct order of the mean, median, and range of the lengths of Andrew's guppies?

(A) mean < range < median   **(B)** median < mean < range   **(C)** range < median < mean
(D) range < mean < median

11. To determine the percent of people in a neighborhood who prefer reading to working out, Sanjay surveyed 50 people at the neighborhood library. Of the 50 people surveyed, 58% said they preferred reading to working out. Which of the following statements is true?

   (A) The results of the survey may be biased because the sampling method is flawed.

   (B) The results of the survey are unbiased because the sampling method is not flawed.

   (C) An accurate result cannot be determined because the sample size is too small.

   (D) In this neighborhood, 58% of the people prefer reading to working out.

12. The administration of the local school district wanted to know if there was an association betweeen participation in extracurricular activities and grade point average (GPA). They used a sample of 1000 students from grades 8-12 in the district. They found there was a significant relationship in which students who participated in an extracurricular activity also had higher GPAs. Which of the following conclusions is best supported by this data?

   (A) Participating in extracurricular activities causes students in grades 8-12 to have higher GPAs in this school district.

   (B) Participating in extracurricular activities causes all students to have higher GPAs in the U.S.

   (C) There is a positive association between participating in extracurricular activities and GPA for all students in grades 8-12 in the U.S.

   (D) There is a positive association between participating in extracurricular activities and GPA for students in grades 8-12 in this school district.

13. Researchers sampled 500 people between the ages of 20 and 30 years. They found that there was strong evidence to suggest a link between blood pressure and average weekly exercise. The results showed that people who exercised regularly had lower blood pressure than those who did not. Which of these statements is best supported by this study?

   (A) There is a negative correlation between regular exercise and blood pressure for all people.

   (B) There is a negative correlation between regular exercise and blood pressure for 20-30 year-olds.

   (C) There is a positive correlation between regular exercise and blood pressure for all people.

   (D) There is a positive correlation between regular exercise and blood pressure for 20-30 year-olds.

14. The mean of a and b is 36, and the mean of b and c is 20. What is the value of $a - c$?

15. Kevin buys stock in Company X for $\$x$ per share. After a better than expected earnings report for Company X, the value of the stock increases by 20% per share. Then, an SEC investigation into Company X is announced and the value of the stock decreases by 25% per share. In terms of x, what is the current value per share of the Company X stock that Kevin has?

   (A) $0.85x$ **(B)** $0.88x$ **(C)** $0.9x$ **(D)** $0.95x$

16. In a group of seven friends, the youngest friend is 24 years old and the oldest friend is 33 years old. The only two friends in the group who are the same age are both 26 years old. If the median age of the seven friends is 28, which of the following could be the age, in years, of one of the other friends in the group?

   I. 27   **II.** 29   **III.** 31

   (A) I only   **(B)** III only **(C)** I and II only   **(D)** II and III only

17. Last week James purchased a pair of gloves for $32.75 prior to his trip to Europe. He saw the same pair of gloves in Germany selling for 25 Euros. How much money would he have saved, in dollars, if he bought the gloves in Germany rather than the US? ($\$1 = 0.8$ Euros)

   A $1.50   **(B)** $1.25   **(C)** $1.00   **(D)** $0.75

18. On her drive to work yesterday, Linda went an average of 40 miles per hour for 30 minutes then hit some traffic and went an average of 20 miles per hour for 15 minutes. What was the distance Linda drove to get to work yesterday?

(A) 12.5 miles   **(B)** 22.5 miles   **(C)** 25 miles   **(D)** 45 miles

19. An oceanographer measures the salinity of the ocean water at 25 locations. He later discovers that the greatest of the measurements was actually higher than he originally calculated. Which of the following measurements did not change when the data point was corrected?

(A) Mean   **(B)** Median   **(C)** Range   **(D)** Standard Deviation

20. Mandy is making 26 gift bags for a party. Her budget is $300, which includes an 8% sales tax. Which of the following is closest to the maximum she can spend per gift bag before sales tax?

(A) $10.68   **(B)** $11.54   **(C)** $12.46   D. $13.02

21. A random sample of students at a high school was selected and asked if they would prefer to change from a semester system to a trimester system. Of the sample, 38% of the students said yes, with a 5% margin of error. Based on this data, which of the following is the most appropriate conclusion?

(A) At least 33% of the students at this school would prefer a trimester system.

(B) It is plausible that between 33% and 43% of the students at this school would prefer a trimester system.

(C) An average of 38% of all high school students would favor a trimester system.

(D) Between 33% and 43% of the students at this school will vote yes to change to a trimester system.

22. Length of crabs in cm

18	18	19	21	22	22
22	23	23	23	23	25

What is the median length, in cm, of the crabs measured for the table above?

23. If an ant lays 150 eggs in one hour, how many eggs does she lay in one day?

24. The number of students attending workshops last week started with 40 students on Monday, then increased to 80 students on Tuesday, but dropped to 20 students on Wednesday. What is the positive difference between the percent increase from Monday to Tuesday and the percent decrease from Tuesday to Wednesday?

(A) 20% **(B)** 25% **(C)** 50% **(D)** 55%

25. The ratio of red to blue to orange fish in a tank is 6:5:11, respectively. If there are 20 blue fish in this tank, how many fish are there in this tank?

26. Visitors at a local aquarium were asked to vote for their favorite of 2 exhibits (A or B). They could vote via text message or by filling out a ballot, and the winning exhibit would be the one that received more than half the votes. Fifty percent of aquarium visitors voted and of those votes, 75% were cast via text message. Exhibit A won 30% of the text message votes and 80% of the ballot votes. Based on this information, which of the following is the most reasonable conclusion?

(A) If all visitors who voted had voted by ballot instead of text message, Exhibit A would have won.

(B) Visitors who filled out a ballot were probably older than those who voted via text message.

(C) Visitors who voted by text message were less likely to have voted for Exhibit A than were visitors voting by ballot.

(D) If all visitors had voted, Exhibit B would have won.

27. A set of numbers contains 9 positive integers less than 50. Eight of those integers are shown below.

35, 43, 43, 36, 27, 42, 30, 32

The mean of these 8 numbers is 36 and the mean of the set of 9 numbers is an integer more than 36. What is the value of the greatest integer in the set of 9 numbers?

Solutions

1. 5.6
2. 35
3. C
4. A
5. 20
6. D
7. 1.4
8. 19.3
9. 1/2
10. D
11. A
12. D
13. B
14. 32
15. C
16. D
17. A
18. C
19. B
20. A
21. B
22. 22
23. 3600
24. B
25. 88
26. C
27. 45

4 Advanced Algebra

1. Leroy is training for a marathon race. Each day he runs between 8 miles and 14 miles. Which of the following inequalities shows all possible distances, d, that Leroy might run on any given day?

   (A) $|d - 14| < 8$ **(B)** $|d + 8| < 14$ **(C)** $|d - 11| < 3$ **(D)** $|d - 11| < 8$

2.
$$|x - 4| = 10$$

   Given the absolute value equation, if a and b are the two possible solutions, what is the value of $|a - b|$?

3. Which of the following expressions is equivalent to $(3x^2 - 2x + 5) - (-x^2 + 4x - 3)$?

   (A) $2x^2 - 6x + 2$ **(B)** $2x^2 + 2x + 8$ **(C)** $4x^2 + 2x + 2$ **(D)** $4x^2 - 6x + 8$

4.
$$\frac{1}{\frac{1}{x+1} + \frac{1}{x+2}}$$

   Which of the following is equivalent to the expression given?

   (A) $\frac{x^2+3x+2}{2x+3}$ **(B)** $\frac{2x+3}{x^2+3x+2}$ **(C)** $2x + 3$ **(D)** $x^2 + 3x + 2$

5. Which of the following is equal to $(5 + 3i)(4 - 5i)$? (Note: $i = \sqrt{-1}$)?

   (A) $35 - 13i$ **(B)** $20 - 15i$ **(C)** 5 **(D)** -6

6. The number of miles driven varies directly with the number of gallons of gasoline used. Scott drove his car 297 miles on 9 gallons of gasoline. At this rate, how many miles should he be able to drive using 14 gallons of gasoline?

7. In order to obtain a certain volume, the height of a can will be inversely proportional to the square of the can's radius. A can has a height of 9 inches and a radius of 2 inches. To maintain the same volume, what must the height equal, in inches, when the radius is 3 inches?

8. Annie's Apples is a commercial apple orchard. Within the last 10 years, its largest tree produced as few as 400 apples in one season and as many as 800 apples in one season. Which of the following inequalities correctly identifies the number of apples, a, that could have been produced by this tree in any single season over the last 10 years?

   (A) $|a - 400| \leq 800$ **(B)** $|a - 600| \leq 200$ **(C)** $|a - 800| \leq 400$ **(D)** $|a - 200| \leq 600$

9. What is the sum of complex numbers $4 - 2i$ and $3 + 5i$? (Note: $i = \sqrt{-1}$)

   (A) $12 - 10i$ **(B)** $7 + 3i$ **(C)** $10i$ **(D)** 10

10. Which of the following expressions is equivalent to $(x - 4)^2$?

    (A) $(x - 6)^2 - (x - 5)$ **(B)** $(x - 5)^2 - (x + 9)$ **(C)** $(x - 3)^2 - (2x - 7)$ **(D)** $(x - 2)^2 - (4x - 8)$

11. The time it takes to dig a trench is inversely proportional to the number of people digging. If 6 workers need 5 hours to dig a certain trench, how many hours would it take 4 workers to dig the same trench?

12. If $2x = 8y + 4z$, which of the following correctly identifies y in terms of x and z?

    A. $\frac{x-2z}{4}$
    B. $\frac{x+2z}{4}$
    C. $2x - 4z$
    D. $2x + 4z$

13. If $\frac{8^{3x}}{4^{2y}} = k$ and $9x - 4y = 5$, what is the value of k?

14. If $\frac{9^{3x}}{27^y} = 1$, what is the value of the ratio $\frac{y}{x}$?

15. Which of the following is equivalent to $2^{\frac{5}{4}}$?
A. $2\sqrt[5]{2}$
B. $2\sqrt[4]{2}$
C. $2\sqrt[5]{4}$
D. $2\sqrt[4]{4}$

16.
$$\sqrt{20} + \sqrt{20} = x\sqrt{y}$$
In the equation above, x and y are integers. Which of the following can be the value of y?
A. 2   B. 4   C. 5   D. 10

17. What is the set of all real values of x that satisfy the equation $\sqrt{3x + 4} - x = -12$?
A. 7   B. 20   C. 7, 20   D. THere are no real solutions to this equation.

18. A model predicts that the population of Webster was 60,000 in 2015. The model also predicts that each year for the next 7 years, the population p of Webster increased by 3% of the previous year's population. Which equation best represents this model, where y is the number of years after 2015 for $y < 7$?
A. $p = 0.97(60,000)^y$
B. $p = 1.03(60,000)^y$
C. $p = 60,000(0.97)^y$
D. $p = 60,000(1.03)^y$

19. The function $h(t) = 500(3)^{\frac{t}{150}}$ gives the number of bacteria in a petri dish t minutes after the bacteria were initially placed in the dish. How many minutes does it take for the number of bacterial in the petri dish to triple?

20. If $\frac{27^x}{9^y} = 1$, what is the value of the ratio $\frac{x}{y}$?

21. If $a = 2\sqrt{3}$ and $4a = \sqrt{16b}$, what is the value of b?

22. If $a = \sqrt{a^2}$, which of the following values is NOT a solution to the equation?
A. -2   B. 0   C. 1   D. 2

23. A park ranger estimates that the current population of deer in her state's largest park is 6,000. She further estimates that the deer population in that park will decrease by 10% every 5 years. Which of the following equations models p, the deer population in the park, t years from now?
A. $p = 6,000(0.9)^{5t}$
B. $p = 6,000(0.9)^{\frac{t}{5}}$
C. $p = 6,000(1.1)^{5t}$
D. $p = 6,000(1.1)^{\frac{t}{5}}$

24.
$$\sqrt{3x + 22} = x - 2$$
Given the equation above, which of the following are solutions for x?

I. -2
II. 9

A. Neither of the above
B. I only
C. II only
D. I and II

25.

$$\sqrt{a+5} - 10 = -2$$

What is the value of a in the equation above?

26. The temperature of Fargo, ND hit a high of $72°$ F on a day when a storm blew in, and the low temperature that same day was $10°$ F. Which of the following inequalities indicates the range of temperatures, t, in Fargo that day?
A. $|t - 10| \leq 72$
B. $|t - 41| \leq 31$
C. $|t - 72| \leq 10$
D. $|t - 46| \leq 26$

27. Which of the following is equal to $(6 + 3i)(6 - 3i)$? (Note: $i = \sqrt{-1}$)
A. 27   B. 45   C. $36 - 9i$ D. $36 + 9i$

28. If $c = b^{-3}$, what is b in terms of c?
A. $c^{\frac{1}{3}}$
B. c^3
C. $\frac{1}{c^3}$
D. $\frac{1}{\sqrt[3]{c}}$

29. In physics, Boyle's law states that pressure on a gas varies inversely with the volume of the gas. The volume of air inside a tube is 5.2 cubic inches at a pressure of 15.5 psi. If the volume decreases to 2.6 cubic inches, what is the new pressure on the compressed air?
A. 7.75 psi   B. 15.6 psi   C. 23.25 psi   D. 31 psi

30.

$$x^{\frac{y}{2}} = 64$$

For positive integers x and y, what is one possible value of y in the equation above?

31. The integer y represents the value of $3x$ in the equation $\sqrt{84} + \sqrt{525} = x\sqrt{y}$. What is the value of y?

32. Which of the following expressions is equivalent to $(9x^2 + 10x - 4) - (3x^2 - 2x + 6)$?
A. $6x^2 + 12x - 10$
B. $6x^2 + 8x + 2$
C. $12x^2 + 12x - 10$
D. $12x^2 + 8x + 2$

33. Tara invests $200 in a bank account that accrues 2.5% interest each year. Which of the following equations gives the amount of money, a, that Tara will have in this account after 5 years?
A. $a = 0.025(200)^5$
B. $a = 1.025(200)^5$
C. $a = 200(0.025)^5$
D. $a = 200(1.025)^5$

34. If y and z are teh two solutions to the absolute value equation $|x + 9| = 11$, what is the value of $y + z$?

35. Which of the following expresisons is equivalent to $\frac{5^{10}}{5^3}$?
A. 5^{-7}
B. 5^5
C. 5^7
D. 5^{13}

36. If x and y are inversely related and $x = 6$ when $y = 3$, what is the value of x when $y = 9$?

37. Jubilee invests \$500 into a bank account that earns 2% interest annually. What will be the total amount a, in Jubilee's account after 3 years, assuming that she does not withdraw or deposit any other money into the account?
A. $a = 500(0.98)^3$
B. $a = 500(1.02)^3$
C. $a = 0.98(500)^3$
D. $a = 1.02(500)^3$

38. If $\sqrt{17 - x} + 5 = x$, what is the set of all real solutions for x?
A. 1   B. 8   C. 1, 8   D. There are no real solutions to this equation.

39. Which of the following expressions is equivalent to $25y^2 - 9$?
A. $(5y - 3)^2$
B. $(y - 9)(25y + 1)$
C. $(5y + 3)^2$
D. $(5y - 3)(5y + 3)$

40. The height of an object varies directly with the square of its instability coefficient. An object that measures 160 ft. in height has an instability coefficient of 0.4. If the object has an instability coefficient of 0.5, what is its height, in ft.?

41. If the complex number $\frac{6+6i}{3-3i}$ is expressed in $a + bi$ form, what is the value of a? (Note: $i = \sqrt{-1}$)

42. A bungee cord is attached to a platform that is 50 feet above a pool. When a person jumps from the platform the cord will take them to within 5 feet of the water's surface and back up to within 3 feet of the platform. Which of the following inequalities shows all possible distances, d, that the person is away from the platfrom at any given moment once the person has reached the lowest point?
A. $|d - 24| \le 21$
B. $|d - 21| \le 24$
C. $|d - 25| \le 25$
D. $|d - 5| \le 45$

43. If $\left(\frac{a^3 b^{-5}}{a^4 b^{-6}}\right)^{-2} = \left(a^{\frac{x-2}{3}}\right)\left(b^{\frac{x-y}{2}}\right)$, what is the value of $\frac{x}{y}$?

44. Which of the following is equivalent to $\frac{2x^2 + 3x}{2x - 1}$?
A. $x + 2$
B. $x + 3$
C. $x + 2 + \frac{2}{2x - 1}$
D. $x + 2 + \frac{4}{2x - 1}$

Solutions

1. C
2. 20
3. D
4. A
5. A
6. 462
7. 4
8. B

9. B
10. C
11. 7.5
12. A
13. 5
14. 2
15. B
16. C
17. B
18. D
19. 150
20. 2/3
21. 12
22. A
23. B
24. D
25. 59
26. B
27. B
28. D
29. D
30. 4, 6, 12
31. 21
32. A
33. D
34. -18
35. C
36. 2
37. B
38. B
39. D
40. 250
41. 0
42. A
43. 2/3
44. C

5 Non-Linear Equations and Functions

1. If $x^2 - y^2 = 322$ and $x + y = 23$, what is the value of $x - y$?

2.
$$2x^2 + 5x + 1 = 0$$

In the equation above, what is the largest possible value of x?

A. $\frac{-5-\sqrt{17}}{4}$

B. $\frac{-2+\sqrt{17}}{5}$

C. $\frac{-2-\sqrt{17}}{5}$

D. $\frac{-5+\sqrt{17}}{4}$

3. If the equation $y = (x-3)(x-7)$ is graphed on the xy-plane, which of the following is an equivalent form that identifies the x-coordinate of the parabola's vertex as a constant?

A. $y = (x-5)^2 - 4$

B. $y = (x+5)^2 - 4$

C. $y = (x-5)^2 + 21$

D. $y = (x+5)^2 + 21$

4. How many real solutions exist for the equation $4x^2 + 16x + 16 = 0$?

5. The function f is defined as $f(x) = x^3 - 2x^2 + 4x + d$. If $(3, 0)$ is a solution, what is the value of d?

6. If $m + n = 12$ and $m^2 - n^2 = 48$, what does $m - n$ equal?

7. What is the sum of the solutions to the equation $8x^2 - 24x + 100 = 0$?

8. In the xy-plane, the graph of $y = x^3 - x^2 - kx - 24$ has the solutions $(e, 0)$, $(f, 0)$, and $(6, 0)$. What is the value of k?

9. If $x^2 - 6x - 27 = 0$ and $x > 0$, what is the value of x?

10. If $f(x) = 3x^2 - 5x + 2$, which of the following is equal to $f(-2)$?

A. 0   B. 4   C. 12   D. 24

11. The function f is defined as $f(x) = 10\sqrt{x}$. For what value of x does $f(x) = 60$?

12. When the function f is graphed in the xy-plane, the point $(3, 8)$ lies on the graph. The function g is defined as $g(x) = -f(x+2) - 3$. Which of the following points must lie on the graph of g in the xy-plane?

A. $(-3, 9)$ B. $(-1, -5)$ C. $(1, -11)$ D. $(1, 5)$

13.

$$-6x + y = 14$$
$$2x^2 = y + 6$$

The graphs of the equations in the given system of equations intersect at the point (x, y) in the xy-plane. What is one possible value of x?

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

14. The function f is defined as $f(x) = 6x^2$. Which of the following is a possible value of a for which $f(a) = 54$?
A. -5   B. -3   C. 2   D. 9

15. The function f is defined as $f(x) = 2x - 5$ and the function g is defined as $g(x) = -f(x) + 3$. What is the value of $g(-4)$?

16.

$$x^2 + y^2 = 333$$
$$-6x = y$$

What is a possible value of y in the system of equations above?
A. -9   B. -3   C. 3   D. 18

17. The function f is defined as $f(x) = 10x - 15$. What is the value of $f(4)$?

18. If the quadratic equation $x^2 - kx = 24$ has only integer solutions, which of the following cannot be a possible value of k?
A. 11   B. 10   C. 5   D. 2

19. How many real solutions exist for the equation $2x^2 - 10x + 5 = 0$?

20. If $a + b = 12$ and $a - b = 8$, what is the value of $a^2 - b^2$?

21. The equation of a parabola graphed in the xy-plane is given as $y = x^2 - 8x + 12$. Which of the following is an equivalent form that displays the solutions as constants or coefficients?
A. $y = (x - 2)(x - 6)$
B. $y = (x + 2)(x + 6)$
C. $y = (x - 4)^2 - 4$
D. $y = (x - 4)^2 + 12$

22. In the xy-plane, the point $(1, 5)$ lies on the graph of $f(x) = x^3 + 3x^2 + cx - 12$. What is the value of c?

23. If the solutions to the equation $2x^2 - 13x + 15 = 0$ are represented as c and d, what is the value of $c + d$?

24. The equation of a parabola in the xy-plane is given as $y = (x - 6)^2 + 4$. If this parabola is transformed left 4 units and up 4 units, what are the coordinates of the vertex of the transformed parabola?
A. (-10, 0)   B. (2, 8)   C. (6, 4)   D. (10, 8)

25. Given the system of equations $y = x^2$ and $y = 9x - 20$, which of the following is a possible solution for x?
A. 2   B. 4   C. 6   D. 8

26. Which of the following shows the solutions for the equation $n^2 - 10n - 24 = 0$?
A. -12 and 2   B. -6 and 4   C. 12 and -2   D. 6 and -4

27. How many real solutions does the function $k(x)$ have if $k(x) = 11x^2 + 22x + 11$?

28. If $x^2 - px - 14 = 0$ for all values of x and the sum of the roots is 5, what is the value of p?

29. For $x > 0$, what is one possible solution to the equation $x^3 - x^2 - 9x + 9 = 0$?

30. The function f 9s defined as $f(x) = 3x - 5$. The function g is defined as $g(x) = 2f(x - 2) + 6$. The function h is defined as $h(x) = -g(x) + 3$. What is the value of $h(8)$?

31. The XYZ company produces widgets. The company uses the formula $p = -3w^2 + kw + 1200$ to model its profit, p, in dollars versus the number of widgets, w, sold. If XYZ Company makes \$1800 on sales of 10 widgets and k is a constant, what is the maximum profit that XYZ Company can make for a given number of widgets sold?

Answers:

1. 14
2. D
3. A
4. 1
5. -21
6. 4
7. 3
8. 26
9. 9
10. D
11. 36
12. D
13. B
14. B
15. 16
16. D
17. 25
18. A
19. 2
20. 96
21. A
22. 13
23. 6.5
24. B
25. B
26. C
27. 1
28. 5
29. 1, 3
30. -29
31. 1875

6 Geometry and Trigonometry

1. A cone-shaped cup is filled with shaved ice and then syrups is added to make a snow cone. The height of the cone is 15 cm and the area of the base of the cone is 9 cm^2. After adding 10 cm^3 of syrup, the cone is full. Which of the following is the volume of the shaved ice in the cup? (Assume no melting has occurred.)

2. If a cube has an edge of 14 inches, what is its volume, in cubic inches?

3. Given a parallelogram $DEFG$, angle D measures $30°$ and angle E measures $6x°$. If angle F measures $y°$, what is the value of $y - x$?

4. To determine the height of a tree, a person measures 50 feet from the base of the tree and determines the angle of elevation from the ground to the top of the tree is $43°$. Which of the following equations could be used to determine the height of the tree?
A. $h = \frac{50}{\tan 43°}$
B. $h = 50 \sin 43°$
C. $h = 50 \tan 43°$
D. $h = \frac{50}{\sin 43°}$

5. Which of the following is equivalent to the value of $sin 42°$?
A. $\cos 42°$
B. $\sin 48°$
C. $\tan 48°$
D. $\cos 48°$

6. If an angle measures $\frac{8\pi}{5}$ radians, what is its measure in degrees?

7. In a circle with center O, radius 12 centimeters, and length of arc $\overarc{AB}$ is 9π centimeters, what is the measure, in degrees, of angle AOB?

8.
$$(x - 2)^2 + (y + 3)^2 = 25$$
For the equation of the circle given above, which of the following represents the center and the radius?
A. (2, -3); $r = 5$
B. (-2, 3); $r = 5$
C. (2, -3); $r = 25$
D. (-2 ,3); $r = 25$

9. A figure represents a giant hourglass found in Red Square in Moscow. The promoters claim that it's 12 meters tall. You want to confirm its height, so you stand 3 meters away from the hourglass and measure the angle at 76°. Which of the following equations could be used to find the height, h, of the hourglass, in meters?
A. $h = 3 \tan 76°$
B. $h = 3 \tan 14°$
C. $h = 3 \cos 76°$
D. $h = 3 \sin 76°$

10. The center of a circle is point C and the measure of arc $\overarc{AB}$ is 75°. What is the measure, in degrees, of the central angle ACB?

11. In triangle EFG, F is a right angle and $\sin(G) = \frac{15}{39}$. What is the value of $\sin(E)$?
A. $\frac{5}{13}$
B. $\frac{12}{13}$
C. $\frac{12}{5}$
D. $\frac{13}{5}$

12.
$$x^2 + 6x + y^2 - 12y = 99$$
If the equation above is graphed in the xy-plane, what is the y-coordinate of the center of the resulting circle?

13. If a shaded sector of a circle M is $\frac{1}{8}$ of the area of the circle, what is the degree measure of $\angle LMN$?

14. You are constructing a zip line at your house. You have 110 feet of cable to connect from the top of your house to the groud. If your house is 30 ft. tall, how far away, to the nearest foot, from the base of the hosue will the cable connect to the groud? (Disregard any amount needed to secure the cable.)

15. A square pyramid has a height of 12 cm and the area of the square is 25 cm^2. What is the volume of the pyramid, in cubic cm?

16. In a right triangle ABC, $\sin A = \frac{8}{10}$. What is the value of $\cos A$?

17. A cylinder has a volume of 640π cubic feet and a base diameter of 16 feet. What is the height, in feet, or the cylinder?

18. If $0 < \theta < \frac{\pi}{2}$ and $\cos \theta = \frac{12}{13}$, what is $\sin \theta$?

19. In circle O, central angle AOB measures 120°. If $OA = 9$, what is the length of minor arc $\overset{\frown}{AB}$?
A. 5π B. 6π C. 8π D. 9π

20. A 20-foot ladder is leaning against a wall and the base of the ladder has to be more than 12 feet away from the wall. Which of these is one possible value for the height that the ladder can reach up the wall?
A. 15 ft.   B. 16 ft.   C. 20 ft.   D. 32 ft.

21. Which of the following is equal to $\sin \frac{\pi}{7}$?
A. $\cos \frac{\pi}{7}$ B. $-\sin \frac{\pi}{7}$ C. $\cos \frac{6\pi}{7}$ D. $\sin \frac{6\pi}{7}$

22.
$$(x - 3)^2 + (y + 4)^2 = 36$$
Given the equation of a circle shown above, which of the following points would NOT lie in the interior of the circle?
A. (-2, -7)   B. (-1, 1)   C. (5, 1)   D. (7, -8)

23. Which of the following is true of the graph of a circle represented by the equation $(x - 8)^2 + (y + 3)^2 = 36$?
A. The circle intersects the x-axis 2 times and the y-axis 0 times.
B. The circle intersects the x-axis 2 times and the y-axis 2 times.
C. The circle intersects the x-axis 0 times and the y-axis 0 times.
D. The circle intersects the x-axis 0 times and the y-axis 2 times.

Answers:

1. 35
2. 2744
3. 5

4. C
5. D
6. 288
7. 135
8. A
9. A
10. 75
11. B
12. 6
13. 45
14. 106
15. 100
16. 3/5
17. 10
18. 5/13
19. B
20. A
21. D
22. B
23. A