

1. A publishing company ships hard-cover textbooks in boxes that weigh 54 pounds each, and soft-cover workbooks in boxes that weigh 25 pounds each. A shipment going to several schools weighs 2,728 pounds total and contains 72 boxes. How many boxes of soft-cover workbooks are in the shipment?

2. A candy company ships chocolate in boxes that weigh 42 pounds each, and chewing gum in boxes that weigh 30 pounds each. A shipment going to a store weighs 2,220 pounds total and contains 62 boxes. How many boxes of chewing gum are in the shipment?

3. A candy company ships chocolate in boxes that weigh 50 pounds each, and chewing gum in boxes that weigh 34 pounds each. A shipment going to a store weighs 2,828 pounds total and contains 70 boxes. How many boxes of chewing gum are in the shipment?

4. If the radius of a circle is tripled, by what percent is the area of the circle increased?
 - (A) 300%
 - (B) 600%
 - (C) 800%
 - (D) 900%

$$x^2 + y^2 + 10y = 24$$

5. The equation of a circle in the xy -plane is show above. What is the radius of the circle?
- A) 5
 - B) 6
 - C) 7
 - D) 8

$$x^2 + y^2 + 8x - 2y = 19$$

6. The equation of a circle in the xy -plane is show above. What is the radius of the circle?
- A) 2
 - B) 3
 - C) 4
 - D) 6

$$x^2 + y^2 - 12x - 6y = 36$$

7. The equation of a circle in the xy -plane is show above. What is the radius of the circle?
- A) 6
 - B) 7
 - C) 8
 - D) 9

8. If $\frac{x^{a^2}}{x^{b^2}} = x^{20}$, $x > 1$, and $a + b = 4$, what is the value of $a - b$?

- A) 20
- B) 16
- C) 8
- D) 5

9. If $\frac{x^a}{x^b} = x^{18}$, $x > 1$, and $a - b = 9$, what is the value of $a + b$?

- A) 2
- B) 9
- C) 11
- D) 18

$$x^2 + y^2 + 8y = 20$$

10. The equation of a circle in the xy -plane is show above. What is the radius of the circle?

- A) 5
- B) 6
- C) 7
- D) 8

$$x^2 + y^2 + 10x - 12y = 3$$

11. The equation of a circle in the xy -plane is show above. What is the radius of the circle?

- A) 6
- B) 7
- C) 8
- D) 9

$$x^2 + y^2 - 14x - 4y = 28$$

12. The equation of a circle in the xy -plane is show above. What is the radius of the circle?

- A) 6
- B) 7
- C) 8
- D) 9

13. On January 1, 2000, there were 125,000 gallons of milk in a silo that had a capacity of 275,000 gallons. Each year since then, the amount of milk in the silo increased by 12,500 gallons. If y represents the time, in years, after January 1, 2000, which of the following inequalities describes the set of years where the silo is at or above capacity?

- A) $275,000 - 12,500 \leq y$
- B) $275,000 \leq 12,500y$
- C) $150,000 \geq 12,500y$
- D) $125,000 + 12,500y \geq 275,000$

$$M = \frac{2Y}{N + Y}$$

14. A marketing company uses the formula above to calculate a click-through measurement M for a website based on the number of yes votes, Y , and no votes, N . Which of the following expresses the number of yes votes in terms of the other variables?

- A) $Y = \frac{MN}{2-M}$
- B) $Y = \frac{MN}{M-2}$
- C) $Y = \frac{N}{2-M}$
- D) $Y = \frac{N}{M-2}$

15. Which of the following expressions is equivalent to $(3x^3)^{\frac{3}{2}}$?

A) $x^3 * \sqrt[3]{3}$

B) $3x^4 * \sqrt{3}$

C) $3x^4 * \sqrt{3x}$

D) $3x^3 * \sqrt{3x}$

16. Which of the following expressions is equivalent to $(-2x^4)^{\frac{4}{3}}$?

A) $8x^5 * \sqrt[3]{2x}$

B) $2x^5 * \sqrt[3]{2}$

C) $2x^5 * \sqrt[3]{2x}$

D) $2x^4 * \sqrt[3]{2x}$

17. Which of the following expressions is equivalent to $(9x^3)^{\frac{2}{3}}$?

A) $27x^2 * \sqrt[3]{3x}$

B) $3x^2 * \sqrt[3]{3}$

C) $3x^2 * \sqrt[3]{3x}$

D) $3x * \sqrt[3]{3x^2}$

$$P(t) = 50(2)^{\frac{t}{2}}$$

18. The number of microscopic organisms in a petri dish grows exponentially with time. The function P above models the number of organisms after growing for t days in the petri dish. Based on the function, which of the following statements is true?

A) The predicted number of organisms in the dish doubles every two days.

B) The predicted number of organisms in the dish triples every two days.

C) The predicted number of organisms in the dish doubles every three days.

D) The predicted number of organisms in the dish doubles every day.

$$P(t) = 50(2)^{\frac{t}{3}}$$

19. The number of microscopic organisms in a petri dish grows exponentially with time. The function P above models the number of organisms after growing for t days in the petri dish. Based on the function, which of the following statements is true?
- A) The predicted number of organisms in the dish doubles every two days.
 - B) The predicted number of organisms in the dish triples every two days.
 - C) The predicted number of organisms in the dish doubles every three days.
 - D) The predicted number of organisms in the dish doubles every day.
20. A circle in the xy -plane has a diameter with endpoints $(-2, -4)$ and $(4, 4)$. If the point $(-3, b)$ lies on the circle and $b > 0$, what is the value of b ?
21. A circle in the xy -plane has a diameter with endpoints $(-3, -6)$ and $(13, 6)$. If the point $(-3, b)$ lies on the circle and $b > 0$, what is the value of b ?
22. A circle in the xy -plane has a diameter with endpoints $(-7, 3)$ and $(1, -3)$. If the point $(0, b)$ lies on the circle and $b > 0$, what is the value of b ?

$$\frac{x-1}{x-2} = \frac{1}{x} + \frac{1}{x-2}$$

23. What is the solution set of the equation above?

- A) {1}
- B) {0,3}
- C) {1,2}
- D) {1,3}

24. If $\frac{\sqrt{x^7}}{\sqrt[4]{x^3}} = x^{\frac{a}{b}}$ for all positive values of x , what is the value of $\frac{a}{b}$?

25. If $\frac{\sqrt{x^3}}{\sqrt[5]{x^2}} = x^{\frac{a}{b}}$ for all positive values of x , what is the value of $\frac{a}{b}$?

26. If $\frac{\sqrt{x^9}}{\sqrt[3]{x^7}} = x^{\frac{a}{b}}$ for all positive values of x , what is the value of $\frac{a}{b}$?

27. The dimensions of a right rectangular prism are 3 feet by 4 feet by 5 feet. What is the surface area, in square feet, of the prism?
28. The dimensions of a right rectangular prism are 3 feet by 5 feet by 7 feet. What is the surface area, in square feet, of the prism?
29. The dimensions of a right rectangular prism are 4 feet by 6 feet by 8 feet. What is the surface area, in square feet, of the prism?
30. The graph of the equation $ax + ky = 4$ is a line in the xy -plane, where a and k are constants. If the line contains the points $(-1, -5)$ and $(2, 4)$, what is the value of k ?
- A. -4
 - B. -3
 - C. -2
 - D. 3

$$g(x) = 3^x - 3$$

31. The function g is defined by the equation above. Which of the following points in the xy -plane is an x -intercept of the graph of the equation $y = g(x)$?
- A. $(-1, g(-1))$
 - B. $(0, g(0))$
 - C. $(1, g(1))$
 - D. $(2, g(2))$
32. A donkey travels 8 miles in 27 minutes. What is the average speed of the donkey, to the nearest tenth of a mile per hour ?
33. A horse travels 13 miles in 28 minutes. What is the average speed of the horse, to the nearest tenth of a mile per hour ?
34. The graph of the function f is defined by $f(x) = 3x - 5$. The graph of the function g is perpendicular to the graph of f and passes through the point $(3,3)$. What is the value of $g(0)$?

35. The graph of the function f is defined by $f(x) = -2x + 7$. The graph of the function g is perpendicular to the graph of f and passes through the point $(6,8)$. What is the value of $g(0)$?
36. The graph of the exponential function g in the xy -plane, where $y = g(x)$, has a y -intercept of c , where c is a positive constant. Which of the following could define the function g ?
- A) $g(x) = -4(c)^x$
 - B) $g(x) = 4(x)c$
 - C) $g(x) = c(-x)^3$
 - D) $g(x) = c(4)^x$
37. The graph of the function f in the xy -plane is a parabola with vertex of $(3,5)$ and passing through the point $(1,13)$. Which of the following defines f ?
- A) $f(x) = 2(x - 3)^2 + 5$
 - B) $f(x) = (x - 3)^2 + 5$
 - C) $f(x) = 2(x + 3)^2 + 5$
 - D) $f(x) = -2(x - 3)^2 + 5$
38. The graph of the function f in the xy -plane is a parabola with vertex of $(2,4)$ and passing through the point $(1,1)$. Which of the following defines f ?
- A) $f(x) = 3(x - 2)^2 + 4$
 - B) $f(x) = (x - 2)^2 + 4$
 - C) $f(x) = -2(x + 2)^2 + 4$
 - D) $f(x) = -3(x - 2)^2 + 4$

39. The graph of the function f in the xy -plane is a parabola with vertex of $(-3,6)$ and passing through the point $(-1, -2)$. Which of the following defines f ?

A) $f(x) = 2(x + 3)^2 + 6$

B) $f(x) = (x + 3)^2 + 6$

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

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

Answers:

1. 40
2. 32
3. 42
4. C
5. C
6. D
7. D
8. D
9. A
10. B
11. C
12. D
13. D
14. A
15. C
16. C
17. B
18. A
19. C
20. 3
21. 6
22. 4
23. A
24. $11/4$
25. $11/10$
26. $13/6$
27. 94
28. 142
29. 208
30. C
31. C
32. 17.8
33. 27.8
34. 4
35. 5
36. D
37. A
38. D
39. C