1. Solve \(2 + 3y = 4x - xy\) for \(y\).

   \[a\] \(y = \frac{4x - 2}{x + 3}\)  \hspace{1cm} \[b\] \(y = \frac{3x + 2}{4 - x}\)  \hspace{1cm} \[c\] \(y = \frac{4x - 1}{x}\)  \hspace{1cm} \[d\] None of the Above

2. Write the slope-intercept form of an equation for the line that passes through \((1, 4)\) and perpendicular to the line \(x - 6y = 2\).

   \[a\] \(y = 6x - 2\)  \hspace{1cm} \[b\] \(y = -6x + 10\)  \hspace{1cm} \[c\] \(y = \frac{1}{6}x + \frac{23}{6}\)  \hspace{1cm} \[d\] None of the Above

3. Given two numbers \(n_1\) and \(n_2\) such that \(n_1\) is three more than twice the other number. The sum of the two numbers is 33. Find \(n_1\) and \(n_2\).

   \[a\] \(n_1 = 30, n_2 = 3\)  \hspace{1cm} \[b\] \(n_1 = 23, n_2 = 10\)  \hspace{1cm} \[c\] \(n_1 = 21, n_2 = 12\)  \hspace{1cm} \[d\] None of the above

4. Factor the trinomial \(x^2 - 9x + 20\).

   \[a\] \((x - 5)(x + 4)\)  \hspace{1cm} \[b\] \((x + 5)(x - 4)\)  \hspace{1cm} \[c\] \((x - 5)(x - 4)\)  \hspace{1cm} \[d\] None of the above

5. Find the product of \((4 - \sqrt{11})(4 + \sqrt{11})\).

   \[a\] 5  \hspace{1cm} \[b\] 16 - \sqrt{11}  \hspace{1cm} \[c\] 11  \hspace{1cm} \[d\] None of the above

6. Find the sum of \(\frac{-4}{a + 3} + \frac{-12}{a^2 + 3a}\).

   \[a\] \(-\frac{4}{a}\)  \hspace{1cm} \[b\] \(-\frac{16}{a^2 + 2a}\)  \hspace{1cm} \[c\] \(-\frac{16}{a^2 + 4a + 3}\)  \hspace{1cm} \[d\] None of the above

7. If the length of a rectangle is 2 less than 3 times the width, then find the perimeter of the rectangle when the width is 9 inches.

   \[a\] 34 inches  \hspace{1cm} \[b\] 225 inches  \hspace{1cm} \[c\] 68 inches  \hspace{1cm} \[d\] None of the above

8. Simplify the expression \(\left(\frac{12a^4b^8}{21a^5b^4}\right)^{-2}\).

   \[a\] \(\frac{16b^8}{49a^2}\)  \hspace{1cm} \[b\] \(\frac{49b^8}{16a^2}\)  \hspace{1cm} \[c\] \(\frac{49a^8}{16b^2}\)  \hspace{1cm} \[d\] None of the Above
9. How many 9-inch ribbons can be cut from \( \frac{9 \frac{3}{4}}{4} \) yards of ribbon?

[a] 13  [b] 39  [c] 104  [d] None of the Above

10. Joe earns a 7.5% commission on his weekly sales at a store. Last week he had $3,600 in sales. What was his commission for the week?

[a] $270  [b] $333  [c] $396  [d] None of the Above

11. Solve \( |2x - 4| - 3 = 9 \) for \( x \).

[a] \( x = -5, 2 \)  [b] \( x = 8, -4 \)  [c] \( x = -6, 6 \)  [d] None of the above

12. The scale factor for two similar triangles is 4:5. The perimeter of the smaller triangle is 60 cm. What is the perimeter of the larger triangle?

[a] 75 cm  [b] 48 cm  [c] 96 cm  [d] None of the above

13. A hang glider 37 meters above the ground starts to descend at a constant rate of 3 meters per second. Which equation could be used to determine \( h \), the hang glider’s height after \( t \) seconds of descent?

[a] \( h = -37t + 3 \)  [b] \( h = 3t + 37 \)  [c] \( h = 3t - 37 \)  [d] None of the above

14. The number of students at Octothorpe Academy increased from 760 to 830 over a 5-year period. What was the percent of increase?

[a] 46.1%  [b] 8.4%  [c] 9.2%  [d] None of the above

15. What is the base of the triangle if the height is 9 feet and the area is 72 square feet?

[a] 4 feet  [b] 8 feet  [c] 16 feet  [d] None of the above

16. Suppose that a car rental service charges $50 per day plus 20 cents per mile for car rentals. How much does it cost to rent a car to drive 150 miles in 2 days?

[a] $130.00  [b] $80.00  [c] $74.40  [d] None of the Above

17. Solve for \( a \). \( ab + c = \frac{b}{c} \)
18. Solve $2x^2 + 3x - 7 = -4$ for $x$.

[a] $x = \frac{-3}{4}, \frac{-3}{2}$  
[b] $x = \frac{-3+\sqrt{11}}{4}, \frac{-3-\sqrt{11}}{4}$  
[c] $x = \frac{-3+\sqrt{33}}{4}, \frac{-3-\sqrt{33}}{4}$  
[d] None of the Above

19. Suppose that a fridge costs $972 after the dealer adds a 15% markup. How much did the dealer pay for the fridge?

[a] $1117.80$  
[b] $800.00$  
[c] $845.22$  
[d] None of the Above

20. A field is 10 feet longer than it is wide and the perimeter of the field is 400 feet. What is the width of the field?

[a] 95 feet  
[b] 105 feet  
[c] 100 feet  
[d] None of the Above

21. Solve the inequality $2 + |x - 4| < 9$ for $x$ and write the answer in interval notation.

[a] $(-3, 11)$  
[b] $(11, -3)$  
[c] $(-\infty, 11)$  
[d] None of the Above

22. Simplify the following expression $2(x^2y^3)(9x^3y^5)$.

[a] $54x^6y^{15}$  
[b] $27x^5y^8$  
[c] $54x^5y^8$  
[d] None of the Above

23. Given the function $f(x) = \frac{3}{4}x^2 + 2^x$. Compute $f(2)$.

[a] 11  
[b] 7  
[c] $\frac{33}{4}$  
[d] None of the Above

24. Simplify the following expression $4\sqrt{50} + 3\sqrt{18}$.

[a] $29\sqrt{2}$  
[b] $7\sqrt{2}$  
[c] $30\sqrt{3}$  
[d] None of the Above

25. A path runs diagonally through a rectangular park that is 10 kilometers long and 5 kilometers wide. How long is the path?

[a] 12 km  
[b] 15 km  
[c] $10\sqrt{5}$ km  
[d] None of the Above
26. Suppose that 12% of 7500 people polled said vanilla was their favorite flavor of ice cream. How many people had a favorite flavor other than vanilla?

[a] 900  [b] 6600  [c] 5400  [d] None of the Above

27. 3 times a number is 7 less than 40. Find the number.

[a] 11  [b] 33  [c] 7  [d] None of the Above

28. Simplify the following expression \( \frac{3x^2 + 2}{yx^2} - \frac{y + 3x}{yx} \).

[a] \( \frac{6x^2 - xy + 2}{yx^2} \)  [b] \( \frac{y^2 x + 2}{xy} \)  [c] \( \frac{2 - xy}{yx^2} \)  [d] None of the Above

29. Find the midpoint of (5, 4) and (-5, -4).

[a] (0, 0)  [b] (2.5, 2)  [c] (-2.5, -2)  [d] None of the Above

30. Solve \( \sqrt{x^2 - 12} = 2 \) for \( x \).

[a] \( x = \sqrt{14}, -\sqrt{14} \)  [b] \( x = 4, -4 \)  [c] \( x = 2, 5 \)  [d] None of the Above

31. Suppose your car gets 20 mpg and a gallon of gas costs $2. How much does it cost you to drive 500 miles?

[a] $50  [b] $35  [c] $69.50  [d] None of the Above

32. Solve the inequality \( 7 - 5x \leq 22 \) and give the answer in interval notation.

[a] \([-3, \infty) \)  [b] \((-\infty, -3) \)  [c] \((-3, \infty) \)  [d] None of the above

33. Simplify the following fraction \( \frac{x + 2}{x - \frac{x}{x + 3}} \).

[a] \( \frac{(x + 2)(x + 3)}{3} \)  [b] \( \frac{x + 3}{x} \)  [c] \( \frac{x + 2}{x} \)  [d] None of the above
34. Perform the operation and simplify: \( \frac{x^2 + x}{x^2 - 4} + \frac{x^2 - 1}{x^2 + 5x + 6} \).

[a] \( \frac{x(x + 2)}{(x - 1)(x - 4)} \)  
[b] \( \frac{x(x + 6)}{(x + 2)(x - 2)} \)  
[c] \( \frac{x(x + 3)}{(x - 1)(x - 2)} \)  
[d] None of the above

35. Solve the absolute value inequality for \( x \), \(|4x + 7| > 5\). Express the solution in interval notation.

[a] \( (-3, -\frac{1}{2}) \)  
[b] \( (-\infty, -3) \)  
[c] \( (-\frac{1}{2}, \infty) \)  
[d] None of the above

36. Rationalize the denominator of this expression \( \sqrt{\frac{7}{75}} \).

[a] \( \frac{x^3 \sqrt{3}}{15} \)  
[b] \( \frac{x^3 \sqrt{3x}}{15} \)  
[c] \( \frac{x^3 \sqrt{3x}}{5} \)  
[d] None of the above

37. Divide: \( (m^2 - 7m - 11) \div (m - 8) \)

[a] \( m + 1 - \frac{3}{m - 8} \)  
[b] \( m - 15 + \frac{120}{m - 8} \)  
[c] \( -m - 1 - \frac{3}{m - 8} \)  
[d] None of the above

38. The function \( f(x) \) is defined as \( f(x) = \frac{1 + b}{x} \) with \( b > 0 \). Compute \( f \left( \frac{1}{b} \right) \).

[a] \(-1\)  
[b] \( \frac{2b^2}{(b - 1)(b + 1)} \)  
[c] \( \frac{2b}{b^2 + 1} \)  
[d] None of the Above

39. Given the quadratic equation \( P(x) = -ax^2 - ax + \frac{1}{a} \) if \( a < 0 \), the graph of \( P(x) \) will

[a] open upward  
[b] open downward  
[c] both open upward and downward  
[d] None of the above

40. Write the formula for the nth term of the sequence. 2, 6, 10, 14, …

[a] \( a_n = 4n - 2 \)  
[b] \( a_n = 2 + 4n \)  
[c] \( a_n = 2 - 4n \)  
[d] None of the above

41. Simplify and write in standard form \( \frac{7 + 4i}{2 - 5i} \).

[a] \(-1\)  
[b] \( \frac{6 - 43i}{21} \)  
[c] \( \frac{6}{29} - \frac{43}{29}i \)  
[d] None of the above

42. From a point on level ground 125 feet from the base of a tower, the angle of elevation to the top of the tower is 57.2°. Approximate the height of the tower to the nearest foot.

[a] 95.29 feet  
[b] 105.07 feet  
[c] 193.96 feet  
[d] None of the above
43. A building that is 21 meters tall casts a shadow 25 meters long. Find the angle of elevation of the sun.

[a] 32.86°  [b] 40.03°  [c] 57.14°  [d] None of the above

44. A right triangle has leg 21 and hypotenuse 29, what is the length of the missing leg.

[a] 8  [b] 20  [c] 35.8  [d] None of the above

45. The perimeter of an equilateral triangle is \(21a^3b^6 + 3a - 3\) units. Find the length of a side.

[a] 21 units  [b] 7ab^2 + 3 units  [c] 7a^3b^6 + a - 1 units  [d] None of the above

46. Simplify and write in scientific notation. \((6.1 \times 10^{-3})(5 \times 10^{-2})\)

[a] 3.05 \times 10^{-5}  [b] 3.05 \times 10^{-6}  [c] 30.5 \times 10^{-5}  [d] None of the above

47. Solve the system of linear equations.

\[
\begin{align*}
y &= -5x \\
5x + y &= 9
\end{align*}
\]

[a] (0, 0)  [b] no solutions  [c] infinite number of solution  [d] None of the above

48. Find the amount of 14% saline solution that should be added to 80 cc (cubic centimeters) of 24% saline solution in order to have 18% solution.

[a] 10 cc  [b] 120 cc  [c] 170 cc  [d] None of the above

49. Two bikers start at opposite ends of a trail and bike toward each other. The trail is 132 miles long and they meet in 4 hours. If one biker is twice as fast as the other, find the speed of the slower biker.

[a] 11 mph  [b] 22 mph  [c] 44 mph  [d] None of the above

50. Given the quadratic equation \(x^2 - kx + k - 1 = 0\), with \(k\) a real number, the equation has two distinct real solutions

[a] for no \(k\)  [b] for \(k = 2\)  [c] for all \(k\)  [d] None of the above
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