1. Evaluate \( \frac{p}{5+q} \) when \( p = 5 \) and \( q = 10 \).

- [A] \( \frac{1}{10} \)
- [B] \( \frac{1}{3} \)
- [C] 1
- [D] \( \frac{1}{7} \)
- [E] None of the above.

2. Find an expression equivalent to \( \frac{2}{3} \) with denominator \( 3y \).

- [A] \( \frac{2+y}{3y} \)
- [B] \( \frac{2}{3y} \)
- [C] \( \frac{2y}{3y} \)
- [D] \( \frac{2y}{3y} \)
- [E] None of the above.

3. Simplify by removing the parentheses and collecting like terms.

\[-5t + (4t - 12) - 2(3t + 7)\]

- [A] \( -7t - 26 \)
- [B] \( -7t + 2 \)
- [C] \( -4t - 26 \)
- [D] \( -4t + 2 \)
- [E] None of the above.

4. Simplify \( \frac{11^{1+b+2}}{11^{3b-2}} \)

- [A] \( 11^{-2b+5} \)
- [B] \( 11^{-2b-1} \)
- [C] \( 11^{3b-6} \)
- [D] \( \frac{1}{11^{2b-1}} \)
- [E] None of the above.
5. Solve $\frac{9}{2} y + 4 = -\frac{91}{2}$ for $y$.

[A] $\frac{-95}{9}$
[B] $\frac{-95}{9}$
[C] $\frac{99}{72}$
[D] 11
[E] None of the above.

6. The first angle of a triangle is four times as large as a second angle. The third angle measures 15° less than twice the first angle. Let $x$ be the measure of the second angle, an equation that is necessary to find the value of $x$ is:

[A] $(4x) + (x) + (2x - 15) = 180$
[B] $(4x) + (x) + (8x - 15) = 180$
[C] $(4x) + (x) + (8x - 120) = 180$
[D] $(4x) + (x) + (2x - 30) = 180$
[E] None of the above.

7. A simple interest formula is $I = Prt$. How long will it take a deposit of $75 to earn $3 interest when invested at 5% simple interest?

[A] .6 years
[B] .7 years
[C] .8 years
[D] .9 years
[E] None of the above.

8. Translate to an inequality: "Twice the product of two numbers plus 27 is at most -3".

[A] $2ab \leq -3$
[B] $2ab \geq -3$
[C] $2ab < -3$
[D] $2ab > -3$
[E] None of the above.

9. In a chemistry lab a beaker must be within .3mm of 30mm in length. Which of the following is an inequality which describes this condition?

[A] $x - .3 > 30$
[B] $|x - 30| \leq .3$
[C] $x > .27$
[D] $|x + .3| \leq 30$
[E] None of the above.
10. Find the x and y intercepts of the line $5y = x + 5$.
   [A] (-5, 0), (0, 1)
   [B] (1, 0), (0, -5)
   [C] (1, 0), (0, 1)
   [D] (-5, 0), (0, -5)
   [E] None of the above.

11. Find the equation of the line with slope -8 and y-intercept (0, 4).
   [A] $-8x + y = 4$
   [B] $8x + y = 4$
   [C] $y + 4x = 8$
   [D] $y - 4x = -8$
   [E] None of the above.

12. Write an equation of the line containing the point (4,1), and perpendicular to the line $x - 3y = 9$.
    [A] $y = -3x + 13$
    [B] $y = \frac{1}{3}x + 13$
    [C] $y = 3x + 13$
    [D] $y = -\frac{1}{3}x + 13$
    [E] None of the above.

13. A river flows at a slope of .08. How many feet does it fall vertically for every 250 ft. horizontally?
    [A] 3125
    [B] 20
    [C] 30
    [D] 3155
    [E] None of the above.

14. Multiply: $(2x^2 + 3)(x - 8)$
    [A] $2x^3 - 16x^2 + 3x - 24$
    [B] $3x^2 + 3x - 24$
    [C] $2x^3 - 13x - 24$
    [D] $3x^3 - 16x^2 + 3x - 24$
    [E] None of the above.
15. In solving the system of equations:
\[ 5x + 3y = 19 \]
\[ 2x - 5y = 11 \]
by eliminating the \( x \) variable, you obtain which equation?

[A] \( 31y = -17 \)
[B] \( 5y = 117 \)
[C] \( 17y = -31 \)
[D] \( y = \frac{128}{31} \)
[E] None of the above.

![Figure 1](image)

16. Using Figure 1, which line is the graph of the equation \( y = x - 1 \)?

[A] A
[B] B
[C] C
[D] D
[E] E

17. Which line has a slope of 0?

[A] A
[B] B
[C] C
[D] D
[E] E

18. Using Figure 1, the solution of the two equations represented by lines E and D is:

[A] \( (0, -1) \)
[B] \( (1, 0) \)
[C] \( (-2, -2) \)
[D] \( (-1, -2) \)
[E] None of the above.
19. The cost of a taxi ride is $4.75 for 2.5 MI and $4.90 for 3.0 mi. Let \( M \) = the number of miles driven and \( C \) = the cost in dollars. Find a linear equation that fits the data points with \( C \) expressed in terms of \( M \).

[A] \( (M - 4.75) = \frac{3}{10}(C - 2.5) \)

[B] \( (M - 4.75) = \frac{10}{3}(C - 2.5) \)

[C] \( (M - 4.95) = \frac{3}{10}(C - 2.5) \)

[D] \( (M - 4.95) = \frac{10}{3}(C - 2.5) \)

[E] None of the above.

20. A canoeist paddled for 4 hr with a 6-km/h current to reach a campsite. The return trip against the same current took 10 hr. Find the speed of the canoe in still water.

[A] 13 km/h

[B] 14 km/h

[C] 15 km/h

[D] 16 km/h

[E] None of the above.

21. Determine which ordered pair is a solution to the inequality: \( 4x + 3y > 0 \)

[A] (-3, 4)

[B] (5, -6)

[C] (-3, -5)

[D] (2, -3)

[E] None of the above.

22. Subtract: \( (3xy^3 - 4x^2 + y) - (-3x^2 + 2xy^3 - y) \)

[A] \( 5xy^3 - x^2 \)

[B] \( xy^3 - x^2 \)

[C] \( xy^3 - x^2 + y^2 \)

[D] \( xy^3 - x^2 + 2y \)

[E] None of the above.

23. Factor completely: \( 32y + 4y^2 - y^3 \)

[A] \( y(32 + 4y - y^2) \)

[B] \( -y(y + 8)(y - 4) \)

[C] \( y(y - 8)(y - 4) \)

[D] \( y(y + 8)(y - 4) \)

[E] None of the above.
24. Factor Completely: $14x^4 - 19x^3 - 3x^2$

[A] $x^2(7x - 1)(2x + 3)$

[B] $x^2(7x + 1)(2x - 3)$

[C] $x^2(14x^2 - 19x - 3)$

[D] The polynomial is prime.

[E] None of the above.

25. Divide: $(y^3 - 25) ÷ (y - 5)$

[A] $y^2 + 25$, R 5

[B] $y + 5$

[C] $y^2 + 5y + 25$

[D] $y^2 + 5y + 5$

[E] $y + 5$, R 25

26. Factor completely: $24a^3 + 3$

[A] $3(a^3 + 1)$

[B] $3(8a + 1)((8a)^2 + (8a)(1) + 1^2)$

[C] $3(2a - 1)(4a^2 + 2a + 1)$

[D] $3(2a + 1)(4a^2 - 2a + 1)$

[E] $3(2a + 1)(4a^2 + 2a + 1)$

27. Factor completely: $y^3 + 3y^2 + 4y + 12$

[A] $y^2(y + 3) + 4(y + 3)$

[B] $y(y^2 + 3y + 4) + 12$

[C] $(y + 2)(y - 2)(y + 3)$

[D] $(y^2 + 4)(y + 3)$

[E] None of the above.

28. The perimeter of a square window is 4 more than its area. Find the length of one side.

[A] 1

[B] 2

[C] 3

[D] 4

[E] None of the above.

29. Solve: $\frac{x - 2}{x - 4} = \frac{x}{x - 4}$

[A] $x = 4$

[B] $x = 3$

[C] $x = 2$

[D] $x = 1$

[E] No Solution.
30. Simplify: \( \frac{x(x + 1) - 2(x + 3)}{(x + 1)(x + 2)(x + 3)} \)

[A] \( \frac{x - 2}{x + 3} \)

[B] \( \frac{x(x + 1) - 2(x + 3)}{(x + 1)(x + 2)(x + 3)} \)

[C] \( \frac{x - 3}{(x + 1)(x + 3)} \)

[D] \( \frac{-x - 6}{(x + 1)(x + 2)} \)

[E] None of the above.

31. Which of the following is the LCM of \( y^2 + 6y + 9 \) and \( y^2 - 9 \)?

[A] \( (y + 3)(y - 3) \)

[B] \( (y^2 - 9)(y^2 + 6y + 9) \)

[C] \( (y + 3)^2(y - 3) \)

[D] \( (y + 3)^2(y - 3) \)

[E] \( 2(y + 3)(y - 3) \)

32. Add and Simplify: \( \frac{2r}{r^2 - s^2} - \frac{1}{r + s} + \frac{1}{s - r} \)

[A] \( \frac{2r}{r^2 - s^2 - 2s} \)

[B] \( \frac{s - r}{s - r} \)

[C] \( \frac{r + s + (r + s)(r - s)}{(r + s)(r - s)(s - r)} \)

[D] 0

[E] None of the above.

33. A tank can be filled in 18 hours by pipe A alone and in 22 hours by pipe B alone. How long will it take to fill the tank if both pipes are working at once?

[A] 10 hours

[B] \( 8 \frac{1}{10} \) hours

[C] \( 9 \frac{9}{10} \) hours

[D] \( 7 \frac{3}{10} \) hours

[E] None of the above.
34. The weight of an object on Mars to the weight of an object on Earth is 0.4 to 1. How much will a 120 lb. astronaut weigh on Mars?

[A] 46 lb.
[B] 47 lb.
[C] 48 lb.
[D] 49 lb.
[E] None of the above.

35. Simplify completely: \(\frac{1 - \frac{3}{3x}}{\frac{4}{9x}}\)

[A] \(\frac{9x - 6}{9x^2 - 4}\)
[B] \(\frac{3}{3x + 2}\)
[C] \(\frac{x - 8}{27x}\)
[D] \(\frac{9x}{9x^2 - 4}\)
[E] None of the above.

36. Simplify: \(\sqrt[3]{(x - 2)^3}\)

[A] \(\pm(x - 2)\)
[B] \(x - 2\)
[C] \(|x - 2|\)
[D] \(- (x - 2)\)
[E] None of the above.

37. Multiply and Simplify: \(\sqrt[3]{30x^3 y^4 \sqrt[4]{15xy}} \sqrt[5]{18x^2 y^5}\)

[A] \(36x^2 y^4 \sqrt[3]{15xy}\)
[B] \(6x^4 y^8 \sqrt[4]{15xy}\)
[C] \(6x^2 y^4 \sqrt[5]{15xy}\)
[D] \(36x^4 y^8 \sqrt[3]{15xy}\)
[E] None of the above.
38. Rationalize the denominator and simplify: \( \frac{\sqrt[3]{7b^2}}{\sqrt[3]{3a^5}} \)

[A] \( \frac{\sqrt[3]{21a^5b^2}}{3a^5} \)
[B] \( \frac{\sqrt[3]{63ab^2}}{3a^2} \)
[C] \( \frac{\sqrt[3]{63b^2}}{3a^3} \)
[D] \( \frac{\sqrt[3]{63ab^2}}{3a^5} \)
[E] None of the above.

39. Which of the following is equivalent to \( a^{\frac{3}{2}}b^\frac{5}{3} \)?

[A] \( \sqrt{ab} \)
[B] \( \frac{12}{a^8b^9} \)
[C] \( \sqrt[12]{(ab)^{17}} \)
[D] \( \frac{12}{a^2b^3} \)
[E] None of the above.

40. Solve: \( \sqrt{x+1} - \frac{2}{\sqrt{x+1}} = 1 \)

[A] 0
[B] 3
[C] Both A and B
[D] 8
[E] None of the above.

41. The diagonal of a square has length \( 8\sqrt{2} \) ft. Find the length of a side of the square.

[A] 8.9 ft.
[B] 9.0 ft.
[C] 9.1 ft.
[D] 9.2 ft.
[E] None of the above.

42. Express in terms of \( i \): \( \sqrt{-4} + \sqrt{-12} \)

[A] \( (2 + 2\sqrt{3})i \)
[B] \( 4i - 12i \)
[C] \( 4i + 12i \)
[D] \( (-2 - \sqrt{12})i \)
[E] None of the above.
43. Solve: $x^2 + x = 1$

[A] $\frac{-2 \pm 2\sqrt{6}}{4}$

[B] $\frac{-1 \pm \sqrt{5}}{4}$

[C] $\frac{-1 \pm \sqrt{5}}{2}$

[D] $\frac{-1 \pm \sqrt{6}}{2}$

[E] None of the above.

44. Solve: $11(x-2) + (x-5) = (x+2)(x-6)$

[A] 1, 15

[B] 3, 15

[C] 1, 17

[D] 3, 17

[E] None of the above.

45. Which of the following will have two real solutions?

[A] $x^2 + 3x + 4 = 0$

[B] $4x^2 - 12x + 9 = 0$

[C] $x^2 - 2x + 4 = 0$

[D] $4x^2 + 7x = 0$

[E] None of the above.

46. Which of the following are solutions to $2x - 9\sqrt{x} + 4 = 0$?

[A] $\frac{1}{8}$, 16

[B] $\frac{1}{12}$, 16

[C] $\frac{1}{4}$, 16

[D] $\frac{1}{16}$, 16

[E] None of the above.
47. The formula for the area of a cylinder is $A = 2\pi r^2 + 2\pi rh$. Often, the area is known as well as $h$ the height of the cylinder. Solve this formula for $r$, the radius (remember, distance is always positive, so $r$ will be positive).

[A] $r = \frac{-\pi h + \sqrt{\pi^2 h^2 + 2\pi A}}{2\pi}$

[B] $r = \frac{-2\pi h + \sqrt{4\pi^2 h^2 + 8\pi A}}{2\pi}$

[C] $r = \frac{-\pi h + \sqrt{\pi^2 h^2 + 2\pi A}}{4\pi}$

[D] $r = \frac{-2\pi h + \sqrt{2\pi^2 h^2 + 8\pi A}}{4\pi}$

[E] None of the above.

48. Convert $\log_x N = t$ to an exponential equation.

[A] $x^t = N$

[B] $t = N$

[C] $N^t = t$

[D] $t^N = x$

[E] None of the above.

49. Convert $y = x^t$

[A] $\log_x x = y$

[B] $\log_x t = y$

[C] $\log_x x = l$

[D] $\log_x y = l$

[E] None of the above.

50. Which of the following is equivalent to: $\log_3 \frac{2x}{3y}$

[A] $\frac{\log_3 2x}{\log_3 3y}$

[B] $\log_3 2x - 3y$

[C] $\log_3 2x - \log_3 3y$

[D] $\log_3 2x + \log_3 3y$

[E] None of the above.