

1. If x is an integer, which of the following **MUST** be an integer?

I. $5x$

II. $\frac{x}{5}$

III. $x - 5$

- a) I only b) III only c) I and II only d) I and III only e) none of these

2. Solve for x : $\frac{53}{x} = \frac{\frac{53}{y}}{R}$

- a) $y - R$ b) $\frac{1}{yR}$ c) $\frac{R}{y}$ d) $\frac{y}{R}$ e) none of these

3. If $\frac{x+y}{x} = 3$ and $\frac{y+R}{R} = 5$, what is the value of $\frac{R}{x}$?

- a) $\frac{1}{2}$ b) 2 c) $\frac{5}{3}$ d) $\frac{3}{5}$ e) none of these

4. Nine points are equally spaced on a circumference (40 degrees apart). How many different line segments can be drawn which connect any two of these nine points?

- a) 72 b) 63 c) 54 d) 48 e) none of these

5. The measure of a positive acute angle is $(4x + 41)$ degrees. Find the **SUM** of all possible **INTEGER** values of x .

- a) 21 b) 23 c) 25 d) 27 e) none of these

6. If 360 gallons of an 18% acid solution are mixed with 360 gallons of a 10% acid solution, the result will be a 14% acid solution. How many **ADDITIONAL** gallons of the 18% acid solution should be added to this new 14% solution to create a 15% acid solution.

- a) 200 b) 240 c) 300 d) 360 e) none of these

7. Simplify: $\frac{(27a^3b^6)^{\frac{1}{3}}}{(81a^8b^{-4})^{\frac{1}{4}}}$.

- a) $\frac{b}{a}$ b) $\frac{b^3}{a}$ c) $\frac{a}{b}$ d) $\frac{a}{b^3}$ e) none of these

8. For all real $x \neq 0.5$, $\frac{5x^2 + 4x - 3}{2x - 1} = ax + b + \frac{R}{2x - 1}$. Find $a + b + R$.

- a) 4 b) 5 c) 6 d) 7 e) none of these

9. The area of a right triangle is x square units. The ratio of the legs is 1.875 to 1. The perimeter is 30. Find x .

- a) 34.5 b) 34.25 c) 34 d) 33.75 e) none of these

10. The vertices of a rectangle are (4, 3), (-2, 3), (-2, -8), and (4, -8). Find the probability that a point randomly selected from inside this rectangle will be in the first quadrant.

- a) $\frac{1}{11}$ b) $\frac{2}{11}$ c) $\frac{3}{16}$ d) $\frac{7}{66}$ e) none of these

11. Find $a + b$ where $x^a y^b = \sqrt{x^3 y^2} \left(\sqrt[4]{xy^3} \right)$ and x and y are both positive.

- a) 3 b) 3.25 c) 3.5 d) 3.75 e) none of these

12. Find $a + b + c$ where a , b , and c are positive integers and $2\sqrt{84} + \sqrt{\frac{3}{7}} - 2\sqrt{\frac{7}{3}} = \frac{a\sqrt{b}}{c}$.

Assume that the expression $\frac{a\sqrt{b}}{c}$ is fully reduced and is in simplest radical form.

- a) 115 b) 116 c) 117 d) 118 e) none of these

13. Find bc where $-1 \pm \sqrt{-3}$ are the two solutions of $x^2 = bx + c$.
a) 2 c) -2 d) -8 e) none of these
14. The distances passed over by a certain pendulum bob in succeeding swings form a geometric progression 24 inches, 20.4 inches, 17.34 inches, The total distance traversed by this bob before coming to rest is x inches. Find x .
a) 158 b) 158.5 c) 159 d) 159.5 e) none of these
15. Find the sum of all the positive integers which are multiples of three and which satisfy the inequality $136 \leq x < 750$.
a) 90274 b) 90272 c) 90270 d) 90268 e) none of these
16. How many positive integers BETWEEN 3000 and 5000 can be formed by using the 7 digits: 0, 1, 2, 3, 4, 5, and 6 if each digit must not be repeated in any one number?
a) 360 b) 320 c) 280 d) 240 e) none of these
17. A housing development has 24 3-bedroom homes and 12 4-bedroom homes. If 3 of these are chosen at random to be redecorated, what is the probability that all 3 will be 3-bedroom homes? Round your final answer to the nearest hundredth.
a) .20 b) .28 c) .33 d) .38 e) none of these
18. Find $a + b - c$ where $ax^b y^c$ is term number nine of $\left(\frac{x}{2} - 2y\right)^{12}$. Hint: The first two terms of this binomial expression are ${}_{12}C_0 \left(\frac{x}{2}\right)^{12} (-2y)^0$ and ${}_{12}C_1 \left(\frac{x}{2}\right)^{11} (-2y)^1$.
a) 7916 b) 7796 c) 228 d) 216 e) none of these

19. Find the x coordinate of the centroid of the region in the first quadrant bounded by $y = \sqrt{x}$, $x = 1$, $x = 9$, and the positive x -axis. Round your final answer to the nearest 0.001 unit.

- a) 5.585 b) 5.584 c) 5.583 d) 5.582 e) none of these

20. If 10, a , b , c , 20, ... is a harmonic progression, find $a + b + c$.

- a) $\frac{856}{23}$ b) $\frac{855}{23}$ c) $\frac{855}{21}$ d) $\frac{856}{21}$ e) none of these

21. The surface area of the sphere $x^2 + y^2 + z^2 = 100$ which is included between the planes $z = 2$ and $z = 10$ is x square units. Find x . Round your final answer to the nearest 0.001 unit.

- a) 502.655 b) 502.654 c) 502.653 d) 502.652 e) none of these

22. Find the distance from the point (4, 1, -2) to the line having parametric equations

$$\begin{cases} x = 2T + 2 \\ y = 2T \\ z = T - 3 \end{cases} \quad . \text{ Round your final answer to the nearest 0.001 unit.}$$

- a) 0.747 b) 0.746 c) 0.745 d) 0.744 e) none of these

23. $F(x) = \frac{d}{dx} \int_x^\pi \sqrt{3}y^{\sqrt{2}} dy$. Find $F(\sqrt{6})$. Round your final answer to the nearest 0.001 unit.

- a) -6.149 b) 6.149 c) -6.148 d) 6.148 e) none of these

24. The horizontal axis is marked in degrees. Find $a + b + c$ where one period of the sinusoid $y = a + b \sin c(x - 45^\circ)$ begins at $(45^\circ, 11)$ and ends at $(135^\circ, 11)$ with horizontal tangent lines at $(67.5^\circ, 16)$ and $(112.5^\circ, 6)$.

- a) 21.5 b) 21 c) 20.5 d) 20 e) none of these

Solutions

1. D
2. E
3. A
4. E
5. B
6. B
7. B
8. C
9. D
10. B
11. C
12. A
13. C
14. E
15. C
16. D
17. B
18. A
19. A
20. D
21. A
22. C
23. A
24. D