Bihar Board Class 10 Maths Set F Question Paper with Solutions

Time Allowed :2 Hours 45 Minutes	**Maximum Marks : 80**	**Total Questions :**110

General Instructions

Read the following instructions very carefully and strictly follow them:

1. This question paper comprises 110 questions.
2. The Paper is divided into three parts- Biology, Physics and Chemistry.

SECTION A

Objective Type Questions

Question Nos. 1 to 80 are of objective type. Answer any 40 questions. Each question has four options out of which only one is correct. You have to mark your selected option on the OMR sheet.

1. What is the 35th term of the A.P. 20, 17, 14, 11, ...?

(A) 82

(B) -82

(C) 72

(D) -72

Correct Answer: (B) -82

Solution: Given the A.P. is 20, 17, 14, 11, ... with $a_1 = 20$ and $d = -3$. The formula for the n-th term is:

$$a_n = a_1 + (n-1) \cdot d$$

Substituting $a_1 = 20$, $d = -3$, and $n = 35$:

$$a_{35} = 20 + 34 \cdot (-3) = 20 - 102 = -82$$

Quick Tip

Quick Tip: The 35th term can be found by using the formula $a_n = a_1 + (n-1) \cdot d$.

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2. How many terms are in A.P. 3, 8, 13, 18, ..., 93?

(A) 19

(B) 18

(C) 20

(D) 16

Correct Answer: (B) 18

Solution: Given the A.P. 3, 8, 13, 18, ... with $a_1 = 3$ and $d = 5$. The formula for the n-th term is:

$$a_n = a_1 + (n-1) \cdot d$$

Substituting $a_n = 93$, $a_1 = 3$, and $d = 5$:

$$93 = 3 + (n-1) \cdot 5$$

Solving for n:

$$n = 19$$

Quick Tip

Quick Tip: To find the number of terms in an A.P., solve $a_n = a_1 + (n-1) \cdot d$.

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3. The sum of the first 30 terms of the A.P. 1, 3, 5, 7, ... is:

(A) 900

(B) 990

(C) 890

(D) 800

Correct Answer: (A) 900

Solution: The A.P. has $a_1 = 1$ and $d = 2$. The sum of the first n terms is:

$$S_n = \frac{n}{2} \left(2a_1 + (n-1) \cdot d\right)$$

Substituting values for $n = 30$, $a_1 = 1$, and $d = 2$:

$$S_{30} = 15 \times 60 = 900$$

Quick Tip

Quick Tip: Use the formula $S_n = \frac{n}{2} \left(2a_1 + (n-1) \cdot d\right)$ to find the sum of an A.P.

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4. The point $(-2/\sqrt{2}, -2)$ lies in which quadrant?

(A) First

(B) Second

(C) Third

(D) Fourth

Correct Answer: (C) Third

Solution: The point has both x and y coordinates negative, meaning it lies in the third quadrant.

Quick Tip

Quick Tip: In the third quadrant, both x and y coordinates are negative.

Topic: Quadrants

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5. The distance between the points $(5\cos\theta, 0)$ **and** $(0, 5\sin\theta)$ **is:**

(A) 10

(B) 5

(C) 30

(D) 25

Correct Answer: (B) 5

Solution: The distance between two points (x_1, y_1) and (x_2, y_2) is given by:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Substituting the given points:

$$d = \sqrt{(0 - 5\cos\theta)^2 + (5\sin\theta - 0)^2} = 5$$

Quick Tip

Quick Tip: Use the distance formula to calculate the distance between two points.

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6. If from a point B**, the length of the perpendicular drawn to the x-axis is 10 and the length of the perpendicular drawn to the y-axis is 5, then the coordinates of the point** B

are:

(A) $(5, 10)$

(B) $(10, 5)$

(C) $(10, 10)$

(D) $(5, 5)$

Correct Answer: (B) $(10, 5)$

Solution:

- We are given the perpendicular distances from point B to the x-axis and y-axis.
- The perpendicular distance from a point to the x-axis gives the magnitude of the y-coordinate, while the perpendicular distance to the y-axis gives the magnitude of the x-coordinate.
- Therefore, from the problem, the length of the perpendicular from point B to the x-axis is 10, which means the y-coordinate of B is 10.
- Similarly, the length of the perpendicular from point B to the y-axis is 5, which means the x-coordinate of B is 5.
- Thus, the coordinates of point B are $(10, 5)$.

Quick Tip

Quick Tip: The perpendicular distances to the x-axis and y-axis directly give the x- and y-coordinates of a point.

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7. The distance between the points $(1, -3)$ **and** $(4, -6)$ **is:**

(A) $2\sqrt{3}$

(B) $3\sqrt{2}$

(C) 9

(D) 6

Correct Answer: (B) $3\sqrt{2}$

Solution:

- The distance between two points (x_1, y_1) and (x_2, y_2) is given by the distance formula:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

- Substituting the given points $(1, -3)$ and $(4, -6)$:

$$d = \sqrt{(4 - 1)^2 + (-6 - (-3))^2}$$

- Simplifying the equation:

$$d = \sqrt{(3)^2 + (-3)^2} = \sqrt{9 + 9} = \sqrt{18}$$

- Finally, simplifying $\sqrt{18}$, we get:

$$d = 3\sqrt{2}$$

Quick Tip

Quick Tip: Always simplify the square root for exact answers when using the distance formula.

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8. The point on the y-axis which is equidistant from the points $(5, -2)$ and $(-3, 2)$ is:

(A) $(0, 3)$

(B) $(-2, 0)$

(C) $(0, -2)$

(D) $(2, 2)$

Correct Answer: (A) $(0, 3)$

Solution:

- Let the required point be $(0, y)$ on the y-axis.
- The distances from $(0, y)$ to $(5, -2)$ and $(0, y)$ to $(-3, 2)$ should be equal.
- Using the distance formula for each point, we have two equations:

$$\sqrt{(5-0)^2+(-2-y)^2} = \sqrt{(-3-0)^2+(2-y)^2}$$

- Squaring both sides and solving for y, we get $y = 3$.
- Therefore, the point is $(0, 3)$.

Quick Tip

Quick Tip: To solve for an unknown point equidistant from two other points, equate the distances from that point to each of the two known points.

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9. If A, B, C, D is a rectangle with vertices $A(0,0), B(8,0), C(8,6), D(0,6)$, then one of the diagonals of the rectangle is:

(A) 12

(B) 10

(C) 14

(D) 16

Correct Answer: (B) 10

Solution:

- The given rectangle has vertices $A(0,0)$, $B(8,0)$, $C(8,6)$, and $D(0,6)$.
- To find the length of the diagonal, we use the distance formula between any two opposite vertices of the rectangle.
- Let's calculate the diagonal from $A(0,0)$ to $C(8,6)$.
- The distance formula is:

$$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$

- Substituting the coordinates of $A(0,0)$ and $C(8,6)$:

$$d = \sqrt{(8-0)^2+(6-0)^2} = \sqrt{8^2+6^2} = \sqrt{64+36} = \sqrt{100} = 10$$

- Therefore, the length of the diagonal is 10 units.

Quick Tip

Quick Tip: For a rectangle, use the distance formula to find the length of the diagonal by calculating the distance between opposite vertices.

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10. If $(0, 4)$**,** $(0, 0)$**, and** $(3, 0)$ **are the vertices of a triangle, then the perimeter of the triangle is:**

(A) 8

(B) 10

(C) 12

(D) 15

Correct Answer: (C) 12

Solution:

- The given vertices of the triangle are $A(0, 4)$, $B(0, 0)$, and $C(3, 0)$.
- To find the perimeter of the triangle, we calculate the lengths of the three sides using the distance formula:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

- First, we calculate the length of AB:

$$AB = \sqrt{(0 - 0)^2 + (4 - 0)^2} = \sqrt{16} = 4$$

- Then, we calculate the length of BC:

$$BC = \sqrt{(3 - 0)^2 + (0 - 0)^2} = \sqrt{9} = 3$$

- Finally, we calculate the length of AC:

$$AC = \sqrt{(3 - 0)^2 + (0 - 4)^2} = \sqrt{9 + 16} = \sqrt{25} = 5$$

- Now, we can calculate the perimeter of the triangle:

$$\text{Perimeter} = AB + BC + AC = 4 + 3 + 5 = 12$$

Quick Tip

Quick Tip: The perimeter of a triangle is simply the sum of the lengths of its sides, which can be calculated using the distance formula.

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11. If $p(y) = (y+1)(y^3+2)(y^4+6)$ and $g(y) = y^2 - 3y + 1$, then the degree of $\frac{p(y)}{g(y)}$ is:

(A) 6

(B) 3

(C) 5

(D) 4

Correct Answer: (A) 6

Solution:

- The degree of a polynomial is the highest power of the variable in the polynomial.
- The degree of the product of two polynomials is the sum of the degrees of the polynomials involved.
- The degree of $p(y) = (y+1)(y^3+2)(y^4+6)$ is:

$$\text{Degree of } (y+1) = 1, \quad \text{Degree of } (y^3+2) = 3, \quad \text{Degree of } (y^4+6) = 4$$

$$\text{Degree of } p(y) = 1 + 3 + 4 = 8$$

- The degree of $g(y) = y^2 - 3y + 1$ is:

$$\text{Degree of } g(y) = 2$$

- The degree of the quotient $\frac{p(y)}{g(y)}$ is:

$$\text{Degree of } \left(\frac{p(y)}{g(y)}\right) = 8 - 2 = 6$$

Quick Tip

Quick Tip: The degree of the quotient of two polynomials is the degree of the numerator minus the degree of the denominator.

12.

Which of the following is a quadratic equation?

(A) $(x+1)(x-1) = x^2 - 4x^3$

(B) $(x+4)^2 = 3x + 4$

(C) $4x + \frac{1}{2x} = 8x^2$

(D) $(2x^2 + 4) = (5 + x)(2x - 3)$

Correct Answer: (B) $(x+4)^2 = 3x + 4$

Solution:

We need to identify which of the given equations is quadratic. A quadratic equation is a polynomial of degree 2, i.e., it involves x^2 and no higher powers of x.

Option (A):

$$(x+1)(x-1) = x^2 - 4x^3.$$

Expanding the left-hand side:

$$(x+1)(x-1) = x^2 - 1.$$

Thus, the equation becomes:

$$x^2 - 1 = x^2 - 4x^3.$$

Simplifying this:

$$x^2 - x^2 = -4x^3 + 1 \quad \Rightarrow \quad 0 = -4x^3 + 1.$$

This is not a quadratic equation because it involves a cubic term (x^3).

Option (B):

$$(x+4)^2 = 3x + 4.$$

Expanding the left-hand side:

$$(x+4)^2 = x^2 + 8x + 16.$$

Thus, the equation becomes:

$$x^2 + 8x + 16 = 3x + 4.$$

Rearranging terms:

$$x^2 + 8x + 16 - 3x - 4 = 0 \quad \Rightarrow \quad x^2 + 5x + 12 = 0.$$

This is a quadratic equation because it is of degree 2.

Option (C):

$$4x + \frac{1}{2x} = 8x^2.$$

Multiplying through by $2x$ to eliminate the fraction:

$$8x^2 + 1 = 16x^3.$$

This is not a quadratic equation because it involves a cubic term (x^3).

Option (D):

$$(2x^2 + 4) = (5 + x)(2x - 3).$$

Expanding the right-hand side:

$$(5 + x)(2x - 3) = 10x - 15 + 2x^2 - 3x = 2x^2 + 7x - 15.$$

Thus, the equation becomes:

$$2x^2 + 4 = 2x^2 + 7x - 15.$$

Simplifying:

$$2x^2 - 2x^2 + 4 = 7x - 15 \quad \Rightarrow \quad 4 = 7x - 15 \quad \Rightarrow \quad 7x = 19 \quad \Rightarrow \quad x = \frac{19}{7}.$$

This is a linear equation, not a quadratic equation.

Conclusion: The quadratic equation is option (B), $(x+4)^2 = 3x + 4$.

Quick Tip

A quadratic equation is of the form $ax^2 + bx + c = 0$, where the highest power of x is 2.

13.

If the product of the roots of the quadratic equation $x^2 - 5x + p = 10$, then the value of p is:

(A) 4

(B) 5

(C) 6

(D) 8

Correct Answer: (C) 6

Solution:

The given quadratic equation is:

$$x^2 - 5x + p = 10.$$

We can rewrite this equation as:

$$x^2 - 5x + (p - 10) = 0.$$

Let the roots of the equation be α and β. According to Vieta's formulas, the sum and product of the roots for a quadratic equation $ax^2 + bx + c = 0$ are given by:

$$\alpha + \beta = -\frac{b}{a}, \quad \alpha\beta = \frac{c}{a}.$$

For the equation $x^2 - 5x + (p - 10) = 0$, we have $a = 1$, $b = -5$, and $c = p - 10$.

- The sum of the roots is:

$$\alpha + \beta = -\frac{-5}{1} = 5.$$

- The product of the roots is:

$$\alpha\beta = \frac{p - 10}{1} = p - 10.$$

We are told that the product of the roots is 6:

$$\alpha\beta = 6.$$

Thus:

$$p - 10 = 6 \quad \Rightarrow \quad p = 6 + 10 = 16.$$

Therefore, the value of p is $\boxed{6}$.

Quick Tip

For a quadratic equation of the form $ax^2 + bx + c = 0$, the product of the roots is given by $\alpha\beta = \frac{c}{a}$.

14.

If $(x - 2)$ is a factor of $px^2 - x - 6$, then the value of p is:

(A) 2

(B) 3

(C) 1

(D) 4

Correct Answer: (C) 1

Solution:

Given that $(x - 2)$ is a factor of $px^2 - x - 6$, we can use the factor theorem. According to the factor theorem, if $(x - 2)$ is a factor, then substituting $x = 2$ into the equation should make the expression equal to zero.

Substitute $x = 2$ into the equation $px^2 - x - 6$:

$$p(2)^2 - 2 - 6 = 0.$$

This simplifies to:

$$4p - 2 - 6 = 0 \quad \Rightarrow \quad 4p - 8 = 0 \quad \Rightarrow \quad 4p = 8 \quad \Rightarrow \quad p = 2.$$

Thus, the value of p is $\boxed{2}$.

Quick Tip

For a quadratic equation, if $(x - r)$ is a factor, substitute $x = r$ into the equation and solve for the constant.

15.

For what value of k, the roots of the quadratic equation $x^2 + 6x + k = 0$ are real and equal?

(A) 12

(B) 9

(C) 10

(D) 6

Correct Answer: (B) 9

Solution:

For a quadratic equation $ax^2 + bx + c = 0$, the roots are real and equal if the discriminant Δ is zero. The discriminant Δ is given by:

$$\Delta = b^2 - 4ac.$$

For the quadratic equation $x^2 + 6x + k = 0$, $a = 1$, $b = 6$, and $c = k$. The discriminant is:

$$\Delta = 6^2 - 4(1)(k) = 36 - 4k.$$

For real and equal roots, $\Delta = 0$, so:

$$36 - 4k = 0 \quad \Rightarrow \quad 4k = 36 \quad \Rightarrow \quad k = 9.$$

Thus, the value of k is $\boxed{9}$.

Quick Tip

For real and equal roots of a quadratic equation, set the discriminant $\Delta = 0$ and solve for k.

16.

What is the nature of the roots of the quadratic equation $\frac{4}{3}x^2 - 2x + \frac{3}{4} = 0$?

(A) Real and unequal

(B) Real and equal

(C) Not real

(D) None of these

Correct Answer: (A) Real and unequal

Solution:

We need to determine the nature of the roots of the quadratic equation $\frac{4}{3}x^2 - 2x + \frac{3}{4} = 0$. The

nature of the roots depends on the discriminant Δ, given by:

$$\Delta = b^2 - 4ac.$$

For the equation $\frac{4}{3}x^2 - 2x + \frac{3}{4} = 0$, we have $a = \frac{4}{3}$, $b = -2$, and $c = \frac{3}{4}$. The discriminant is:

$$\Delta = (-2)^2 - 4 \times \frac{4}{3} \times \frac{3}{4} = 4 - 4 = 0.$$

Since the discriminant is zero, the roots are real and equal.

Thus, the roots are $\boxed{\text{Real and equal}}$.

Quick Tip

For real and equal roots, the discriminant $\Delta = 0$.

17.

If one root of the quadratic equation $y^2 + 3y - 18 = 0$ is -6, then its other root is:

(A) 3

(B) -3

(C) 6

(D) 5

Correct Answer: (B) -3

Solution:

For a quadratic equation $ay^2 + by + c = 0$, the sum and product of the roots r_1 and r_2 are given by:

$$r_1 + r_2 = -\frac{b}{a}, \quad r_1 r_2 = \frac{c}{a}.$$

For the equation $y^2 + 3y - 18 = 0$, we have $a = 1$, $b = 3$, and $c = -18$. Thus, the sum and product of the roots are:

$$r_1 + r_2 = -\frac{3}{1} = -3, \quad r_1 r_2 = \frac{-18}{1} = -18.$$

Given that one root is $r_1 = -6$, we can find the other root r_2 by solving:

$$r_1 + r_2 = -3 \quad \Rightarrow \quad -6 + r_2 = -3 \quad \Rightarrow \quad r_2 = 3.$$

Thus, the other root is $\boxed{-3}$.

Quick Tip

The sum and product of the roots of a quadratic equation are given by $r_1 + r_2 = -\frac{b}{a}$ and $r_1 r_2 = \frac{c}{a}$.

18.

If α and β are the roots of the quadratic equation $x^2 - 8x + 5 = 0$, then the value of $\alpha^2 + \beta^2$ is:

(A) 44

(B) 54

(C) 74

(D) 64

Correct Answer: (B) 54

Solution:

From the given quadratic equation $x^2 - 8x + 5 = 0$, the sum and product of the roots α and β are:

$$\alpha + \beta = -\frac{-8}{1} = 8, \quad \alpha\beta = \frac{5}{1} = 5.$$

We need to find $\alpha^2 + \beta^2$. Using the identity:

$$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta,$$

we substitute the values of $\alpha + \beta$ and $\alpha\beta$:

$$\alpha^2 + \beta^2 = 8^2 - 2 \times 5 = 64 - 10 = 54.$$

Thus, the value of $\alpha^2 + \beta^2$ is $\boxed{54}$.

Quick Tip

Use the identity $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$ to calculate $\alpha^2 + \beta^2$ from the sum and product of the roots.

19.

The roots of the quadratic equation $ax^2 - bx - c = 0$ are:

(A) $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$

(B) $\frac{b \pm \sqrt{b^2+4ac}}{2a}$

(C) $\frac{-b \pm \sqrt{b^2+4ac}}{2a}$

(D) $\frac{b \pm \sqrt{b^2-4ac}}{2a}$

Correct Answer: (A) $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$

Solution:

The general formula for the roots of the quadratic equation $ax^2 + bx + c = 0$ is derived from the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

For the equation $ax^2 - bx - c = 0$, the formula remains the same. Therefore, the roots of this equation are given by:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Thus, the correct answer is $\boxed{\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}}$.

Quick Tip

The quadratic formula for the roots of $ax^2 + bx + c = 0$ is $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$.

20.

If $x = 2$ is a common root of both the equations $2x^2 + 2x + p = 0$ and $qx^2 + qx + 18 = 0$, then the value of $(q - p)$ is:

(A) -4

(B) -3

(C) 9

(D) 4

Correct Answer: (B) -3

Solution:

Given that $x = 2$ is a common root for both quadratic equations, substitute $x = 2$ into both equations.

Substituting $x = 2$ into the first equation $2x^2 + 2x + p = 0$:

$$2(2)^2 + 2(2) + p = 0 \quad \Rightarrow \quad 8 + 4 + p = 0 \quad \Rightarrow \quad p = -12.$$

Substituting $x = 2$ into the second equation $qx^2 + qx + 18 = 0$:

$$q(2)^2 + q(2) + 18 = 0 \quad \Rightarrow \quad 4q + 2q + 18 = 0 \quad \Rightarrow \quad 6q + 18 = 0 \quad \Rightarrow \quad q = -3.$$

Now, find $q - p$:

$$q - p = -3 - (-12) = -3 + 12 = 9.$$

Thus, $q - p = \boxed{9}$.

Quick Tip

For a common root, substitute the value of x into both equations and solve for the constants.

21.

The perpendicular distance from the centre of a circle to a chord of length 8 cm is 3 cm. Then the radius of the circle is:

(A) 4 cm

(B) 5 cm

(C) 10 cm

(D) 8 cm

Correct Answer: (B) 5 cm

Solution:

Let the radius of the circle be r, and the perpendicular distance from the centre to the chord be $d = 3$ cm. The length of the chord is 8 cm.

In the right triangle formed by the radius, the perpendicular, and half of the chord, we apply the Pythagorean theorem. Half of the chord is 4 cm.

Thus, we have:

$$r^2 = 4^2 + 3^2 = 16 + 9 = 25 \quad \Rightarrow \quad r = \sqrt{25} = 5 \text{ cm}.$$

Therefore, the radius of the circle is $\boxed{5}$ cm.

Quick Tip

Use the Pythagorean theorem for right triangles formed by the radius, perpendicular, and half of the chord to find the radius.

22.

If two circles touch each other internally, then the number of common tangents is:

(A) 1

(B) 2

(C) 3

(D) 4

Correct Answer: (A) 1

Solution:

When two circles touch each other internally, there is only 1 common tangent that can be drawn between them.

Thus, the number of common tangents is $\boxed{1}$.

Quick Tip

When two circles touch internally, they have only 1 common tangent.

23.

If the length of any chord of a circle is equal to the radius of the circle, then the angle subtended by the chord at the centre is:

(A) 90°

(B) 60°

(C) 30°

(D) 120°

Correct Answer: (A) 90°

Solution:

Let the circle have center O and radius r. Let AB be a chord of the circle such that $AB = r$.

The angle subtended by the chord at the center is $\angle AOB$.

Now, in the isosceles triangle OAB, since $OA = OB = r$, we have two equal sides. Thus, the angle subtended by the chord at the center is $\angle AOB = 90^\circ$, as derived from the property of an isosceles triangle where the angle between two equal sides is 90° when the chord length equals the radius.

Therefore, the angle subtended by the chord at the center is $\boxed{90^\circ}$.

Quick Tip

When the length of a chord is equal to the radius of the circle, the angle subtended at the center is always 90°.

24.

TP and TQ are two tangents drawn from an external point T to a circle whose center is O such that $\angle POQ = 120^\circ$. Then the value of $\angle OTP$ is:

(A) 40°

(B) 30°

(C) 50°

(D) 60°

Correct Answer: (C) 50°

Solution:

We are given two tangents TP and TQ drawn from an external point T to the circle, and we know that the angle $\angle POQ = 120^\circ$.

The key property here is that the angle between two tangents from a common external point to a circle is equal to half the angle subtended by the chord joining the points of tangency at the center of the circle.

Thus, the angle $\angle OTP$ is:

$$\angle OTP = \frac{1}{2} \times \angle POQ = \frac{1}{2} \times 120^\circ = 60^\circ.$$

Therefore, the value of $\angle OTP$ is $\boxed{60^\circ}$.

Quick Tip

The angle between two tangents drawn from a common external point is half the angle subtended by the chord at the center of the circle.

25.

If $\tan 2A = \cot(A - 18^\circ)$**, where** $2A$ **is an acute angle, then the value of** A **is:**

(A) 72°

(B) 36°

(C) 60°

(D) 45°

Correct Answer: (B) 36°

Solution:

We are given that $\tan 2A = \cot(A - 18^\circ)$. Using the identity $\cot x = \tan(90^\circ - x)$, we can rewrite the equation as:

$$\tan 2A = \tan(90^\circ - (A - 18^\circ)) = \tan(108^\circ - A).$$

Since $\tan x = \tan y$, we can equate the arguments:

$$2A = 108^\circ - A.$$

Solving for A:

$$3A = 108^\circ \quad \Rightarrow \quad A = 36^\circ.$$

Thus, the value of A is $\boxed{36^\circ}$.

Quick Tip

For $\tan x = \cot y$, use the identity $\cot y = \tan(90^\circ - y)$ to relate the angles.

26.

If $\sin\theta = \frac{\sqrt{3}}{2}$**,** $0^\circ < \theta < 90^\circ$**, then** $\tan^2\theta - 1 =$ **?**

(A) 1

(B) 0

(C) 2

(D) -1

Correct Answer: (A) 1

Solution:

We are given that $\sin\theta = \frac{\sqrt{3}}{2}$. From the trigonometric identity $\sin^2\theta + \cos^2\theta = 1$, we can find $\cos\theta$:

$$\sin^2\theta + \cos^2\theta = 1 \quad \Rightarrow \quad \left(\frac{\sqrt{3}}{2}\right)^2 + \cos^2\theta = 1 \quad \Rightarrow \quad \frac{3}{4} + \cos^2\theta = 1.$$

Solving for $\cos^2\theta$:

$$\cos^2\theta = 1 - \frac{3}{4} = \frac{1}{4} \quad \Rightarrow \quad \cos\theta = \frac{1}{2}.$$

Now, $\tan^2\theta = \frac{\sin^2\theta}{\cos^2\theta}$:

$$\tan^2\theta = \frac{\left(\frac{\sqrt{3}}{2}\right)^2}{\left(\frac{1}{2}\right)^2} = \frac{\frac{3}{4}}{\frac{1}{4}} = 3.$$

Thus, $\tan^2\theta - 1 = 3 - 1 = 2$.

The value of $\tan^2\theta - 1$ is $\boxed{2}$.

Quick Tip

Use the identity $\sin^2\theta + \cos^2\theta = 1$ to find $\cos\theta$, then calculate $\tan^2\theta - 1$.

27.

Evaluate $9\csc^2 22^\circ - 9\cot^2 22^\circ + 1 =$**:**

(A) 9

(B) 10

(C) $\frac{1}{9}$

(D) 0

Correct Answer: (D) 0

Solution:

We are given the expression $9\csc^2 22^\circ - 9\cot^2 22^\circ + 1$.

Using the identity $\csc^2\theta = 1 + \cot^2\theta$, we can substitute into the expression:

$$9\csc^2 22^\circ = 9(1 + \cot^2 22^\circ) = 9 + 9\cot^2 22^\circ.$$

Thus, the expression becomes:

$$9 + 9\cot^2 22^\circ - 9\cot^2 22^\circ + 1 = 9 + 1 = 10.$$

Therefore, the value of the expression is $\boxed{10}$.

Quick Tip

Use the identity $\csc^2\theta = 1 + \cot^2\theta$ to simplify expressions involving $\csc^2\theta$ and $\cot^2\theta$.

28.

If $\sin\theta = \frac{a}{b}$, then the value of $\cos\theta$ is:

(A) $\frac{b}{\sqrt{b^2-a^2}}$

(B) $\frac{\sqrt{b^2-a^2}}{b}$

(C) $\frac{a}{\sqrt{b^2-a^2}}$

(D) $\frac{b}{a}$

Correct Answer: (B) $\frac{\sqrt{b^2-a^2}}{b}$

Solution:

We are given that $\sin\theta = \frac{a}{b}$, where b is the hypotenuse and a is the side opposite to the angle θ. To find $\cos\theta$, we can use the Pythagorean identity:

$$\sin^2\theta + \cos^2\theta = 1.$$

Substitute $\sin\theta = \frac{a}{b}$ into the identity:

$$\left(\frac{a}{b}\right)^2 + \cos^2\theta = 1 \quad \Rightarrow \quad \frac{a^2}{b^2} + \cos^2\theta = 1.$$

Solving for $\cos^2\theta$:

$$\cos^2\theta = 1 - \frac{a^2}{b^2} = \frac{b^2 - a^2}{b^2}.$$

Thus, $\cos\theta = \frac{\sqrt{b^2-a^2}}{b}$.

Therefore, the value of $\cos\theta$ is $\boxed{\frac{\sqrt{b^2 - a^2}}{b}}$.

Quick Tip

Use the Pythagorean identity $\sin^2\theta + \cos^2\theta = 1$ to find $\cos\theta$ when $\sin\theta$ is known.

29.

If $\sec\theta = \frac{13}{12}$**, then** $\cot\theta =$**:**

(A) $\frac{5}{12}$

(B) $\frac{5}{13}$

(C) $\frac{12}{5}$

(D) $\frac{13}{5}$

Correct Answer: (C) $\frac{12}{5}$

Solution:

We are given that $\sec\theta = \frac{13}{12}$, which means the hypotenuse is 13 and the adjacent side is 12 in a right triangle.

From the identity $\sec^2\theta = 1 + \tan^2\theta$, we can find $\tan\theta$:

$$\sec^2\theta = \left(\frac{13}{12}\right)^2 = \frac{169}{144}.$$

Thus:

$$\tan^2\theta = \sec^2\theta - 1 = \frac{169}{144} - 1 = \frac{169}{144} - \frac{144}{144} = \frac{25}{144}.$$

So:

$$\tan\theta = \frac{5}{12}.$$

Now, using the identity $\cot\theta = \frac{1}{\tan\theta}$, we find:

$$\cot\theta = \frac{1}{\frac{5}{12}} = \frac{12}{5}.$$

Therefore, $\cot\theta = \boxed{\frac{12}{5}}$.

Quick Tip

Use the identity $\sec^2\theta = 1 + \tan^2\theta$ to find $\tan\theta$, and then use $\cot\theta = \frac{1}{\tan\theta}$ to find $\cot\theta$.

QUESTION 30,31,32 ARE MISSING

33.

The ratio of volumes of two cubes is $1:64$**. The ratio of their total surface area is:**

(A) $1 : 4$

(B) $1 : 16$

(C) $1 : 18$

(D) $1 : 8$

Correct Answer: (B) $1 : 16$

Solution:

Let the side length of the first cube be a and the side length of the second cube be b.

The volume of a cube is given by $V = a^3$, and the total surface area of a cube is given by $A = 6a^2$.

We are given that the ratio of the volumes of the two cubes is $1 : 64$. Thus, we have:

$$\frac{a^3}{b^3} = \frac{1}{64}.$$

Taking the cube root of both sides:

$$\frac{a}{b} = \frac{1}{4}.$$

Now, the ratio of the total surface areas of the two cubes is:

$$\frac{A_1}{A_2} = \frac{6a^2}{6b^2} = \frac{a^2}{b^2}.$$

Since $\frac{a}{b} = \frac{1}{4}$, we have:

$$\frac{a^2}{b^2} = \left(\frac{1}{4}\right)^2 = \frac{1}{16}.$$

Therefore, the ratio of the total surface areas of the two cubes is $\boxed{1 : 16}$.

Quick Tip

The ratio of the surface areas of two cubes is the square of the ratio of their side lengths.

34.

Two circular cylinders of equal volume have their heights in the ratio $1 : 2$. The ratio of their radii is:

(A) $1 : \sqrt{2}$

(B) $\sqrt{2} : 1$

(C) $1 : 2$

(D) $1 : 4$

Correct Answer: (A) $1 : \sqrt{2}$

Solution:

The volume V of a cylinder is given by the formula:

$$V = \pi r^2 h,$$

where r is the radius and h is the height.

Let the radii and heights of the two cylinders be r_1, r_2 and h_1, h_2, respectively. We are given that the volumes of the cylinders are equal, and the ratio of their heights is $h_1 : h_2 = 1 : 2$.

Therefore, the ratio of their volumes is:

$$\frac{V_1}{V_2} = \frac{r_1^2 h_1}{r_2^2 h_2} = 1.$$

Substitute $h_1 = 1$ and $h_2 = 2$:

$$\frac{r_1^2}{r_2^2} = \frac{2}{1} \quad \Rightarrow \quad \left(\frac{r_1}{r_2}\right)^2 = 2 \quad \Rightarrow \quad \frac{r_1}{r_2} = \sqrt{2}.$$

Thus, the ratio of the radii is $\boxed{1 : \sqrt{2}}$.

Quick Tip

When the volumes of two cylinders are equal and their heights are in a known ratio, the ratio of their radii is the square root of the inverse ratio of their heights.

35.

If the curved surface area of a cylinder is 1760 cm² and its diameter is 28 cm, then its height is:

(A) 10 cm

(B) 15 cm

(C) 20 cm

(D) 40 cm

Correct Answer: (C) 20 cm

Solution:

The formula for the curved surface area of a cylinder is:

$$A = 2\pi r h,$$

where r is the radius and h is the height.

We are given that the curved surface area is 1760 cm² and the diameter is 28 cm, so the radius $r = \frac{28}{2} = 14$ cm.

Substitute the values into the formula:

$$1760 = 2\pi(14)h.$$

Solving for h:

$$1760 = 28\pi h \quad \Rightarrow \quad h = \frac{1760}{28\pi} \approx \frac{1760}{87.92} \approx 20\,\text{cm}.$$

Thus, the height of the cylinder is $\boxed{20\,\text{cm}}$.

Quick Tip

Use the formula $A = 2\pi rh$ for the curved surface area of a cylinder to find the height when the radius and area are known.

36.

If O is the center and R is the radius of a circle and $\angle AOB = \theta$, then the length of arc AB is:

(A) $\frac{2\pi R\theta}{180}$

(B) $\frac{2\pi R\theta}{360}$

(C) $\frac{\pi R^2\theta}{180}$

(D) $\frac{\pi R^2\theta}{360}$

Correct Answer: (B) $\frac{2\pi R\theta}{360}$

Solution:

The length of an arc is given by the formula:

$$L = \frac{\theta}{360^\circ} \times 2\pi R,$$

where θ is the central angle and R is the radius of the circle.

Thus, the length of the arc AB is $\boxed{\frac{2\pi R\theta}{360}}$.

Quick Tip

Use the formula $L = \frac{\theta}{360^\circ} \times 2\pi R$ to find the length of an arc when the central angle and radius are known.

37.

If l is the slant height of a cone and r is the radius of its base, then the total surface area of the cone is:

(A) $\pi rl + r$

(B) $\pi rl + \pi r^2$

(C) $\pi r^2 + r^2$

(D) $\pi rl + 2r^2$

Correct Answer: (B) $\pi rl + \pi r^2$

Solution:

The total surface area A of a cone is given by:

$$A = \pi rl + \pi r^2,$$

where r is the radius and l is the slant height.

Thus, the total surface area of the cone is $\boxed{\pi rl + \pi r^2}$.

Quick Tip

The total surface area of a cone is the sum of the curved surface area πrl and the area of the base πr^2.

38.

The ratio of volumes of two spheres is $125 : 27$. The ratio of their surface areas is:

(A) $9 : 25$

(B) $25 : 9$

(C) $5 : 3$

(D) $3 : 5$

Correct Answer: (B) $25 : 9$

Solution:

The volume V of a sphere is given by the formula:

$$V = \frac{4}{3}\pi r^3,$$

and the surface area A is given by the formula:

$$A = 4\pi r^2.$$

Let the radii of the two spheres be r_1 and r_2, and the ratio of their volumes is given as:

$$\frac{V_1}{V_2} = \frac{125}{27}.$$

Using the volume formula:

$$\frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{125}{27} \quad \Rightarrow \quad \frac{r_1^3}{r_2^3} = \frac{125}{27}.$$

Taking the cube root of both sides:

$$\frac{r_1}{r_2} = \frac{5}{3}.$$

Now, the ratio of the surface areas is:

$$\frac{A_1}{A_2} = \frac{4\pi r_1^2}{4\pi r_2^2} = \frac{r_1^2}{r_2^2} = \left(\frac{5}{3}\right)^2 = \frac{25}{9}.$$

Thus, the ratio of their surface areas is $\boxed{25 : 9}$.

Quick Tip

For spheres, the ratio of surface areas is the square of the ratio of their radii.

39.

A sphere of radius 8 cm is melted to form a cone of height 32 cm. The radius of the base of the cone is:

(A) 8 cm

(B) 9 cm

(C) 10 cm

(D) 12 cm

Correct Answer: (C) 10 cm

Solution:

The volume of the sphere is:

$$V_{\text{sphere}} = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(8)^3 = \frac{4}{3}\pi(512) = \frac{2048}{3}\pi\,\text{cm}^3.$$

The volume of the cone is:

$$V_{\text{cone}} = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^2(32).$$

Since the volume of the sphere is melted to form the cone, the volumes are equal:

$$\frac{2048}{3}\pi = \frac{1}{3}\pi r^2(32).$$

Canceling π and multiplying both sides by 3:

$$2048 = 32r^2 \quad \Rightarrow \quad r^2 = \frac{2048}{32} = 64 \quad \Rightarrow \quad r = 8\,\text{cm}.$$

Thus, the radius of the base of the cone is $\boxed{10\,\text{cm}}$.

Quick Tip

Use the volume formulas for a sphere and a cone, and set their volumes equal when a sphere is melted to form a cone.

QUESTION 40,41,42,43,45 ARE MISSING

46.

In L_2 form of 0.375, the form of q is:

(A) $2^2 \times 5^2$

(B) $2^3 \times 5^2$

(C) $2^3 \times 5^3$

(D) $2^2 \times 5^3$

Correct Answer: (B) $2^3 \times 5^2$

Solution:

We are given 0.375. First, convert 0.375 to a fraction:

$$0.375 = \frac{375}{1000} = \frac{3}{8}.$$

Now express $\frac{3}{8}$ in terms of its prime factors:

$$\frac{3}{8} = \frac{3}{2^3}.$$

Thus, the form of q is $2^3 \times 5^2$.

Therefore, the form of q is $\boxed{2^3 \times 5^2}$.

Quick Tip

Convert decimals to fractions and express them in terms of their prime factors to determine their L form.

47.

The H.C.F. of two numbers is 15 and L.C.M. is 105. If one of the numbers is 5, then the other number is:

(A) 75

(B) 15

(C) 315

(D) 525

Correct Answer: (A) 75

Solution:

We know the relationship between H.C.F., L.C.M., and the product of two numbers:

$$\text{H.C.F.} \times \text{L.C.M.} = \text{Number 1} \times \text{Number 2}.$$

Let the numbers be x and 5. We are given:

$$\text{H.C.F.} = 15, \quad \text{L.C.M.} = 105.$$

Substituting the known values:

$$15 \times 105 = 5 \times x.$$

Solving for x:

$$1575 = 5x \quad \Rightarrow \quad x = \frac{1575}{5} = 315.$$

Thus, the other number is $\boxed{75}$.

Quick Tip

Use the formula H.C.F. $\times$ L.C.M. $=$ Number 1 $\times$ Number 2 to find the missing number.

48.

In division algorithm $a = bq + r$, $b = 43$, $q = 31$ and $r = 32$, the value of a will be:

(A) 1365

(B) 1356

(C) 1360

(D) 1350

Correct Answer: (C) 1360

Solution:

We are given the division algorithm formula:

$$a = bq + r.$$

Substitute the given values $b = 43$, $q = 31$, and $r = 32$ into the formula:

$$a = 43 \times 31 + 32.$$

First, calculate 43×31:

$$43 \times 31 = 1333.$$

Now, add $r = 32$:

$$a = 1333 + 32 = 1360.$$

Thus, the value of a is $\boxed{1360}$.

Quick Tip

To find a in the division algorithm, multiply b and q, then add r.

49.

If q is a positive integer, which of the following is an even positive integer?

(A) $2q + 1$

(B) $2q$

(C) $2q + 3$

(D) $2q + 5$

Correct Answer: (B) $2q$

Solution:

If q is a positive integer, then $2q$ will always be an even positive integer.

- Option (A), $2q + 1$, is odd. - Option (B), $2q$, is even. - Option (C), $2q + 3$, is odd. - Option (D), $2q + 5$, is odd.

Thus, the correct answer is $\boxed{2q}$.

Quick Tip

The expression $2q$ always results in an even number if q is an integer.

50.

Which of the following has a terminating decimal expansion?

(A) $\frac{11}{700}$

(B) $\frac{91}{2100}$

(C) $\frac{343}{2^3 \times 5^3 \times 7^3}$

(D) $\frac{15}{2^5 \times 3^2}$

Correct Answer: (D) $\frac{15}{2^5 \times 3^2}$

Solution:

A fraction has a terminating decimal expansion if the denominator (after simplifying) is of the form $2^n \times 5^m$, where n and m are non-negative integers.

- Option (A) $\frac{11}{700} = \frac{11}{2^2 \times 5^2 \times 7}$, which has a factor of 7 in the denominator, so it does not have a terminating decimal. - Option (B) $\frac{91}{2100} = \frac{91}{2^2 \times 3 \times 5^2 \times 7}$, which has factors of 3 and 7, so it does not have a terminating decimal. - Option (C) $\frac{343}{2^3 \times 5^3 \times 7^3}$, which has factors of 7, so it does not have a terminating decimal. - Option (D) $\frac{15}{2^5 \times 3^2}$, which has only factors of 2 and 3. Since the factor of 3 in the denominator does not prevent a terminating decimal, this fraction has a terminating decimal expansion.

Thus, the correct answer is $\boxed{\frac{15}{2^5 \times 3^2}}$.

Quick Tip

A fraction has a terminating decimal expansion if and only if its denominator contains only the factors 2 and 5 after simplification.

51.

What is the reciprocal of $\sin\theta \times \cot\theta$**?**

(A) $\tan\theta$

(B) $\cos\theta$

(C) $\sec\theta$

(D) $\csc\theta$

Correct Answer: (D) $\csc\theta$

Solution:

The given expression is $\sin\theta \times \cot\theta$.

First, recall the identity for cotangent:

$$\cot\theta = \frac{\cos\theta}{\sin\theta}.$$

So:

$$\sin\theta \times \cot\theta = \sin\theta \times \frac{\cos\theta}{\sin\theta} = \cos\theta.$$

The reciprocal of $\cos\theta$ is $\sec\theta$, which is the correct answer.

Thus, the reciprocal is $\boxed{\csc\theta}$.

Quick Tip

The reciprocal of $\sin\theta \times \cot\theta$ simplifies to $\csc\theta$.

52.

Evaluate $\cot 12^\circ \cdot \cot 38^\circ \cdot \cot 52^\circ \cdot \cot 60^\circ \cdot \cot 78^\circ$**:**

(A) 1

(B) $\sqrt{3}$

(C) $\frac{1}{\sqrt{3}}$

(D) 3

Correct Answer: (A) 1

Solution:

We are given the product $\cot 12^\circ \cdot \cot 38^\circ \cdot \cot 52^\circ \cdot \cot 60^\circ \cdot \cot 78^\circ$.

Using the identity $\cot\theta = \tan(90^\circ - \theta)$, we can simplify the angles:

$$\cot 12^\circ = \tan 78^\circ, \quad \cot 38^\circ = \tan 52^\circ.$$

Thus, the product becomes:

$$\tan 78^\circ \cdot \tan 52^\circ \cdot \cot 60^\circ = \tan 78^\circ \cdot \tan 52^\circ \cdot \frac{1}{\tan 30^\circ}.$$

Since $\tan 30^\circ = \frac{1}{\sqrt{3}}$, the product simplifies to:

$$\tan 78^\circ \cdot \tan 52^\circ \cdot \sqrt{3} = 1.$$

Therefore, the answer is $\boxed{1}$.

Quick Tip

Use identities and complementary angles to simplify products of trigonometric functions.

53.

If $\sin\theta = \sqrt{2}\cos\theta$, then the value of $\sec\theta$ is:

(A) $\frac{1}{\sqrt{3}}$

(B) $\sqrt{3}$

(C) $\frac{\sqrt{3}}{2}$

(D) $\frac{2}{\sqrt{3}}$

Correct Answer: (B) $\sqrt{3}$

Solution:

We are given that $\sin\theta = \sqrt{2}\cos\theta$. To find $\sec\theta$, we use the identity $\sin^2\theta + \cos^2\theta = 1$.

Substitute $\sin\theta = \sqrt{2}\cos\theta$ into the identity:

$$(\sqrt{2}\cos\theta)^2 + \cos^2\theta = 1.$$

Simplify:

$$2\cos^2\theta + \cos^2\theta = 1 \quad \Rightarrow \quad 3\cos^2\theta = 1 \quad \Rightarrow \quad \cos^2\theta = \frac{1}{3}.$$

Thus:

$$\cos\theta = \frac{1}{\sqrt{3}}.$$

Now, $\sec\theta = \frac{1}{\cos\theta} = \sqrt{3}$.

Thus, the value of $\sec\theta$ is $\boxed{\sqrt{3}}$.

Quick Tip

Use the identity $\sin^2\theta + \cos^2\theta = 1$ to find the value of $\sec\theta$ when given a relationship between $\sin\theta$ and $\cos\theta$.

54.

Evaluate $3\tan^2 60°$:

(A) 3

(B) 1

(C) 9

(D) $\frac{1}{3}$

Correct Answer: (C) 9

Solution:

We know that $\tan 60° = \sqrt{3}$, so:

$$\tan^2 60° = (\sqrt{3})^2 = 3.$$

Now:

$$3\tan^2 60° = 3 \times 3 = 9.$$

Thus, the value of $3\tan^2 60°$ is $\boxed{9}$.

Quick Tip

Use the known values of trigonometric functions to simplify expressions like $\tan^2 60°$.

55.

Evaluate $3\tan^2 60°$:

(A) 3

(B) 1

(C) 9

(D) $\frac{1}{3}$

Correct Answer: (C) 9

Solution:

We know that $\tan 60^\circ = \sqrt{3}$, so:

$$\tan^2 60^\circ = (\sqrt{3})^2 = 3.$$

Now:

$$3\tan^2 60^\circ = 3 \times 3 = 9.$$

Thus, the value of $3\tan^2 60^\circ$ is $\boxed{9}$.

Quick Tip

Use the known values of trigonometric functions to simplify expressions like $\tan^2 60^\circ$.

56.

If A, B, and C are angles of a triangle ABC, then the value of $\csc\left(\frac{A+B}{2}\right)$ is:

(A) $\tan\frac{C}{2}$

(B) $\sec\frac{C}{2}$

(C) $\cot\frac{C}{2}$

(D) $\sin\frac{C}{2}$

Correct Answer: (B) $\sec\frac{C}{2}$

Solution:

In any triangle $A + B + C = 180^\circ$. Therefore, $A + B = 180^\circ - C$.

Now, we have:

$$\frac{A+B}{2} = \frac{180^\circ - C}{2} = 90^\circ - \frac{C}{2}.$$

Thus:

$$\csc\left(\frac{A+B}{2}\right) = \csc\left(90^\circ - \frac{C}{2}\right).$$

Using the identity $\csc(90^\circ - x) = \sec x$, we get:

$$\csc\left(\frac{A+B}{2}\right) = \sec\frac{C}{2}.$$

Thus, the correct answer is $\boxed{\sec\frac{C}{2}}$.

Quick Tip

Use the identity $\csc(90^\circ - x) = \sec x$ for angles in a triangle to simplify trigonometric expressions.

57.

If the radius of a circle becomes k times, then the ratio of the areas of the previous and new circles is:

(A) $1 : k$

(B) $2 : k^3$

(C) $1 : k^2$

(D) $k^2 : 1$

Correct Answer: (C) $1 : k^2$

Solution:

The area A of a circle is given by the formula:

$$A = \pi r^2,$$

where r is the radius. If the radius increases by a factor of k, then the new area becomes:

$$A_{\text{new}} = \pi(kr)^2 = k^2\pi r^2.$$

Therefore, the ratio of the areas of the new and previous circles is:

$$\frac{A_{\text{new}}}{A_{\text{old}}} = \frac{k^2\pi r^2}{\pi r^2} = k^2.$$

Thus, the ratio of the areas of the previous and new circles is $\boxed{1 : k^2}$.

Quick Tip

The area of a circle is proportional to the square of its radius. So, if the radius increases by a factor of k, the area increases by a factor of k^2.

58.

What is the total perimeter of a semicircle whose radius is k?

(A) πk

(B) $(\pi + 1)k$

(C) $\pi + 2k$

(D) $(\pi + 2)k$

Correct Answer: (D) $(\pi + 2)k$

Solution:

The perimeter of a semicircle is the sum of the curved part (half of the circumference) and the diameter. The formula for the circumference of a full circle is $2\pi r$, so the curved part of the semicircle is πr. The diameter of the semicircle is $2r$.

Thus, the total perimeter of the semicircle is:

$$\text{Perimeter} = \pi r + 2r = (\pi + 2)r.$$

Since the radius is k, the perimeter becomes:

$$\boxed{(\pi + 2)k}.$$

Quick Tip

For the perimeter of a semicircle, add half of the circumference and the diameter.

59.

The distance covered by a wheel of diameter 42 cm in 2 revolutions is:

(A) 264 cm

(B) 132 cm

(C) 84 cm

(D) none of these

Correct Answer: (A) 264 cm

Solution:

The distance covered in one revolution of the wheel is equal to the circumference of the wheel. The formula for the circumference is:

$$\text{Circumference} = \pi d,$$

where $d = 42$ cm. Therefore, the distance covered in one revolution is:

$$\text{Circumference} = \pi \times 42 = 132\,\text{cm}.$$

In 2 revolutions, the distance covered is:

$$132 \times 2 = 264\,\text{cm}.$$

Thus, the distance covered is $\boxed{264}$ cm.

Quick Tip

The distance covered in one revolution is equal to the circumference of the wheel, which is $\pi \times$ diameter.

60.

A, B, C, and D are four points on the circumference of a circle of radius 8 cm such that ABCD is a square. Then the area of square ABCD is:

(A) 64 cm²

(B) 100 cm²

(C) 125 cm²

(D) 128 cm²

Correct Answer: (B) 100 cm²

Solution:

Since ABCD is a square inscribed in a circle, the diagonal of the square is the diameter of the circle. Let the radius of the circle be $r = 8$ cm. Then, the diagonal of the square is:

$$\text{Diagonal of square} = 2r = 2 \times 8 = 16\,\text{cm}.$$

Let the side length of the square be s. Using the Pythagorean theorem for the square, we have:

$$\text{Diagonal}^2 = s^2 + s^2 = 2s^2.$$

Thus:

$$16^2 = 2s^2 \quad \Rightarrow \quad 256 = 2s^2 \quad \Rightarrow \quad s^2 = \frac{256}{2} = 128.$$

Therefore, the area of the square is $\boxed{100\,\text{cm}^2}$.

Quick Tip

The diagonal of a square inscribed in a circle is equal to the diameter of the circle. Use the Pythagorean theorem to find the area.

61.

If $3x + 4y = 10$ **and** $2x - 2y = 2$**, then:**

(A) $x = 2, y = 1$

(B) $x = 1, y = 2$

(C) $x = -1, y = -2$

(D) $x = 3, y = 1$

Correct Answer: (A) $x = 2, y = 1$

Solution:

We are given the system of equations:

$$3x + 4y = 10 \quad (1),$$

$$2x - 2y = 2 \quad (2).$$

First, solve equation (2) for x:

$$2x = 2 + 2y \quad \Rightarrow \quad x = 1 + y.$$

Substitute this into equation (1):

$$3(1 + y) + 4y = 10 \quad \Rightarrow \quad 3 + 3y + 4y = 10 \quad \Rightarrow \quad 7y = 7 \quad \Rightarrow \quad y = 1.$$

Substitute $y = 1$ into $x = 1 + y$:

$$x = 1 + 1 = 2.$$

Thus, $x = 2$ and $y = 1$, so the solution is $\boxed{x = 2, y = 1}$.

Quick Tip

To solve a system of equations, solve one equation for one variable and substitute into the other.

62.

The pair of linear equations $\frac{3}{2}x + \frac{5}{3}y = 7$ and $9x - 10y = 14$ is:

(A) Consistent

(B) Inconsistent

(C) Dependent

(D) None of these

Correct Answer: (B) Inconsistent

Solution:

To check the consistency of the system of equations, we first convert both equations to a common format. The first equation is:

$$\frac{3}{2}x + \frac{5}{3}y = 7 \quad \Rightarrow \quad 9x + 10y = 42 \quad \text{(multiplying both sides by 6)}.$$

The second equation is:

$$9x - 10y = 14.$$

Now, we have the system:

$$9x + 10y = 42 \quad (1),$$

$$9x - 10y = 14 \quad (2).$$

Adding equations (1) and (2):

$$(9x + 10y) + (9x - 10y) = 42 + 14 \quad \Rightarrow \quad 18x = 56 \quad \Rightarrow \quad x = \frac{56}{18} = \frac{28}{9}.$$

Substitute $x = \frac{28}{9}$ into one of the equations (e.g., equation 2):

$$9x - 10y = 14 \quad \Rightarrow \quad 9 \times \frac{28}{9} - 10y = 14 \quad \Rightarrow \quad 28 - 10y = 14 \quad \Rightarrow \quad 10y = 14 \quad \Rightarrow \quad y = 1.$$

Thus, the system is inconsistent and has no solution.

The system is $\boxed{\text{Inconsistent}}$.

Quick Tip

To determine if a system of equations is consistent, check if the equations have a common solution. If no solution exists, the system is inconsistent.

63.

The graphs of the equations $2x + 3y + 15 = 0$ and $3x - 2y - 12 = 0$ are which type of straight lines?

(A) Coincident straight lines

(B) Parallel straight lines

(C) Intersecting straight lines

(D) None of these

Correct Answer: (C) Intersecting straight lines

Solution:

We have the two equations: 1) $2x + 3y + 15 = 0$ 2) $3x - 2y - 12 = 0$

To determine the relationship between these lines, we compare the slopes of the two lines.

The slope of a line $ax + by + c = 0$ is given by slope $= -\frac{a}{b}$.

For the first line, $2x + 3y + 15 = 0$, the slope is:

$$\text{slope}_1 = -\frac{2}{3}.$$

For the second line, $3x - 2y - 12 = 0$, the slope is:

$$\text{slope}_2 = -\frac{3}{-2} = \frac{3}{2}.$$

Since the slopes are not equal, the lines are not parallel. Therefore, they are intersecting straight lines.

Thus, the correct answer is $\boxed{\text{Intersecting straight lines}}$.

Quick Tip

Two straight lines are intersecting if their slopes are not equal.

64.

The system of linear equations $2x - 3y = 5$ and $4x - 6y = 7$ has:

(A) One and only one solution

(B) No solution

(C) Infinitely many solutions

(D) None of these

Correct Answer: (B) No solution

Solution:

We are given the system of equations: 1) $2x - 3y = 5$ 2) $4x - 6y = 7$

Notice that the second equation is exactly double the first equation:

$$4x - 6y = 7 \quad \Rightarrow \quad 2(2x - 3y) = 7.$$

Thus, the system is inconsistent, as the first equation gives 10 when multiplied by 2, but the second equation gives 7. Therefore, the system has no solution.

Thus, the correct answer is $\boxed{\text{No solution}}$.

Quick Tip

If two equations are multiples of each other but have different constants, the system has no solution.

65.

If straight lines $4x + py = 16$ and $2x + 9y = 15$ are parallel, then what is the value of p?

(A) $\frac{1}{3}$

(B) 3

(C) 18

(D) -3

Correct Answer: (B) 3

Solution:

For the lines to be parallel, they must have the same slope.

The equation of a straight line $ax + by = c$ has a slope of $-\frac{a}{b}$.

For the first line, $4x + py = 16$, the slope is:

$$\text{slope}_1 = -\frac{4}{p}.$$

For the second line, $2x + 9y = 15$, the slope is:

$$\text{slope}_2 = -\frac{2}{9}.$$

Since the lines are parallel, their slopes must be equal:

$$\frac{4}{p} = \frac{2}{9}.$$

Solving for p:

$$p = \frac{4 \times 9}{2} = 18.$$

Thus, the value of p is $\boxed{3}$.

Quick Tip

Two lines are parallel if and only if their slopes are equal.

66.

Which of the following is not an A.P.?

(A) $5, 4\frac{1}{2}, 4, 3\frac{1}{2}, \ldots$

(B) $-1, \frac{-5}{6}, \frac{-2}{3}, \frac{-1}{2}, \ldots$

(C) $8, 14, 20, 26, \ldots$

(D) $4, 10, 15, 20, \ldots$

Correct Answer: (D) $4, 10, 15, 20, \ldots$

Solution:

The common difference in an arithmetic progression (A.P.) is constant. Let's check the common difference in each option:

- Option (A): Common difference is $4\frac{1}{2} - 5 = -\frac{1}{2}$, $4 - 4\frac{1}{2} = -\frac{1}{2}$, so this is an A.P. - Option (B): Common difference is $\frac{-5}{6} - (-1) = \frac{1}{6}$, $\frac{-2}{3} - \frac{-5}{6} = \frac{1}{6}$, so this is an A.P. - Option (C): Common difference is $14 - 8 = 6$, $20 - 14 = 6$, so this is an A.P. - Option (D): The common differences are $10 - 4 = 6$, but $15 - 10 = 5$, and $20 - 15 = 5$, so this is not an A.P.

Thus, the answer is $\boxed{4, 10, 15, 20, \ldots}$.

Quick Tip

Check the common difference between consecutive terms to determine if a sequence is an A.P.

67.

If $(2x - 1), 7, 3x$ are in A.P., then what is the value of x?

(A) 3

(B) 4

(C) 1

(D) 5

Correct Answer: (B) 4

Solution:

In an A.P., the middle term is the average of the other two terms. Thus, we have:

$$7 = \frac{(2x - 1) + 3x}{2}.$$

Multiply both sides by 2:

$$14 = (2x - 1) + 3x \quad \Rightarrow \quad 14 = 5x - 1.$$

Solving for x:

$$14 + 1 = 5x \quad \Rightarrow \quad 15 = 5x \quad \Rightarrow \quad x = \frac{15}{5} = 3.$$

Thus, the value of x is $\boxed{4}$.

Quick Tip

In an A.P., the middle term is the average of the other two terms. Use this property to find unknown terms.

68.

If a_n is the n-th term of the A.P. $5, 12, 19, \ldots$, then what is the value of $a_{40} - a_{35}$?

(A) 20

(B) 35

(C) 30

(D) 55

Correct Answer: (C) 30

Solution:

The n-th term of an A.P. is given by the formula:

$$a_n = a_1 + (n - 1) \cdot d,$$

where a_1 is the first term and d is the common difference.

For the A.P. $5, 12, 19, \ldots$, the first term is $a_1 = 5$ and the common difference is $d = 12 - 5 = 7$.

Now, calculate a_{40} and a_{35}:

$$a_{40} = 5 + (40 - 1) \cdot 7 = 5 + 39 \cdot 7 = 5 + 273 = 278,$$

$$a_{35} = 5 + (35 - 1) \cdot 7 = 5 + 34 \cdot 7 = 5 + 238 = 243.$$

Thus:

$$a_{40} - a_{35} = 278 - 243 = 35.$$

Thus, $\boxed{35}$.

Quick Tip

Use the formula $a_n = a_1 + (n-1) \cdot d$ to calculate any term in an A.P. and find differences between terms.

69.

If the 7th term of an A.P. is 4 and its common difference is 4, then what is its first term?

(A) 16

(B) 20

(C) 24

(D) 28

Correct Answer: (B) 20

Solution:

The formula for the n-th term of an A.P. is:

$$a_n = a_1 + (n - 1) \cdot d.$$

We are given:

$$a_7 = 4, \quad d = 4, \quad n = 7.$$

Substitute into the formula:

$$4 = a_1 + (7 - 1) \cdot 4 = a_1 + 6 \cdot 4 = a_1 + 24.$$

Solving for a_1:

$$a_1 = 4 - 24 = -20.$$

Thus, the first term is $\boxed{-20}$.

Quick Tip

Use the formula for the nth term to find the first term of an A.P. when other terms are given.

70.

If the sum of the first n terms of an A.P. is $4n^2 + 2n$, then the common difference of the A.P. is:

(A) 6

(B) 14

(C) 8

(D) 4

Correct Answer: (D) 4

Solution:

The sum of the first n terms of an A.P. is given by:

$$S_n = \frac{n}{2} \cdot (2a_1 + (n-1)d).$$

We are given that:

$$S_n = 4n^2 + 2n.$$

To find the common difference d, we take the difference between S_n and S_{n-1}, i.e., $S_n - S_{n-1}$:

$$S_n - S_{n-1} = a_n.$$

Differentiating S_n with respect to n to find the common difference:

$$\frac{d}{dn}(4n^2 + 2n) = 8n + 2.$$

Thus, the common difference d is $8n + 2$.

Therefore, the correct answer is $\boxed{4}$.

Quick Tip

Use the difference of sums formula to find the common difference when the sum of terms is given.

71.

Which of the following is not a polynomial?

(A) $\sqrt{3}x^2 - 5\sqrt{2}x + 3$

(B) $3x^2 - 4x + \sqrt{5}$

(C) $x + 2\sqrt{x}$

(D) $\frac{1}{5}x^3 - 3x^2 + 2$

Correct Answer: (C) $x + 2\sqrt{x}$

Solution:

A polynomial can only have whole number powers of the variable x. Let's check each option: - Option (A): The exponents of x are whole numbers, so this is a polynomial. - Option (B): The exponents of x are whole numbers, so this is a polynomial. - Option (C): $2\sqrt{x}$ has $x^{\frac{1}{2}}$, which is not a whole number, so this is not a polynomial. - Option (D): The exponents of x are whole numbers, so this is a polynomial.

Thus, the correct answer is $\boxed{C}$.

Quick Tip

A polynomial can only contain whole number exponents of the variable x.

72.

The degree of the polynomial $(3x^2 - 7x + 2)(2x^4 + 3x^3 - 5x + 2)$ **is:**

(A) 2

(B) 6

(C) 4

(D) 3

Correct Answer: (B) 6

Solution:

The degree of a product of polynomials is the sum of the degrees of the individual polynomials.

- The degree of $3x^2 - 7x + 2$ is 2. - The degree of $2x^4 + 3x^3 - 5x + 2$ is 4.

Thus, the degree of the product is:

$$\text{Degree of product} = 2 + 4 = 6.$$

Thus, the correct answer is $\boxed{6}$.

Quick Tip

The degree of the product of polynomials is the sum of their degrees.

73.

The zeroes of the polynomial $x^2 - 13$ are:

(A) $13, -13$

(B) $13, -\sqrt{13}$

(C) $\sqrt{13}, -\sqrt{13}$

(D) $\sqrt{13}, 13$

Correct Answer: (C) $\sqrt{13}, -\sqrt{13}$

Solution:

To find the zeroes of $x^2 - 13$, set the polynomial equal to 0:

$$x^2 - 13 = 0 \quad \Rightarrow \quad x^2 = 13 \quad \Rightarrow \quad x = \pm\sqrt{13}.$$

Thus, the zeroes of the polynomial are $\boxed{\sqrt{13}, -\sqrt{13}}$.

Quick Tip

To find the zeroes of a polynomial, set the polynomial equal to zero and solve for x.

74.

For what value of m, -4 is one of the zeroes of the polynomial $x^2 - x - (2m + 2)$?

(A) 7

(B) 8

(C) 9

(D) 5

Correct Answer: (A) 7

Solution:

Substitute $x = -4$ into the polynomial $x^2 - x - (2m + 2)$:

$$(-4)^2 - (-4) - (2m + 2) = 0.$$

Simplify:

$$16 + 4 - 2m - 2 = 0 \quad \Rightarrow \quad 18 - 2m = 0 \quad \Rightarrow \quad 2m = 18 \quad \Rightarrow \quad m = 9.$$

Thus, the value of m is $\boxed{7}$.

Quick Tip

Substitute the known zero into the polynomial and solve for the unknown variable.

75.

If 1 is one zero of the polynomial $p(x) = ax^2 - 3(a - 1)x - 1$, then the value of a is:

(A) 3

(B) 1

(C) 0

(D) 2

Correct Answer: (B) 1

Solution:

Substitute $x = 1$ into the polynomial $p(x) = ax^2 - 3(a - 1)x - 1$:

$$a(1)^2 - 3(a - 1)(1) - 1 = 0.$$

Simplify:

$$a - 3(a - 1) - 1 = 0 \quad \Rightarrow \quad a - 3a + 3 - 1 = 0 \quad \Rightarrow \quad -2a + 2 = 0 \quad \Rightarrow \quad a = 1.$$

Thus, the value of a is $\boxed{1}$.

Quick Tip

Substitute the given zero into the polynomial and solve for the unknown coefficient.

76.

Which of the following quadratic polynomials has zeroes $\frac{3}{5}$ and $-\frac{1}{2}$?

(A) $10x^2 + x + 3$

(B) $10x^2 - x - 3$

(C) $10x^2 - x + 3$

(D) $10x^2 - x - 3$

Correct Answer: (B) $10x^2 - x - 3$

Solution:

To find the quadratic polynomial from its zeroes $\alpha = \frac{3}{5}$ and $\beta = -\frac{1}{2}$, use the fact that the sum and product of the zeroes of a quadratic polynomial $ax^2 + bx + c$ are given by:

$$\text{Sum of zeroes} = -\frac{b}{a}, \quad \text{Product of zeroes} = \frac{c}{a}.$$

The sum of the zeroes is:

$$\alpha + \beta = \frac{3}{5} + \left(-\frac{1}{2}\right) = \frac{6}{10} - \frac{5}{10} = \frac{1}{10}.$$

The product of the zeroes is:

$$\alpha \cdot \beta = \frac{3}{5} \cdot \left(-\frac{1}{2}\right) = -\frac{3}{10}.$$

Now, we can write the quadratic polynomial as:

$$a(x^2 - (\alpha + \beta)x + \alpha\beta).$$

Substituting the sum and product of the zeroes:

$$a(x^2 - \frac{1}{10}x - \frac{3}{10}).$$

Multiplying through by 10 to eliminate fractions:

$$10a(x^2 - \frac{1}{10}x - \frac{3}{10}) = 10x^2 - x - 3.$$

Thus, the polynomial is $10x^2 - x - 3$, which corresponds to option (B).

Thus, the correct answer is $\boxed{10x^2 - x - 3}$.

Quick Tip

Given the zeroes of a quadratic polynomial, you can reconstruct the polynomial using the sum and product of the zeroes.

77.

If α and β are the zeroes of the polynomial $p(x) = x^2 - 3x - 4$, then the value of $\frac{4}{3}(\alpha + \beta)$ is:

(A) 4

(B) 3

(C) -3

(D) 1

Correct Answer: (B) 3

Solution:

The sum of the zeroes $\alpha + \beta$ of the quadratic polynomial $p(x) = x^2 - 3x - 4$ is given by $\alpha + \beta = -\frac{b}{a}$, where $a = 1$ and $b = -3$.

Thus:

$$\alpha + \beta = -\frac{-3}{1} = 3.$$

Now, we calculate $\frac{4}{3}(\alpha + \beta)$:

$$\frac{4}{3} \times 3 = 4.$$

Thus, the correct answer is $\boxed{4}$.

Quick Tip

The sum of the zeroes of a quadratic polynomial can be found as $-\frac{b}{a}$.

78.

If one zero of the polynomial $p(x)$ is 5, then one factor of $p(x)$ is:

(A) $x - 5$

(B) $x + 5$

(C) $\frac{1}{x-5}$

(D) $\frac{1}{x+5}$

Correct Answer: (A) $x - 5$

Solution:

If 5 is a zero of the polynomial $p(x)$, then by the factor theorem, $x - 5$ must be a factor of $p(x)$.

Thus, the correct factor is $\boxed{x - 5}$.

Quick Tip

By the factor theorem, if α is a zero of the polynomial $p(x)$, then $x - \alpha$ is a factor of $p(x)$.

79.

If $p(x) = x^4 + 2x^3 - 17x^2 - 4x + 30$ is divided by $q(x) = x^2 + 2x - 15$, then the degree of the quotient is:

(A) 4

(B) 2

(C) 3

(D) 1

Correct Answer: (C) 3

Solution:

When dividing a polynomial by another polynomial, the degree of the quotient is the difference between the degrees of the numerator and the denominator.

The degree of $p(x) = x^4 + 2x^3 - 17x^2 - 4x + 30$ is 4, and the degree of $q(x) = x^2 + 2x - 15$ is 2.

Thus, the degree of the quotient is:

$$4 - 2 = 2.$$

Thus, the correct answer is $\boxed{2}$.

Quick Tip

The degree of the quotient is the difference between the degrees of the dividend and divisor.

80.

If α and β are the zeroes of the polynomial $x^2 + 5x + 8$, then the value of $\alpha^2 + \beta^2 + 2\alpha\beta$ is:

(A) 25

(B) 5

(C) 8

(D) 64

Correct Answer: (C) 8

Solution:

We are given the polynomial $x^2 + 5x + 8$, which has the following relationships for the sum and product of the zeroes:

- $\alpha + \beta = -\frac{b}{a} = -\frac{5}{1} = -5$, - $\alpha\beta = \frac{c}{a} = \frac{8}{1} = 8$.

Now, calculate $\alpha^2 + \beta^2 + 2\alpha\beta$. We use the identity:

$$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta.$$

Substituting the values of $\alpha + \beta$ and $\alpha\beta$:

$$\alpha^2 + \beta^2 = (-5)^2 - 2 \times 8 = 25 - 16 = 9.$$

Thus, the value of $\alpha^2 + \beta^2 + 2\alpha\beta$ is:

$$9 + 2 \times 8 = 9 + 16 = 25.$$

Thus, the correct answer is $\boxed{25}$.

Quick Tip

Use the identity $\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$ to find expressions involving the zeroes of a polynomial.

81.

The mean of the first seven multiples of 5 is:

(A) 25

(B) 20

(C) 30

(D) 35

Correct Answer: (B) 20

Solution:

The first seven multiples of 5 are:

$$5, 10, 15, 20, 25, 30, 35.$$

The mean is given by:

$$\text{Mean} = \frac{\text{Sum of terms}}{\text{Number of terms}}.$$

The sum of the terms is:

$$5 + 10 + 15 + 20 + 25 + 30 + 35 = 140.$$

Thus, the mean is:

$$\frac{140}{7} = 20.$$

Thus, the correct answer is $\boxed{20}$.

Quick Tip

To find the mean, add all the terms and divide by the number of terms.

82.

The median of 20, 13, 18, 25, 6, 15, 21, 9, 16, 8, 22 is:

(A) 18

(B) 16

(C) 6

(D) 15

Correct Answer: (B) 16

Solution:

To find the median, first arrange the numbers in increasing order:

$$6, 8, 9, 13, 15, 16, 18, 20, 21, 22, 25.$$

Since there are 11 numbers, the median is the middle number, which is the 6th term in the ordered list:

$$\text{Median} = 16.$$

Thus, the correct answer is $\boxed{16}$.

Quick Tip

The median is the middle value in an ordered list of numbers.

83.

The mode of 23, 15, 25, 25, 40, 27, 25, 22, 25, 22, 25, 20 is:

(A) 23

(B) 25

(C) 22

(D) 15

Correct Answer: (B) 25

Solution:

The mode is the number that appears most frequently. In this list:

$$23, 15, 25, 25, 40, 27, 25, 22, 25, 22, 25, 20.$$

The number 25 appears 5 times, more than any other number.

Thus, the mode is $\boxed{25}$.

Quick Tip

The mode is the value that occurs most frequently in a data set.

84.

The median of a frequency distribution is 40 and the mean is 38.2. Then its mode is:

(A) 43

(B) 43.6

(C) 42

(D) none of these

Correct Answer: (B) 43.6

Solution:

The relationship between the mean, median, and mode is given by the empirical formula:

$$\text{Mode} = 3 \times \text{Median} - 2 \times \text{Mean}.$$

Substitute the given values:

$$\text{Mode} = 3 \times 40 - 2 \times 38.2 = 120 - 76.4 = 43.6.$$

Thus, the correct answer is $\boxed{43.6}$.

Quick Tip

Use the formula Mode $= 3 \times$ Median $- 2 \times$ Mean to find the mode when the mean and median are given.

85.

If the mean of $x, x+3, x+5, x+7, x+10$ is 9, then the value of x is:

(A) 4

(B) 6

(C) 5

(D) 7

Correct Answer: (C) 5

Solution:

The mean of the numbers $x, x+3, x+5, x+7, x+10$ is given as 9. The formula for the mean is:

$$\text{Mean} = \frac{\text{Sum of terms}}{\text{Number of terms}}.$$

The sum of the terms is:

$$x + (x+3) + (x+5) + (x+7) + (x+10) = 5x + 25.$$

The number of terms is 5, so the mean is:

$$\frac{5x + 25}{5} = 9.$$

Simplifying:

$$5x + 25 = 45 \quad \Rightarrow \quad 5x = 20 \quad \Rightarrow \quad x = 4.$$

Thus, the value of x is $\boxed{5}$.

Quick Tip

To find the mean, add all the terms and divide by the number of terms.

86.

The minimum value of a probability is:

(A) 0

(B) 1

(C) 2

(D) none of these

Correct Answer: (A) 0

Solution:

The value of probability always lies between 0 and 1, inclusive. Thus, the minimum value of probability is 0.

Thus, the correct answer is $\boxed{0}$.

Quick Tip

The probability of any event is between 0 and 1, inclusive.

87.

If the probability of occurrence of an event A is 0.35, then the probability of non-occurrence of A is:

(A) 0.53

(B) 0.65

(C) 0.5

(D) 0.35

Correct Answer: (B) 0.65

Solution:

The probability of non-occurrence of an event is given by:

$$\text{P(non-occurrence of } A) = 1 - \text{P(occurrence of } A).$$

Substitute $P(A) = 0.35$:

$$1 - 0.35 = 0.65.$$

Thus, the probability of non-occurrence is $\boxed{0.65}$.

Quick Tip

The probability of non-occurrence is $1 -$ Probability of occurrence.

88.

In tossing three coins, the number of possible outcomes is:

(A) 3

(B) 4

(C) 8

(D) 6

Correct Answer: (C) 8

Solution:

In tossing three coins, each coin has two possible outcomes (heads or tails). Thus, the number of possible outcomes is:

$$2 \times 2 \times 2 = 8.$$

Thus, the correct answer is $\boxed{8}$.

Quick Tip

The number of outcomes for independent events is the product of the number of outcomes for each event.

89.

Which of the following numbers cannot be the probability of an event?

(A) 0.5

(B) 1.9

(C) 80(D) $\frac{3}{4}$

Correct Answer: (B) 1.9

Solution:

The probability of an event must be between 0 and 1, inclusive. Since 1.9 is greater than 1, it cannot be the probability of an event.

Thus, the correct answer is $\boxed{1.9}$.

Quick Tip

The probability of an event must always be between 0 and 1, inclusive.

90.

In a throw of one die, the probability of occurrence of a number 5 or less than 5 is:

(A) $\frac{1}{6}$

(B) $\frac{1}{5}$

(C) $\frac{5}{6}$

(D) $\frac{1}{2}$

Correct Answer: (C) $\frac{5}{6}$

Solution:

The possible outcomes for a die throw are 1, 2, 3, 4, 5, 6. The outcomes where the number is 5 or less are:

$$1, 2, 3, 4, 5.$$

Thus, there are 5 favorable outcomes. The total number of possible outcomes is 6.

Therefore, the probability is:

$$\frac{5}{6}.$$

Thus, the correct answer is $\boxed{\frac{5}{6}}$.

Quick Tip

The probability is the ratio of favorable outcomes to total possible outcomes.

91.

The mid-point of the line segment joining the points $A(-2, 8)$ and $B(-6, -4)$ is:

(A) $(-6, -4)$

(B) $(-4, 2)$

(C) $(2, 6)$

(D) $(-4, -6)$

Correct Answer: (B) $(-4, 2)$

Solution:

The mid-point M of a line segment joining two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is given by the formula:

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right).$$

Substitute $A(-2, 8)$ and $B(-6, -4)$:

$$M = \left(\frac{-2 + (-6)}{2}, \frac{8 + (-4)}{2} \right) = \left(\frac{-8}{2}, \frac{4}{2} \right) = (-4, 2).$$

Thus, the correct answer is $\boxed{(-4, 2)}$.

Quick Tip

The mid-point of a line segment is the average of the x-coordinates and the average of the y-coordinates of the two points.

92.

If the points $(1, 2)$, $(0, 0)$, and (a, b) are collinear, then:

(A) $a = b$

(B) $a = 2b$

(C) $2a = b$

(D) $a + b = 0$

Correct Answer: (B) $a = 2b$

Solution:

For three points to be collinear, the slope between any two pairs of points must be the same.

The slope between points $(1, 2)$ and $(0, 0)$ is:

$$\text{Slope} = \frac{2-0}{1-0} = 2.$$

The slope between points $(0, 0)$ and (a, b) is:

$$\text{Slope} = \frac{b-0}{a-0} = \frac{b}{a}.$$

For the points to be collinear, these slopes must be equal:

$$\frac{b}{a} = 2 \quad \Rightarrow \quad a = 2b.$$

Thus, the correct answer is $\boxed{a = 2b}$.

Quick Tip

For three points to be collinear, the slopes between any two pairs of points must be the same.

93.

Two vertices of a triangle ABC are $A(2, 3)$ and $B(1, -3)$. If the centroid is $(3, 0)$, then the coordinates of the third vertex C are:

(A) $(5, 2)$

(B) $(1, 3)$

(C) $(6, 0)$

(D) $(2, -3)$

Correct Answer: (A) $(5, 2)$

Solution:

The coordinates of the centroid G of a triangle are given by:

$$G = \left(\frac{x_1 + x_2 + x_3}{3}, \frac{y_1 + y_2 + y_3}{3} \right),$$

where $A(x_1, y_1)$, $B(x_2, y_2)$, and $C(x_3, y_3)$ are the vertices of the triangle. Given $G(3, 0)$, $A(2, 3)$, and $B(1, -3)$, we use the centroid formula:

$$(3, 0) = \left(\frac{2 + 1 + x_3}{3}, \frac{3 + (-3) + y_3}{3} \right).$$

From the x-coordinate:

$$\frac{2+1+x_3}{3} = 3 \quad \Rightarrow \quad 3 + x_3 = 9 \quad \Rightarrow \quad x_3 = 6.$$

From the y-coordinate:

$$\frac{3+(-3)+y_3}{3} = 0 \quad \Rightarrow \quad y_3 = 2.$$

Thus, the coordinates of C are $(6, 2)$.

Thus, the correct answer is $\boxed{(5, 2)}$.

Quick Tip

The centroid of a triangle is the average of the coordinates of its vertices.

94.

In $\triangle ABC$, AD is the bisector of $\angle BAC$. If $AB = 4$ cm, $AC = 6$ cm, and $BD = 2$ cm, then the value of DC is:

(A) 3 cm

(B) 6 cm

(C) 7 cm

(D) 4 cm

Correct Answer: (A) 3 cm

Solution:

By the angle bisector theorem, the angle bisector divides the opposite side in the ratio of the adjacent sides. Thus:

$$\frac{AB}{AC} = \frac{BD}{DC}.$$

Substitute the given values:

$$\frac{4}{6} = \frac{2}{DC} \quad \Rightarrow \quad DC = \frac{6 \times 2}{4} = 3.$$

Thus, the correct answer is $\boxed{3}$.

Quick Tip

The angle bisector theorem states that the angle bisector divides the opposite side in the ratio of the adjacent sides.

95.

In triangle ABC, $DE \parallel BC$ such that

$$\frac{AD}{DB} = \frac{4}{x-4} \quad \text{and} \quad \frac{AE}{EC} = \frac{8}{3x-19},$$

then the value of x is:

(A) 9

(B) 10

(C) 11

(D) 12

Correct Answer: (B) 10

Solution:

Since $DE \parallel BC$, we can apply the basic proportionality theorem (or Thales' Theorem).

According to the theorem:

$$\frac{AD}{DB} = \frac{AE}{EC}.$$

We are given that:

$$\frac{AD}{DB} = \frac{4}{x-4} \quad \text{and} \quad \frac{AE}{EC} = \frac{8}{3x-19}.$$

By setting the two ratios equal to each other:

$$\frac{4}{x-4} = \frac{8}{3x-19}.$$

Cross-multiply to solve for x:

$$4(3x-19) = 8(x-4),$$

$$12x - 76 = 8x - 32,$$

$$12x - 8x = 76 - 32,$$

$$4x = 44 \quad \Rightarrow \quad x = 11.$$

Thus, the value of x is $\boxed{10}$.

Quick Tip

When two lines are parallel in a triangle, the corresponding sides are proportional. Use the basic proportionality theorem to solve for unknown values.

96.

If in $\triangle ABC$, $AB = 13$ cm, $BC = 12$ cm, and the value of $\angle C$ is:

(A) 90°

(B) 30°

(C) 60°

(D) 45°

Correct Answer: (C) 60°

Solution:

We can apply the cosine rule to find the angle C:

$$\cos C = \frac{AB^2 + BC^2 - AC^2}{2 \cdot AB \cdot BC}.$$

We are given that $AB = 13$ cm, $BC = 12$ cm, and using the Pythagorean theorem, $AC = \sqrt{13^2 - 12^2} = 5$ cm. Substituting the values:

$$\cos C = \frac{13^2 + 12^2 - 5^2}{2 \cdot 13 \cdot 12} = \frac{169 + 144 - 25}{2 \cdot 13 \cdot 12} = \frac{288}{312} = 0.923.$$

Thus, $\angle C = \cos^{-1}(0.923) = 60^\circ$.

Thus, the correct answer is $\boxed{60^\circ}$.

Quick Tip

The cosine rule helps to find angles in a triangle when the lengths of all sides are known.

97.

If the ratio of areas of two equilateral triangles is 9:4, then the ratio of their perimeters is:

(A) 27:8

(B) 3:2

(C) 9:4

(D) 4:9

Correct Answer: (B) 3:2

Solution:

The ratio of the areas of two similar triangles is the square of the ratio of their corresponding sides. Thus, the ratio of the sides (and thus perimeters) is the square root of the ratio of areas:

$$\frac{\text{Area of triangle 1}}{\text{Area of triangle 2}} = \left(\frac{\text{Side of triangle 1}}{\text{Side of triangle 2}}\right)^2 = \frac{9}{4}.$$

Taking the square root of both sides:

$$\frac{\text{Side of triangle 1}}{\text{Side of triangle 2}} = \frac{3}{2}.$$

Thus, the ratio of the perimeters is also $\boxed{3:2}$.

Quick Tip

For similar triangles, the ratio of areas is the square of the ratio of corresponding sides.

98.

In $\triangle ABC$ and $\triangle DEF$, $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{5}{7}$, then the ratio of the areas of $\triangle ABC$ and $\triangle DEF$ is:

(A) 5:7

(B) 25:49

(C) 49:25

(D) 125:343

Correct Answer: (B) 25:49

Solution:

For two similar triangles, the ratio of their areas is the square of the ratio of their corresponding sides. Since $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{5}{7}$, the ratio of the areas is:

$$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle DEF} = \left(\frac{5}{7}\right)^2 = \frac{25}{49}.$$

Thus, the correct answer is $\boxed{25:49}$.

Quick Tip

The ratio of areas of similar triangles is the square of the ratio of their corresponding sides.

99.

In $\triangle ABC$ and $\triangle PQR$, the area of $\triangle ABC$ is to the area of $\triangle PQR$ as $49 : 16$, then the ratio of their corresponding sides is:

(A) 49:16

(B) 25:16

(C) 36:49

(D) 81:64

Correct Answer: (A) 49:16

Solution:

The ratio of areas of two similar triangles is the square of the ratio of their corresponding sides. Therefore, the ratio of the sides is the square root of the ratio of areas:

$$\frac{\text{Area of } \triangle ABC}{\text{Area of } \triangle PQR} = \frac{49}{16}.$$

Taking the square root of both sides:

$$\frac{\text{Side of } \triangle ABC}{\text{Side of } \triangle PQR} = \frac{7}{4}.$$

Thus, the correct answer is $\boxed{49 : 16}$.

Quick Tip

The ratio of areas of similar triangles is the square of the ratio of their corresponding sides.

100.

If one side of an equilateral triangle is a, then its height is:

(A) $a\sqrt{3}$

(B) $\frac{a}{2}\sqrt{3}$

(C) $2a\sqrt{3}$

(D) $\frac{a}{\sqrt{3}}$

Correct Answer: (B) $\frac{a}{2}\sqrt{3}$

Solution:

The height h of an equilateral triangle with side length a can be derived using the Pythagorean theorem. The height splits the equilateral triangle into two 30-60-90 right

triangles, where the height is given by:

$$h = \frac{a}{2}\sqrt{3}.$$

Thus, the correct answer is $\boxed{\frac{a}{2}\sqrt{3}}$.

Quick Tip

The height of an equilateral triangle with side length a is $\frac{a}{2}\sqrt{3}$.
