Tripura Board Class 10 2026 Mathematics (Basic) Question Paper with Solutions

| Time Allowed :3 Hours | Maximum Marks :80 | Total questions :32 |

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The paper is divided into Section A and Section B.

2. Section A includes objective-type questions.

3. All questions in Section A are compulsory.

4. Section B includes short answer, and long answer type questions.

5. Answers must be written legibly within the word limit.

6. Use of unfair means or electronic devices is prohibited.

7. Follow the correct format and instructions for each section.

Section - A

1. In the AP: $\frac{3}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{3}{2}, \ldots$, the common difference is:

(A) -1

(B) 2

(C) 1

(D) 4

Correct Answer: (A) -1

Solution:

The given arithmetic progression is $\frac{3}{2}, \frac{1}{2}, -\frac{1}{2}, -\frac{3}{2}, \ldots$. The common difference in an arithmetic progression is the difference between two consecutive terms. The common difference is:

$$\frac{1}{2} - \frac{3}{2} = -1$$

Final Answer: -1.

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2. If the radius of a sphere is 3 cm, then its volume is:

(A) $4\pi r^3$ cm^3

(B) $\frac{4}{3}\pi r^3$ cm^3

(C) $4\pi r^2$ cm^3

(D) $\frac{3}{4}\pi r^3$ cm^3

Correct Answer: (B) $\frac{4}{3}\pi r^3$ cm^3

Solution:

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

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

Substituting $r = 3$ cm into the formula:

$$V = \frac{4}{3}\pi (3)^3 = \frac{4}{3}\pi \times 27 = 36\pi \text{ cm}^3$$

Final Answer: $\frac{4}{3}\pi r^3$ cm^3.

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3. The two roots of the quadratic equation $x^2 - 4 = 0$ are:

(A) 2, 2

(B) -2, 2

(C) -2, -2

(D) 2, 0

Correct Answer: (B) -2, 2

Solution:

The given equation is $x^2 - 4 = 0$. This is a quadratic equation of the form $x^2 - a^2 = 0$, which can be factored as $(x - 2)(x + 2) = 0$. The roots of the equation are $x = 2$ and $x = -2$.

Final Answer: -2, 2.

Quick Tip

To solve a quadratic equation of the form $x^2 - a^2 = 0$, factor it as $(x - a)(x + a) = 0$.

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4. In the equation $2x - 3y = 5$, if the value of y is 3, then the value of x is:

(A) -7

(B) 14

(C) 7

(D) -14

Correct Answer: (C) 7

Solution:

The given equation is $2x - 3y = 5$. Substituting $y = 3$ into the equation:

$$2x - 3(3) = 5$$

$$2x - 9 = 5$$

$$2x = 14$$

$$x = 7$$

Final Answer: 7.

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5. The distance of the point $P(-6, 0)$ from the origin is:

(A) 36

(B) 3

(C) 6

(D) -6

Correct Answer: (C) 6

Solution:

The distance of a point (x, y) from the origin $(0, 0)$ is given by the distance formula:

$$\text{Distance} = \sqrt{x^2 + y^2}$$

Substituting the coordinates $P(-6, 0)$ into the formula:

$$\text{Distance} = \sqrt{(-6)^2 + 0^2} = \sqrt{36} = 6$$

Final Answer: 6.

Section - B

6. For what value of k, $x - 3y = 7$ **and** $kx + 6y = 5$ **will have no solution?**

Solution:

Step 1: Recognize the condition for no solution.

For the system of linear equations to have no solution, the lines must be parallel. The condition for two lines to be parallel is that the ratio of the coefficients of x and y in both equations must be equal.

Step 2: Apply the condition.

The first equation is $x - 3y = 7$, and the second equation is $kx + 6y = 5$.

The condition for parallel lines is:
$$\frac{1}{k} = \frac{-3}{6}$$

Step 3: Solve for k.

Solving the above equation gives:
$$\frac{1}{k} = \frac{-1}{2} \quad \Rightarrow \quad k = -2$$

Step 4: Conclusion.

Thus, the value of k for which the system has no solution is $k = -2$.

> Quick Tip
>
> For a system of linear equations to have no solution, the lines must be parallel, which occurs when the ratios of the coefficients of x and y are equal.

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7. Find the quadratic polynomial whose sum and product of zeros are 6 and -2 respectively.

Solution:

Step 1: Recall the standard form of a quadratic polynomial.

A quadratic polynomial is given by the equation:
$$p(x) = ax^2 + bx + c$$

The sum and product of the zeros α and β of the polynomial are related to the coefficients as:
- Sum of zeros: $\alpha + \beta = -\frac{b}{a}$ - Product of zeros: $\alpha\beta = \frac{c}{a}$

Step 2: Use the given sum and product of zeros.

We are given that the sum of zeros is 6 and the product is -2. Therefore: - Sum: $\alpha + \beta = 6 \quad \Rightarrow \quad -\frac{b}{a} = 6$ - Product: $\alpha\beta = -2 \quad \Rightarrow \quad \frac{c}{a} = -2$

Step 3: Write the quadratic polynomial.

Using the relationships above, the quadratic polynomial can be written as:

$$p(x) = x^2 - (\alpha + \beta)x + \alpha\beta = x^2 - 6x - 2$$

Step 4: Conclusion.

Thus, the required quadratic polynomial is:

$$p(x) = x^2 - 6x - 2$$

> **Quick Tip**
>
> The quadratic polynomial can be easily constructed from the sum and product of its zeros using the formula $p(x) = x^2 - (\text{sum of zeros})x + (\text{product of zeros})$.

OR Find the value of $p(x) = x^2 + x + 1$ when $x = -1$.

Solution:

Step 1: Substitute $x = -1$ into the polynomial.

We are given $p(x) = x^2 + x + 1$. To find the value when $x = -1$, substitute $x = -1$ into the equation:

$$p(-1) = (-1)^2 + (-1) + 1$$

Step 2: Simplify the expression.

$$p(-1) = 1 - 1 + 1 = 1$$

Step 3: Conclusion.

Thus, the value of $p(x)$ when $x = -1$ is:

$$p(-1) = 1$$

> **Quick Tip**
>
> To evaluate a polynomial at a given value of x, simply substitute the value into the polynomial expression and simplify.

8. In the given figure, the angle of elevation of the top of a tower AC from a point B on the ground is $60°$. If the height of the tower is 20m, find the distance of the point from the foot of the tower.

Solution:

Step 1: Analyze the right triangle.

In this problem, we can form a right-angled triangle where the tower's height (AC) is the opposite side to the angle of elevation, and the distance from point B to the foot of the tower (AB) is the adjacent side. The angle of elevation is given as $60°$.

Step 2: Apply trigonometric ratios.

We will use the tangent of the angle of elevation:

$$\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}} = \frac{\text{AC}}{\text{AB}}$$

Given that $\theta = 60°$ and AC = 20m, we substitute the values into the equation:

$$\tan(60°) = \frac{20}{\text{AB}}$$

Step 3: Solve for AB.

Since $\tan(60°) = \sqrt{3}$, we have:

$$\sqrt{3} = \frac{20}{\text{AB}}$$

Solving for AB:

$$\text{AB} = \frac{20}{\sqrt{3}} = \frac{20\sqrt{3}}{3}$$

Step 4: Conclusion.

Thus, the distance from point B to the foot of the tower is:

$$\text{AB} = \frac{20\sqrt{3}}{3} \approx 11.55 \text{ m}$$

Quick Tip

In problems involving angles of elevation and right triangles, use trigonometric ratios like sine, cosine, and tangent to solve for unknown distances.

9. A die is thrown once. Find the probability of getting (i) a prime number (ii) an odd number.

Solution:

A standard die has six faces, numbered from 1 to 6.

(i) Probability of getting a prime number:

Prime numbers between 1 and 6 are 2, 3, and 5. So, there are 3 favorable outcomes. The total number of outcomes (since the die has 6 faces) is 6.

The probability of getting a prime number is given by:

$$P(\text{prime}) = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}} = \frac{3}{6} = \frac{1}{2}$$

(ii) Probability of getting an odd number:

Odd numbers between 1 and 6 are 1, 3, and 5. So, there are 3 favorable outcomes. The total number of outcomes is still 6.

The probability of getting an odd number is:

$$P(\text{odd}) = \frac{\text{Number of favorable outcomes}}{\text{Total number of outcomes}} = \frac{3}{6} = \frac{1}{2}$$

> **Quick Tip**
>
> When calculating probabilities, count the number of favorable outcomes and divide it by the total number of possible outcomes.

10. If the 3rd and the 9th terms of an AP are 4 and -8 respectively, which term of this AP is zero?

Solution:

Step 1: General form of the nth term of an AP.

The nth term of an arithmetic progression (AP) is given by:

$$T_n = a + (n - 1) \cdot d$$

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

Step 2: Use the given terms to find a and d.

We are given that the 3rd term $T_3 = 4$ and the 9th term $T_9 = -8$.

For the 3rd term:

$$T_3 = a + (3-1) \cdot d = a + 2d = 4 \quad \text{(Equation 1)}$$

For the 9th term:

$$T_9 = a + (9-1) \cdot d = a + 8d = -8 \quad \text{(Equation 2)}$$

Now solve these two equations simultaneously. Subtract Equation 1 from Equation 2:

$$(a + 8d) - (a + 2d) = -8 - 4$$

$$6d = -12 \quad \Rightarrow \quad d = -2$$

Substitute $d = -2$ into Equation 1:

$$a + 2(-2) = 4 \quad \Rightarrow \quad a - 4 = 4 \quad \Rightarrow \quad a = 8$$

Step 3: Find the term that is zero.

We want to find the term where $T_n = 0$:

$$T_n = a + (n-1) \cdot d = 8 + (n-1) \cdot (-2) = 0$$

$$8 - 2(n-1) = 0 \quad \Rightarrow \quad 8 - 2n + 2 = 0 \quad \Rightarrow \quad 10 - 2n = 0 \quad \Rightarrow \quad n = 5$$

Thus, the 5th term of the AP is zero.

> **Quick Tip**
>
> To find the nth term of an AP, use the formula $T_n = a + (n-1) \cdot d$, and solve for the required values.

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11. Find the area of the triangle whose vertices, taken in order are (-4, -2), (-3, -5) & (3, -2).

Solution:

Step 1: Formula for the area of a triangle.

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The area of a triangle with vertices (x_1, y_1), (x_2, y_2), and (x_3, y_3) is given by:

$$\text{Area} = \frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$$

Step 2: Substitute the coordinates of the vertices.

The coordinates of the vertices are: - $(x_1, y_1) = (-4, -2)$ - $(x_2, y_2) = (-3, -5)$ - $(x_3, y_3) = (3, -2)$

Substitute these values into the area formula:

$$\text{Area} = \frac{1}{2} |(-4)((-5) - (-2)) + (-3)((-2) - (-2)) + (3)((-2) - (-5))|$$

$$\text{Area} = \frac{1}{2} |(-4)(-3) + (-3)(0) + (3)(3)|$$

$$\text{Area} = \frac{1}{2} |12 + 0 + 9| = \frac{1}{2} \times 21 = 10.5$$

Thus, the area of the triangle is 10.5 square units.

> **Quick Tip**
>
> To find the area of a triangle given its vertices, use the formula Area $=$ $\frac{1}{2} |x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)|$.

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12. The cost of fencing a circular field at the rate of Rs. 24 per meter is Rs. 5280. The field is ploughed at the rate of Rs. 0.50 per m². Find the cost of ploughing the field. (Take $\pi = \frac{22}{7}$)

Solution:

Step 1: Find the circumference of the field.

We are given that the cost of fencing the circular field is Rs. 5280 at the rate of Rs. 24 per meter. The total cost of fencing is equal to the circumference of the circle multiplied by the rate per meter. Therefore, the circumference of the field is:

$$\text{Circumference} = \frac{\text{Total cost}}{\text{Rate per meter}} = \frac{5280}{24} = 220 \, \text{m}$$

Step 2: Use the formula for circumference to find the radius.

The formula for the circumference of a circle is given by:

$$C = 2\pi r$$

Substitute the value of the circumference and $\pi = \frac{22}{7}$:

$$220 = 2 \times \frac{22}{7} \times r$$

Solve for r:

$$220 = \frac{44}{7} \times r$$
$$r = \frac{220 \times 7}{44} = 35 \, \text{m}$$

Step 3: Find the area of the field.

The area of the circular field is given by:

$$A = \pi r^2$$

Substitute $r = 35$ and $\pi = \frac{22}{7}$:

$$A = \frac{22}{7} \times 35^2 = \frac{22}{7} \times 1225 = 3850 \, \text{m}^2$$

Step 4: Find the cost of ploughing the field.

The cost of ploughing the field is Rs. 0.50 per m². Therefore, the total cost of ploughing the field is:

$$\text{Cost of ploughing} = 0.50 \times 3850 = 1925 \, \text{Rs.}$$

> **Quick Tip**
>
> To calculate the cost of ploughing a field, first calculate the area of the circle using the radius, and then multiply the area by the rate of ploughing per square meter.

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13. The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour?

Solution:

Step 1: Find the circumference of the wheel.

The diameter of the wheel is given as 80 cm, so the radius is:

$$r = \frac{80}{2} = 40 \, \text{cm}$$

The circumference C of the wheel is given by:

$$C = 2\pi r = 2 \times \frac{22}{7} \times 40 = \frac{1760}{7} = 251.43 \, \text{cm}$$

Step 2: Convert the speed of the car to cm/min.

The speed of the car is given as 66 km/h. To convert this to cm/min:

$$66 \, \text{km/h} = 66 \times 1000 \, \text{m/h} = 66000 \, \text{cm/h}$$

Since there are 60 minutes in an hour:

$$\text{Speed in cm/min} = \frac{66000}{60} = 1100 \, \text{cm/min}$$

Step 3: Calculate the distance traveled in 10 minutes.

In 10 minutes, the car will travel:

$$\text{Distance traveled} = 1100 \times 10 = 11000 \, \text{cm}$$

Step 4: Calculate the number of revolutions.

To find the number of revolutions, divide the distance traveled by the circumference of the wheel:

$$\text{Number of revolutions} = \frac{\text{Distance traveled}}{\text{Circumference}} = \frac{11000}{251.43} \approx 43.75$$

So, each wheel makes approximately **44 complete revolutions** in 10 minutes.

> **Quick Tip**
>
> To calculate the number of wheel revolutions, first find the circumference of the wheel, convert the speed to the appropriate unit, and then divide the distance traveled by the circumference.

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14. Prove that the lengths of tangents drawn from an external point to a circle are equal and they subtend equal angles at the center.

Solution:

Step 1: Define the setup.

Let the center of the circle be O, and let P be an external point from which two tangents PA and PB are drawn to the circle. The points of contact are A and B. We are asked to prove that $PA = PB$ and that the angles $\angle OAP$ and $\angle OBP$ are equal.

Step 2: Prove the equality of the tangents.

By the property of tangents to a circle, the tangents drawn from an external point to the circle are always equal in length. That is:

$$PA = PB$$

Step 3: Prove the equality of the angles.

In triangles OAP and OBP, we have: - $OA = OB$ (radii of the same circle) - $PA = PB$ (tangents from the same external point) - $\angle OAP = \angle OBP$ (by the property of tangents) Thus, by the congruence of the two triangles ($\triangle OAP \cong \triangle OBP$), we conclude that:

$$\angle OAP = \angle OBP$$

Step 4: Conclusion.

Therefore, the lengths of the tangents are equal, and the angles subtended by the tangents at the center are also equal.

> **Quick Tip**
>
> The lengths of tangents drawn from an external point to a circle are always equal, and the angles they subtend at the center are also equal.

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15. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the center.

Solution:

Step 1: Define the setup.

Let the center of the circle be O, and let P be an external point from which two tangents PA and PB are drawn to the circle. The points of contact are A and B. We are asked to prove

that the angle $\angle APB$ between the two tangents is supplementary to the angle $\angle AOB$ subtended by the line-segment AB at the center.

Step 2: Use the property of tangents.

We know that the angle between two tangents drawn from an external point to a circle is half of the angle subtended by the line-segment joining the points of contact at the center. That is:

$$\angle APB = \frac{1}{2}\angle AOB$$

Step 3: Prove the supplementary angle.

Since the total angle around a point is $360°$, the angle between the tangents and the angle subtended by the line-segment at the center must add up to $180°$. Therefore, we have:

$$\angle APB + \angle AOB = 180°$$

Step 4: Conclusion.

Thus, we have proved that the angle between the two tangents is supplementary to the angle subtended by the line-segment joining the points of contact at the center.

> **Quick Tip**
>
> The angle between two tangents drawn from an external point is supplementary to the angle subtended by the line-segment joining the points of contact at the center.

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16. Evaluate $-5\cos^2 60° + 4\sec^2 30° - \tan 45°$

Solution:

Step 1: Simplify each trigonometric expression.

We are asked to evaluate the expression:

$$-5\cos^2 60° + 4\sec^2 30° - \tan 45°$$

We know the following values: - $\cos 60° = \frac{1}{2}$, so $\cos^2 60° = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$ - $\sec 30° = \frac{2}{\sqrt{3}}$, so $\sec^2 30° = \left(\frac{2}{\sqrt{3}}\right)^2 = \frac{4}{3}$ - $\tan 45° = 1$

Step 2: Substitute the values into the expression.

Substitute the values into the given expression:

$$-5 \cdot \frac{1}{4} + 4 \cdot \frac{4}{3} - 1$$

$$= -\frac{5}{4} + \frac{16}{3} - 1$$

Step 3: Simplify the expression.

To simplify, first find a common denominator:

$$-\frac{5}{4} + \frac{16}{3} - 1 = -\frac{5}{4} + \frac{16}{3} - \frac{4}{4}$$

$$= \frac{-5 + 64 - 16}{12} = \frac{43}{12}$$

Thus, the value of the expression is:

$$\frac{43}{12}$$

> **Quick Tip**
>
> When simplifying trigonometric expressions, remember to use standard values for common angles like $30°$, $45°$, and $60°$.

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17. If $\cot\theta = \frac{7}{8}$, then evaluate

$$\frac{(1 + \sin\theta)(1 - \sin\theta)}{(1 + \cos\theta)(1 - \cos\theta)}$$

Solution:

Step 1: Express $\sin\theta$ and $\cos\theta$ using $\cot\theta$.

We are given $\cot\theta = \frac{7}{8}$. We know that:

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

Thus, $\cos\theta = 7k$ and $\sin\theta = 8k$ for some constant k. Also, since $\sin^2\theta + \cos^2\theta = 1$, we substitute:

$$(8k)^2 + (7k)^2 = 1 \quad \Rightarrow \quad 64k^2 + 49k^2 = 1 \quad \Rightarrow \quad 113k^2 = 1 \quad \Rightarrow \quad k = \frac{1}{\sqrt{113}}$$

Step 2: Substitute values of $\sin\theta$ and $\cos\theta$ into the expression.

Now that we know $k = \frac{1}{\sqrt{113}}$, we substitute $\sin\theta = \frac{8}{\sqrt{113}}$ and $\cos\theta = \frac{7}{\sqrt{113}}$ into the expression:

$$\frac{(1 + \sin\theta)(1 - \sin\theta)}{(1 + \cos\theta)(1 - \cos\theta)} = \frac{(1 + \frac{8}{\sqrt{113}})(1 - \frac{8}{\sqrt{113}})}{(1 + \frac{7}{\sqrt{113}})(1 - \frac{7}{\sqrt{113}})}$$

Step 3: Simplify the expression.

Use the difference of squares formula to simplify both the numerator and the denominator:

$$= \frac{1 - \left(\frac{8}{\sqrt{113}}\right)^2}{1 - \left(\frac{7}{\sqrt{113}}\right)^2} = \frac{1 - \frac{64}{113}}{1 - \frac{49}{113}} = \frac{\frac{113-64}{113}}{\frac{113-49}{113}} = \frac{49}{64}$$

Thus, the value of the expression is:
$$\frac{49}{64}$$

Quick Tip

For trigonometric identities, express $\sin$ and $\cos$ in terms of $\cot$ and simplify using the Pythagorean identity $\sin^2\theta + \cos^2\theta = 1$.

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18. Two coins are tossed simultaneously. What is the probability of getting (i) at least one head (ii) no head?

Solution:

When two coins are tossed, the possible outcomes are:

{HH, HT, TH, TT}

So, there are 4 possible outcomes.

(i) Probability of getting at least one head:

The outcomes where at least one head appears are: HH, HT, TH. So, there are 3 favorable outcomes. The total number of outcomes is 4.

The probability of getting at least one head is:

$$P(\text{at least one head}) = \frac{3}{4}$$

(ii) Probability of getting no head (i.e., getting two tails):

The only outcome where no head appears is TT. So, there is 1 favorable outcome. The total number of outcomes is 4.

The probability of getting no head is:

$$P(\text{no head}) = \frac{1}{4}$$

> **Quick Tip**
>
> When dealing with multiple coin tosses, list all possible outcomes to help calculate the probability of specific events.

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19. Find the L.C.M of 17, 23, and 29.

Solution:

The LCM (Least Common Multiple) of numbers is the smallest multiple that is evenly divisible by all of them. Since 17, 23, and 29 are prime numbers, their LCM is simply the product of these numbers.

Thus, the LCM of 17, 23, and 29 is:

$$\text{LCM} = 17 \times 23 \times 29 = 11,303$$

> **Quick Tip**
>
> When calculating the LCM of prime numbers, the LCM is the product of the numbers because they have no common factors other than 1.

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20. If $\tan A = \cot B$, prove that $A + B = 90°$.

Solution:

We are given that:

$$\tan A = \cot B$$

We know that:
$$\cot B = \frac{1}{\tan B}$$

So, the equation becomes:
$$\tan A = \frac{1}{\tan B}$$

This implies:
$$\tan A \cdot \tan B = 1$$

Now, using the identity for the tangent of complementary angles:
$$\tan(90° - A) = \cot A$$

Thus, we have:
$$\tan A = \cot B \implies A + B = 90°$$

Hence, we have proved that $A + B = 90°$.

Quick Tip

To prove trigonometric identities, use fundamental identities like $\tan(90° - \theta) = \cot \theta$ to relate different angles.