

## Class X Mathematics Class Test

**Topics:** Pair of Linear Equations, Polynomials and Quadratic Equations

**Time Duration:** 35 Minutes

**Maximum Marks:** 15

### SECTION A: Objective Type Questions [1 × 6 = 6]

1. For what value of k will the following pair of linear equations have no solutions?

$$3x + 4y = 5 \text{ and } (3k + 1)x + 8y = k + 2$$

|     |               |     |                |     |               |     |               |
|-----|---------------|-----|----------------|-----|---------------|-----|---------------|
| (A) | $\frac{5}{3}$ | (B) | $\frac{5}{13}$ | (C) | $\frac{2}{3}$ | (D) | $\frac{4}{3}$ |
|-----|---------------|-----|----------------|-----|---------------|-----|---------------|

2. The quadratic equation whose roots are the x and y intercepts of the line passing through (1, 1) and making a triangle of area A with the axes, is-

|     |                     |     |                      |     |                    |     |                     |
|-----|---------------------|-----|----------------------|-----|--------------------|-----|---------------------|
| (A) | $x^2 + Ax + 2A = 0$ | (B) | $x^2 - 2Ax + 2A = 0$ | (C) | $x^2 + Ax + A = 0$ | (D) | $x^2 - Ax + 2A = 0$ |
|-----|---------------------|-----|----------------------|-----|--------------------|-----|---------------------|

3. If  $\alpha$  and  $\beta$  are the zeroes of the quadratic polynomial  $f(x) = px^2 - qx + r$ , then find the quadratic polynomial whose zeroes are  $\frac{1}{\alpha^3}, \frac{1}{\beta^3}$ .

- (A)  $r^3x^2 - (q^3 - 3pq)x + p^3 = 0$   
 (B)  $r^3x^2 + (q^3 - 3pqr)x + p^3 = 0$   
 (C)  $r^3x^2 - (q^3 - 3pqr)x + p^3 = 0$   
 (D)  $q^3x^2 + (p^3 - 3pqr)x + r^3 = 0$

**Directions for Q4 & Q5:** In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option:

- (A) Both A and R are true and R is the correct explanation of A.  
 (B) Both A and R are true but R is not the correct explanation of A.  
 (C) A is true but R is false.  
 (D) A is false but R is true.

4. **Assertion (A):** If the roots of the equation  $ax^2 + bx + c = 0$  are real and in the ratio m:n, then the following equation is true :  $mnb^2 = ac(m + n)^2$

**Reason (R):** A quadratic equation  $ax^2 + bx + c = 0$  has non-real roots if its discriminant  $b^2 - 4ac < 0$ .

5. **Assertion (A):** The lines represented by  $3x + 4y = 5$  and  $6x + 8y = 9$  are parallel.

**Reason (R):** The system of linear equations  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$  has a unique solution if  $a_1/a_2 = b_1/b_2 \neq c_1/c_2$

6. **Assertion (A):** If the sum of the zeros of a quadratic polynomial is twice the product of its zeros, then the polynomial can be written in the form  $x^2 - 2kx + k^2 = 0$

**Reason (R):** For a quadratic polynomial  $ax^2 + bx + c$ , sum of the zeroes =  $-\frac{b}{a}$  and product =  $\frac{c}{a}$

**SECTION B: Higher Order Thinking Skills (HOTS) [5 marks]**

6. Pipe A can fill a tank. Pipe B is a drainage pipe that can empty the full tank in 5 hours more than Pipe A takes to fill it. Both pipes are opened together in an empty tank. After 4 hours, it is realized that the drainage pipe was left open by mistake, so it is immediately closed. Pipe A continues to run and fills the remaining portion of the tank in 3 hours. Find the time taken by Pipe A alone to fill the tank.

**SECTION C: Case Study Based Questions [4 Marks]**



DRDO is designing an underground solar-powered drone launch tunnel. The tunnel has a parabolic cross-section to ensure optimal aerodynamics and structural stability.

The following informations are known about the tunnel:

- The tunnel touches the ground at two points A and B, which are 20 m apart.
- The highest point of the tunnel is 5 m above the ground.
- The tunnel is symmetric about the vertical line passing through the midpoint of AB.
- The ground level is taken as the x-axis, and the midpoint of AB is taken as the origin.

Q7. Which of the following polynomial can correctly represent the tunnel?

|     |                 |     |                           |     |                   |     |                            |
|-----|-----------------|-----|---------------------------|-----|-------------------|-----|----------------------------|
| (A) | $y = x^2 - 100$ | (B) | $y = \frac{1}{20}x^2 - 5$ | (C) | $y = 20x^2 - 100$ | (D) | $y = -\frac{1}{20x^2} + 5$ |
|-----|-----------------|-----|---------------------------|-----|-------------------|-----|----------------------------|

Q8. At a horizontal distance of 4 m from the centre, the maximum possible height of the tunnel is closest to:

|     |       |     |       |     |       |     |       |
|-----|-------|-----|-------|-----|-------|-----|-------|
| (A) | 4.2 m | (B) | 4.0 m | (C) | 3.2 m | (D) | 2.8 m |
|-----|-------|-----|-------|-----|-------|-----|-------|

Q9. If the tunnel height is required to be at least 2 m, the maximum horizontal distance from the centre at which a drone can fly safely is given by solving:

|     |                 |     |                |     |                |     |                |
|-----|-----------------|-----|----------------|-----|----------------|-----|----------------|
| (A) | $x^2 - 100 = 0$ | (B) | $x^2 - 60 = 0$ | (C) | $x^2 - 80 = 0$ | (D) | $x^2 - 40 = 0$ |
|-----|-----------------|-----|----------------|-----|----------------|-----|----------------|

Q10. A drone of rectangular cross-section (width = 6 m, height = 3 m) passes through the tunnel parallel to the ground, with its centre aligned vertically with  $x = 4$ .

Which of the following statements is correct?

- (A) The drone safely passes with clearance on all sides.
- (B) The drone touches the tunnel at exactly one point.
- (C) The drone cannot pass due to insufficient vertical clearance.
- (D) The drone collides with the tunnel walls before reaching  $x = 4$ .