# 2. Polynomials - Board Exam Questions

The detailed solution for all the questions can be found at pschool.in/math/ncert/g10/chap-2

## 1 Mark Questions (MCQ)

1) The graph of y = f(x) is given. The number of zeroes of f(x) is:
Graph: a W-shaped curve lying entirely above the x-axis.

2) The graph of y = f(x) is given. The number of distinct zeroes of y = f(x) is:
Graph: a cubic-like curve crossing the x-axis at A to the left of O, rising over the y-axis, then dipping to touch the x-axis at one point on the right before rising again.

3) If α and β are two zeroes of a polynomial $f(x) = px^2 - 2x + 3p$ and α + β = αβ, then value of p is:

4) The sum and product of zeroes of a quadratic polynomial p(x) are $\frac{-1}{3}$ and 2 respectively. The polynomial p(x) is:
(a) $3x^2 - x + 6$ (b) $x^2 + \frac{1}{3}x - 2$
(c) $3x^2 - x + 2$ (d) $-3x^2 - x - 6$

5) Observe the graph of polynomial p(x). Number of zeroes of p(x) is
Graph: a cubic-like curve y = p(x) crossing the x-axis three times — twice to the left of O and once to the right.

6) If the zeroes of a polynomial p(x) are −3 and 8, then p(x) equals
(a) $x^2 + 5x - 4$ (b) (x + 3)(−x + 8)
(c) $a(x^2 + 5x - 24)$ (d) $x^2 - 24$

7) If $f(x) = px^2 + qx + r$, $p \neq 0$ and $p + r = q$, then one of the zeroes of $f(x)$ is:

8) If α and β are the zeroes of polynomial $3x^2 + 6x + k$ such that $\alpha + \beta + \alpha\beta = -\frac{2}{3}$, then the value of k is:

9) Two polynomials are shown in the graph below. The number of distinct zeroes of both the polynomials is:
Graph: an upward parabola and a downward parabola, both

cutting the x-axis at the same two points, one on each side of the y-axis.

10) If −4 is a zero of the polynomial $p(x) = x^2 - x - (2 + 2k)$, then the value of k is:

11) If α and β are the zeroes of the polynomial $p(x) = x^2 - ax - b$, then the value of (α + β + αβ) is equal to:

12) Zeroes of the polynomial $p(x) = x^2 - 3\sqrt{2}x + 4$ are:

13) Which of the following statements is true for a polynomial p(x) of degree 3?
(a) p(x) has at most two distinct zeroes (b) p(x) has at least two distinct zeroes
(c) p(x) has exactly three distinct zeroes (d) p(x) has at most three distinct zeroes

14) If the zeroes of the polynomial $ax^2 + bx + \frac{2a}{b}$ are reciprocal of each other, then the value of b is

15) If zeroes of the quadratic polynomial $ax^2 + bx + c$ $(a, c \neq 0)$ are equal, then
(a) c and b must have opposite signs
(b) c and a must have opposite signs
(c) c and b must have same signs
(d) c and a must have same signs

16) If the sum of zeroes of the polynomial $p(x) = 2x^2 - k\sqrt{2}x + 1$ is $\sqrt{2}$, then value of k is:

17) The zeroes of a polynomial $x^2 + px + q$ are twice the zeroes of the polynomial $4x^2 - 5x - 6$. The value of p is:

18) If α and β are zeroes of the polynomial $5x^2 + 3x - 7$, the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ is

19) The zeroes of the quadratic polynomial $2x^2 - 3x - 9$ are:

20) If a polynomial p(x) is given by $p(x) = x^2 - 5x + 6$, then the value of p(1) + p(4) is:

21) If α and β are the zeroes of the polynomial $p(x) = kx^2 - 30x + 45k$ and α + β = αβ, then the value of k is:

22) The graph of a quadratic polynomial $p(x)$ passes through the

points (−6, 0), (0, −30), (4, −20) and (6, 0). The zeroes of the polynomial are

23) A quadratic polynomial having zeroes $-\sqrt{\frac{5}{2}}$ and $\sqrt{\frac{5}{2}}$ is
(a) $x^2 - 5\sqrt{2}x + 1$ (b) $8x^2 - 20$
(c) $15x^2 - 6$ (d) $x^2 - 2\sqrt{5}x - 1$

24) The graph of $y = p(x)$ is given, for a polynomial $p(x)$. The number of zeroes of $p(x)$ from the graph is
Graph: a downward-opening parabola that touches the x-axis at one point, just to the right of the origin.

25) If $\alpha$, $\beta$ are the zeroes of a polynomial $p(x) = x^2 + x - 1$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ equals to

26) Which of the following is a quadratic polynomial having zeroes $\frac{-2}{3}$ and $\frac{2}{3}$?
(a) $4x^2 - 9$ (b) $\frac{4}{9}(9x^2 + 4)$
(c) $x^2 + \frac{9}{4}$ (d) $5(9x^2 - 4)$

27) If one zero of the polynomial $6x^2 + 37x - (k - 2)$ is reciprocal of the other, then what is the value of k?

28) The zeroes of the polynomial $p(x) = x^2 + 4x + 3$ are given by:

29) If $\alpha$ and $\beta$ are the zeroes of the quadratic polynomial $p(x) = x^2 - ax - b$, then the value of $\alpha^2 + \beta^2$ is:

30) If $\alpha$, $\beta$ are zeroes of the polynomial $x^2 - 1$, then value of $(\alpha + \beta)$ is:

31) If $\alpha$, $\beta$ are the zeroes of the polynomial $p(x) = 4x^2 - 3x - 7$, then $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$ is equal to:

32) The number of polynomials having zeroes −3 and 5 is:

33) The number of quadratic polynomials having zeroes −5 and −3 is

34) If the zeroes of the quadratic polynomial $x^2 + (a + 1)x + b$ are 2 and −3, then

35) The given linear polynomial $y = f(x)$ has
Graph: a straight line through (0, 4) and (3, 0).

(a) 2 zeros (b) 1 zero and the zero is '3'
(c) 1 zero and the zero is '4' (d) No zero

Assertion and Reason

1) ASSERTION (A): The polynomial $p(y) = y^2 + 4y + 3$ has two zeroes.
REASON (R): A quadratic polynomial can have at most two zeroes.
2) ASSERTION (A): If zeroes of the polynomial $(2k - 1)x^2 + 4x - 3$ are reciprocal of each other, then $k = -1$.
REASON (R): If $a = c$, then zeroes of the polynomial $ax^2 + bx + c$, $a \neq 0$ are reciprocal of each other.
3) ASSERTION (A): If the graph of a polynomial touches x-axis at only one point, then the polynomial cannot be a quadratic polynomial.
REASON (R): A polynomial of degree n(n > 1) can have at most n zeroes.
4) ASSERTION (A): Degree of a zero polynomial is not defined.
REASON (R): Degree of a non-zero constant polynomial is 0.
5) ASSERTION (A): The polynomial $p(x) = x^2 + 3x + 3$ has two real zeroes.
REASON (R): A quadratic polynomial can have at most two real zeroes.

2 Mark Questions

1) Find the zeroes of the polynomial $p(x) = x^2 + \frac{4}{3}x - \frac{4}{3}$.
2) If α, β are zeroes of the polynomial $p(x) = 5x^2 - 6x + 1$, then find the value of α + β + αβ.
3) If α, β are the zeroes of the polynomial $p(x) = x^2 - 3x - 1$, then find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$.
4) If p and q are zeroes of the polynomial $p(y) = 21y^2 - y - 2$, then find the value of (1 − p)(1 − q).
5) α and β are the zeroes of the polynomial $5x^2 - 16x - 10$. Find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.

6) If 'α' and 'β' are the zeroes of the polynomial $p(y) = y^2 - 5y + 3$, then find the value of $\alpha^4\beta^3 + \alpha^3\beta^4$.

7) If α, β are the zeroes of the quadratic polynomial $px^2 + qx + r$, then find the value of $\alpha^3\beta + \beta^3\alpha$.

8) If one zero of the polynomial $p(x) = 6x^2 + 37x - (k - 2)$ is reciprocal of the other, then find the value of k.

3 Mark Questions

1) Find the zeroes of the quadratic polynomial $x^2 - 15$ and verify the relationship between the zeroes and the coefficients of the polynomial.

2) Find the zeroes of the polynomial $4x^2 + 4x - 3$ and verify the relationship between zeroes and coefficients of the polynomial.

3) Find the zeroes of the quadratic polynomial $2x^2 - (1 + 2\sqrt{2})x + \sqrt{2}$ and verify the relationship between the zeroes and coefficients of the polynomial.

4) If $\alpha$, $\beta$ are zeroes of quadratic polynomial $5x^2 + 5x + 1$, find the value of (1) $\alpha^2 + \beta^2$ (2) $\alpha^{-1} + \beta^{-1}$.

5) If α and β are the zeroes of the polynomial $x^2 + x - 2$, then find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.

6) If $\alpha$ and $\beta$ are the zeroes of the quadratic polynomial $2x^2 - 8x + 5$, then find the value of $\left(\alpha + \frac{1}{\beta}\right) \times \left(\beta + \frac{1}{\alpha}\right)$.

7) Obtain the zeroes of the polynomial $7x^2 + 18x - 9$. Hence, write a polynomial each of whose zeroes is twice the zeroes of given polynomial.

8) Find the zeroes of the polynomial $p(x) = 3x^2 - 4x - 4$. Hence, write a polynomial whose each of the zeroes is 2 more than zeroes of p(x).

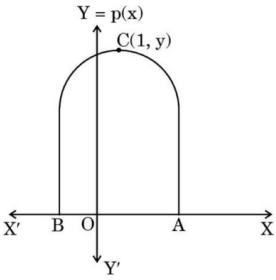
9) If the zeroes of the polynomial $x^2 + px + q$ are double in value to the zeroes of the polynomial $2x^2 - 5x - 3$, then find the values of $p$ and $q$.

10) If $\alpha$ and $\beta$ are zeroes of a polynomial $6x^2 - 5x + 1$ then form a quadratic polynomial whose zeroes are $\alpha^2$ and $\beta^2$.

11) α and β are zeroes of a quadratic polynomial $px^2 + qx + 1$. Form a quadratic polynomial whose zeroes are $\frac{2}{\alpha}$ and $\frac{2}{\beta}$.

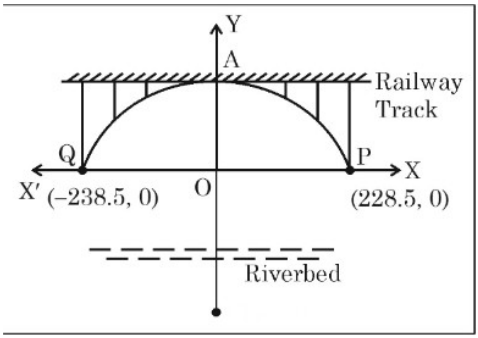
4 Mark Questions

1) During a theatre drama, a backdrop of building arches was used. The shape of the curve shown below can be represented by the polynomial $p(x) = -x^2 + 2x + 8$, where $x$ is the length (in feet) on stage level.



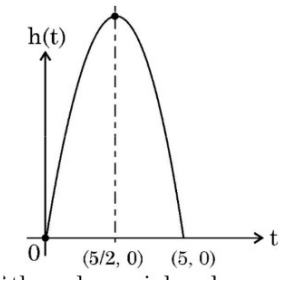

(i) Determine the height of the arch. (1)
(ii) (a) Find zeroes of the polynomial $p(x)$. Which points on the graph represent the zeroes? (2)
OR (b) Find the span of the arch on the stage floor.
(iii) Write the coordinates of the point of intersection of the above curve with the $y$-axis. (1)

2) An arch of a railway bridge, built on Chenab riverbed, is shown in the above diagram. It is a parabolic arch connecting two hills at P and Q. If the parabolic curve is represented by the polynomial $p(x) = -0.0025x^2 - 0.025x + 136$.




(i) Write the co-ordinates of point A. (1)
(ii) Find the span of the arch. (1)
(iii) (a) Write the zeroes of the polynomial using diagram and verify the relationship between sum of zeroes and polynomials. (2)
OR (b) Find the values of $p(x)$ at $x = 100$ and $x = -100$. Are they same?

3) A ball is thrown in the air so that $t$ seconds after it is thrown, its height $h$ metre above its starting point is given by the polynomial $h = 25t - 5t^2$.



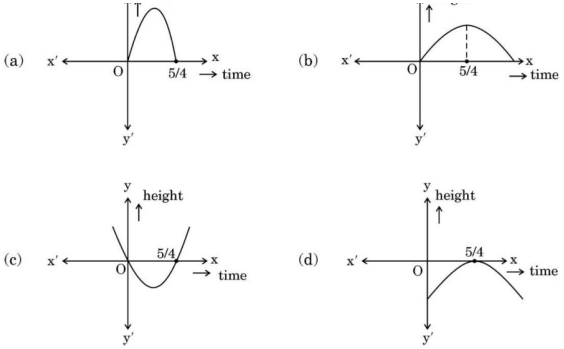

(i) Write zeroes of the given polynomial. (1)

(ii) Find the maximum height achieved by ball. (1)

(iii) (a) After throwing upward, how much time did the ball take to reach to the height of 30 m? (2)

OR (b) Find the two different values of $t$ when the height of the ball was 20 m.

4) In a pool at an aquarium, a dolphin jumps out of the water travelling at 20 cm per second. Its height above water level after $t$ seconds is given by $h = 20t - 16t^2$.




(i) Find zeroes of polynomial $p(t) = 20t - 16t^2$. (1)

(ii) Which of the following types of graph represents $p(t)$? (1)

(iii) (a) What would be the value of $h$ at $t = \frac{3}{2}$? Interpret the result. (2)

OR (b) How much distance has the dolphin covered before hitting the water level again?