CHAPTER – 2
POLYNOMIALS

QUADRATIC POLYNOMIAL

Relationship between zeroes and coefficients

General form of Quadratic polynomial: $ax^2 + bx + c$, $a \neq 0$

Sum of zeroes $(\alpha + \beta) = -\dfrac{\text{Coefficient of x}}{\text{Coefficient of x}^2} = -\dfrac{b}{a}$

Product of zeroes $(\alpha\beta) = \dfrac{\text{Constant term}}{\text{Coefficient of x}^2} = \dfrac{c}{a}$

IMPORTANT QUESTIONS

Find a quadratic polynomial, the sum and product of whose zeroes are – 3 and 2, respectively.

Solution: Here, $\alpha + \beta = -3$ and $\alpha\beta = 2$

We know that quadratic polynomial is given by $p(x) = x^2 - (\alpha + \beta)x + \alpha\beta$

$= x^2 - (-3)x + 2 = x^2 + 3x + 2$

Hence, required quadratic polynomial is $x^2 + 3x + 2$

Find a quadratic polynomial, whose zeroes are – 3 and 2.

Solution: Here, $\alpha = -3$ and $\beta = 2$.

Now, $\alpha + \beta = -3 + 2 = -1$ and $\alpha\beta = (-3)(2) = -6$

We know that quadratic polynomial is given by $p(x) = x^2 - (\alpha + \beta)x + \alpha\beta$

$= x^2 - (-1)x + (-6) = x^2 + x - 6$

Hence, required quadratic polynomial is $x^2 + x - 6$

Find the zeroes of the quadratic polynomial $x^2 - 2x - 8$ and verify the relationship between the zeroes and the coefficients.

Solution: Here, $p(x) = x^2 - 2x - 8 = 0$

$x^2 - 4x + 2x - 8 = 0 \Rightarrow x(x - 4) + 2(x - 4) = 0 \Rightarrow (x - 4)(x + 2) = 0$

$\Rightarrow x = 4, -2$

Now, $a = 1$, $b = -2$, $c = -8$, $\alpha = 4$, $\beta = -2$

Sum of zeroes, $\alpha + \beta = 4 + (-2) = 2$ and $\dfrac{-b}{a} = \dfrac{-(-2)}{1} = 2$ $\quad \therefore \alpha + \beta = \dfrac{-b}{a}$

Product of zeroes, $\alpha\beta = 4(-2) = -8$ and $\dfrac{c}{a} = \dfrac{-8}{1} = -8$ $\quad \therefore \alpha\beta = \dfrac{c}{a}$.

Hence verified.

Questions for practice

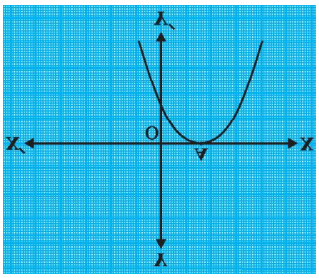
1. Find a quadratic polynomial, the sum and product of whose zeroes are – 5 and 3, respectively.
2. Find a quadratic polynomial, whose zeroes are – 4 and 1, respectively.
3. Find the zeroes of the quadratic polynomial $x^2 + 7x + 10$, and verify the relationship between the zeroes and the coefficients.
4. Find the zeroes of the polynomial $x^2 - 3$ and verify the relationship between the zeroes and the coefficients.
5. Find the zeroes of the quadratic polynomial $6x^2 - 3 - 7x$ and verify the relationship between the zeroes and the coefficients.
6. Find the zeroes of the quadratic polynomial $3x^2 - x - 4$ and verify the relationship between the zeroes and the coefficients.
7. Find the zeroes of the quadratic polynomial $4x^2 - 4x + 1$ and verify the relationship between the zeroes and the coefficients.

MCQ (1 MARK)

1. The value of k for which (–4) is a zero of the polynomial $x^2 – x – (2k +2)$ is
(a) 3 (b) 9 (c) 6 (d) –1

2. If the zeroes of the quadratic polynomial ax2 + bx + c, $c \neq 0$ are equal, then
(a) c and a have opposite sign (b) c and b have opposite sign
(c) c and a have the same sign (d) c and b have the same sign

3. The number of zeroes of the polynomial from the graph is
(a) 0 (b) 1 (c) 2 (d) 3



4. If one of the zero of the quadratic polynomial $x^2 +3x + k$ is 2, then the value of k is
(a) 10 (b) –10 (c) 5 (d) –5

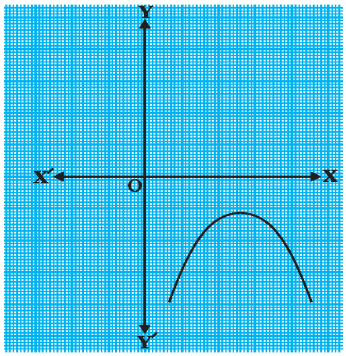
5. A quadratic polynomial whose zeroes are –3 and 4 is
(a) $x^2 – x +12$ (b) $x^2 +x + 12$ (c) $2x^2 + 2x – 24$. (d) none of the above.

6. The relationship between the zeroes and coefficients of the quadratic polynomial $ax^2 + bx + c$ is (a) $\alpha + \beta = \frac{c}{a}$ (b) $\alpha + \beta = \frac{-b}{a}$ (c) $\alpha + \beta = \frac{-c}{a}$ (d) $\alpha + \beta = \frac{b}{a}$

7. The zeroes of the polynomial $x^2 + 7x + 10$ are
(a) 2 and 5 (b) –2 and 5 (c) –2 and –5 (d) 2 and –5

8. The relationship between the zeroes and coefficients of the quadratic polynomial $ax^2 + bx + c$ is (a) $\alpha.\beta = \frac{c}{a}$ (b) $\alpha .\beta = \frac{-b}{a}$ (c) $\alpha .\beta = \frac{-c}{a}$ (d) $\alpha .\beta = \frac{b}{a}$

9. The zeroes of the polynomial $x^2 – 3$ are
(a) 2 and 5 (b) –2 and 5 (c) –2 and –5 (d) none of the above



10. The number of zeroes of the polynomial from the graph is
(a) 0 (b) 1 (c) 2 (d) 3

11. A quadratic polynomial whose sum and product of zeroes are –3 and 2 is
(a) $x^2 – 3x +2$ (b) $x^2 + 3x + 2$ (c) $x^2 + 2x – 3$. (d) $x^2 + 2x + 3$.

12. Which of the following is a polynomial?

$(a) x^2 - 5x + 3$

$(b) \sqrt{x} + \frac{1}{\sqrt{x}}$

$(c) x^{3/2} - x + x^{1/2}$

$(d) x^{1/2} + x + 10$

13. Which of the following is not a polynomial?

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

$(b)\frac{3}{2}x^3 - 5x^2 - \frac{1}{\sqrt{2}}x - 1$

$(c)x + \frac{1}{x}$

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

14. If α, β are the zeroes of the polynomials f(x) = x^2 + 5x + 8, then $\alpha + \beta$

(a) 5 (b) –5 (c) 8 (d) none of these

15. If α, β are the zeroes of the polynomials f(x) = x^2 + 5x + 8, then $\alpha.\beta$

(a) 0 (b) 1 (c) –1 (d) none of these

16. Which of the following is a polynomial:

(a) $x^2 + \frac{1}{x}$ (b) $2x^2 - 3\sqrt{x} + 1$ (c) $x^2 + x^{-2} + 7$ (d) $3x^2 - 3x + 1$

17. The product and sum of zeroes of the quadratic polynomial ax^2 + bx + c respectively are:

(a)$\frac{b}{a}, \frac{c}{a}$ (b) $\frac{c}{a}, \frac{b}{a}$ (c) $\frac{c}{b}$,1 (d) $\frac{c}{a}, \frac{-b}{a}$

18. The zeroes of the quadratic polynomial x^2 + kx + k, $k \neq 0$,

(a) cannot both be positive (b) cannot both be negative

(c) are always unequal (d) are always equal

19. A quadratic polynomial can have at most …….. zeroes

(a) 0 (b) 1 (c) 2 (d) 3

20. A cubic polynomial can have at most …….. zeroes.

(a) 0 (b) 1 (c) 2 (d) 3

21. Which are the zeroes of p(x) = x^2 – 1:

(a) 1, –1 (b) – 1, 2 (c) –2, 2 (d) –3, 3

22. Which are the zeroes of p(x) = (x – 1)(x – 2):

(a) 1, –2 (b) – 1, 2 (c) 1, 2 (d) –1, –2