Polynomial

1. If one of the zeroes of the quadratic polynomial (a-1)x^2+ax+1 is -3, then the value of a is: (2024)

(a) $-\frac{2}{3}$ (b) $\frac{2}{3}$ (c) $\frac{4}{3}$ (d) $\frac{3}{4}$

Answer. (c) $\frac{4}{3}$

2. For what value of k, the product of zeroes of the polynomial kx^2-4x-7 is 2? (2024)

(a) $-\frac{1}{14}$ (b) $-\frac{7}{2}$ (c) $\frac{7}{2}$ (d) $-\frac{2}{7}$

Answer. (b) $-\frac{7}{2}$

Directions:
Assertion (A) is followed by a statement
of Reason (R). Select the correct option from the following options:
(a) Both, Assertion (A) and Reason (R) are true. Reason (R) explains Assertion (A) completely.
(b) Both, Assertion (A) and Reason (R) are true. Reason (R) does not explain Assertion (A).
(c) Assertion (A) is true but Reason (R) is false.
(d) Assertion (A) is false but Reason (R) is true.

3. Assertion (A): Zeroes of a polynomial p(x) = x^2-2x-3 are -1 and 3.
Reason (R): The graph of polynomial p(x) = x^2-2x-3 intersects x-axis at (-1, 0) and (3, 0). (2024)

Answer. (a) Both Assertion (A) and Reason (R) are true. Reason (R) explains Assertion (A) completely.

4. 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: (2024)

(a) $-\frac{5}{2}$ (b) $\frac{5}{2}$ (c) -5 (d) 10

Answer.
(a) $-\frac{5}{2}$

5. 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: (2024)

(a) $\sqrt{2}$ (b) 2 (c) $2\sqrt{2}$ (d) $\frac{1}{2}$

Answer. (b) 2

2.1 Introduction

MCQ

1. If one of the zeroes of a quadratic polynomial $(k-1)x^2 + kx + 1$ is -3, then the value of k is

(a) $\frac{4}{3}$ (b) $-\frac{4}{3}$ (c) $\frac{2}{3}$ (d) $-\frac{2}{3}$

(NCERT Exemplar, Term I, 2021-22)

2. The degree of polynomial having zeroes -3 and 4 only is

(a) 2 (b) 1

(c) more than 3 (d) 3 *(2020)*

3. If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is

(a) 10

(b) -10

(c) -7

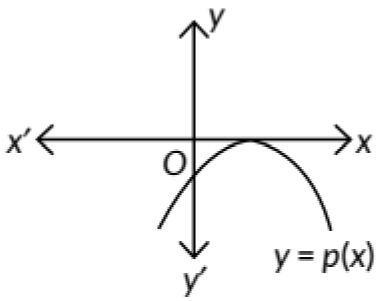
(d) -2

(2020)

2.2 Geometrical Meaning of the Zeroes of a Polynomial

MCQ

4. The graph of $y = p(x)$ is given, for a polynomial $p(x)$. The number of zeroes of $p(x)$ from the graph is



2.3 Relationship between Zeroes and Coefficients of a Polynomial

MCQ

5. Which of the following is a quadratic polynomial with zeroes $\frac{5}{3}$ and 0?

(a) $3x(3x - 5)$ (b) $3x(x - 5)$

(c) $x^2 - \frac{5}{3}$ (d) $\frac{5}{3}x^2$ *(2023)*

6. If α, ß are the zeroes of a polynomial $p(x) = x^2 + x - 1$,

then $\frac{1}{\alpha} + \frac{1}{\beta}$ equals to

(a) 1 (b) 2 (c) −1 (d) $\frac{-1}{2}$

(2023)

7. If α, ß are zeroes of the polynomial $x^2 - 1$, then value of (a + B) is
(a) 2
(b) 1
(c) -1
(d) O (2023)

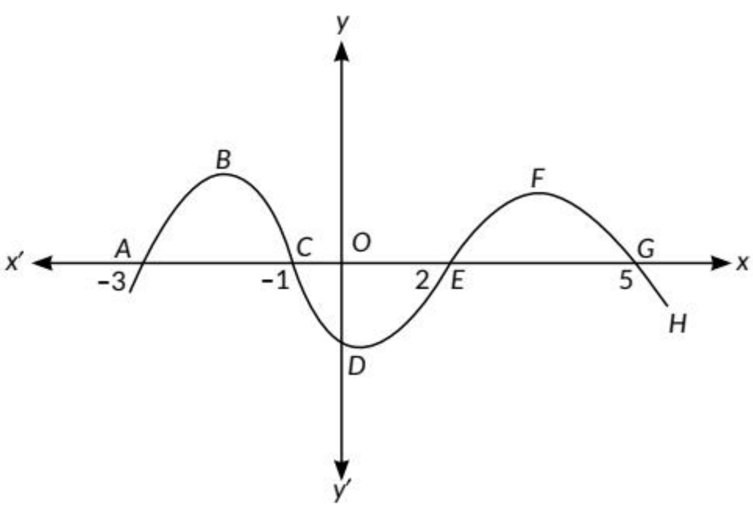
8. If a, ß are the zeroes of the polynomial $p(x) = 4x^2 - 3x$

-7, then $\left(\frac{1}{\alpha}+\frac{1}{\beta}\right)$ is equal to

(a) $\frac{7}{3}$ (b) $\frac{-7}{3}$ (c) $\frac{3}{7}$ (d) $\frac{-3}{7}$

(2023)

Case study: A car moves on a highway. The path it traces is given below:



Based on the above information, attempt any 4 questions from 9 to 13.

9. What is the shape of the curve EFG?
(a) Parabola
(b) Ellipse
(c) Straight line
(d) Circle (Term I, 2021-22)

10. If the curve ABC is represented by the polynomial $-(x^2+4x+3)$, then its zeroes are
(a) 1 and -3
(b) -1 and 3

(c) 1 and 3
(d) - 1 and -3 (Term I, 2021-22)

11. If the path traced by the car has zeroes at -1 and 2, then it is given by
(a) x^2+x+2
(b) x^2-x+2
(c) x^2-x-2
(d) x^2+x-2 (Term I, 2021-22)

12. The number of zeroes of the polynomial representing
the whole curve, is
(a) 4
(b) 3
(c) 2
(d) 1 (Term I, 2021-22)

13. The distance between C and Gis
(a) 4 units
(b) 6 units
(c) 8 units
(d) 7 units (Term I, 2021-22)

14. The quadratic polynomial, the sum of whose zeroes is -5 and their product is 6, is
(a) x^2+5x+6
(b) x^2-5x+6
(c) $x^2 - 5x - 6$
(d) $-x^2+5x+6$ (Term I, 2021-22, 2020)

VSA (1 mark)

15. If a and ß are the zeroes of the quadratic polynomial
$f(x) = x^2 - x - 4$, find the value of $\frac{1}{\alpha}+\frac{1}{\beta}-\alpha\beta$. *(2021C)*

16. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then find the value of k. (2021C)

17. If a, ß are zeroes of the polynomial $2x^2 - 5x-4$, then

$\frac{1}{\alpha}+\frac{1}{\beta}=$ ________ . (2020C)

18. If a, ß are zeroes of the polynomial - $3x^2 + x - 5$, then

the value of $\frac{1}{\alpha}+\frac{1}{\beta}$ is ________ . (2020C)

19. Form a quadratic polynomial, the sum and product of whose zeroes are -3 and 2 respectively. (2020)

20. Find the quadratic polynomial whose zeroes are 3 and -4 respectively. (Board Term 1, 2015)

SAI (2 marks)

21. If one zero of the polynomial $p(x) = 6x^2 + 37x - (k - 2)$ is reciprocal of the other, then find the value of k. (2023)

22. If a and ß are zeroes of the polynomial $x^2 - p(x + 1) + c$ such that (a+1)(B+ 1) = 0, then find the value of c. (Board Term 1, 2016)

23. If a and Bare zeroes of $4x^2 +3x+7$, then find the value

of $\frac{1}{\alpha}+\frac{1}{\beta}$. (Board Term I, 2015)

SA II (3 marks)

24. Find a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, a +0, c + 0. (2020)

25. Find the value of k such that the polynomial $x^2 - (k+6)x+2(2k - 1)$ has sum of its zeroes equal to half of their product. (Delhi 2019)

26. Find the zeroes of the quadratic polynomial

$7y^2-\frac{11}{3}y-\frac{2}{3}$ and verify the relationship between the zeroes and the coefficients. (2019)

27. Find the quadratic polynomial, sum and product of whose zeroes are -1 and - 20 respectively. Also, find the zeroes of the polynomial so obtained. (2019)

28. If a and ß are zeroes of $4x^2$ - x - 4, find quadratic

polynomial whose zeroes are $\frac{1}{2\alpha}$ and $\frac{1}{2\beta}$.

(Board Term I, 2017,

29. If a and ß are the zeroes of p(x) = $6x^2$ - 7x + 2. Find

the quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ & $\frac{1}{\beta}$.

(Board Term I, 2017)

30. Find the zeroes of quadratic polynomial $6x^2$ - 3 - 7x and verify the relationship between the zeroes and the coefficients of the polynomial. (Board Term 1, 2015)

CBSE Sample Questions

2.3 Relationship between Zeroes and Coefficients of a Polynomial

MCQ

1. If a and ß are the zeros of a polynomial f(x) = px^2 - 2x + 3p and α + B = aß, then pis
(a) -2/3
(b) 2/3
(c) 1/3
(d) -1/3 (2022-23)

2. If 2 and 1/2 are the zeroes of px^2 +5x+r, then
(a) p=r=2
(b) p=r=-2
(c) p=2, r=-2
(d) p=-2, r=2 (Term I, 2021-22)

Case study: The figure given alongside shows the path of a diver, when she takes a jump from the diving board. Clearly, it is a parabola.

Annie was standing on a
diving board, 48 feet above

the water level. She took
a dive into the pool. Her
height (in feet) above the
water level at any time 't'
(in seconds) is given by the
polynomial h(t) such that h(t)
$=-16t^2 + 8t+k$.
Based on above information,
attempt any 4 out of 5 subparts.

3. What is the value of k?
(a) 0
(b) -48
(c) 48
(d) 48 / -16
(Term I, 2021-22)

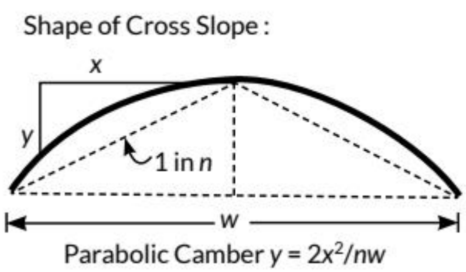
4. At what time will she touch the water in the pool?
(a) 30 seconds
(c) 1.5 seconds
(b) 2 seconds
(d) 0.5 seconds (Term I, 2021-22)

5. Rita's height (in feet) above the water level is given by another polynomial p(t) with zeroes -1 and 2. Then p(t) is given by
(a) t^2+t-2
(b) t^2+2t-1
(c) 24t2-24t+48
(d) $-24t^2 + 24t+48$ (Term I, 2021-22)

6. A polynomial q(t) with sum of zeroes as 1 and the product as -6 is modelling Anu's height in feet above the water at any time t (in seconds). Then q(t) is given by
(a) t^2+t+6
(b) t^2+t-6
(c) $-8t^2+8t+48$
(d) $8t^2 - 8t+48$ (Term I, 2021-22)

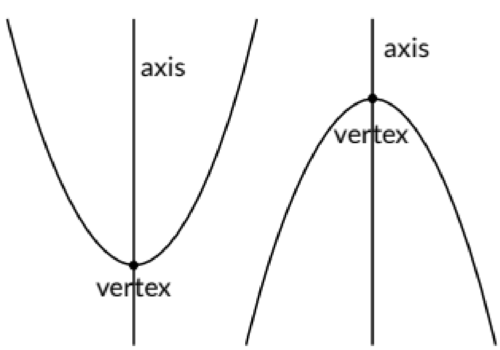
7. The zeroes of the polynomial $r(t) = -12t^2 + (k - 3)t + 48$ are additive inverse of each other. Then k is
(a) 3
(b) 0
(c) -1.5
(d) -3 (Term 1, 2021-22)

8. **Case Study:** Applications of Parabolas-Highway Overpasses/Underpasses
A highway underpasses is parabolic in shape.



Parabola

A parabola is the graph that results from $p(x) = ax^2 + bx + c$. Parabolas are symmetric about a vertical line known as the Axis of Symmetry.
The Axis of Symmetry runs through the maximum or minimum point of the parabola which is called the Vertex.



Based on above information, attempt any 4 out of 5 subparts.
(i) If the highway overpass is represented by x^2 - 2x - 8. Then its zeroes are
(a) (2,-4)
(b) (4,-2)
(c) (-2,-2)
(d) (-4,-4)
(ii) The highway overpass is represented graphically. Zeroes of a polynomial can be expressed graphically. Number of zeroes of polynomial is equal to number of points where the graph of polynomial
(a) Intersects x-axis
(b) Intersects y-axis
(c) Intersects y-axis or x-axis
(d) None of the above
(iii) Graph of a quadratic polynomial is a
(a) straight line
(b) circle
(c) parabola
(d) ellipse
(iv) The representation of Highway Underpass whose one zero is 6 and sum of the zeroes is 0, is
(a) x^2-6x+2
(b) x^2-36
(c) x^2-6
(d) x^2-3
(v) The number of zeroes that polynomial $f(x) = (x - 2)^2 + 4$ can have is
(a) 1
(b) 2
(c) 0
(d) 3 (2020-21)

VSA (1 mark)

9. If the sum of the zeroes of the quadratic polynomial
$3x^2 - kx + 6$ is 3, then find the value of k. (2020-21)

SAI (2 marks)

10. Find a quadratic polynomial whose zeroes are 5-3√2
and 5+3√2. (2020-21)

SA II (3 marks)

11. If the zeroes of the polynomial $x^2 + px + q$ are double in value to the zeroes of the polynomial 2x2 - 5x - 3, then find the values of p and q. (2022-23)

SOLUTIONS

Previous Years' CBSE Board Questions

1. (a): Given, -3 is a zero of quadratic polynomial
$(k-1)x^2 + kx + 1$.
:- (k-1) (-3)2+k(-3)+1=0
= 9k-9-3k+1=06k-8=0
k=8/6 = k= 4/2

2. (a): Since, the polynomial has two zeroes only. So, the degree of the polynomial is 2.

3. (b): Given, 2 is a zero of the polynomial
$p(x) = x^2+3x+k$.
:- $p(2) = 0 \Rightarrow (2)^2 + 3(2) + k = 0 \Rightarrow 4+6+k=0$
= 10+ k=0k = -10

4. (b):
Here, y = p(x) touches the x-axis at one point.
So, number of zeros is one.

5. (a): Consider option (a)
3x(3x-5)=0

$$\Rightarrow \quad 3x = 0 \text{ or } 3x - 5 = 0 \Rightarrow x = 0 \quad \text{or} \quad x = \frac{5}{3}$$

6. (a): We have, $p(x) = x^2 + x - 1$, a + B = -1
and a . ß=-1

$$\text{Now, } \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{-1}{-1} = 1$$

7. (d): Since, a, ß are the zeroes of polynomial x^2 - 1
:- x^2+0x-1=0
:- Sum of zeroes, (a + B) = 0

8. (d): Since, a, ß are the zeroes of polynomial p(x) = $4x^2$ - 3x-7

$$\therefore \quad \text{Sum of zeroes, } (\alpha+\beta)=\frac{3}{4}$$

$$\text{and product of zeroes } (\alpha\beta)=\frac{-7}{4}$$

$$\text{Now, } \frac{1}{\alpha}+\frac{1}{\beta}=\frac{\alpha+\beta}{\alpha\beta}=\frac{\frac{3}{4}}{\frac{-7}{4}}=\frac{-3}{7}$$

9. (a): Shape of curve EFG is parabola.

10. (d): Given polynomial is - (x^2+4x+3).
Corresponding equation is x^2 + 4x+3=0
⇒ x^2+x+3x+3= 0 (x + 1)(x+3)= 0
⇒ x=-1,- 3

11. (c): The polynomial having zeroes α, ß is
k[x^2 - (a + B) x + aß], where k is real.
Here α = -1 and B = 2
:- Required polynomial = k [x^2 - (-1+2)x+(-1) x (2)]
= [x2-x-2] (for k = 1)

12. (a): Given curve cuts the x-axis at four distinct points. So, number of zeroes will be 4.

13. (b): The distance between point C and G is 6 units.

14. (a): Let a, ß be the zeroes of required polynomial p(x).
Given, α + B = -5 and aß = 6
:- p(x) = k[x^2 - (-5)x + 6] = k[x^2 +5x+6]
Thus, one of the polynomial which satisfy the given condition is x^2+5x+6.

15. Given, a and ß are the zeros of the polynomial
f(x) = x^2-x-4.

:- α + B = 1 and aß = -4

$$\text{Now, } \frac{1}{\alpha}+\frac{1}{\beta}-\alpha\beta=\frac{\alpha+\beta}{\alpha\beta}-\alpha\beta \;=\frac{1}{-4}-(-4)=\frac{-1}{4}+4=\frac{15}{4}$$

16. Given, polynomial is f(x) = x^2+3x+k
Since, 2 is zero of the polynomial f(x).
:- f(2) = 0
= f(2) = $(2)^2$+3x2+k⇒ 4+6+k=0⇒ k = -10

17. Given, a and ß are zeros of $2x^2$-5x-4
:- α+ß = 5/2 and aß = -2

$$\text{Now, } \frac{1}{\alpha}+\frac{1}{\beta}=\frac{\alpha+\beta}{\alpha\beta}=\frac{5/2}{-2}=-5/4$$

18. Given, a and ß are zeros of $-3x^2$+x-5
:- α + B = 1/3 and aß = 5/3

$$\text{Now, } \frac{1}{\alpha}+\frac{1}{\beta}=\frac{\alpha+\beta}{\alpha\beta}=\frac{1/3}{5/3}=1/5$$

19. Let a, ß be the zeroes of required polynomial p(x).
Given, a + B = -3 and aß = 2
:- p(x) = k[x^2 - (-3)x + 2] = k[x^2 + 3x + 2]
For k = 1, p(x) = x^2+3x+2
Hence, one of the polynomial which satisfy the given condition is x^2 + 3x + 2.

20. We have, 3 and - 4 are the zeroes of quadratic polynomial. Now, sum of zeroes = 3 + (− 4) = − 1
Product of zeroes = 3(-4) = - 12
:- Required quadratic polynomial is
k[x^2 - (sum of zeroes)x + product of zeroes]
= k[x^2 - (-1)x+(-12)] = x^2+x-12 (for k = 1)

21. Let one zero of the polynomial p(x) be a, then the other zero be 1/α.
For zeroes of polynomial p(x) = $6x^2$+37x - (k-2)

$$\therefore \quad \text{Product of zeroes } =\alpha\times\frac{1}{\alpha}=\frac{-(k-2)}{6}$$

$$\Rightarrow \quad \frac{-(k-2)}{6}=1$$

⇒k-2-6 ⇒ k=-4

22. The given polynomial is x^2 - p(x + 1) + c If a and ß are zeroes of given polynomial

$$\therefore \quad \text{Sum of zeroes} = \alpha + \beta = -\frac{b}{a} = \frac{-(-p)}{1} = p$$

$$\text{and product of zeroes} = \alpha\beta = \frac{-p+c}{1} = -p+c$$

Now, (a + 1) (B + 1) = 0
= aß+a+B+1=0
= -p+c+p+1=0c+1=0.. c = -1

23. Given, a and ß are zeroes of $4x^2 + 3x + 7$.

$$\therefore \quad \alpha + \beta = -\frac{3}{4} \text{ and } \alpha\beta = \frac{7}{4}$$

$$\text{Now, } \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{\frac{-3}{4}}{\frac{7}{4}} = \frac{-3}{7}$$

24. Let α, ß are the zeroes of the polynomial $ax^2 + bx + c$.

$$\therefore \quad \alpha+\beta = \frac{-b}{a} \text{ and } \alpha\beta = \frac{c}{a}$$

Now we have to find quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

$$\text{Now, } \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{-b/a}{c/a} = \frac{-b}{c} \text{ and } \left(\frac{1}{\alpha}\right)\left(\frac{1}{\beta}\right) = \frac{1}{\alpha\beta} = \frac{1}{c/a} = \frac{a}{c}$$

Thus, the required polynomial is

$$p(x) = k\left(x^2 - \left(-\frac{b}{c}\right)x + \frac{a}{c}\right) = \frac{k}{c}(cx^2 + bx + a)$$

For $k = c, p(x) = cx^2 + bx + a$

25. The given polynomial is $f(x) = x^2 - (k + 6)x + 2(2k - 1)$

Now, sum of zeroes = $\frac{k+6}{1}$ and product of zeroes

$$= \frac{2(2k-1)}{1}$$

According to question,

$$\text{Sum of zeroes} = \frac{1}{2}(\text{Product of zeroes}) \Rightarrow k+6=\frac{1}{2}\times 2(2k-1)$$

$$\Rightarrow \quad k+6 = 2k-1 \Rightarrow k=7$$

26.

$$\text{Let } f(y)=7y^2-\frac{11}{3}y-\frac{2}{3} \text{ or } \frac{21y^2-11y-2}{3}$$

$$\Rightarrow f(y)=\frac{(3y-2)(7y+1)}{3}$$

Zeros of polynomial is given by $f(y) = 0$

$$\Rightarrow \quad (3y-2)(7y+1)=0 \Rightarrow \text{ Either } y=\frac{2}{3} \text{ or } y=\frac{-1}{7}$$

Hence, $\frac{-1}{7}$ and $\frac{2}{3}$ are zeros of $f(y)$.

$$\therefore \quad \text{Sum of zeros } \frac{-1}{7}+\frac{2}{3}=\frac{-3+14}{21}=\frac{11}{21}$$

$$=-\frac{(\text{Coefficient of } y)}{(\text{Coefficient of } y^2)}$$

$$\text{and product of zeros } =\left(\frac{-1}{7}\right)\left(\frac{2}{3}\right)=\frac{-2}{21}=\frac{\text{Constant term}}{\text{Coefficient of } y}$$

Hence, the relationship between zeros and coefficients of the polynomial is verified.

27. Let the zeros of the quadratic polynomial be a and B.
Given, a + B = -1 and α-B = -20
Then, the quadratic polynomial will be
$f(x) = x^2 - (\alpha + B)x + \alpha.B$
$\Rightarrow f(x) = x^2 - (-1)x + (-20) \Rightarrow f(x) = x^2+x-20$
To find the zeros of the polynomial, we put f(x) = 0
$\Rightarrow x^2+x-20=0 \Rightarrow x^2+5x-4x-20=0$
$\Rightarrow x(x+5)-4(x+5)=0 \Rightarrow x=4, -5$
:- x = 4 and 5 are the zero of the polynomial so obtained.

28. Given, & and ß are the zeroes of the polynomial $4x^2 - x - 4$.

$$\therefore \quad \alpha+\beta=\frac{1}{4} \text{ and } \alpha\beta=\frac{-4}{4}=-1$$

Let S and P denote respectively the sum and product of the zeroes of the polynomial whose zeroes are $\frac{1}{2\alpha}$ and $\frac{1}{2\beta}$.

Then, $S = \frac{1}{2\alpha}+\frac{1}{2\beta}=\frac{\alpha+\beta}{2\alpha\beta}=\frac{\frac{1}{4}}{2(-1)}=\frac{-1}{8}$

$P = \left(\frac{1}{2\alpha}\right)\left(\frac{1}{2\beta}\right)=\frac{1}{4\alpha\beta}=\frac{1}{4(-1)}=\frac{-1}{4}$

Thus, the required polynomial is $k(x^2 - Sx + P)$

$=k\left(x^2-\left(-\frac{1}{8}\right)x+\left(-\frac{1}{4}\right)\right)$

$= 8x^2 + x - 2$ (for $k = 8$)

29. Given, a and ß are the zeroes of the polynomial 6x2-7x+2.

$$\therefore \quad \alpha + \beta = \frac{7}{6} \text{ and } \alpha\beta = \frac{2}{6}=\frac{1}{3}$$

Now, we have to find quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

Now, $\frac{1}{\alpha}+\frac{1}{\beta}=\frac{\alpha+\beta}{\alpha\beta}=\frac{\frac{7}{6}}{\frac{1}{3}}=\frac{7}{2}$ and $\left(\frac{1}{\alpha}\right)\left(\frac{1}{\beta}\right)=\frac{1}{\alpha\beta}=\frac{1}{\frac{1}{3}}=3$

Thus, the required polynomial is

$p(x) = k\left(x^2-\frac{7}{2}x+3\right)$

For $k = 2$, $p(x) = 2x^2 - 7x + 6$.

30. Let f(x)=6x2-3-7x or 6x2-7x-3

$= 6x^2-9x+2x-3=(3x+1)(2x-3)$

Zeroes of polynomial is given by f(x) = 0

$\Rightarrow \quad (3x+1)(2x-3)=0 \Rightarrow$ either $x=-\frac{1}{3}$ or $x=\frac{3}{2}$

Hence, $-\frac{1}{3}$ and $\frac{3}{2}$ are zeroes of $f(x)$.

$\therefore \quad$ Sum of zeroes $=-\frac{1}{3}+\frac{3}{2}=\frac{-2+9}{6}=\frac{7}{6}$

$$=\frac{-(\text{Coefficient of } x)}{(\text{Coefficient of } x^2)}$$

and product of zeroes $=\left(-\frac{1}{3}\right)\left(\frac{3}{2}\right)=\frac{-3}{6}=\frac{\text{Constant term}}{\text{Coefficient of } x^2}$

Hence, the relationship between zeroes and coefficients of the polynomial is verified.

CBSE Sample Questions

1. (b): Given polynomial, $f(x) = px^2 - 2x + 3p$
a, ß are the roots of $px^2 - 2x + 3p = 0$

So, $\alpha+\beta=\frac{2}{p}$ and $\alpha\cdot\beta=3$

Given, $\alpha + \beta = \alpha\beta$

$\Rightarrow \quad \frac{2}{p}=3 \quad \Rightarrow \quad p=\frac{2}{3}$

2.

(b): We have, sum of zeroes $= 2+\frac{1}{2}=\frac{-5}{p}$

$\Rightarrow \frac{5}{2}=\frac{-5}{p} \Rightarrow p=-2$

Also, product of zeroes $= 2\times\frac{1}{2}=\frac{r}{p}$

$\Rightarrow \frac{r}{p}=1 \Rightarrow r=p=-2$

3. (c): Initially, at t = 0, Annie's height above water level is 48 feet

So, at $t = 0$, $h(0) = 48$ feet

:- $h(0)=-16(0)^2+8(0) + k = 48$
$\Rightarrow k=48$ (1)

4. (b): When Annie touches the pool,
her height = 0 feet
i.e., $-16t^2+8t+48 = 0$
$2t^2$ t-602t2-4t+3t-6=0
$2t(t-2)+3(t-2)=0$
$(2t+3)(t-2)=0t=2$ or $t = -3/2$
Since time cannot be negative, so t = 2 seconds. (1)

5. (d): :: t = -1 and t = 2 are the two zeroes of the polynomial p(t), then
$p(t) = k(t-(-1))(t - 2)$
$= k(t + 1)(t-2) = k(t^2 - t -2)$
When t = 0 (initially), h(0) = 48 feet
$\Rightarrow p(0) = k(02-0-2)=48-2k=48\Rightarrow k=-24$
So the polynomial is
$p(t)=-24(t2- t- 2) = -24t^2 + 24t+48$ (1)

6. (c): A polynomial q(t) with sum of zeroes as 1 and the product of zeroes as 6 is given by
$q(t) = k(t^2$ - (sum of zeroes)t + product of zeroes)
$= k(t^2 - 1t + (-6)) = k(t^2 - t - 6)$
When t = 0 (initially), q(0) = 48 feet
$q(0) = k(0^2 - 1(0) - 6) = 48$
$-6k = 48$ $k=-8$
Required polynomial $q(t) = -8(t^2 - t -6)$
$=-8t^2+8t+48$ (1)

7. (a): When the zeroes are negative of each other, then sum of the zeroes = 0

$$\Rightarrow -\frac{k-3}{-12}=0 \Rightarrow \frac{k-3}{12}=0 \Rightarrow k-3=0 \Rightarrow k=3 \qquad \textbf{(1)}$$

8. (i) (b): Let $p(x) = x^2 - 2x-8= x^2-4x+2x-8$
$= x(x-4)+2(x-4) = (x + 2)(x - 4)$
Clearly, p(x) = 0 when x = 4, -2
So, (4, -2) are zeroes of polynomial.

(ii) (a): Intersects x-axis
(iii) (c): parabola
(iv) (b): Since sum of zeroes is 0 and one zero is 6.
:- The other zero is -6.
So, the required equation of curve is (x+6) (x-6)
$= x^2 - 36$
(v) (c): Let f(x) = 0
$\Rightarrow (x-2)^2+4=0 \Rightarrow (x-2)^2 = -4$ which is not possible.

9. Given polynomial is $3x^2 - kx + 6$
Clearly, sum of zeroes, a + B = k/3
⇒ 3=k/3 ⇒ k=9
(1×4) (1)

10. Given, 5-3√2 and 5+3√2 are the zeroes of a quadratic polynomial.
:- Sum of zeroes = 5-3√2+5+3√2=10 (1/2)
Product of zeroes = (5-3√2)(5+3√2)=7 (1/2)
:- Required polynomial is $k[x^2 - 10x+7]$
or $x^2-10x+7$
(For k = 1) (1)

11. Let a and ß be the zeros of the polynomial $2x^2 - 5x - 3$
Then sum of roots α + B = 5/2 (1/2)
And product of roots aß = -3/2. (1/2)
According to question,
2α and 2ß will be the zeros of $x^2 + px + q$
Then 2a +2ß= -p
2(α + B) = -p
2 x 5/2=-p
p = -5 (1)
And 2α × 2B = q
4αß= q
So q=4x-3/2=-6 (1)