CBSE Class–10 Mathematics

NCERT solution

Chapter - 2

Polynomials - Exercise 2.2

1. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeros and the coefficients.

(i) x^2-2x-8

(ii) $4s^2-4s+1$

(iii) $6x^2-3-7x$

(iv) $4u^2+8u$

(v) t^2-15

(vi) $3x^2-x-4$

Ans. (i) x^2-2x-8

Comparing given polynomial with general form of quadratic polynomial ax^2+bx+c,

We get a = 1, b = -2 and c = -8

We have, x^2-2x-8

$=x^2-4x+2x-8$

$= x(x-4)+2(x-4) = (x-4)(x+2)$

Equating this equal to 0 will find values of 2 zeroes of this polynomial.

$(x-4)(x+2) = 0$

$\Rightarrow x = 4, -2$ are two zeroes.

Sum of zeroes = 4 + (– 2) = 2 =

=> $\frac{-(-2)}{1}$ = $\frac{-b}{a} = \frac{-\text{Coefficient of } x}{\text{Coefficient of } x^2}$

Product of zeroes = 4 × (−2) = −8

= $\frac{-8}{1} = \frac{c}{a} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$

(ii) $4s^2 - 4s + 1$

Here, a = 4, b = -4 and c = 1

We have, $4s^2 - 4s + 1$

= $4s^2 - 2s - 2s + 1$

=$2s(2s-1)-1(2s-1)$
= $(2s-1)(2s-1)$

Equating this equal to 0 will find values of 2 zeroes of this polynomial.

⇒ $(2s-1)(2s-1) = 0$

⇒ s = $\frac{1}{2}, \frac{1}{2}$

Therefore, two zeroes of this polynomial are $\frac{1}{2}, \frac{1}{2}$

Sum of zeroes = $\frac{1}{2} + \frac{1}{2}$ = 1 = $\frac{-(-1)}{1} \times \frac{4}{4} = \frac{-(-4)}{4}$

= $\frac{-b}{a} = \frac{-\text{Coefficient of } x}{\text{Coefficient of } x^2}$

Product of Zeroes = $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

$= \frac{c}{a} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$

(iii) $6x^2 - 3 - 7x \quad \Rightarrow \quad 6x^2 - 7x - 3$

Here, a = 6, b = -7 and c = -3

We have, $6x^2 - 7x - 3$

$= 6x^2 - 9x + 2x - 3$

= $3x(2x-3)+1(2x-3) = (2x-3)(3x+1)$

Equating this equal to 0 will find values of 2 zeroes of this polynomial.

$\Rightarrow (2x-3)(3x+1) = 0$

$\Rightarrow x = \frac{3}{2}, \frac{-1}{3}$

Therefore, two zeroes of this polynomial are $\frac{3}{2}, \frac{-1}{3}$

Sum of zeroes = $\frac{3}{2} + \frac{-1}{3} = \frac{9-2}{6} = \frac{7}{6} = \frac{-(-7)}{6} = \frac{-b}{a} = \frac{-\text{Coefficient of } x}{\text{Coefficient of } x^2}$

Product of Zeroes = $\frac{3}{2} \times \frac{-1}{3} = \frac{-1}{2} = \frac{c}{a} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$

(iv) $4u^2 + 8u$

Here, a = 4, b = 8 and c = 0

$4u^2 + 8u = 4u(u+2)$

Equating this equal to 0 will find values of 2 zeroes of this polynomial.

$\Rightarrow 4u(u+2) = 0$

$\Rightarrow u = 0, -2$

Therefore, two zeroes of this polynomial are 0, −2

Sum of zeroes = 0−2 = −2

= $\frac{-2}{1}\times\frac{4}{4}=\frac{-8}{4}$ = $\frac{-b}{a}=\frac{-\text{Coefficient of } x}{\text{Coefficient of } x^2}$

Product of Zeroes = 0×-2 = 0

= $\frac{0}{4}=\frac{c}{a}=\frac{\text{Constant term}}{\text{Coefficient of } x^2}$

(v) t^2-15

Here, a = 1, b = 0 and c = -15

We have, $t^2-15 \Rightarrow t^2 = 15 \Rightarrow t = \pm\sqrt{15}$

Therefore, two zeroes of this polynomial are $\sqrt{15}, -\sqrt{15}$

Sum of zeroes = $\sqrt{15}+\left(-\sqrt{15}\right)=0=\frac{0}{1}=\frac{-b}{a}=\frac{-\text{Coefficient of } x}{\text{Coefficient of } x^2}$

Product of Zeroes = $\sqrt{15}\times\left(-\sqrt{15}\right)=-15$

$=\frac{-15}{1}=\frac{c}{a}=\frac{\text{Constant term}}{\text{Coefficient of } x^2}$

(vi) $3x^2-x-4$

Here, a = 3, b = -1 and c = -4

We have, $3x^2-x-4 = 3x^2-4x+3x-4$

= $x(3x-4)+1(3x-4) = (3x-4)(x+1)$

Equating this equal to 0 will find values of 2 zeroes of this polynomial.

⇒ $(3x-4)(x+1) = 0$

$\Rightarrow x = \frac{4}{3}, -1$

Therefore, two zeroes of this polynomial are $\frac{4}{3}, -1$

Sum of zeroes = $\frac{4}{3}+(-1)=\frac{4-3}{3}=\frac{1}{3}=\frac{-(-1)}{3}=\frac{-b}{a}=\frac{-\text{Coefficient of } x}{\text{Coefficient of } x^2}$

Product of Zeroes = $\frac{4}{3}\times(-1)=\frac{-4}{3}=\frac{c}{a}=\frac{\text{Constant term}}{\text{Coefficient of } x^2}$

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2. Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively.

(i) $\frac{1}{4}$ **, -1**

(ii) $\sqrt{2}$ **, 13**

(iii) 0, $\sqrt{5}$

(iv) 1, 1

(v) $\frac{-1}{4}, \frac{1}{4}$

(vi) 4, 1

Ans. (i) $\frac{1}{4}$, -1

Let quadratic polynomial be ax^2+bx+c

Let α and β are two zeroes of above quadratic polynomial.

$\alpha+\beta = \frac{1}{4} = \frac{-b}{a}$

$\alpha \times \beta$ = -1 $= \frac{-1}{1} \times \frac{4}{4} = \frac{-4}{4}$ = $\frac{c}{a}$

On comparing, we get

$\therefore\ a = 4, b = -1, c = -4$

Putting the values of a, b and c in quadratic polynomial $ax^2 + bx + c$, we get

Quadratic polynomial which satisfies above conditions = $4x^2 - x - 4$

(ii) $\sqrt{2}, \frac{1}{3}$

Let quadratic polynomial be $ax^2 + bx + c$

Let α and β be two zeros of above quadratic polynomial.

$\alpha+\beta$ = $\sqrt{2} \times \frac{3}{3} = \frac{3\sqrt{2}}{3}$ = $\frac{-b}{a}$

$\alpha \times \beta$ = $\frac{1}{3}$ which is equal to $\frac{c}{a}$

On comparing, we get

$\therefore\ a = 3, b = -3\sqrt{2}, c = 1$

Putting the values of a, b and c in quadratic polynomial $ax^2 + bx + c$, we get

Quadratic polynomial which satisfies above conditions = $3x^2 - 3\sqrt{2}x + 1$.

(iii) 0, $\sqrt{5}$

Let quadratic polynomial be $ax^2 + bx + c$

Let α and β be two zeros of above quadratic polynomial.

$\alpha+\beta$ = 0 $= \frac{0}{1}$ = $\frac{-b}{a}$

$\alpha \times \beta = \sqrt{5} = \frac{\sqrt{5}}{1} = \frac{c}{a}$

On comparing, we get

$\therefore \ a = 1, b = 0, c = \sqrt{5}$

Putting the values of a, b and c in quadratic polynomial $ax^2 + bx + c$, we get

Quadratic polynomial which satisfies above conditions $= x^2 + \sqrt{5}$

(iv) 1, 1

Let quadratic polynomial be $ax^2 + bx + c$

Let α and β be two zeros of above quadratic polynomial.

$\alpha + \beta = 1 = \frac{-(-1)}{1} = \frac{-b}{a}$

$\alpha \times \beta = 1 = \frac{1}{1} = \frac{c}{a}$

On comparing, we get

$\therefore \ a = 1, b = -1, c = 1$

Putting the values of a, b and c in quadratic polynomial $ax^2 + bx + c$, we get

Quadratic polynomial which satisfies above conditions = $x^2 - x + 1$

(v) $\frac{-1}{4}, \frac{1}{4}$

Let quadratic polynomial be $ax^2 + bx + c$

Let α and β be two zeros of above quadratic polynomial.

$\alpha+\beta$ = $\frac{-1}{4}$ = $\frac{-b}{a}$

$\alpha \times \beta$ = $\frac{1}{4}$ = $\frac{c}{a}$

On comparing, we get

$\therefore \ a=4, b=1, c=1$

Putting the values of a, b and c in quadratic polynomial ax^2+bx+c , we get

Quadratic polynomial which satisfies above conditions = $4x^2+x+1$

(vi) 4, 1

Let quadratic polynomial be ax^2+bx+c

Let α and β be two zeros of above quadratic polynomial.

$\alpha+\beta$ = 4 $\frac{-(-4)}{1}$ = $\frac{-b}{a}$

$\alpha \times \beta$ = 1 $=\frac{1}{1}$ = $\frac{c}{a}$

On comparing, we get

$\therefore \ a=1, b=-4, c=1$

Putting the values of a, b and c in quadratic polynomial ax^2+bx+c , we get

Quadratic polynomial which satisfies above conditions $=x^2-4x+1$