Exercise 2.2 Page: 33

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

Solutions:

(i)x^2–2x –8

⇒x^2– 4x+2x–8 = x(x–4)+2(x–4) = (x-4)(x+2)

Therefore, zeroes of polynomial equation x^2–2x–8 are (4, -2)

Sum of zeroes = 4–2 = 2 = -(-2)/1 = -(Coefficient of x)/(Coefficient of x^2)

Product of zeroes = 4×(-2) = -8 =-(8)/1 = (Constant term)/(Coefficient of x^2)

(ii)4s^2–4s+1

⇒4s^2–2s–2s+1 = 2s(2s–1)–1(2s-1) = (2s–1)(2s–1)

Therefore, zeroes of polynomial equation 4s^2–4s+1 are (1/2, 1/2)

Sum of zeroes = (½)+(1/2) = 1 = -4/4 = -(Coefficient of s)/(Coefficient of s^2)

Product of zeros = (1/2)×(1/2) = 1/4 = (Constant term)/(Coefficient of s^2)

(iii) 6x^2–3–7x

⇒6x^2–7x–3 = 6x^2 – 9x + 2x – 3 = 3x(2x - 3) +1(2x - 3) = (3x+1)(2x-3)

Therefore, zeroes of polynomial equation 6x^2–3–7x are (-1/3, 3/2)

Sum of zeroes = -(1/3)+(3/2) = (7/6) = -(Coefficient of x)/(Coefficient of x^2)

Product of zeroes = -(1/3)×(3/2) = -(3/6) = (Constant term) /(Coefficient of x^2)

(iv)4u^2+8u

⇒ 4u(u+2)

Therefore, zeroes of polynomial equation 4u^2 + 8u are (0, -2).

Sum of zeroes = 0+(-2) = -2 = -(8/4) = = -(Coefficient of u)/(Coefficient of u^2)

Product of zeroes = $0\times-2 = 0 = 0/4$ = (Constant term)/(Coefficient of u^2)

(v) $t^2–15$

$\Rightarrow t^2 = 15$ or $t = \pm\sqrt{15}$
Therefore, zeroes of polynomial equation $t^2 – 15$ are ($\sqrt{15}$, $-\sqrt{15}$)

Sum of zeroes $=\sqrt{15}+(-\sqrt{15}) = 0= -(0/1)=$ -(Coefficient of t) / (Coefficient of t^2)

Product of zeroes = $\sqrt{15}\times(-\sqrt{15}) = -15 = -15/1$ = (Constant term) / (Coefficient of t^2)

(vi) $3x^2–x–4$

$\Rightarrow 3x^2–4x+3x–4 = x(3x-4)+1(3x-4) = (3x - 4)(x + 1)$

Therefore, zeroes of polynomial equation $3x^2 – x – 4$ are (4/3, -1)

Sum of zeroes = $(4/3)+(-1) = (1/3)= -(-1/3)$ = -(Coefficient of x) / (Coefficient of x^2)

Product of zeroes=$(4/3)\times(-1) = (-4/3)$ = (Constant term) /(Coefficient of x^2)

2. Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes respectively.
(i) 1/4 , -1

Solution:

From the formulas of sum and product of zeroes, we know,
Sum of zeroes = $\alpha+\beta$
Product of zeroes = $\alpha\, \beta$
Sum of zeroes = $\alpha+\beta = 1/4$
Product of zeroes = $\alpha\, \beta = -1$

$\therefore$ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-
$x^2–(\alpha+\beta)x +\alpha\beta = 0$

$x^2–(1/4)x +(-1) = 0$

$4x^2–x-4 = 0$

Thus, $4x^2–x–4$ is the quadratic polynomial.

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

Solution:

Sum of zeroes = $\alpha + \beta = \sqrt{2}$
Product of zeroes = $\alpha \beta = 1/3$

∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-

$x^2 - (\alpha+\beta)x + \alpha\beta = 0$

$x^2 - (\sqrt{2})x + (1/3) = 0$

$3x^2 - 3\sqrt{2}x + 1 = 0$

Thus, $3x^2 - 3\sqrt{2}x + 1$ is the quadratic polynomial.

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

Solution:
Given,
Sum of zeroes = $\alpha+\beta = 0$
Product of zeroes = $\alpha \beta = \sqrt{5}$
∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-

$x^2 - (\alpha+\beta)x + \alpha\beta = 0$

$x^2 - (0)x + \sqrt{5} = 0$

Thus, $x^2 + \sqrt{5}$ is the quadratic polynomial.

(iv) 1, 1

Solution:

Given,
Sum of zeroes = $\alpha+\beta = 1$
Product of zeroes = $\alpha \beta = 1$

∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-
$x^2–(α+β)x +αβ = 0$

$x^2–x+1 = 0$

Thus , $x^2–x+1$is the quadratic polynomial.

(v) -1/4, 1/4

Solution:

Given,
Sum of zeroes = α+β = -1/4
Product of zeroes = α β = 1/4

∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-

$x^2–(α+β)x +αβ = 0$

$x^2–(-1/4)x +(1/4) = 0$

$4x^2+x+1 = 0$

Thus,$4x^2+x+1$ is the quadratic polynomial.

(vi) 4, 1

Solution:

Given,
Sum of zeroes = α+β = 4
Product of zeroes = αβ = 1

∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-

$x^2–(α+β)x+αβ = 0$

$x^2–4x+1 = 0$

Thus,$x^2–4x+1$ is the quadratic polynomial.