DAY 3

Relationship between zeroes & co-efficients of a polynomial:-

Consider a quadratic polynomial $p(x) = ax^2 + bx + c, a \neq 0$ having zeros as α and β then

$$\textbf{sum of zeroes } (\alpha + \beta) = -\frac{b}{a} = -\frac{\textbf{coefficient of } x}{\textbf{coefficient of } x^2}$$

and $$\textbf{product of zeroes i.e. } \alpha\beta = \frac{c}{a} = \frac{\textbf{constant term}}{\textbf{coefficient of } x^2}$$

1. *Find the zeroes of quadratic polynomial and also verify their relationship with zeroes and coefficients:*

(i) $x^2 + 7x + 10$ **(ii)** $2x^2 - 5x + 3$ **(iii)** $2x^2 + 4x$ **(iv)** $x^2 - 3$

Sol:- **(i)** Given $p(x) = x^2 + 7x + 10 = x^2 + 2x + 5x + 10$

$= x(x + 2) + 5(x + 2) = (x + 2)(x + 5)$

For Zeros: $(x + 2)(x + 5) = 0$

$\Rightarrow x + 2 = 0$ and $x + 5 = 0 \Rightarrow x = -2$ or $x = -5$

Zeroes of $x^2 + 7x + 10$ are -2 and -5

Verification:-

Now Sum of zeroes $= -2 + (-5) = -7 = -\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$

Product of zeroes $= (-2)(-5) = 10 = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$

(ii) Given $p(x) = 2x^2 - 5x + 3 = 2x^2 - 2x - 3x + 3$

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

For Zeros: $(x - 1)(2x - 3) = 0$

$\Rightarrow x - 1 = 0$ and $2x - 3 = 0 \Rightarrow x = 1$ or $x = \frac{3}{2}$

Zeroes of $2x^2 - 5x + 3$ are 1 and $\frac{3}{2}$

Verification:-

Now Sum of zeroes $= 1 + \frac{3}{2} = \frac{2+3}{2} = \frac{5}{2} = -\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$

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

(iii) Given $p(x) = 2x^2 + 4x = 2x(x + 2)$

For Zeroes: $2x(x + 2) = 0$

$\Rightarrow 2x = 0$ and $x + 2 = 0 \Rightarrow x = 0$ or $x = -2$

Zeroes of $2x^2 + 4x$ are 0 and -2

Verification:-

Now Sum of zeroes $= 0 + (-2) = -2 = -\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$

$$\text{Product of zeroes} = (0)(-2) = 0 = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$$

(**iv**) Given $p(x) = x^2 - 3 = x^2 - \left(\sqrt{3}\right)^2 = \left(x - \sqrt{3}\right)(x + \sqrt{3})$

For Zeroes: $\left(x - \sqrt{3}\right)\left(x + \sqrt{3}\right) = 0$

$\Rightarrow\ x - \sqrt{3} = 0$ and $x + \sqrt{3} = 0\ \Rightarrow x = \sqrt{3}$ or $x = -\sqrt{3}$

Zeroes of $x^2 + 7x + 10$ are $\sqrt{3}$ and $-\sqrt{3}$

Verification:-

$$\text{Now Sum of zeroes} = \sqrt{3} + \left(-\sqrt{3}\right) = 0 = -\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$$

$$\text{Product of zeroes} = \left(\sqrt{3}\right)\left(-\sqrt{3}\right) = -3 = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$$

EXERCISE

1. Exercise 2.2, Q1