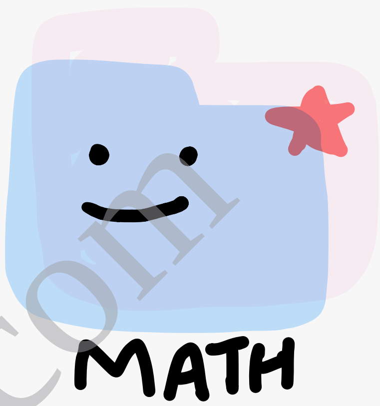
Polynomials
Ex. 2.2



Ex. 2.2

1 (i) $x^2 - 2x - 8$

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

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

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

Zeroes are 4 and (-2)

Verification

Let $\alpha = 4$, $\beta = -2$

$\alpha + \beta = 4 + (-2) = 2 = \frac{-(-2)}{1} = -\frac{b}{a}$

$\alpha\beta = 4(-2) = -8 = \frac{-8}{1} = \frac{c}{a}$

Hence verified

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

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

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

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

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

$= (2s)^2 - 2 \times 2s \times 1 + (1)^2$

$= (2s-1)^2 \quad [a^2 - 2ab + b^2 = (a-b)^2]$

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

$\therefore$ Zeroes are $\frac{1}{2}, \frac{1}{2}$

Verification

Let $\alpha = \frac{1}{2}$, $\beta = \frac{1}{2}$

$\alpha + \beta = \frac{1}{2} + \frac{1}{2} = 1 = 1 \times \frac{4}{4} = \frac{-(-4)}{4} = -\frac{b}{a}$

$\alpha\beta = \left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1}{4} = \frac{c}{a}$

Hence verified

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

$= 6x^2 - 7x - 3$

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

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

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

$\therefore$ zeroes are $\frac{3}{2}, -\frac{1}{3}$

<u>Verification</u>

Let $\alpha = \frac{3}{2}$, $\beta = -\frac{1}{3}$

$\alpha + \beta = \frac{3}{2} + \left(\frac{-1}{3}\right) = \frac{9-2}{6} = \frac{7}{6} = \frac{-(-7)}{6} = -\frac{b}{a}$

$\alpha\beta = \left(\frac{3}{2}\right)\left(-\frac{1}{3}\right) = -\frac{3}{6} = \frac{c}{a}$

Hence verified.

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

$= 4u(u+2)$

$\therefore$ zeroes are $0, -2$

<u>Verification</u>

Let $\alpha = 0$, $\beta = -2$

$\alpha + \beta = 0 + (-2) = -2 = -2 \times \frac{4}{4} = -\frac{8}{4} = -\frac{b}{a}$

$\alpha\beta = 0(-2) = 0 = \frac{0}{4} = \frac{c}{a}$

Hence verified

(v) $t^2 - 15$

$= t^2 - (\sqrt{15})^2$

$= (t + \sqrt{15})(t - \sqrt{15})$ $\quad [a^2 - b^2 = (a+b)(a-b)]$

$\therefore$ zeroes are $\sqrt{15}, -\sqrt{15}$

<u>Verification</u>

Let $\alpha = \sqrt{15}$, $\beta = -\sqrt{15}$

$\alpha + \beta = \sqrt{15} + (-\sqrt{15}) = 0 = \frac{0}{1} = -\frac{b}{a}$

$\alpha\beta = (\sqrt{15})(-\sqrt{15}) = -15 = -\frac{15}{1} = \frac{c}{a}$

Hence verified.

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

$= 3x^2 + 3x - 4x - 4$

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

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

Zeroes are $-1, \frac{4}{3}$

<u>Verification</u>

Let $\alpha = -1, \beta = \frac{4}{3}$

$\alpha + \beta = -1 + \frac{4}{3} = \frac{-3+4}{3} = \frac{1}{3} = \frac{-(-1)}{3} = -\frac{b}{a}$

$\alpha\beta = (-1)\left(\frac{4}{3}\right) = -\frac{4}{3} = \frac{c}{a}$

Hence verified.

2(i) Let the zeroes be α and β.

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

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

Comparing $a = 4, b = -1, c = -4$

$\therefore$ Required polynomial is $k(ax^2 + bx + c)$, where

k is a real number

or $k(4x^2 - x - 4)$

(ii) Let the zeroes be α and β.

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

$\alpha\beta = \frac{1}{3} = \frac{c}{a}$

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

$\therefore$ Required polynomial is $k(ax^2 + bx + c)$, where k is a real number.

or $k(3x^2 - 3\sqrt{2}x + 1)$

(iii) Let the zeroes be α and β.

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

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

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

$\therefore$ Required polynomial is $k(ax^2 + bx + c)$, where k is a real number.

or $k(x^2 + 0x + \sqrt{5})$

or $k(x^2 + \sqrt{5})$

(iv) Let the zeroes be α and β.

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

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

Comparing $a=1$, $b=-1$, $c=1$

$\therefore$ Required polynomial is $k(ax^2+bx+c)$, where k is a real number

or $k(x^2-x+1)$

(v) Let the zeroes be α and β.

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

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

Comparing $a=4$, $b=1$, $c=1$

$\therefore$ Required polynomial is $k(ax^2+bx+c)$, where k is a real number.

or $k(4x^2+x+1)$

(vi) Let the zeroes be α and β.

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

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

Comparing $a=1$, $b=-4$, $c=1$

$\therefore$ Required polynomial is $k(ax^2+bx+c)$, where k is a real number.

or $k(x^2-4x+1)$