

Exercise 4.5

Q.1 (i)

$$2x^2 - 5x + 3 = 0$$

$$a = 2, b = -5, c = 3$$

$$D = b^2 - 4ac$$

$$= (-5)^2 - (4 \times 2 \times 3)$$

$$= 25 - 24$$

$$= \boxed{1}$$

(iii)

$$(x-1)(2x-1) = 0$$

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

$$2x^2 - 3x + 1 = 0$$

$$a = 2, b = -3, c = 1$$

$$D = b^2 - 4ac$$

$$= (-3)^2 - (4 \times 2 \times 1)$$

$$= 9 - 8$$

$$= \boxed{1}$$

(iv)

$$x^2 - 2x + k = 0$$

$$a = 1, b = -2, c = k$$

$$D = b^2 - 4ac$$

$$= (-2)^2 - (4 \times 1 \times k)$$

$$= \boxed{4 - 4k}$$

(v)

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

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

$$D = b^2 - 4ac$$

$$= (2\sqrt{2})^2 - [4 \times \sqrt{3} \times (-2\sqrt{3})]$$

$$= 8 + 24$$

$$= \boxed{32}$$

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

$$x^2 + \cancel{10x} + 25 = \cancel{10x} - 6$$

$$x^2 + 25 + 6 = 0$$

$$x^2 + 31 = 0$$

$$a = 1, b = 0, c = 31$$

$$D = b^2 - 4ac$$

$$= (0)^2 - (4 \times 1 \times 31)$$

$$= \boxed{-124}$$

$$(ii) x^2 + x + 2 = 0$$

$$a = 1, b = 1, c = 2$$

$$D = b^2 - 4ac$$

$$= (1)^2 - (4 \times 1 \times 2)$$

$$= 1 - 8 = -7$$

$$\text{As } D < 0$$

$\therefore$ There are no real roots.

$$(iii) \sqrt{3}x^2 + 10x - 8\sqrt{3} = 0$$

$$a = \sqrt{3}, b = 10, c = -8\sqrt{3}$$

$$D = b^2 - 4ac$$

$$= (10)^2 - [4 \times \sqrt{3} \times (-8\sqrt{3})]$$

$$= 100 + 96 = 196$$

$$\text{As } D > 0$$

$\therefore$ There are real roots

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-10 \pm \sqrt{196}}{2 \times \sqrt{3}}$$

$$= \frac{-10 \pm 14}{2\sqrt{3}}$$

$$x = \frac{-10 + 14}{2\sqrt{3}}$$

$$x = \frac{-10 + 14}{2\sqrt{3}}$$

$$x = \frac{2 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$$

$$x = \frac{2\sqrt{3}}{3}$$

$$x = \frac{-10 - 14}{2\sqrt{3}}$$

$$x = \frac{-24}{2\sqrt{3}}$$

$$x = \frac{-12 \times \sqrt{3}}{\sqrt{3} \times \sqrt{3}}$$

$$x = \frac{-12\sqrt{3}}{3}$$

$$x = -4\sqrt{3}$$

(iv) $2x^2 - 2\sqrt{6}x + 3 = 0$
 $a = 2, b = -2\sqrt{6}, c = 3$

$$\begin{aligned} D &= b^2 - 4ac \\ &= (-2\sqrt{6})^2 - (4 \times 2 \times 3) \\ &= 24 - 24 = 0 \end{aligned}$$

$\therefore$ There are equal real roots

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-2\sqrt{6}) \pm 0}{2 \times 2}$$

$$x = \frac{2\sqrt{6}}{4} = \frac{\sqrt{6}}{2}$$

$$x = \frac{\sqrt{3} \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}}$$

$$x = \frac{\sqrt{3}}{\sqrt{2}}$$

$$x = \frac{\sqrt{3}}{\sqrt{2}}$$

(vi) $3a^2x^2 + 8abx + 4b^2 = 0$

$a = 3a^2, b = 8ab, c = 4b^2$

$$\begin{aligned} D &= b^2 - 4ac \\ &= (8ab)^2 - (4 \times 3a^2 \times 4b^2) \\ &= 64a^2b^2 - 48a^2b^2 \\ &= 16a^2b^2 \end{aligned}$$

As $D > 0$,

$\therefore$ There are real roots.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-8ab \pm \sqrt{16a^2b^2}}{2 \times 3a^2}$$

$$x = \frac{-8ab \pm 4ab}{6a^2}$$

$$x = \frac{-8ab + 4ab}{6a^2}$$

$$x = \frac{-4ab}{3a^2}$$

$$x = \frac{-2b}{3a}$$

$$x = \frac{-8ab - 4ab}{6a^2}$$

$$x = \frac{-12ab}{6a^2}$$

$$x = \frac{-2b}{a}$$

$$x = \frac{-2b}{a}$$

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classmate

Date

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Exercise 4.5

Q.2 (viii) $x^2 - 2x + 1 = 0$

$a = 1, b = -2, c = 1$

$$\begin{aligned}
 D &= b^2 - 4ac \\
 &= (-2)^2 - (4 \times 1 \times 1) \\
 &= 4 - 4 = 0
 \end{aligned}$$

As, $D = 0$,

 $\therefore$ There are equal real roots

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-2) \pm 0}{2 \times 1}$$

$$x = \frac{2}{2}$$

$$x = 1, x = 1$$

Q.3 (i) $\frac{x-1}{x-2} + \frac{x-3}{x-4} = 10$

$\frac{x-2}{x-4} = 3$

$$\frac{(x-1)(x-4) + (x-3)(x-2)}{(x-2)(x-4)} = \frac{10}{3}$$

~~$x^2 - 5x + 4 + x^2 - 5x$~~

$$\frac{x^2 - 4x - x + 4 + x^2 - 2x - 3x + 6}{x^2 - 4x - 2x + 8} = \frac{10}{3}$$

$$\frac{2x^2 - 10x + 10}{x^2 - 6x + 8} = \frac{10}{3}$$

$$6x^2 - 30x + 30 = 10x^2 - 60x + 80$$

$$6x^2 - 10x^2 - 30x + 60x + 30 - 80 = 0$$

$$-4x^2 + 30x - 50 = 0$$

$$4x^2 - 30x + 50 = 0$$

$$2x^2 - 15x + 25 = 0$$

$$a = 2, b = -15, c = 25$$

$$D = b^2 - 4ac$$

$$= (-15)^2 - (4 \times 2 \times 25)$$

$$= 225 - 200 = 25$$

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-15) + \sqrt{25}}{2 \times 2}$$

$$x = \frac{15 + 5}{4}$$

$$x = \frac{20}{4}$$

$$x = 5$$

$$x = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-15) - \sqrt{25}}{2 \times 2}$$

$$x = \frac{15 - 5}{4}$$

$$x = \frac{10}{4}$$

$$x = \frac{5}{2}$$

$$(ii) \quad \frac{1}{x} + \frac{2}{2x-3} = \frac{1}{x-2}$$

$$\frac{(2x-3) + 2x}{x(2x-3)} = \frac{1}{x-2}$$

$$(4x-3)(x-2) = (x)(2x-3)$$

$$4x^2 - 8x - 3x + 6 = 2x^2 - 3x$$

$$4x^2 - 11x + 6 = 2x^2 - 3x$$

$$4x^2 - 2x^2 - 11x + 3x + 6 = 0$$

$$2x^2 - 8x + 6 = 0$$

$$x^2 - 4x + 3 = 0$$

$$x^2 - 3x - x + 3 = 0$$

$$x(x-3) - 1(x-3) = 0$$

$$(x-3)(x-1) = 0$$

$$x-3 = 0$$

$$\boxed{x=3}$$

$$x-1 = 0$$

$$\boxed{x=1}$$

$$(iv) \quad \frac{16-x}{x} = \frac{15}{x+1}$$

$$\frac{16-x}{x} = \frac{15}{x+1}$$

$$(16-x)(x+1) = 15x$$

$$16x + 16 - x^2 - x = 15x$$

$$-x^2 + 15x + 16 = 15x$$

$$x^2 - 16 = 0$$

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

$$\boxed{x=0}$$

$$x-4 = 0$$

$$\boxed{x=4}$$

$$(v) \quad \frac{1}{x-3} - \frac{1}{x+5} = \frac{1}{6}$$

$$\frac{(x+5) - (x-3)}{(x-3)(x+5)} = \frac{1}{6}$$

$$\frac{x+5 - x+3}{x^2 + 5x - 3x - 15} = \frac{1}{6}$$

$$8x - 15 = x^2 + 2x - 15$$

$$8x - 15 = x^2 + 2x - 15$$

$$x^2 + 2x - 15 - 48 = 0$$

$$x^2 + 2x - 63 = 0$$

$$x^2 + 9x - 7x - 63 = 0$$

$$x(x+9) - 7(x+9) = 0$$

$$(x+9)(x-7) = 0$$

$$x+9=0$$

$$\boxed{x = -9}$$

$$x-7=0$$

$$\boxed{x = 7}$$

