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Ex. 7.1

$$i) \frac{2}{3}x - \frac{1}{2}x = x + \frac{1}{6}$$

$$26 \times \frac{2}{3}x - \frac{1}{2}x \times 6^3 = 6x + \frac{1}{6} \times 6$$

$$4x - 3x = 6x + 1$$

$$x - 6x = 1$$

$$-5x = 1$$

$$x = -\frac{1}{5}$$

S.S $\left\{ -\frac{1}{5} \right\}$

Linear equation

$$ax + b = 0$$

$$a \neq 0$$

$$\begin{array}{r|rrr} 3 & 3 & -2 & -6 \\ \hline 2 & 1 & -2 & -2 \\ \hline & 1 & -1 & -1 \end{array}$$

$$\text{ii) } \frac{x-3}{3} - \frac{x-2}{2} = -1$$

$$\cancel{2} \times \frac{x-3}{\cancel{3}} - \frac{x-2}{\cancel{x}} \times \cancel{3}^3 = -1 \times 6$$

$$2x - \cancel{6} - 3x + \cancel{6} = -6$$

$$\cancel{x} = \cancel{6}$$

$$x = 6$$

S.S { 6 }

$$\text{iii) } \frac{1}{2} \left(\frac{x-1}{1} - \frac{1}{6} \right) + \frac{2}{3} = \frac{5}{6} + \frac{1}{3} \left(\frac{1}{2} - \frac{3x}{1} \right)$$

$$\frac{1}{2} \left(\frac{6x-1}{6} \right) + \frac{2}{3} = \frac{5}{6} + \frac{1}{3} \left(\frac{1-6x}{2} \right)$$

$$\frac{6x-1}{12} + \frac{2}{3} = \frac{5}{6} + \frac{1-6x}{6}$$

$$\cancel{12} \times \frac{6x-1}{\cancel{12}} + \frac{2}{3} \times \cancel{12}^4 = \frac{5}{6} \times \cancel{12}^2 + \frac{1-6x}{6} \times \cancel{12}^2$$

$$6x-1 + 8 = 10 + 2 - 12x$$

$$6x + 12x = 12 - 8 + 1$$

$$18x = 5 \quad \text{s.s } \left\{ \frac{5}{18} \right\}$$

$$x = \frac{5}{18} = \underline{\underline{\quad}}$$

$$iv) \quad \frac{x+1}{1} \cdot \frac{1}{3} = 2 \left[x - \frac{2}{3} \right] - 6x$$

$$\frac{3x+1}{3} = 2 \left[\frac{3x-2}{3} \right] - 6x$$

$$\cancel{3} \times \frac{3x+1}{\cancel{3}} = \frac{6x-4}{\cancel{3}} - 6x \times 3$$

$$3x+1 = 6x-4-18x$$

$$3x-6x+18x = -4-1$$

$$15x = -5$$

$$x = \frac{-5}{15} = \frac{-1}{3}$$

$$x = -\frac{1}{3}$$

S.S. $\left\{ -\frac{1}{3} \right\}$

$$v) \frac{5(x-3)}{6} - x = 1 - \frac{x}{9}$$

$$\frac{5x-15}{6} - x = 1 - \frac{x}{9}$$

$$\cancel{3} \times \frac{5x-15}{\cancel{6}} - x \times 18 = 1 \times 18 - \frac{x}{\cancel{9}} \times \cancel{18}^2$$

$$15x - 45 - 18x = 18 - 2x$$

$$-3x - 45 = 18 - 2x$$

$$-3x + 2x = 18 + 45$$

$$\frac{-x}{-1} = \frac{63}{-1}$$

$$x = -63$$

S.S } -63

$$\text{vi) } \frac{x}{3x-6} = 2 - \frac{2x}{x-2}, \quad x \neq 2$$

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

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

$$x + 6x = 2 \times 3(x-2)$$

$$7x = 6x - 12$$

$$7x - 6x = -12$$

$$x = -12 \quad \text{S.S } \{-12\}$$

$$\text{vii) } \frac{2x}{2x+5} = \frac{2}{3} - \frac{5}{4x+10} \quad x \neq -\frac{5}{2}$$

$$\frac{2x}{2x+5} + \frac{5}{4x+10} = \frac{2}{3}$$

$$\frac{2x}{2x+5} + \frac{5}{2(2x+5)} = \frac{2}{3}$$

~~$$\frac{4x+5}{2(2x+5)} = \frac{2}{3}$$~~

$$12x+15 = 2 \times 2(2x+5)$$

$$12x+15 = 8x+20$$

$$12x-8x = 20-15$$

$$6x = 5$$

$$x = \frac{5}{6}$$

$$\text{S.S } \left\{ \frac{5}{6} \right\}$$

viii)

$$\frac{2x}{x-1} + \frac{1}{3} = \frac{5}{6} + \frac{2}{x-1}, \quad x \neq 0$$

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

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

$$\frac{2(\cancel{x-1})}{\cancel{x-1}} = \frac{5}{6} - \frac{1}{3}$$

Not Possible

$$ix) \quad \frac{2}{x^2-1} - \frac{1}{x+1} = \frac{1}{x+1} \quad x \neq \pm 1$$

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

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

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

$$1 = x - 1$$

$$1 + 1 = x$$

$$x = 2$$

S.S { 2 }

==

$$x) \frac{2}{3x+6} = \frac{1}{6} - \frac{1}{2x+4}, \quad x \neq -2$$

$$\frac{2}{3x+6} + \frac{1}{2x+4} = \frac{1}{6}$$

$$\frac{2}{3(x+2)} + \frac{1}{2(x+2)} = \frac{1}{6}$$

$$\frac{1}{x+2} \left[\frac{2}{3} + \frac{1}{2} \right] = \frac{1}{6}$$

$$\frac{1}{x+2} \left[\frac{4+3}{6} \right] = \frac{1}{6}$$

$$\frac{7}{6(x+2)} = \frac{1}{6}$$

$$\frac{7}{x(x+2)} = \frac{1}{x} \quad \cancel{x}$$

$$\frac{7}{x+2} = \frac{1}{1}$$

$$x+2 = 7$$

$$x = 7 - 2$$

$$x = 5$$

s.s } + 5 }

② Solve each equation and check for Extraneous roots, if any

① $\sqrt{3x+4} = 2$

$$(\sqrt{3x+4})^2 = (2)^2$$

$$3x+4 = 4$$

$$3x = 4-4$$

$$3x = 0$$

$$x = \frac{0}{3}$$

$$x = 0$$

check!

$$\text{At } = 0$$

$$3(0) + 4 = 4$$

$$4 = 4$$

$$\{0\}$$

==

Radical equation
جزئی مساوات

Extraneous roots

roots

Extraneous roots

$$\text{ii) } \sqrt[3]{2x-4} - 2 = 0$$

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

$$(2x-4)^{\frac{1}{3} \times 3} = (2)^3$$

$$2x-4 = 8 \text{ --- (A)}$$

$$2x = 8 + 4$$

$$2x = 12$$

$$x = \frac{12}{2}$$

$$x = 6$$

check!

put $x = 6$ in eq (A)

$$2(6) - 4 = 8$$

$$12 - 4 = 8$$

$$8 = 8$$

s.s {6}

6

$$\text{iii) } \sqrt{x-3} - 7 = 0$$

$$\sqrt{x-3} = 7$$
$$(\sqrt{x-3})^2 = (7)^2$$

$$x-3 = 49 \text{ --- (A)}$$

$$x = 49 + 3$$

$$x = 52$$

check!

Put $x = 52$ in
equation (A)

$$52 - 3 = 49$$

$$49 = 49$$

S.S } 52 }

$$\text{iv) } 2\sqrt{t+4} = 5$$

$$\sqrt{t+4} = \frac{5}{2}$$

$$(\sqrt{t+4})^2 = \left(\frac{5}{2}\right)^2$$

$$t+4 = \frac{25}{4} \quad \text{--- (A)}$$

$$t = \frac{25}{4} - \frac{4}{1}$$

$$t = \frac{25-16}{4}$$

$$t = \frac{9}{4}$$

check!

put $t = \frac{9}{4}$ in eq (A)

$$\frac{9}{4} + 4 = \frac{25}{4}$$

$$\frac{9+16}{4} = \frac{25}{4}$$

$$\frac{25}{4} = \frac{25}{4}$$

S.S. $\left\{ \frac{9}{4} \right\}$

$$\begin{aligned}
 \sqrt[3]{2x+3} &= \sqrt[3]{x-2} \\
 (2x+3)^{\frac{1}{3}} &= (x-2)^{\frac{1}{3}} \\
 (2x+3)^{\cancel{3} \times \frac{1}{3}} &= (x-2)^{\cancel{3} \times \frac{1}{3}} \\
 2x+3 &= x-2 \quad \text{--- (A)} \\
 2x-x &= -2-3 \\
 x &= -5
 \end{aligned}$$

check!

Put $x = -5$ in eq (A)

$$2(-5) + 3 = -5 - 2$$

$$-10 + 3 = -7$$

$$-7 = -7$$

S.S $\{-5\}$

$$vi) \sqrt[3]{2-t} = \sqrt[3]{2t-28}$$

$$(2-t)^{\frac{1}{3}} = (2t-28)^{\frac{1}{3}}$$

$$(2-t)^{\frac{1}{3} \times \frac{3}{3}} = (2t-28)^{\frac{1}{3} \times \frac{3}{3}}$$

$$2-t = 2t-28 \quad \text{--- (A)}$$

$$-t - 2t = -28 - 2$$

$$-3t = -30$$

$$t = \frac{30}{3}$$

$$t = 10$$

check!

Put $t = 10$ in eq (A)

$$2 - 10 = 2(10) - 28$$

$$-8 = 20 - 28$$

$$-8 = -8$$

$$S.S \{ 10 \}$$

\equiv

$$\text{vii) } \sqrt{2t-6} - \sqrt{2t-5} = 0$$

$$\sqrt{2t-6} = \sqrt{2t-5}$$

Squaring

$$(\sqrt{2t-6})^2 = (\sqrt{2t-5})^2$$

$$2t-6 = 2t-5$$

$$2t-2t = -5-6$$

$$0 = -11$$

Not possible

S.S { }

//

viii) $\sqrt{\frac{x+1}{2x+5}} = 2$

$\left(\sqrt{\frac{x+1}{2x+5}}\right)^2 = (2)^2$

~~$\frac{4}{1}$~~

$\frac{x+1}{2x+5}$

$x+1 = 8x+20 \text{ --- (A)}$

$x-8x = 20-1$

$-7x = 19$

$x = -\frac{19}{7}$

$x \neq -\frac{5}{2}$

check!

put $x = -\frac{19}{7}$ in eq (A)

$-\frac{19}{7} + 1 = 8\left(-\frac{19}{7}\right) + \frac{20}{1}$

$\frac{-19+7}{7} = \frac{-152+140}{7}$

$\frac{-12}{7} = -\frac{12}{7}$

S.S } $-\frac{19}{7}$ }