EXERCISE 7.1. (SOLUTION)

9^{th} Class

❖ **Solve the following equations.**

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

(Solution): Multiply both sides by 6

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

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

$$-5x = 1$$

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

$$\boldsymbol{Solution\ Set} = \left\{-\frac{1}{5}\right\}$$

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

(Solution): Multiply both sides by 6

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

$$2(x-3) - 3(x-2) = -6$$

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

$$-x = -6$$

$$x = 6$$

$$\boldsymbol{Solution\ Set} = \{6\}$$

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

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

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

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

$$Multiply\ both\ sides\ by\ 12$$

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

$$6x - 1 - 2(1-6x) = 10 - 8$$

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

$$18x - 3 = 2$$

$$18x = 5$$

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

$$\boldsymbol{Solution\ Set} = \left\{\frac{\mathbf{5}}{\mathbf{18}}\right\}$$

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

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

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

$$Multiply\ both\ sides\ by\ 3$$

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

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

$$3x + 1 = -12x - 4$$

$$3x + 12 = -5$$

$$15x = -5$$

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

$$\boldsymbol{Solution\ Set} = \left\{-\frac{\mathbf{1}}{\mathbf{3}}\right\}$$

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

(Solution):

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

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

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

$$9(-x-15) = 6(9-x)$$

$$-9x-135 = 54-6x$$

$$-9x+6x = 54+135$$

$$-3x = 189$$

$$x = \frac{-189}{3}$$

$$x = -63$$

$$\boldsymbol{Solution\ Set} = \{\mathbf{-63}\}$$

vi) $\frac{x}{3x-6} = 2 - \frac{2x}{x-2}$

(Solution):

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

Multiply both sides by "x-2"

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

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

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

$$x = -12$$

$$\boldsymbol{Solution\ Set} = \{\mathbf{-12}\}$$

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

(Solution):

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

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

Multiply both sides by "$2(2x+5)$"

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

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

$$4x+5=\frac{8x+20}{3}$$

Multiply by "3" both sides

$$3(4x+5)=3\times\frac{8x+20}{3}$$

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

$$4x=5$$

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

$$\boldsymbol{Solution\ Set}=\left\{\frac{\mathbf{4}}{\mathbf{5}}\right\}$$

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

(Solution):

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

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

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

$$\frac{2x-2}{x-1}=\frac{1}{2}$$

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

$$4x - 4 = x - 1$$

$$4x - x = 4 - 1$$

$$3x = 3$$

$$x = 1$$

$$\therefore \textit{Solution is not possible because } x \neq 1$$

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

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

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

$$\textit{Multiply both sides by } (x+1)(x-1)$$

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

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

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

$$2 - x + 1 = x - 1$$

$$-x - x = -1 - 3$$

$$-2x = -4$$

$$x = 2$$

$$\boldsymbol{Solution\ Set} = \{\mathbf{2}\}$$

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

(Solution): $\frac{2}{3x+6} + \frac{1}{2x+4} = \frac{1}{6}$

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

$$Multiply\ both\ sides\ by\ (x+2)$$

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

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

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

$$7=x+2$$

$$x=7-2$$

$$x=5$$

$$\boldsymbol{Solution\ Set}=\{\mathbf{5}\}$$

1. Solve each equation and check for extraneous solution , if any.

i) $\sqrt{\boldsymbol{3x+4}}=\mathbf{2}$

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

$$Taking\ square\ on\ both\ sides$$

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

$$3x+4=4$$

$$3x=4-4$$

$$3x=0$$

$$x=0$$

Check:

$$\sqrt{3(0)+4}=2$$

$$\sqrt{4}=2$$

$$2=2$$

$$\boldsymbol{Solution\ Set}=\{\mathbf{2}\}$$

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

(Solution): $(2x-4)^{\frac{1}{3}}-2=0$

Taking cube on both sides

$$\left[(2x-4)^{\frac{1}{3}}\right]^3 = (2)^3$$

$$2x - 4 = 8$$

$$2x = 12$$

$$x = 6$$

Check:

$$\sqrt[3]{12-4} - 2 = 0$$

$$\sqrt[3]{8} - 2 = 0$$

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

$$2 = 2$$

$$\boldsymbol{Solution\ Set} = \{\mathbf{6}\}$$

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

(Solution): $$\sqrt{x-3} - 7 = 0$$

$$\sqrt{x-3} = 7$$

Taking square on both sides

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

$$x - 3 = 49$$

$$x = 49 + 3$$

$$x = 52$$

Check:

$$\sqrt{52-3} - 7 = 0$$

$$\sqrt{49} = 7$$

$$7 = 7$$

$$\boldsymbol{Solution\ Set} = \{\mathbf{52}\}$$

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

$(Solution)$: $\sqrt[2]{t+4} = 5$:

$Taking\ square\ on\ both\ sides$

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

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

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

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

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

Check:

$$\sqrt[2]{\frac{9}{4} + 4} = 5$$

$$\sqrt[2]{\frac{9 + 16}{4}} = 5$$

$$\sqrt[2]{\frac{25}{4}} = 5$$

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

$$5 = 5$$

$$Solution\ Set = \left\{\frac{9}{4}\right\}$$

v) $\sqrt[3]{2x+3} = \sqrt[3]{x-2}$

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

$$Taking\ cube\ on\ both\ sides$$

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

$$2x+3 = x-2$$

$$x-2x = -2-3$$

$$x = -5$$

Check:

$$\sqrt[3]{2(-5)+3} = \sqrt[3]{-5-2}$$

$$\sqrt[3]{-10+3} = \sqrt[3]{-7}$$

$$\sqrt[3]{-7} = \sqrt[3]{-7}$$

$$\boldsymbol{Solution\ Set} = \{\mathbf{-5}\}$$

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

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

$$Taking\ cube\ on\ both\ sides$$

$$\left[(2-t)^{\frac{1}{3}}\right]^3 = \left[(2t-28)^{\frac{1}{3}}\right]^3$$

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

$$2+28 = 2t+t$$

$$3t = 30$$

$$t = 10$$

Check:

$$Put\ value\ of\ t$$

$$\sqrt[3]{2-10} = \sqrt[3]{2\times 10-28}$$

$$\sqrt[3]{-8} = \sqrt[3]{-8}$$

$$\boldsymbol{Solution\ Set} = \{\mathbf{10}\}$$

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

$(Solution)$: $\sqrt{2t+6}=\sqrt{2t-5}$:

$Taking\ square\ on\ both\ sides$

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

$$\frac{x-1}{2x+5}=4$$

$$x+1=4(2x+5)$$

$$x+1=8x-x$$

$$-19=7x$$

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

Check:

$Put\ value\ of\ x$

$$\sqrt{\frac{\frac{-19}{7}+1}{2\times\frac{-19}{7}+5}}=2$$

$$\sqrt{\frac{\frac{-19+7}{7}}{\frac{-38-35}{7}}}=2$$

$$2=2$$

$$\boldsymbol{Solution\ Set}=\left\{\frac{-19}{7}\right\}$$

Do good, have good.