MODERN LANGUAGE SCHOOL & COLLEGE

12 June 2020 Mathematics Class 10th

Unit # 1 Quadratic Equations.

Radical Equations.

Ex: 1.4

i) Equation of the type $\sqrt{ax+b} = cx+d$

① $2x+5 = \sqrt{7x+16}$

Sol $2x+5 = \sqrt{7x+16}$ ——— (i)

Squaring both sides of equ. (i) we get

$$(2x+5)^2 = \left(\sqrt{7x+16}\right)^2$$

$$4x^2 + 25 + 20x = 7x + 16$$

$$4x^2 + 20x - 7x + 25 - 16 = 0$$

$$4x^2 + 13x + 9 = 0$$

$$4x^2 + 4x + 9x + 9 = 0$$

$$4x(x+1) + 9(x+1) = 0$$

$$(4x+9)(x+1) = 0$$

$4x = -9$;

$x = \frac{-9}{4}$;

$x+1 = 0$

$x = -1$

Pg#2

$$2x+5=\sqrt{7x+16} \quad \text{---- i)}$$

Checking

Putting $x=\frac{-9}{4}$ in equ i)

$$2\left(\frac{-9}{4}\right)+5=\sqrt{7\left(\frac{-9}{4}\right)+16}$$

$$\frac{-9}{2}+5=\sqrt{\frac{-63+64}{4}}$$

$$\frac{-9+10}{2}=\sqrt{\frac{1}{4}}$$

$$\frac{1}{2}=\frac{1}{2} \quad \text{which is true.}$$

Put $x=-1$ in equ i)

$$2(-1)+5=\sqrt{7(-1)+16}$$

$$-2+5=\sqrt{-7+16}$$

$$3=\sqrt{9}$$

$$3=3 \quad \text{which is true.}$$

Hence $S.S=\left\{-1, \frac{-9}{4}\right\}$

ii) Equation of the type $\sqrt{x+a} + \sqrt{x+b} = \sqrt{x+c}$

5) $\sqrt{x+5} + \sqrt{x+21} = \sqrt{x+60}$

Sol $\sqrt{x+5} + \sqrt{x+21} = \sqrt{x+60}$ ——— i)

Squaring eqn i) on both sides.

$$\left(\sqrt{x+5} + \sqrt{x+21}\right)^2 = \left(\sqrt{x+60}\right)^2$$

$$\left(\sqrt{x+5}\right)^2 + \left(\sqrt{x+21}\right)^2 + 2\sqrt{(x+5)(x+21)} = x+60$$

$$x+5 + x+21 + 2\sqrt{x^2+26x+105} = x+60$$

$$2x+26 + 2\sqrt{x^2+26x+105} = x+60$$

$$2\sqrt{x^2+26x+105} = x-2x+60-26$$

$$2\sqrt{x^2+26x+105} = -x+34$$

$$2\sqrt{x^2+26x+105} = 34-x$$

Again Squaring

$$\left(2\sqrt{x^2+26x+105}\right)^2 = (34-x)^2$$

$$4(x^2+26x+105) = 1156 + x^2 - 68x$$

$$4x^2 + 104x + 420 = 1156 + x^2 - 68x$$

$$4x^2 - x^2 + 104x + 68x + 420 - 1156 = 0$$

$$3x^2 + 172x - 736 = 0$$

Solve by your self and check for S.S.

(iii) Equation of the type

$$\sqrt{x^2+px+m} + \sqrt{x^2+px+n} = q$$

9) $\sqrt{x^2+x+1} - \sqrt{x^2+x-1} = 1$

Sol $\sqrt{x^2+x+1} - \sqrt{x^2+x-1} = 1$ ——— i)

let $x^2+x = y$

$\sqrt{y+1} - \sqrt{y-1} = 1$

Squaring both sides we get

$$\left(\sqrt{y+1} - \sqrt{y-1}\right)^2 = (1)^2$$

$$\left(\sqrt{y+1}\right)^2 + \left(\sqrt{y-1}\right)^2 - 2\sqrt{(y+1)(y-1)} = 1$$

$$y+1 + y-1 - 2\sqrt{y^2-1} = 1$$

$$2y - 2\sqrt{y^2-1} = 1$$

$$2y - 1 = 2\sqrt{y^2-1}$$

Againg squaring both sides we get

$$(2y-1)^2 = \left(2\sqrt{y^2-1}\right)^2$$

$$4y^2 + 1 - 4y = 4(y^2-1)$$

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

$$4y^2 - 4y^2 - 4y + 1 + 4 = 0$$

$$-4y + 5 = 0$$

$$-4y = -5$$

$$y = 5/4$$

Pg # 5

Put $y = x^2 + x$

$$x^2 + x = \frac{5}{4}$$

$$4x^2 + 4x = 5$$

$$4x^2 + 4x - 5 = 0$$

$a = 4 \quad b = 4 \quad c = -5$

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

$$= \frac{-4 \pm \sqrt{(4)^2 - 4(4)(-5)}}{2(4)}$$

$$= \frac{-4 \pm \sqrt{16 + 80}}{8}$$

$$= \frac{-4 \pm \sqrt{96}}{8}$$

$$= -\frac{4 \pm \sqrt{16 \times 6}}{8}$$

$$= \frac{-4 \pm 4\sqrt{6}}{8}$$

$$x = \frac{4(-1 \pm \sqrt{6})}{8}$$

$$x = \frac{-1 \pm \sqrt{6}}{2}$$

$$S.S = \left\{ \frac{-1 \pm \sqrt{6}}{2} \right\}$$