EXERCISE 1.1

Question No 1:

Write the following quadratic equations in the standard Form and point out pure quadratic equation

$(x+7)(x-3)=-7$

$Solution: (x+7)(x-3)=-7$

$x^2-3x+7x-21=-7$

$x^2+4x-21+7=0$

$x^2+4x-14=0$

The standard form of Quadratic equation is:

$x^2+4x-14=0$

(ii)

$\frac{x^2+4}{3}-\frac{x}{7}=1$

$Solution: \frac{x^2+4}{3}-\frac{x}{7}=1$

$\frac{7(x^2+4)-3x}{21}=1$

$7x^2+28-3x=21$

$7x^2-3x+28-21=0$

$7x^2-3x+7=0$

The standard form of Quadratic equation is:

$7x^2-3x+7=0$

(iii)

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

$Solution: \frac{x}{x+1}+\frac{x+1}{x}=6$

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

$x^2+x^2+1+2x=6x(x+1)$

$2x^2+2x+1=6x^2+6x$

$0=6x^2+6x-2x^2-2x-1$

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

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

The standard form of Quadratic equation is

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

(iv)

$\left(\frac{x+4}{x-2}\right)-\left(\frac{x-2}{x}\right)+4=0$

$Solution: \left(\frac{x+4}{x-2}\right)-\left(\frac{x-2}{x}\right)+4=0$

$\frac{(x+4)x-(x-2)^2+4x(x-2)}{(x-2)(x)}=0$

$(x+4)x-\left[(x)^2+(2)^2-2(x)(2)\right]+4x^2-8x=0(x-2)(x)$

$x^2+4x-x^2-4+4x+4x^2-8x=0$

$4x^2+4x+4x-8x-4=0$

$4x^2-4=0$

$4(x^2-1)=0$

$x^2-1=0$

$So, x^2-1=0 \, is \, pure \, Quadratic \, equation$

(v)

$\frac{x+3}{x+4}-\frac{x-5}{x}=1$

$Solution: \frac{x+3}{x+4}-\frac{x-5}{x}=1$

$\frac{x(x+3)-(x+4)(x-5)}{x(x+4)}=1$

$x^2+3x-(x^2-5x+4x-20)=1x(x+4)$

$x^2+3x-(x^2-1x-20)=x^2+4x$

$x^2+3x-x^2+1x+20=x^2+4x$

$3x+1x+20=x^2+4x$

$4x+20=x^2+4x$

$x^2+4x-4x-20=0$

$x^2-20=0$

$x^2-20=0$ *is pure Quadratic equation*

(vi)

$\frac{x+1}{x+2}+\frac{x+2}{x+3}=\frac{25}{12}$

$Solution: \frac{x+1}{x+2}+\frac{x+2}{x+3}=\frac{25}{12}$

$\frac{(x+1)(x+3)+(x+2)(x+2)}{(x+2)(x+3)}=\frac{25}{12}$

$\frac{(x+3x+1x+3)+(x^2+2x+2x+4)}{x^2+3x+2x+6}=\frac{25}{12}$

$\frac{(x^2+4x+3)+(x^2+4x+4)}{x^2+3x+2x+6}=\frac{25}{12}$

$\frac{2x^2+8x+7}{x^2+5x+6}=\frac{25}{12}$

$12(2x^2+8x+7)=25(x^2+5x+6)$

$24x^2+96x+84=25x^2+125x+150$

$25x^2-24x^2+125x-96x+150-84=0$

$x^2+29x+66=0$

The standard form of Quadratic equation is:

$x^2+29x+66=0$

Question no. 2 Solve by factorization

$(i)\ x^2-x-20=0$

$x^2-5x+4x-20=0$

$x(x-5)+4(x-5)=0$

$(x-5)(x+4)=0$

$x-5=0 \quad 0r \quad x+4=0$

$x=5 \quad or \quad x=-4$

Solution set is $\{-4,5\}$

$(ii)\ 3y^2=y(y-5)$

$Solution:\ 3y^2=y^2-5y$

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

$2y^2+5y=0$

$y(2y+5)=0$

$y=0 \quad 2y+5=0$

$y=0 \quad 2y=-5$

$y=0 \quad y=\frac{-5}{2}$

$Solution\ set\ is \left\{0,\ \frac{-5}{2}\right\}$

$(iii)\ 4-32x=-17x^2$

$Solution: 4-32x=-17x^2$

$17x^2+32x-4=0$

$17x^2+34x-2x-4=0$

$17x(x+2)-2(x+2)=0$

$(17x-2)(x+2)=0$

$17x-2=0 \quad x+2=0$

$17x=2 \quad x=-2$

$x=\frac{2}{17} \quad x=-2$

$Solution\ set\ is \left\{-2,\frac{2}{17}\right\}$

$(iv)\ x^2-11x=152$

$Solution:\ x^2-11x=152$

$x^2-19x+8x-152=0$

$x(x-19)+8(x-19)=0$

$x-19=0 \quad x+8=0$

$x=19 \quad x=-8$

$Solution\ set\ is \{19,-8\}$

$(v)\ \frac{x+1}{x}+\frac{x}{x+1}=\frac{25}{12}$

$Solution: \frac{x+1}{x}+\frac{x}{x+1}=\frac{25}{12}$

$\frac{(x+1)^2+x^2}{x(x+1)}=\frac{25}{12}$

$$\frac{x^2+1+2x+x^2}{x^2+x}=\frac{25}{12}$$

$$12(2x^2+2x+1)=25(x^2+x)$$
$$24x^2+24x+12=25x^2+25x$$
$$0=25x^2+25x-24x^2-24x-12$$
$$0=x^2+x-12$$
$$x^2+4x-3x-12=0$$
$$x(x+4)-3(x+4)=0$$
$$(x+4)(x-3)=0$$
$$x+4=0 \quad x-3=0$$
$$x=-4 \qquad x=3$$
$$Solution\ set\ is\ \{3,-4\}$$

$$(vi)\ \frac{2}{x-9}=\frac{1}{x-3}-\frac{1}{x-4}$$

$$Solution:\frac{2}{x-9}=\frac{1}{x-3}-\frac{1}{x-4}$$
$$\frac{2}{x-9}=\frac{(x-4)-(x-3)}{(x-4)(x-3)}$$
$$\frac{2}{x-9}=\frac{x-4-x+3}{x^2-4x-3x+12}$$
$$\frac{2}{x-9}=\frac{-1}{x^2-7x+12}$$
$$2(x^2-7x+12)=-1(x-9)$$
$$2x^2-14x+24=-x+9$$
$$2x^2-14x+x+24-9=0$$
$$2x^2-13x+15=0$$
$$2x^2-10x-3x+15=0$$
$$2x(x-5)-3(x-5)=0$$
$$(x-5)(2x-3)=0$$
$$x-5=0 \quad 2x-3=0$$
$$x=5 \qquad x=\frac{3}{2}$$
$$Solution\ set\ is\ \left\{5,\frac{3}{2}\right\}$$

Question no 3: Solve the following equations by using completing square

$$(i)\ 7x^2+2x-1=0$$
$$Solution:7x^2+2x-1=0$$

Dividing each term by 7

$$\frac{7}{7}x^2+\frac{2}{7}x-\frac{1}{7}=\frac{0}{7}$$
$$x^2+\frac{2}{7}x-\frac{1}{7}=0 \qquad H\,\text{int}\left(\frac{2}{7}\times\frac{1}{2}=\frac{1}{7}\right)$$
$$(x)^2+2(x)\left(\frac{1}{7}\right)=\frac{1}{7}$$

Adding $\left(\frac{1}{7}\right)^2$ *on both sides*

$$(x)^2+2(x)\left(\frac{1}{7}\right)+\left(\frac{1}{7}\right)^2=\frac{1}{7}+\left(\frac{1}{7}\right)^2$$
$$\left(x+\frac{1}{7}\right)^2=\frac{1}{7}+\frac{1}{49}$$
$$\left(x+\frac{1}{7}\right)^2=\frac{7+1}{49}$$
$$\left(x+\frac{1}{7}\right)^2=\frac{8}{49}$$

Taking square root on both sides

$$\sqrt{\left(x+\frac{1}{7}\right)^2}=\pm\sqrt{\frac{8}{49}}$$
$$\sqrt{\left(x+\frac{1}{7}\right)^2}=\pm\sqrt{\frac{4\times2}{49}}$$
$$x+\frac{1}{7}=\pm\frac{2\sqrt{2}}{7}$$
$$x=-\frac{1}{7}\pm\frac{2\sqrt{2}}{7}$$
$$x=\frac{-1\pm2\sqrt{2}}{7}$$
$$S.S\left\{\frac{-1\pm2\sqrt{2}}{7}\right\}$$

$(ii)\ ax^2+4x-a=0$

Solution: $ax^2+4x-a=0$

Dividing each term by a

$$\frac{ax^2}{a}+\frac{4x}{a}-\frac{a}{a}=0$$

$$x^2+\frac{4x}{a}-1=0 \qquad H\text{int}\left(\frac{4}{a}\times\frac{1}{2}=\frac{2}{a}\right)$$

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

Ading $\left(\frac{2}{a}\right)^2$ *on both sides*

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

$$\left(x+\frac{2}{a}\right)^2=1+\frac{4}{a^2}$$

$$\left(x+\frac{2}{a}\right)^2=\frac{a^2+4}{a^2}$$

Taking square root on both sides

$$\sqrt{\left(x+\frac{2}{a}\right)^2}=\sqrt{\frac{a^2+4}{a^2}}$$

$$x+\frac{2}{a}=\pm\frac{\sqrt{a^2+4}}{a^2}$$

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

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

$$S.S\left\{\frac{-2\pm\sqrt{a^2+4}}{a^2}\right\}$$

$(iii) 11x^2-34x+5=0$

Solution: $11x^2-34x+5=0$

Dividing each term by 11

$$\frac{11}{11}x^2-\frac{34}{11}x+\frac{3}{11}=0$$

$$x^2-\frac{34}{11}x=-\frac{3}{11} \qquad H\text{int}\left(\frac{34}{11}\times\frac{1}{2}=\frac{17}{11}\right)$$

$$(x)^2-2(x)\left(\frac{17}{11}\right)=-\frac{3}{11}$$

Adding both sides $\left(\frac{17}{11}\right)^2$

$$(x)^2-2(x)\left(\frac{17}{11}\right)+\left(\frac{17}{11}\right)^2=-\frac{3}{11}+\left(\frac{17}{11}\right)^2$$

$$\left(x-\frac{17}{11}\right)^2=-\frac{3}{11}+\frac{289}{121}$$

$$\left(x-\frac{17}{11}\right)^2=\frac{-33+289}{121}$$

$$\left(x-\frac{17}{11}\right)^2=\frac{256}{121}$$

Taking square root on both sides

$$\sqrt{\left(x-\frac{17}{11}\right)^2}=\sqrt{\frac{256}{121}}$$

$$x-\frac{17}{11}=\pm\frac{16}{11}$$

$$x=\frac{17}{11}\pm\frac{16}{11}$$

$$x=\frac{11\pm16}{11}$$

$$x=\frac{17-16}{11} \qquad x=\frac{17+16}{11}$$

$$x=\frac{1}{11} \qquad x=\frac{33}{11}$$

$$x=\frac{1}{11} \qquad x=3$$

$$S.S\left\{3,\frac{1}{11}\right\}$$

$(iv)\ lx^2+mx+n=0$

Solution: $lx^2+mx+n=0$

Dividing each term by l

$$\frac{lx^2}{l}+\frac{mx}{l}=-\frac{n}{l}$$

$$x^2+\frac{m}{i}x=-\frac{n}{l} \qquad \therefore\left(\frac{m}{i}\times\frac{1}{2}=\frac{m}{2l}\right)$$

Adding $\left(\frac{m}{2l}\right)^2$ *on both sides*

$$(x)^2+2(x)\left(\frac{m}{2l}\right)+\left(\frac{m}{2l}\right)^2=-\frac{n}{l}+\left(\frac{m}{2l}\right)^2$$

$$\left(x+\frac{m}{2l}\right)^2=-\frac{n}{l}+\frac{m^2}{4l^2}$$

$$\left(x+\frac{m}{2l}\right)^2=\frac{-4\ln+m^2}{4l^2}$$

Taking square root on both sides

$$\sqrt{\left(x+\frac{m}{2l}\right)^2}=\sqrt{\frac{-4l\,\mathrm{n}+m^2}{4l^2}}$$

$$x+\frac{m}{2l}=\pm\frac{\sqrt{m^2-4l\,\mathrm{n}}}{2l}$$

$$x=-\frac{m}{2l}\pm\frac{\sqrt{m^2-4l\,\mathrm{n}}}{2l}$$

$$x=\frac{-m\pm\sqrt{m^2-4l\,\mathrm{n}}}{2l}$$

$$S.S\left\{\frac{-m\pm\sqrt{m^2-4l\,\mathrm{n}}}{2l}\right\}$$

$(v)\ 3x^2+7x=0$

Solution: $3x^2+7x=0$

Dividing each term by 3

$$\frac{3x^2}{3}+\frac{7}{3}x=0 \qquad H\,\mathrm{int}\left(\frac{7}{3}\times\frac{1}{2}=\frac{7}{6}\right)$$

$$(x)^2+2(x)\left(\frac{7}{6}\right)=0$$

Adding $\left(\frac{7}{6}\right)^2$ *on both sides*

$$(x)^2+2(x)\left(\frac{7}{6}\right)+\left(\frac{7}{6}\right)^2=\left(\frac{7}{6}\right)^2$$

$$\left(x+\frac{7}{6}\right)^2=\frac{49}{36}$$

Taking square root on both sides

$$\sqrt{\left(x+\frac{7}{6}\right)^2}=\sqrt{\frac{49}{36}}$$

$$\left(x+\frac{7}{6}\right)=\pm\frac{7}{6}$$

$$x=-\frac{7}{6}\pm\frac{7}{6}$$

$$x=\frac{-7\pm7}{6}$$

$$x=\frac{-7-7}{6} \qquad x=\frac{-7+7}{6}$$

$$x=\frac{-14}{6} \qquad x=\frac{0}{6}$$

$$x=-\frac{7}{3} \qquad x=0$$

$$S.S\left\{-\frac{7}{3},0\right\}$$

$(vi)\ x^2-2x-195=0$

Solution: $x^2-2x-195=0$

$$x^2-2x=195 \qquad \therefore\left(2\times\frac{1}{2}=1\right)$$

$$(x)^2-2(x)(1)=195$$

Adding $(1)^2$ *on both sides*

$$(x)^2-2(x)(1)+(1)^2=195+(1)^2$$

$$(x-1)^2=195+1$$

$$(x-1)^2=196$$

Taking square root on both sides

$\sqrt{(x-1)^2} = \sqrt{196}$

$x-1 = \pm 14$

$x = 1 \pm 14$

$x = 1-14 \qquad x = 1+14$

$x = -13 \qquad x = 15$

$S.S\{-13, 15\}$

$(vii)\ -x^2 + \frac{15}{2} = \frac{7}{2}x$

$Solution: -x^2 + \frac{15}{2} = \frac{7}{2}x$

$\frac{15}{2} = x^2 + \frac{7}{2}x$

$x^2 + \frac{7}{2}x = \frac{15}{2} \qquad \therefore \left(\frac{7}{2} \times \frac{1}{2} = \frac{7}{4}\right)$

Adding $\left(\frac{7}{4}\right)^2$ *on both sides*

$(x)^2 + 2(x)\left(\frac{7}{4}\right) + \left(\frac{7}{4}\right)^2 = \frac{15}{2} + \left(\frac{7}{4}\right)^2$

$\left(x + \frac{7}{4}\right)^2 = \frac{15}{2} + \frac{49}{16}$

$\left(x + \frac{7}{4}\right)^2 = \frac{120 + 49}{16}$

$\left(x + \frac{7}{4}\right)^2 = \frac{169}{16}$

Taking square root on both sides

$\sqrt{\left(x + \frac{7}{4}\right)^2} = \sqrt{\frac{169}{16}}$

$x + \frac{7}{4} = \pm\frac{13}{14}$

$x = -\frac{7}{4} \pm \frac{13}{14}$

$x = \frac{-7 \pm 13}{4}$

$x = \frac{-7-13}{4} \qquad x = \frac{-7+13}{4}$

$x = \frac{-20}{4} \qquad x = \frac{6}{4}$

$x = -5 \qquad x = \frac{3}{2}$

$S.S\left\{-5, \frac{3}{2}\right\}$

$(viii)\ x^2 + 17x + \frac{33}{4} = 0$

$Solution: x^2 + 17x + \frac{33}{4} = 0$

$x^2 + 17x = -\frac{33}{4}$

$(x)^2 + 2(x)\left(\frac{17}{2}\right) = -\frac{33}{4}$

Adding $\left(\frac{17}{2}\right)^2$ *on both sides*

$(x)^2 + 2(x)\left(\frac{17}{2}\right) + \left(\frac{17}{2}\right)^2 = -\frac{33}{4} + \left(\frac{17}{2}\right)^2$

$\left(x + \frac{17}{2}\right)^2 = -\frac{33}{4} + \frac{289}{4}$

$\left(x + \frac{17}{2}\right)^2 = \frac{-33 + 289}{4}$

$\left(x + \frac{17}{2}\right)^2 = \frac{256}{4}$

Taking square root on both sides

$\sqrt{\left(x + \frac{17}{2}\right)^2} = \sqrt{\frac{256}{4}}$

$x + \frac{17}{2} = \pm\frac{16}{2}$

$x = -\frac{17}{2} \pm \frac{16}{2}$

$$x=\frac{-17\pm16}{2}$$

$$x=\frac{-17-16}{2} \qquad x=\frac{-17+16}{2}$$

$$x=-\frac{33}{2} \qquad x=-\frac{1}{2}$$

$$S.S\left\{-\frac{33}{2},x=-\frac{1}{2}\right\}$$

$(ix)\ 4-\frac{8}{3x+1}=\frac{3x^2+5}{3x+1}$

$Solution: 4-\frac{8}{3x+1}=\frac{3x^2+5}{3x+1}$

$$4=\frac{8}{3x+1}+\frac{3x^2+5}{3x+1}$$

$$4=\frac{3x^2+5+8}{3x+1}$$

$$4(3x+1)=3x^2+5+8$$

$$12x+4=3x^2+13$$

$$3x^2+13-12x-4=0$$

$$3x^2-12x+9=0$$

Dividing each term by 3

$$\frac{3}{3}x^2-\frac{12}{3}x+\frac{9}{3}=\frac{0}{3}$$

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

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

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

Adding $(2)^2$ *on both sides*

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

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

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

Taking square root on both sides

$$\sqrt{(x-2)^2}=\pm\sqrt{1}$$

$$x-2=\pm1$$

$$x-2=-1 \qquad x-2=+1$$

$$x=2+1 \qquad x=2-1$$

$$x=3 \qquad x=1$$

$$S.S\{3,1\}$$

$(x)\ 7(x+2a)^2+3a^2=5a(7x+23a)$

$Solution: 7(x+2a)^2+3a^2=5a(7x+23a)$

$$7(x^2+4a^2+4ax)+3a^2=35ax+115a^2$$

$$7x^2+28a^2+28ax+3a^2-35ax-115a^2=0$$

$$7x^2-35a+28ax+28a^2+3a^2-115a^2=0$$

$$7x^2-7ax-84a^2=0$$

Dividing each term by 7

$$\frac{7x^2}{7}-\frac{7ax}{7}-\frac{84a^2}{7}$$

$$x^2-ax=12a^2 \qquad H\,\text{int}\left(a\times\frac{1}{2}=\frac{a}{2}\right)$$

Adding $\left(\frac{a}{2}\right)^2$ *on both sides*

$$(x)^2-2(x)\left(\frac{a}{2}\right)+\left(\frac{a}{2}\right)^2=12a^2+\left(\frac{a}{2}\right)^2$$

$$\left(x-\frac{a}{2}\right)^2=12a^2+\frac{a^2}{4}$$

$$\left(x-\frac{a}{2}\right)^2=\frac{48a^2+a^2}{4}$$

$$\left(x-\frac{a}{2}\right)^2=\frac{49a^2}{4}$$

Taking square on both sides

$$\sqrt{\left(x-\frac{a}{2}\right)^2}=\sqrt{\frac{49a^2}{4}}$$

$$\left(x-\frac{a}{2}\right)=\pm\frac{7a}{2}$$

$$x = \frac{a}{2} \pm \frac{7a}{2}$$

$$x = \frac{a+7a}{2} \qquad x = \frac{a-7a}{2}$$

$$x = \frac{8a}{2} \qquad x = \frac{-6a}{2}$$

$$x = 4a \qquad x = -3a$$

$$Solution\ set\ is \{4a, -3a\}$$