Ex 4.3

Q14

(i) $2x^2-7x+3=0$

ans $2x^2-7x=-3$

on dividing both sides of the equation by 2 we obtain

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

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

on adding $\left(\frac{7}{4}\right)^2$ to both sides of equation, we obtain

$$\Rightarrow (x)^2-2\times x\times\frac{7}{4}+\left(\frac{7}{4}\right)^2=\left(\frac{7}{4}\right)^2-\frac{3}{2}$$

$$\Rightarrow \left[x-\frac{7}{4}\right]^2=\frac{49}{16}-\frac{3}{2}$$

$$\Rightarrow \left[x-\frac{7}{4}\right]^2=\frac{25}{16}$$

$$\Rightarrow \left[x-\frac{7}{4}\right]=\pm\frac{5}{4}$$

$$\Rightarrow x=\frac{7}{4}\pm\frac{5}{4}$$

$$\Rightarrow x=\frac{7}{4}+\frac{5}{4} \text{ or } x=\frac{7}{4}-\frac{5}{4}$$

$$\Rightarrow x=\frac{12}{4} \text{ or } x=\frac{2}{4}$$

$$\Rightarrow x=3 \text{ or } \frac{1}{2}$$

Date
Page

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

$\Rightarrow 2x^2+x=4$

On dividing both sides of the equation by 2, we obtain

$\Rightarrow x^2+\frac{1}{2}x=2$

On adding $\left(\frac{1}{4}\right)^2$ to both sides of the equation, we obtain

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

$\Rightarrow \left[x+\frac{1}{4}\right]^2=\frac{33}{16}$

$\Rightarrow x+\frac{1}{4}=\pm\frac{\sqrt{33}}{4}$

$\Rightarrow x=\pm\frac{\sqrt{33}}{4}-\frac{1}{4}$

$\Rightarrow x=\frac{\pm\sqrt{33}-1}{4}$

$\Rightarrow x=\frac{\sqrt{33}-1}{4}$ or $\frac{-\sqrt{33}-1}{4}$

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

$\Rightarrow (2x)^2+2\times 2x\times\sqrt{3}+(\sqrt{3})^2=0$

$\Rightarrow (2x+\sqrt{3})^2=0$

$\Rightarrow (2x+\sqrt{3})=0$ and $(2x+\sqrt{3})=0$

$\Rightarrow x = \frac{-\sqrt{3}}{2}$ & $x = \frac{-\sqrt{3}}{2}$

(iv) $2x^2 + x + 4 = 0$

$\Rightarrow 2x^2 + x = -4$

On dividing both sides of the equation by 2, we obtain

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

$\Rightarrow x^2 + 2 \times x \times \frac{1}{4} = -2$

On adding $\left(\frac{1}{4}\right)^2$ to both sides of the equation, we obtain

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

$\Rightarrow \left[x + \frac{1}{4}\right]^2 = \frac{1}{16} - 2$

$\Rightarrow \left[x + \frac{1}{4}\right]^2 = \frac{-31}{16}$

However, the square of a number cannot be negative. Therefore, there is no real root for the given equation

Q2)

(i) $2x^2 - 7x + 3 = 0$

On comparing this equation with $ax^2 + bx + c = 0$, we obtain

$a = 2, b = -7, c = 3$

By using quadratic formula, we obtain

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

$$x = \frac{7 \pm \sqrt{49-24}}{4}$$

$$x = \frac{7 \pm \sqrt{25}}{4}$$

$$x = \frac{7 \pm 5}{4}$$

$$x = \frac{7+5}{4} \text{ or } \frac{7-5}{4}$$

$$x = \frac{12}{4} \text{ or } \frac{2}{4}$$

$$\therefore x = 3 \text{ or } \frac{1}{2}$$

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

On comparing this equation with $ax^2 + bx + c = 0$, we obtain

$a = 2, b = 1, c = -4$

By using quadratic formula

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

$$x = \frac{-1 \pm \sqrt{1+32}}{4}$$

$$x = \frac{-1 \pm \sqrt{33}}{4}$$

$$x = \frac{-1 \pm \sqrt{33}}{4} \text{ or } \frac{-1 - \sqrt{33}}{4}$$

Date
Page

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

On comparing this equation with $ax^2 + bx + c = 0$

$a = 4, b = 4\sqrt{3}; c = 3$

By using Quadratic formula, we obtain

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

$$x = \frac{-4\sqrt{3} \pm \sqrt{48 - 48}}{8}$$

$$x = \frac{-4\sqrt{3} \pm 0}{8}$$

$\therefore x = \frac{-\sqrt{3}}{2}$ or $\frac{-\sqrt{3}}{2}$

(iv) $2x^2 + x + 4 = 0$

On comparing this equation with $ax^2 + bx + c = 0$, we obtain

$a = 2, b = 1, c = 4$

By using quadratic formula, we obtain

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

$$x = \frac{-1 \pm \sqrt{1 - 32}}{4}$$

$$x = \frac{-1 \pm \sqrt{-31}}{4}$$

However, the square of a number cannot be negative. Therefore, there is no real root for the given equation

Q3)

(i) $x - \frac{1}{x} = 3, x \neq 0$

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

$\Rightarrow x^2 - 3x - 1 = 0$

On Comparing this equation with $ax^2 + bx + c = 0$, we obtain

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

By using Quadratic formula, we obtain

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

$$x = \frac{3 \pm \sqrt{9+4}}{2}$$

$$x = \frac{3 \pm \sqrt{13}}{2}$$

$$\therefore x = \frac{3+\sqrt{13}}{2} \text{ or } \frac{3-\sqrt{13}}{2}$$

(ii) $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$

$\Rightarrow \frac{x-7-x-4}{(x+4)(x-7)} = \frac{11}{30}$

$\Rightarrow \frac{-11}{(x+4)(x-7)} = \frac{11}{30}$

$\Rightarrow (x+4)(x-7) = -30$

$\Rightarrow x^2 - 3x - 28 = -30$

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

$\Rightarrow x^2 - 2x - x + 2 = 0$

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

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

$\Rightarrow x = 1$ or 2

Q4)

ans Let the present age of Rehman be x years

Three years ago, his age was $(x-3)$ years

Five years hence, his age will be $(x+5)$ years.

It is given that the sum of the reciprocals of Rehman's ages 3 years ago and 5 years from now is $\frac{1}{3}$.

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

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

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

$\Rightarrow 3(2x+2) = (x-3)(x+5)$

$\Rightarrow 6x+6 = x^2+2x-15$

$\Rightarrow x^2-4x-21=0$

$\Rightarrow x^2-7x+3x-21=0$

$\Rightarrow x(x-7)+3(x-7)=0$

$\Rightarrow (x-7)(x+3)=0$

$\Rightarrow x = 7, -3$

However, age cannot be negative

Therefore, Rehman's present age is 7 years.

Q5)

ans Let the marks in Maths be x

Then the marks in English will be $30-x$

According to the question,

$(x+2)(30-x-3)=210$

$(x+2)(27-x)=210$

$\Rightarrow -x^2+25x+54=210$

$\Rightarrow x^2-25x+156=0$

$\Rightarrow x^2 - 12x - 13x + 156 = 0$

$\Rightarrow x(x-12) - 13(x-12) = 0$

$\Rightarrow (x-12)(x-13) = 0$

$\Rightarrow x = 12, 13$

If the marks in Maths are 12, then marks in English will be

$30 - 12 = 18$

If the marks in Maths are 13, then marks in English will be
$30 - 13 = 17$

Q67
ans Let the shorter side of the rectangle be x m.

Then, larger side of the rectangle $= (x+30)$m

Diagonal of the rectangle $= \sqrt{x^2 + (x+30)^2}$

It is given that the diagonal of the rectangle is 60m more than the shorter side.

$\therefore \sqrt{x^2 + (x+30)^2} = x + 60$

$\Rightarrow x^2 + (x+30)^2 = (x+60)^2$

$\Rightarrow x^2 + x^2 + 900 + 60x = x^2 + 3600 + 120x$

$\Rightarrow x^2 - 60x - 2700 = 0$

$\Rightarrow x^2 - 90x + 30x - 2700 = 0$

$\Rightarrow x(x-90) + 30(x-90)$

$\Rightarrow (x-90)(x+30) = 0$

$\Rightarrow x = 90, -30$

However, side cannot be negative. Therefore, the length of the shorter side will be

90 m

Hence length of the larger side will be $(90+30)m = 120m$

Q7)

ans Let the larger & smaller number be x and y respectively.

According to the given question,

$x^2 - y^2 = 180$ and $y^2 = 8x$

$\Rightarrow x^2 - 8x = 180$

$\Rightarrow x^2 - 8x - 180 = 0$

$\Rightarrow x^2 - 18x + 10x - 180 = 0$

$\Rightarrow x(x-18) + 10(x-18) = 0$

$\Rightarrow (x-18)(x+10) = 0$

$\Rightarrow x = 18, -10$

However, the larger number cannot be negative as 8 times of the larger number will be negative and hence, the square of the smaller number will be negative which is not possible.

$\therefore$ The larger number will be 18 only.

$x = 18$

$\therefore y^2 = 8x = 8 \times 18 = 144$

$\Rightarrow y = \pm\sqrt{144} = \pm 12$

$\therefore$ Smaller number $= \pm 12$

$\therefore$ The numbers are 18 and 12 or 18 and -12.

Q8)

ans Let the speed of the train be x km/hr

Time taken to cover 360 km $= \frac{360}{x}$ hr

A/Q

$(x+5)\left[\frac{360}{x} - 1\right] = 360$

$\Rightarrow (x+5)\left[\frac{360}{x} - 1\right] = 360$

$\Rightarrow 360 - x + \frac{1800}{x} - 5 = 360$

$\Rightarrow x^2 + 5x - 1800 = 0$

$\Rightarrow x^2 + 45x - 40x - 1800 = 0$

$\Rightarrow x(x+45) - 40(x+45) = 0$

$\Rightarrow (x+45)\ (x-40) = 0$

$\Rightarrow x = 40, 45$

However, speed cannot be negative

Therefore the speed of train is 40km/h

59 ans Let the time taken by the smaller price to fill the tank be x hr.

Time taken by the larger pipe $= (x-10)$ hr

Part of tank filled by larger pipe in 1 hour $= \frac{1}{x-10}$

It is given that the tank can be filled in $9\frac{3}{8} = \frac{75}{8}$ hours by both the pipes together. Therefore,

$\frac{1}{x} + \frac{1}{x-10} = \frac{8}{75}$

$\frac{x-10+x}{x(x-10)} = \frac{8}{75}$

$$\Rightarrow \frac{2x-10}{x(x-10)} = \frac{8}{75}$$

$$\Rightarrow 75(2x-10) = 8x^2 - 80x$$

$$\Rightarrow 150x - 750 = 8x^2 - 80x$$

$$\Rightarrow 8x^2 - 230x + 750 = 0$$

$$\Rightarrow 8x^2 - 200x - 30x + 750 = 0$$

$$\Rightarrow 8x(x-25) - 30(x-25) = 0$$

$$\Rightarrow (x-25)(8x-30) = 0$$

that is $x = 25, \frac{30}{8}$

Time taken by the smaller pipe cannot be $\frac{30}{8} = 3.75$ hrs.

As in this case, the time taken by the larger pipe will be negative, which is logically not possible.

Therefore, time taken individually by the smaller pipe and the larger pipe will be 25 and $25-10 = 15$ hours respectively.

Q10) ans Let the average speed of passenger train be x km/h

Average speed of express train $= (x+11)$ km/h

It is given that the time taken by the express train to cover 132 km is 1 hour less than the passenger train to cover the same distance.

$\therefore \frac{132}{x} - \frac{132}{x+11} = 1$

$\Rightarrow 132\left[\frac{x+11-x}{x(x+11)}\right] = 1$

$\Rightarrow \frac{132 \times 11}{x(x+11)} = 1$

$\Rightarrow 132 \times 11 = x(x+11)$

$\Rightarrow x^2 + 11x - 1452 = 0$

$\Rightarrow x^2 + 44x - 33x - 1452 = 0$

$\Rightarrow x(x+44) - 33(x+44) = 0$

$\Rightarrow (x+44)(x-33) = 0$

$\Rightarrow x = -44, 33$

Speed cannot be negative

Therefore, the speed of the passenger train will be 33 km/h and thus, the speed of the express train will be $33 + 11 = 44$ km/h

Q11)

ans Let the sides of the two square be x m and y m.

Therefore, their Perimeter will be $4x$ and $4y$ respectively

and their area will be x^2 and y^2 respectively.

It is given that

$4x - 4y = 24$

$x - y = 6$

$x = y + 6$

Also $x^2 + y^2 = 468$

$\Rightarrow (6+y)^2 + y^2 = 468$

$\Rightarrow 36 + y^2 + 12y + y^2 = 468$

$\Rightarrow 2y^2 + 12y - 432 = 0$

$\Rightarrow y^2 + 6y - 216 = 0$

$\Rightarrow y^2 + 18y - 12y - 216 = 0$

$\Rightarrow y(y+18) - 12(y+18) = 0$

$\Rightarrow (y+18)(y-12) = 0$

$\Rightarrow y = -18$ or 12.

However side of a square cannot be negative.

Hence, the sides of the square are 12m and $(12+6m) = 18m$