Exercise 4.3

1.

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

$a = 2 \quad b = -7 \quad c = 3$

$\Rightarrow 2x^2 - 7x = -3$

$\Rightarrow 4(2)(2x^2 - 7x) = -3 \times 8$

$\Rightarrow 16x^2 - 56x = -24$

$\Rightarrow (4x)^2 - 2(4x)(7) + (7)^2 = -24 + (7)^2$

$\Rightarrow (4x - 7)^2 = -24 + 49$

$\Rightarrow 4x - 7 = \pm\sqrt{25}$

$\Rightarrow 4x = +7 \pm \sqrt{25}$

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

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

$a = \frac{7+5}{4} \qquad b = \frac{7-5}{4}$

$a = \frac{12}{4} \qquad b = \frac{2}{4}$

$a = 3 \qquad b = \frac{1}{2}$

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

$2x^2+x = 4$

$\Rightarrow 4.2(2x^2+x) = 4.4.2$

$\Rightarrow 8(2x^2+x) = 32$

$\Rightarrow 16x^2+8x = 32$

$\Rightarrow (4x)^2+2(4x)(1)+(1)^2 = 32+(1)^2$

$\Rightarrow (4x+1)^2 = 33$

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

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

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

$a = \frac{-1+\sqrt{33}}{4}$ $\quad b = \frac{-1-\sqrt{33}}{4}$

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

$\Rightarrow 4x^2+4\sqrt{3}x = -3$

$\Rightarrow 4.4(4x^2+4\sqrt{3}x) = -3.4.4$

$\Rightarrow 16(4x^2+4\sqrt{3}x) = -48$

$\Rightarrow 64x^2 + 64\sqrt{3}x = -48$

$\Rightarrow (8x)^2 + (2)(8x)(4\sqrt{3}) + (4\sqrt{3})^2 = -48 + (4\sqrt{3})^2$

$\Rightarrow (8x + 4\sqrt{3})^2 = -48 + 48$

$\Rightarrow (8x + 4\sqrt{3})(8x + 4\sqrt{3}) = 0$

$\Rightarrow 8x = -4\sqrt{3}$

$\Rightarrow x = \frac{-4\sqrt{3}}{8_2}$

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

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

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

$\Rightarrow 4.2(2x^2 + x) = -4(4)(2)$

$\Rightarrow 8(3x^2 + x) = -32$

$\Rightarrow 16x^2 + 8x = -32$

$\Rightarrow (4x)^2 + (2)(4x)(1) + (1)^2 = -32 + (1)^2$

$\Rightarrow (4x + 1)^2 = -32 + 1$

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

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

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

$\frac{-1 \pm \sqrt{-31}}{4}$ is an imaginary valu

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

$a = 2 \quad b = -7 \quad c = 3$

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

$= \frac{-(-7) \pm \sqrt{(-7)^2 - 4.2.3}}{2(2)}$

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

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

$a = \frac{-(-7)+5}{4}$ $\quad b = \frac{+7-5}{4}$

$= \frac{+7+5}{4}$ $\quad = \frac{2}{4}$

$= \frac{12}{4}$ $\quad = \frac{1}{2}$

$= 3$

(ii)

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

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

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

$$= \frac{-2 \pm \sqrt{4 - (-32)}}{4}$$

$$= \frac{-2 \pm \sqrt{36}}{4}$$

$$= \frac{-2 \pm 6}{4}$$

$$a = \frac{-2 + 6}{4} \qquad b = \frac{-2 - 6}{2}$$

$$= \frac{4}{4}, \qquad = \frac{-8}{2}$$

$$= 1 \qquad = -4$$

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

$a = 4 \quad b = 4\sqrt{3} \quad c = 3$

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

$$= \frac{-4\sqrt{3} \pm \sqrt{(4\sqrt{3})^2 - 4(4)(3)}}{2(4)}$$

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

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

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

$a = 2 \quad b = 1 \quad c = 4$

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

$$= \frac{-(1) \pm \sqrt{(1)^2 - 4(2)(4)}}{2(2)}$$

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

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

$a = \frac{-1 \pm \sqrt{31}}{4} \quad b = \frac{-1 \pm \sqrt{31}}{4}$

3.

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

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

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

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

$a = 1 \qquad b = -3 \qquad c = -1$

$D = b^2 - 4ac$

$= (-3)^2 - (4)(1)(-1)$

$= 9 + 4$

$= 13 \qquad > 0$

$\Rightarrow \frac{-b \pm \sqrt{D}}{2a}$

$\Rightarrow \frac{+3 \pm \sqrt{13}}{2}$

Roots $= a = \frac{3 + \sqrt{13}}{2} \qquad b = \frac{3 - \sqrt{13}}{2}$

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

multiplying both sides by $(x+4)(x-7)$

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

$\Rightarrow x - 7 - x - 4 = \frac{11}{30}(x^2 + 4x - 7x - 28)$

$\Rightarrow -11 = \frac{11}{30}(x^2 - 3x - 28)$

$\Rightarrow -11 \times 30 = 11(x^2 - 3x - 28)$

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

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

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Let Rehman's present age = x

2 years ago rehman's age = $(x-3)$

5 years from now rehman's age $(x+5)$

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

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

A.T.Q

d 6 n

$\frac{2n+2}{n^2+2n-15} = \frac{1}{3}$

$6n+6 = n^2+2n-15$

$n^2-4n-21 = 0$

$n^2-7n+3n-21 = 0$

$n(n-7)+3(n-7) = 0$

$(n+3)(n-7) = 0$

$n+3 = 3$ OR $n-7 = 0$

$n = 7$ ~~or~~ $n = -3$ (-3 is not possible)

Rehman is 7 years

Q Sum of Shehzil's English and mathematics

Let Shehzil's maths marks = n

English marks = $30-n$

A.T.Q

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

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

$-n^2+25n+54 = 210$

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

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

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

$x = 12$ or $x = 13$

So

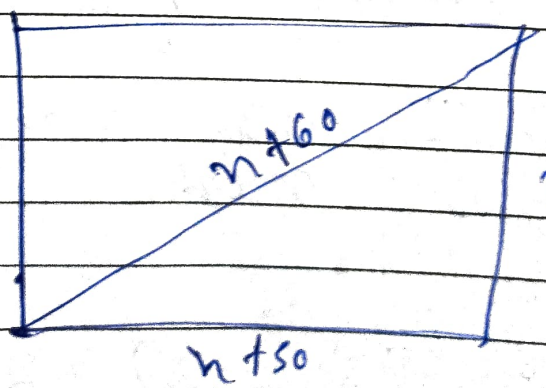
If $x = 12$ math marks = 12
and english = $30 - 12 = 18$

$x = 13$, then math marks = 13
and english = $30 - 13 = 17$

Let the shorter side = x
Diagonal of the field = $60+x$
longer side = $30+x$.

~~$(60+x)(30+x) =$~~

By $\triangle ABC$ $(x+60)^2 = (x+30)^2 + 45^2$



$x^2 + 120x + 3600 = 9x^2 + 60x + 900 + x^2$

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

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

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

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

$\Rightarrow x + 30 = 0$ or $x - 90 = 0$

$x = -30$ (rejected) $x = 90$

Shorter side = 90

Longer side = $90 + 30$

$= 120$ m

7. Difference of squares of two numbers = 180

Let Smaller number be x

Square of Sq of larger number = $\frac{x^2}{8}$

$\left(\frac{x \cdot 2}{8}\right)^2 - x^2 = 180$

$\frac{x^4}{64} - x^2 - 180 = 0$

$= x^2 - 64x^2 - 11520 = 0$

$\Rightarrow y^2 - 64y - 11520 = 0$ Putting $x^2 = y^2$

$a = 1, b = -64 \quad c = -11520$

$D = b^2 - 4ac$

$= (-64)^2 - 4 \times 1 \times (-11520)$

$= 4096 + 46080$

$= 50176$

$$\Rightarrow \frac{-(-64) \pm \sqrt{50176}}{2}$$

$$\Rightarrow \frac{64 \pm \sqrt{50176}}{2}$$

$$\frac{64 \pm 224}{2}$$

64
64
256
384
4096

-11520
4
46080

$a = \frac{64 + 224}{2}$ or $b = \frac{64 - 224}{2}$

$= \frac{288}{2}$ $\quad b = \frac{-160}{2}$

$= 144$ $\quad b = -80$

$x = 144$

$= (144)^2$ $\quad y = x^2$

$x^2 = \pm\sqrt{144}$

$= 12$

$= \pm 12$

$\frac{n^2}{8} + \frac{144}{8}$

$= 18$

Hence the numbers are ± 12 or 18

8

Constant speed $= 360$ km

let the speed $= x$

time $= \frac{360}{x}$

If the the speed was increases

Speed $x + 5$

Time $= \frac{360}{x+5}$

$$\frac{360}{x} - \frac{360}{x+5} = 1$$

$$\Rightarrow \frac{360x + 1800 - 360x}{x^2+5x} = 1$$

$$\Rightarrow 360x + 1800 - 360x = x^2 + 5x$$

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

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

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

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

$$x = 40 \quad \text{or} \quad x = -45$$

Speed of train = 45 km/h

9. Let the smaller tap take n hours to fill
Let the bigger tap fill = $n-10$

If work together: $\frac{1}{n} + \frac{1}{n-10}$

A.T.Q

$$\frac{1}{n} + \frac{1}{n-10} = 9\frac{3}{8}$$

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

The amount of water flowing: $\frac{1}{\frac{75}{8}}$

$$75(2n-10) = 8n(n-10)$$
$$\Rightarrow 150n - 750 = 8n^2 - 80n$$
$$\Rightarrow 8n^2 - 230n + 750 = 0$$

Here, $a = 8$, $b = -230$, $c = 750$

$$D = b^2 - 4ac$$
$$= (-230)^2 - 4 \times 8 \times 750$$
$$= 52900 - 24000$$
$$= 28900$$

$$\frac{-b \pm \sqrt{D}}{2a}$$

$$= \frac{-230 \pm \sqrt{28900}}{2(8)}$$

$$= \frac{-230 \pm \sqrt{28900}}{16}$$

$$= \frac{230 \pm 170}{16}$$

$$a = \frac{230 + 170}{16} \qquad b = \frac{230 - 170}{16}$$

$$= \frac{400}{16} \qquad b = \frac{60}{4}$$

$$= 25 \qquad b = \frac{15}{4}$$

smaller tap takes 25 hours and larger takes 15 hours.

Q) Let the speed of passenger train = x

Speed of express train = $(x+11)$

ATQ

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

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

$132n + 1452 - 132n = n^2 + 11n$

$n^2 + 11n - 1452 = 0$

$n^2 + 44n - 33n - 1452 = 0$

$n(n+44) - 33(n+44) = 0$

$n^2 + 44n =$

$(n+44)(n-33) = 0$

$n = -44 \quad n = 33$

Speed of passenger train = 33

Express train = 44

11) Sum of Areas of two squares = 468 sq cm

Let side of smaller square be n and perimeter of larger = y

perimeter of smaller squares will be $4n$ and that of larger square will be $4y$.

A.T.Q

$4y - 4n = 24$

$y - n = 6$

$y = n + 6$

$n^2 + y^2 = 468$

$n^2 + (n+6)^2 = 468$

$n^2 + n^2 + 12n + 36 = 468$

$2n^2 + 12n - 432 = 0$

$n^2 + 6n - 216 = 0$

$D = b^2 - 4ac$

$= (6)^2 - 4 \times 1 \times (-216) = 36 + 864$

$= 900$

$x = \frac{-b \pm \sqrt{D}}{2a}$

$= \frac{-6 \pm \sqrt{900}}{2 \times 1}$

$= \frac{-6 \pm 30}{2}$

$\frac{-6 + 30}{2}$ or $\frac{-6 - 30}{2}$

$x = 12$ or -18

Length cannot be negative

$\therefore x = 12$ and $y = 12 + 6 = 18$

Height of the sides of two Square are 12m and 18m.