

Chapter 4

Exercise 4.10

$\rightarrow y = x - 2$
Putting value of y in ①

$$x(x-2) = 8$$

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

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

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

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

$$x-4 = 0 \quad , \quad x+2 = 0$$

$$x = 4 \quad , \quad x = -2$$

If $x = 4$ then

$$y = 4 - 2 = 2$$

So number = $x + 10y$

$$= 4 + 10(2)$$

$$= 4 + 20 = 24$$

Required number is 24 or -42

If $x = -2$ then

$$y = -2 - 2 = -4$$

So number = $x + 10y$

$$= -2 + 10(-4)$$

$$= -2 - 40 = -42$$

Q.2 Let x be the positive number its square will be x^2 . Now according to given condition:

$$x \cdot x^2 = 380$$

$$\rightarrow x^3 + 380 = 0$$

$$x^3 + 20x - 19x - 380 = 0$$

$$x(x+20) - 19(x+20) = 0$$

$$(x-19)(x+20) = 0$$

$$x-19 = 0 \quad , \quad x+20 = 0$$

$$x = 19 \quad , \quad x = -20$$

(impossible being negative)

Hence $x = 19$ is required positive number.

Q.3 Let x be one part then other part will be $40 - x$

Sum of squares of parts = $x^2 + (40-x)^2$

Product of the parts = $x(40-x)$

According to given condition

$$[x^2 + (40-x)^2] - 2[x(40-x)] = 100$$

$$x^2 + (1600 - 80x + x^2) - 2x(40-x) = 100$$

$$x^2 + 1600 - 80x + x^2 - 80x + 2x^2 - 100 = 0$$

$$4x^2 - 160x + 1500 = 0$$

Dividing by 4.

$$x^2 - 40x + 375 = 0$$

$$x^2 - 25x - 15x + 375 = 0$$

$$x(x-25) - 15(x-25) = 0$$

$$(x-15)(x-25) = 0$$

$$x-15 = 0 \quad , \quad x-25 = 0$$

$$x = 15 \quad , \quad x = 25$$

If one part is 15 then other part =
 $40 - 15 = 25$

If one part is 25 then other part =
 $40 - 25 = 15$

Q.4 Let x be positive number

According to given condition

$$x + \frac{1}{x} = \frac{26}{5}$$

Multiply by $5x$ we get

$$5x^2 + 5 = 26x$$

$$5x^2 - 26x + 5 = 0$$

$$5x^2 - 25x - x + 5 = 0$$

$$5x(x-5) - 1(x-5) = 0$$

$$(x-5)(5x-1) = 0$$

$$x-5 = 0 \quad , \quad 5x-1 = 0$$

$$x = 5 \quad , \quad x = \frac{1}{5}$$

Hence $x=5$ and $x=\frac{1}{5}$ are required numbers.

Q.5 Let x be the number then its square root $= \sqrt{x}$

Now according to given condition.

$$x = \sqrt{x} + 56$$

$$x - 56 = \sqrt{x}$$

Squaring both sides

$$(x-56)^2 = (\sqrt{x})^2$$

$$x^2 - 112x + 3136 = x$$

$$x^2 - 112x - x + 3136 = 0$$

$$x^2 - 113x + 3136 = 0$$

$$x^2 - 64x - 49x + 3136 = 0$$

$$x(x-64) - 49(x-64) = 0$$

$$(x-64)(x-49) = 0$$

$$x-64 = 0 \quad , \quad x-49 = 0$$

$$x = 64 \quad , \quad x = 49$$

$x=49$ does not satisfy given condition

Hence required number is $x=64$

Q.6 Let x and $x+1$ be two consecutive numbers then according to given condition.

$$x(x+1) = 132$$

$$x^2 + x - 132 = 0$$

$$x^2 + 12x - 11x - 132 = 0$$

$$x(x+12) - 11(x+12) = 0$$

$$(x-11)(x+12) = 0$$

$$x-11 = 0 \quad , \quad x+12 = 0$$

$$x = 11 \quad , \quad x = -12$$

If $x=11$ then $x+1 = 11+1 = 12$

If $x=-12$ then $x+1 = -12+1 = -11$

Hence two consecutive numbers are

11,12 or -12, -11

Q.7 Let x and $x+2$ be two consecutive even numbers then according to given condition;

$$(x+2)^3 - x^3 = 296$$

$$x^3 + 8 + 3(x^2)(2) + 3(x)(2)^2 - x^3 - 296 = 0$$

$$6x^2 + 12x - 288 = 0$$

Dividing by 6 we get

$$x^2 + 2x - 48 = 0$$

$$x^2 + 8x - 6x - 48 = 0$$

$$x(x+8) - 6(x+8) = 0$$

$$(x-6)(x+8) = 0$$

$$x-6 = 0 \quad , \quad x+8 = 0$$

$$x = 6 \quad , \quad x = -8$$

If $x=6$ then $x+2 = 6+2 = 8$

If $x=-8$ then $x+2 = -8+2 = -6$

Hence two consecutive numbers are

6,8 or -8,-6

Q.8 Let x be number of sheep.

Amount for x sheep = 9000

Amount for 1 sheep = $\frac{9000}{x}$

Amount for $x+3$ sheep = $\frac{9000}{x+3}$

According to given condition.

$$\frac{9000}{x} - 100 = \frac{9000}{x+3}$$

Multiply by $x(x+3)$ we get

$$x(x+3) \cdot \frac{9000}{x} - x(x+3)100 = x(x+3) \cdot \frac{9000}{x+3}$$

$$9000(x+3) - 100x(x+3) = 9000x$$

Dividing by 100

$$90(x+3) - x(x+3) = 90x$$

$$90x + 270 - x^2 - 3x = 90x$$

$$0 = x^2 + 3x + 90x - 90x - 270$$

$$x^2 + 3x - 270 = 0$$

$$x^2 + 18x - 15x - 270 = 0$$

$$x(x+18) - 15(x+18) = 0$$

$$(x-15)(x+18) = 0$$

$$x-15=0 \Rightarrow x+18=0$$

$$x=15, \quad x=-18 \text{ (impossible)}$$

Hence $x=15$ is number of sheep.

Q.9 Let total dozen eggs to be sold = x

Amount for x dozen eggs = $\frac{240}{x}$

Amount for 1 dozen egg = $\frac{240}{x^2}$

Amount for $x+2$ dozen eggs = $\frac{240}{x+2}$

According to given condition.

$$\frac{240}{x} - 0.50 = \frac{240}{x+2}$$

Multiplying by $x(x+2)$ we get

$$x(x+2) \cdot \frac{240}{x} - 0.50x(x+2) = \frac{240}{x+2}x(x+2)$$

$$240(x+2) - 0.50x(x+2) = 240x$$

$$240x + 480 - 0.50x^2 - x = 240x$$

$$-0.50x^2 - x + 480 = 0$$

$$0.50x^2 + x - 480 = 0$$

Multiplying by 2

$$x^2 + 2x - 960 = 0$$

$$x^2 + 32 - 30x - 960 = 0$$

$$x(x+32) - 30(x+32) = 0$$

$$(x-30)(x+32) = 0$$

$$x-30=0 \Rightarrow x+32=0$$

$$x=30, \quad x=-32 \quad (\text{impossible})$$

Hence $x=30$ dozen eggs were sold by the stockist.

Q.10 Let speed to cover 48 km = x

Time to cover 48 km = t

As Distance = speed \times time

$$so \quad 48 = xt \quad or \quad xt = 48 \rightarrow ①$$

Now speed to cover 48 km by travelling 2 km/hr slower = $x-2$

Time taken with this speed = $t+2$

Distance = speed \times time

$$48 = (x-2)(t+2)$$

$$\rightarrow 48 = xt + 2x - 2t - 4$$

$$48 = 48 + 2x - 2t - 4$$

$$2x - 2t - 4 = 0$$

$$x - t - 2 = 0$$

$$x = t + 2$$

Pulling value of x in ① we get

$$(t+2)t = 48$$

$$t^2 + 2t - 48 = 0$$

$$t^2 - 6t + 8t - 48 = 0$$

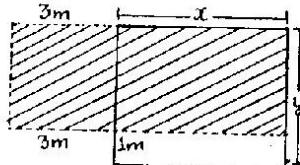
$$t(t-6) + 8(t-6) = 0$$

$$(t-6)(t+8) = 0$$

$$t-6=0, t+8=0 \Rightarrow t=6, t=-8 \quad (\text{impossible})$$

So $t=6$ hours is required time.

Q.11



Let length of original rectangle = x

width of original rectangle = y

\therefore Area = length \times width

$$so \quad 297 = xy \rightarrow ①$$

After changing length and width
Now, Length of new rectangle = $x+3$

width of new rectangle = $y-1$

\therefore Area of new rectangle = $(x+3)(y-1)$

But given that area = $297+3 = 300$

$$\text{So } 300 = (x+3)(y-1)$$

$$300 = xy - x + 3y - 3$$

$$300 = 297 - x + 3y - 3$$

$$300 - 294 + x - 3y = 0$$

$$x - 3y + 6 = 0$$

$$\Rightarrow x = 3y - 6 \longrightarrow ②$$

Putting value of x in ①

$$297 = (3y - 6)y$$

$$3y^2 - 6y = 297 \rightarrow y^2 - 2y - 99 = 0$$

$$y^2 - 9y + 11y - 99 = 0$$

$$y(y+9) - 11(y+9) = 0$$

$$(y-11)(y+9) = 0$$

$$y-11=0, y+9=0 \rightarrow y=11, y=-9$$

$y=-9$ (impossible) If $y=11$ then from

$$x = 3(11) - 6 = 33 - 6 = 27 \quad ②$$

So length of original rectangle = $x=27$ m

width of original rectangle = $y=11$ m

Q.12



Let breadth (width) of original rectangle = x

length of original rectangle = $x+5$

After cutting a strip of 0.5 cm from all around.

Change in breadth = $x-2(0.5)=x-1$

Change in length = $x+5-2(0.5)=x+5-1=x+4$

Now breadth of new rectangle = $x-1$

Length of new rectangle = $x+4$

\therefore Area = Length \times breadth

$$\text{so Area} = (x+4)(x-1)$$

But Area = 500 cm² (given)

$$500 = (x+4)(x-1)$$

$$x^2 - x + 4x - 4 = 500$$

$$x^2 + 3x - 504 = 0$$

$$x^2 + 24x - 21x - 504 = 0$$

$$x(x+24) - 21(x+24) = 0$$

$$(x-21)(x+24) = 0$$

$$x-21=0, x+24=0$$

$$x=21, x=-24 \text{ (impossible)}$$

If $x=21$ then $x+5=21+5=26$

So length of original rectangle = 26 cm

breadth of original rectangle = 21 cm.

Q.13 Let

unit digit = x

tens digit = y

then number = $10y+x$

According to given condition.

$$xy = 18 \longrightarrow ①$$

$$x+10y-27 = y+10x$$

$$x+10y-27-y-10x = 0$$

$$9y - 9x - 27 = 0$$

$$y - x - 3 = 0$$

$$y = x+3 \longrightarrow ②$$

Putting value of y in ①

$$x(x+3) = 18$$

$$x^2 + 3x - 18 = 0$$

$$x^2 - 3x + 6x - 18 = 0$$

$$x(x-3) + 6(x-3) = 0$$

$$(x-3)(x+6) = 0$$

$$x-3=0, x+6=0$$

$$x=3, x=-6$$

If $x=3$ then from ② $y=3+3=6$

$$\begin{aligned}\text{then number} &= x+10y \\ &= 3+10(6) \\ &= 63\end{aligned}$$

If $x=-6$ then from ② $y=-6+3=-3$

$$\begin{aligned}\text{then number} &= x+10y \\ &= -6+10(-3) \\ &= -36\end{aligned}$$

Hence required number is
63 or -36

Q.14

Let unit digit = x

tens digits = y

Then number = $10x+y$
According to given condition.

$$xy = 14 \rightarrow ①$$

$$x+10y+45 = y+10x$$

$$x+10y+45-y-10x = 0$$

$$9y - 9x + 45 = 0$$

$$y - x + 5 = 0$$

$$y = x-5$$

Putting value of y in eq. ①

$$x(x-5) = 14$$

$$x^2 - 5x - 14 = 0$$

$$x^2 + 2x - 7x - 14 = 0$$

$$x(x+2) - 7(x+2) = 0$$

$$(x-7)(x+2) = 0$$

$$x-7=0, x+2=0 \Rightarrow x=7, x=-2$$

If $x=7$ then from ② $y=7-5=2$

Then number = $x+10y$

$$= 7+10(2)$$

$$= 27$$

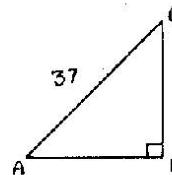
If $x=-2$ then from ② $y=-2-5=-7$

Then number = $x+10y$

$$= -2+10(-7) = -72$$

Hence number is 27 or -72

Q.15



Given that in right angled triangle

Area = 210 m^2 , Hypotenuse = 37

Let Base = x , Perpendicular = y

We know that

$$\text{Area of Triangle} = \frac{1}{2}(\text{Base})(\text{Altitude})$$

$$210 = \frac{1}{2}(x)(y)$$

$$2xy = 420 \rightarrow 2xy = 840 \rightarrow ①$$

By Pythagora's theorem

$$(\text{Hyp})^2 = (\text{Base})^2 + (\text{Perp})^2$$

$$\text{Hyp} = \sqrt{(\text{Base})^2 + (\text{Perp})^2}$$

Putting values we get-

$$37 = \sqrt{x^2 + y^2}$$

$$\text{or } x^2 + y^2 = (37)^2$$

$$x^2 + y^2 = 1369 \rightarrow ②$$

Subtracting eq. ① from eq. ②

$$x^2 + y^2 - 2xy = 1369 - 840$$

$$x^2 + y^2 - 2xy = 529$$

$$(x-y)^2 = (23)^2$$

$$\rightarrow x-y = 23$$

$$x = y + 23 \rightarrow ③$$

Putting value of x in ①

$$2(y+23)y = 840$$

$$y^2 + 23y = 420$$

$$y^2 + 23y - 420 = 0$$

$$y^2 + 35y + 35y - 420 = 0$$

$$y(y+35) + 35(y+35) = 0$$

$$(y+35)(y+12) = 0$$

$$y+35=0, y+12=0$$

$y = -35$ (impossible), $y = 12$
 If $y = 12$ then from ③
 $x = 12 + 23 = 35$
 So, Base = 35 m, Perpendicular = 12 m

Q.16

Let
 length of rectangle = x
 width of rectangle = y
 diagonal of rectangle = z
 $\therefore \text{Area} = \text{length} \times \text{width}$
 So $1680 = xy \rightarrow ①$

Given that $z = 58$

By Pythagora's theorem

$$(\text{Hyp})^2 = (\text{Base})^2 + (\text{Perp})^2$$

By the figure

$$\begin{aligned} z^2 &= x^2 + y^2 \\ \rightarrow (58)^2 &= x^2 + y^2 \\ x^2 + y^2 &= 3364 \rightarrow ② \end{aligned}$$

$$\text{From } ① \quad xy = 1680$$

$$\rightarrow 2xy = 3360 \rightarrow ③$$

Subtracting eq. ③ from eq. ②

$$x^2 + y^2 - 2xy = 3364 - 3360$$

$$x^2 + y^2 - 2xy = 4$$

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

$$\rightarrow x-y = 2$$

$$\rightarrow x = y+2 \rightarrow ④$$

Putting value of x in ①

$$(y+2)y = 1680$$

$$y^2 + 2y - 1680 = 0$$

$$y^2 + 42y - 40y - 1680 = 0$$

$$y(y+42) - 40(y+42) = 0$$

$$(y-40)(y+42) = 0$$

$$y-40 = 0 \Rightarrow y+42 = 0$$

$$y = 40, y = -42 \text{ (impossible)}$$

If $y = 40$ then from ④ $x = 40 + 2 = 42$
 Hence length of rectangle = $x = 42$ m
 Breadth (width) of rectangle = $y = 40$ m

Q.17

Let B can do work in days = x
 Work done by B in one day = $\frac{1}{x}$
 A can do work in days = $x+10$
 Work done by A in one day = $\frac{1}{x+10}$
 Work done by both A and B in one day = $\frac{1}{x} + \frac{1}{x+10}$

Given that

A and B both can do work in one day = 12

Work done by both A and B in one day = $\frac{1}{12}$

$$\text{So } \frac{1}{x} + \frac{1}{x+10} = \frac{1}{12}$$

Multiplying by $12x(x+10)$ we get

$$12x(x+10)\frac{1}{x} + 12x(x+10)\frac{1}{(x+10)} = 12x(x+10)\frac{1}{12}$$

$$12(x+10) + 12x = x(x+10)$$

$$12x + 120 + 12x = x^2 + 10x$$

$$24x + 120 = x^2 + 10x$$

$$x^2 + 10x - 24x - 120 = 0$$

$$x^2 - 14x - 120 = 0$$

$$x^2 - 20x + 6x - 120 = 0$$

$$x(x-20) + 6(x-20) = 0$$

$$(x-20)(x+6) = 0$$

$$x-20 = 0, x+6 = 0$$

$$x = 20, x = -6 \text{ (impossible)}$$

Hence B can finish his work alone in 20 days.

Q.18 Let

B can do the job in days = x

Work done by B in one day = $\frac{1}{x}$

A can do the job in days = $2x$

Work done by A in one day = $\frac{1}{2x}$

Work done by both A and B in one day =
 $= \frac{1}{x} + \frac{1}{2x}$

Given that

A and B both can do the job in days = 4
 work done by both A and B in one day = $\frac{1}{4}$

$$\text{So } \frac{1}{x} + \frac{1}{2x} = \frac{1}{4}$$

Multiplying by $4x$ we get

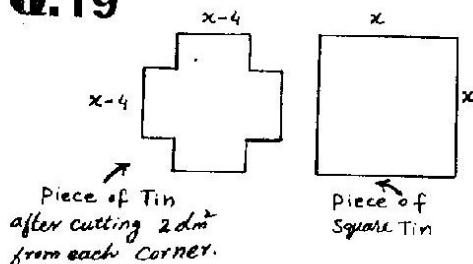
$$4x \cdot \frac{1}{x} + 4x \cdot \frac{1}{2x} = 4x \cdot \frac{1}{4}$$

$$4 + 2 = x \rightarrow x = 6$$

If $x = 6$ then $2x = 2(6) = 12$

So B can do job in 6 days.
 while A can do job in 12 days.

Q.19



Let length of piece of square tin = x dm
 width of piece of square tin = x dm

After cutting 2dm^2 from each corner

Length of base = $x - 4$ dm

width of base = $x - 4$ dm

Height of base = 2 dm

We know that

Volume of base = length \times width \times height

$$\text{So } 128 = (x-4)(x-4) \cdot 2$$

$$(x-4)^2 = 64$$

$$(x-4)^2 = (8)^2$$

$$x-4 = 8 \rightarrow x = 8+4 = 12$$

So $x = 12$ dm is length of square tin piece.

Q.20 Let A and B be the two companies. Now let

Investment in company A = x Rs

Investment in company B = $100000 - x$ Rs.

Profit rate in company A = $y\%$

Profit rate in company B = $(y+1)\%$

As we know that

$$\text{Profit} = \frac{\text{Amount} \times \text{Rate} \times \text{Period}}{100}$$

$$\text{So } 1980 = \frac{x \times y \times 1}{100} \rightarrow xy = 198000 \quad \text{①}$$

$$\text{Also } 3080 = \frac{(100000-x)(y+1) \times 1}{100}$$

$$(100000-x)(y+1) = 308000$$

$$100000y + 100000 - xy - x = 308000$$

$$100000y - 198000 - xy = 308000 - 100000$$

$$100000y - 198000 - xy = 208000$$

$$100000y - xy = 208000 + 198000$$

$$100000y - xy = 406000 \rightarrow \text{②}$$

$$\text{From ① } x = \frac{198000}{y} \rightarrow \text{③}$$

Putting value of x in ②

$$100000y - \frac{198000}{y} = 406000$$

$$100000y^2 - 198000 = 406000y$$

$50y^2 - 99 = 203y$: Dividing by 2000

$$50y^2 - 203y - 99 = 0, \text{ using } y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = \frac{203 \pm \sqrt{(203)^2 - 4(50)(-99)}}{2(50)} \rightarrow y = \frac{203 \pm \sqrt{61009}}{100}$$

$$y = \frac{203 \pm 247}{100} \rightarrow y = \frac{450}{100}, y = \frac{-44}{100}$$

$$y = 4.5, y = -0.44 (\text{impossible})$$

Putting value of y in ③

$$x = \frac{198000}{4.5} \rightarrow x = 44,000$$

Investment in company A = 44,000 Rs.

$$\text{Investment in company B} = 100000 - 44000 \\ = 56,000 \text{ Rs.}$$