



VIDYA BHAWAN, BALIKA VIDYAPITH

Shakti Utthan Ashram, Lakhisarai-811311(Bihar)

(Affiliated to CBSE up to +2 Level)

CLASS: X

SUB.: MATHS (NCERT BASED)

DATE: 14-07-2020

Chapter 4:- Quadratic Equations

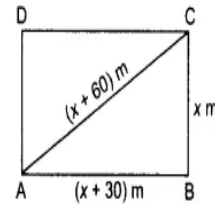
Ex 4.3

Question 6. The diagonal of a rectangular field is 60 metres more than the shorter side. If the longer side is 30 metres more than the shorter side, find the sides of the field.

Let the shorter side of rectangle = x m

Then, longer side = $(x + 30)$ m and diagonal = $(x + 60)$ m

In $\triangle ABC$, $(x + 60)^2 = (x + 30)^2 + (x)^2$ [Pythagoras Theorem]



$$\begin{aligned} \Rightarrow x^2 + 120x + 3600 &= x^2 + 60x + 900 + x^2 \\ \Rightarrow x^2 - 60x - 2700 &= 0 \\ \Rightarrow x^2 - 90x + 30x - 2700 &= 0 \\ \Rightarrow x(x - 90) + 30(x - 90) &= 0 \Rightarrow (x + 30)(x - 90) = 0 \\ \Rightarrow x + 30 = 0 \text{ or } x - 90 &= 0 \\ \Rightarrow x = -30 \text{ (rejected) or } x &= 90 \end{aligned}$$

Hence, shorter side = 90 m
longer side = $90 + 30 = 120$ m

Question 7. The difference of squares of two numbers is 180. The square of the smaller number is 8 times the larger number. Find the two numbers.

Let the smaller number = x

Then, larger number will be $\frac{x^2}{8}$

According to question, we have:

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

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

$$\Rightarrow x^4 - 64x^2 - 11520 = 0$$

$$\Rightarrow y^2 - 64y - 11520 = 0 \quad [\text{Putting } x^2 = y]$$

Here, $a = 1$, $b = -64$ and $c = -11520$

$$\therefore D = b^2 - 4ac$$

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

$$= 4096 + 46080 = 50176$$

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

$$= \frac{-(-64) \pm \sqrt{50176}}{2 \times 1} = \frac{64 \pm 224}{2}$$

$$\Rightarrow y = -80 \text{ or } 144$$

$y = -80$ is rejected because the number cannot be negative.

$$\therefore y = 144$$

$$\Rightarrow x^2 = 144 = (12)^2$$

$$\Rightarrow x = \pm 12$$

i.e., smaller number = ± 12

When smaller number is $+12$, then

the greater number is $\frac{1}{8} \times 144 = 18$.

When smaller number is -12 , then

the greater number is $\frac{1}{8} \times 144 = 18$.

Hence, the numbers are either **12** and **18** or **-12** and **18**.

Ans.

Question 8. A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.

Total distance travelled = 360 km

Let uniform speed be x km/h

Then, increased speed = $(x + 5)$ km/h

According to question,

$$\frac{360}{x} - \frac{360}{x+5} = 1 \quad \left\{ \text{Time} = \frac{\text{Distance}}{\text{Speed}} \right\}$$

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

$$\Rightarrow 360x + 1800 - 360x = x(x+5)$$

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

$$\Rightarrow x^2 + 5x - 1800 = 0 \quad \Rightarrow x^2 + 45x - 40x - 1800 = 0$$

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

$$\Rightarrow x-40 = 0 \quad \text{or} \quad x+45 = 0$$

$$\Rightarrow x = 40 \quad \text{or} \quad x = -45 \quad (\text{rejected})$$

\therefore Speed of the train = 40 km/h

Ans.

Question 9. Two water taps together can fill a tank in $9\frac{3}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank.

Let the smaller tap takes x h to fill the tank.

Then, larger tap will take $(x - 10)$ h to fill the same tank.

If the two work together, the amount of water flowing in one hour = $\frac{1}{x} + \frac{1}{x-10}$

According to the question, we have:

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

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

[\therefore The amount of water flowing in 1 h = $\frac{1}{75}$]

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

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

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

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

$$\therefore D = b^2 - 4ac$$

$$= (-230)^2 - 4 \times 8 \times 750$$

$$= 52900 - 24000 = 28900$$

$$\therefore x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-(-230) \pm \sqrt{28900}}{2 \times 8}$$

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

$$\text{Either } x = \frac{230+170}{16} \text{ or } \frac{230-170}{16}$$

$$\Rightarrow x = 25 \text{ or } x = \frac{15}{4}$$

Neglecting $x = \frac{15}{4}$, we have $x = 25$.

Hence, the smaller tap takes **25 h** and the larger tap takes **15 h** to fill the tank.

Ans.