

ONLINE MATHS CLASS - X – 37 (15 / 09 / 2021)

4 . SECOND DEGREE EQUATIONS - CLASS - 4

Activity 1

How many consecutive terms of the arithmetic sequence 21 , 19 , 17 , . . . should be added to get 112 ?

Answer

Common difference = $19 - 21 = -2$

$$\text{Sum of the first } n \text{ terms} = pn^2 + qn$$

$$= -1 \times n^2 + 22n$$

$$= -n^2 + 22n$$

$$= 22n - n^2$$

$$p = \frac{d}{2} = \frac{-2}{2} = -1$$

$$p + q = f$$

$$-1 + q = 21$$

$$q = 21 + 1 = 22$$

Sum of the first n terms = 112

$$\Rightarrow 22n - n^2 = 112$$

$$n^2 - 22n = -112$$

$$n^2 - 22n + 11^2 = -112 + 11^2$$

$$(n - 11)^2 = -112 + 121 = 9$$

$$n - 11 = \sqrt{9}$$

$$n - 11 = 3$$

Or

$$n - 11 = -3$$

$$n = 3 + 11 = 14$$

Or

$$n = -3 + 11 = 8$$

Number of terms = 8 Or 14

Activity 2

One side of a rectangle is 2 metres longer than the other side and its area is 224 square metres . What are the lengths of the sides ?

Answer

Take , the length of the smaller side = x metre.

Length of the larger side = $x + 2$ metres .

$$\text{Area} = 224 \text{ sq.m} \quad \Rightarrow \quad x (x + 2) = 224$$

$$x^2 + 2 x = 224$$

$$x^2 + 2 x + 1^2 = 224 + 1^2$$

$$(x + 1)^2 = 224 + 1 = 225$$

$$x + 1 = \sqrt{225}$$

$$x + 1 = 15 \quad \text{or} \quad x + 1 = -15$$

$$x = 15 - 1 = 14 \quad \text{or} \quad x = -15 - 1 = -16$$

Length of the smaller side = $x = 14$ m.

Length of the longer side = $x + 2 = 14 + 2 = 16$ m.

Activity 3

The product of a number and 2 more than that is 168 . What are the numbers ?

Answer

Take , first number = x

Second number = $x + 2$

$$\text{Product} = 168 \quad \Rightarrow \quad x (x + 2) = 168$$

$$x^2 + 2 x = 168$$

$$x^2 + 2 x + 1^2 = 168 + 1^2$$

$$(x + 1)^2 = 168 + 1 = 169$$

$$x + 1 = \sqrt{169}$$

$$x + 1 = 13 \quad \text{or} \quad x + 1 = -13$$

$$x = 13 - 1 = 12 \quad \text{or} \quad x = -13 - 1 = -14$$

$$\text{Numbers} = 12, 12 + 2 = 12, 14 \quad \text{or} \quad -14, -14 + 2 = -14, -12$$

Activity 4

How many consecutive terms of the arithmetic sequence 99, 97, 95, . . . must be added to get 900 ?

Answer

$$\text{Common difference} = 97 - 99 = -2$$

$$\text{Sum of the first } n \text{ terms} = pn^2 + qn$$

$$= -1 \times n^2 + 100n$$

$$= -n^2 + 100n$$

$$= 100n - n^2$$

$$p = \frac{d}{2} = \frac{-2}{2} = -1$$

$$p + q = f$$

$$-1 + q = 99$$

$$q = 99 + 1 = 100$$

$$\text{Sum of the first } n \text{ terms} = 900$$

$$\Rightarrow 100n - n^2 = 900$$

$$n^2 - 100n = -900$$

$$n^2 - 100n + 50^2 = -900 + 50^2$$

$$(n - 50)^2 = -900 + 2500 = 1600$$

$$n - 50 = \sqrt{1600}$$

$$n - 50 = 40 \quad \text{Or} \quad n - 50 = -40$$

$$n = 40 + 50 = 90 \quad \text{Or} \quad n = -40 + 50 = 10$$

$$\text{Number of terms} = 10 \quad \text{Or} \quad 90$$