ONLINE MATHS CLASS - X – 36 (14 / 09 / 2021)

4 . SECOND DEGREE EQUATIONS - CLASS -3

Activity 1

1 is added to the product of two consecutive even numbers gives 289 . What are the numbers ?

Answer

First even number $= x$

Second even number $= x + 2$

Product $+ 1 = 289$

$\Longrightarrow x (x + 2) + 1 = 289$

$x^2 + 2x + 1 = 289$

$x^2 + 2x + 1^2 = 289$

$(x + 1)^2 = 289$

$x + 1 = \sqrt{289} = 17$

$x = 17 - 1 = 16$

Even numbers $= 16 , 18$

Activity 2

A rectangle is to be made with perimeter 100 metres and area 525 square metres . What should be the length of the sides ?

Answer

Perimeter $= 100\ m$ ==> **2 length** $+$ **2breadth** $= 100\ m$

$$\text{length} + \text{breadth} = \frac{100}{2} = 50\ m$$

Take , length = x m , then breadth = $50 - x$ m

Area = 525 $sq.m$ ⟹ $x(50 - x) = 525$

$$50x - x^2 = 525 \implies x^2 - 50x = -525$$

$$x^2 - 50x + 25^2 = -525 + 25^2$$

$$(x - 25)^2 = -525 + 625 = 100$$

$$x - 25 = \sqrt{100} = 10$$

$$x = 10 + 25 = 35$$

Length = x = 35 m

Breadth = $50 - x$ = 50 – 35 = 15 m

NOTE : (Another method)

Perimeter = 100 m ==> 2 length + 2 breadth = 100 m

$$\text{length} + \text{breadth} = \frac{100}{2} = 50\ m$$

If we take , length = $25 + x$ m , then breadth = $25 - x$ m

Area = 525 $sq.\ m.$ ⟹ $(25 + x)(25 - x) = 525$

$$25^2 - x^2 = 525$$

$$625 - x^2 = 525$$

$$625 - 525 = x^2$$

$$x^2 = 100$$

$$x = \sqrt{100} = 10$$

Length = $25 + x$ = 25 + 10 = 35 m

Breadth = $25 - x$ = 25 – 10 = 15 m

Activity 3

16 were added to the sum of the first few terms of the arithmetic sequence 9 , 11 , 13 , . . . gave 256 . How many terms were added ?

Answer

Common difference = 11 – 9 = 2

Sum of the first n terms $= pn^2 + qn$

$= 1n^2 + 8n$

$= n^2 + 8n$

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

$p + q = f$

$1 + q = 9 \implies q = 9 - 1 = 8$

Sum of the first n terms + 16 = 256

$\implies n^2 + 8n + 16 = 256$

$n^2 + 8n + 4^2 = 256$

$(n + 4)^2 = 256$

$n + 4 = \sqrt{256} = 16$

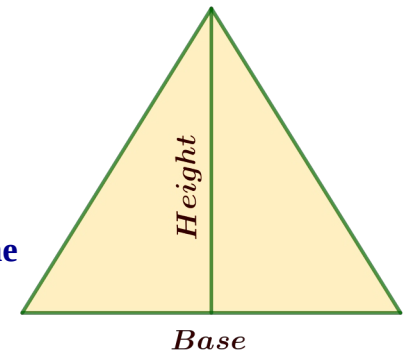
$n = 16 - 4 = 12$

Number of terms = 12

Activity 4

An isosceles triangle has to be made like this .

The height should be 2 metres less than the base and the area of the triangle should be 12 square metres . What should be the length of its sides ?



Answer

Take , base = x m , then , height = $x - 2$ m

Area = 12 *sq. m* $\Longrightarrow$ $\frac{1}{2} \times x(x-2) = 12$

$$\frac{1}{2} \times (x^2 - 2x) = 12$$

$$x^2 - 2x = 12 \times 2 = 24$$

$$x^2 - 2x + 1^2 = 24 + 1^2$$

$$(x-1)^2 = 24 + 1 = 25$$

$$x - 1 = \sqrt{25} = 5$$

$$x = 5 + 1 = 6$$

Base = x = 6 m

Height = $x - 2$ = 6 – 2 = 4 m

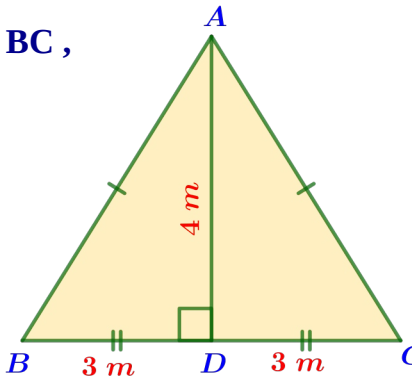
(In right triangle ABC , AB = AC , AD is perpendicular to BC ,

BD = CD = 3 m)

$AB^2 = 3^2 + 4^2 = 9 + 16 = 25$

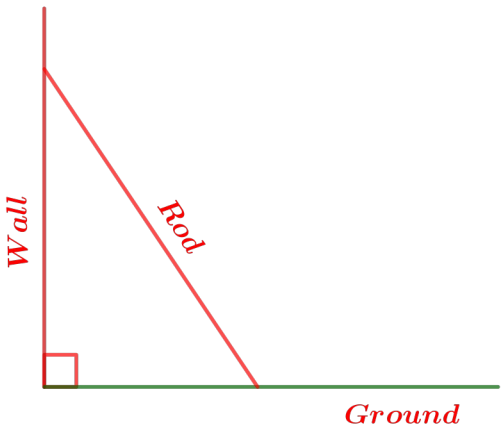
$AB = \sqrt{25} = 5$ m

Length of the sides of the triangle = 5 m , 5 m , 6 m

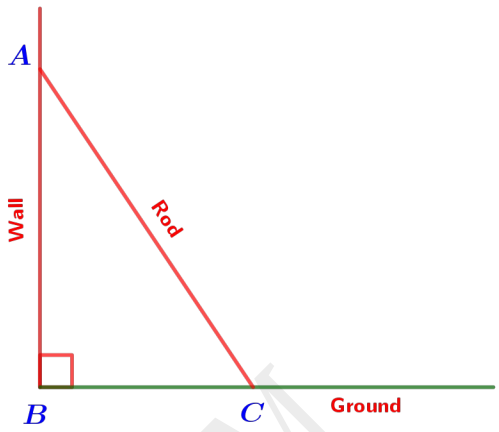


Activity 5

A 2.6 metres long rod leans against a wall , its foot 1 metre from the wall . When the foot is moved a little from the wall , its upper end slides the same length down . How much farther is the foot moved ?



Answer



In right triangle ABC ,

$BC^2 + AB^2 = AC^2 \implies 1^2 + AB^2 = 2.6^2$

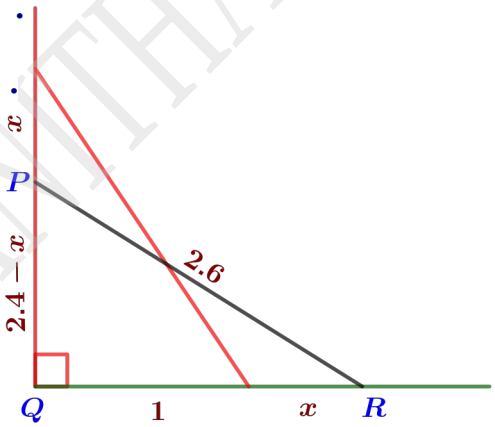
$AB^2 = 2.6^2 - 1^2 = 6.76 - 1 = 5.76$

$AB = \sqrt{5.76} = \sqrt{\frac{576}{100}} = \frac{24}{10} = 2.4\ m$

Height of the wall = AB = 2.4 m .

Take , the distance moved by the foot of the rod = x m .

The distance slided by the upper end of the rod= x m .



In right triangle PQR ,

$QR^2 + PQ^2 = PR^2$

$(1+x)^2 + (2.4-x)^2 = 2.6^2$

$1 + 2x + x^2 + 5.76 - 4.8x + x^2 = 6.76$

$2x^2 - 2.8x + 6.76 = 6.76$

$2x^2 - 2.8x = 0$

$2x^2 = 2.8x$

$2x = 2.8$

$x = \frac{2.8}{2} = 1.4$

The distance moved by the foot of the rod = x = 1.4 m

Activity 6

9 added to the product of two consecutive multiples of 6 gives 729 .What are the numbers?

Answer

Take , two consecutive multiples of 6 = x , $x + 6$

Product + 9 = 729 $\Longrightarrow$ $x\,(x + 6) + 9 = 729$

$$x^2 + 6x + 9 = 729$$

$$x^2 + 6x + 3^2 = 729$$

$$(x + 3)^2 = 729$$

$$x + 3 = \sqrt{729} = 27$$

$$x = 27 - 3 = 24$$

Two consecutive multiples of 6 = 24 , 30