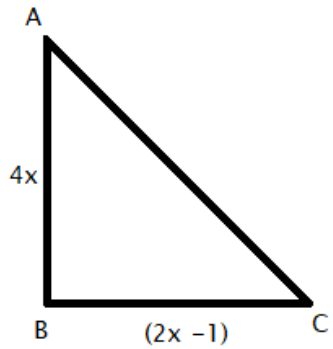
Exercise 6(B) Page No: 71

1. The sides of a right-angled triangle containing the right angle are 4x cm and (2x - 1) cm. If the area of the triangle is 30 cm^2; calculate the lengths of its sides.

Solution:



Given, the area of triangle = 30 cm^2

$\therefore \frac{1}{2} \times (4x) \times (2x - 1) = 30$

Dividing the whole equation by 2

$2x^2 – x = 15$
$2x^2 – x – 15 = 0$
$2x^2 – 6x + 5x – 15 = 0$
$2x(x – 3) + 5(x – 3) = 0$
$(x - 3)(2x + 5) = 0$
$x = 3, -5/2$
As, x cannot be negative, only x = 3 is valid.
Hence, we have
AB = 4 × 3 cm = 12 cm
BC = (2 × 3 - 1) cm = 5 cm
CA = $\sqrt{(12^2 + 5^2)} = \sqrt{169} = 13$cm (Using Pythagoras theorem)

2. The hypotenuse of a right-angled triangle is 26 cm and the sum of other two sides is 34 cm. Find the lengths of its sides.

Solution:

Given, a right triangle
Hypotenuse = 26 cm and the sum of other two sides is 34 cm.
Now, let consider the other two sides to be x cm and (34 - x) cm.
By using Pythagoras theorem,
$(26)^2 = x^2 + (34 - x)^2$
$676 = x^2 + x^2 + 1156 - 68x$
$2x^2 - 68x + 480 = 0$
$x^2 - 34x + 240 = 0$
$x^2 - 10x - 24x + 240 = 0$
$x(x - 10) - 24(x - 10) = 0$
$(x - 10) (x - 24) = 0$
So, x = 10, 24
If x = 10; (34 - x) = 24

Or if x = 24; (34 - x) = 10
Therefore, the lengths of the three sides of the right-angled triangle are 10 cm, 24 cm and 26 cm.

3. The sides of a right-angled triangle are (x - 1) cm, 3x cm and (3x + 1) cm. Find:
(i) the value of x,
(ii) the lengths of its sides,
(iii) its area.
Solution:

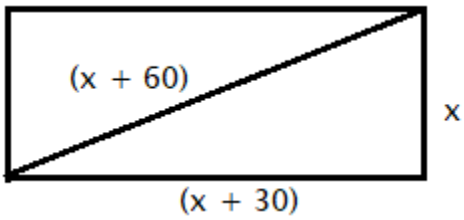
Given,
The longer side = Hypotenuse = (3x + 1) cm
And the lengths of other two sides are (x - 1) cm and 3x cm.
By using Pythagoras theorem, we have
$(3x + 1)^2 = (x - 1)^2 + (3x)^2$
$9x^2 + 1 + 6x = x^2 + 1 - 2x + 9x^2$
$x^2 - 8x = 0$
$x(x - 8) = 0$
$x = 0, 8$
Now, if x = 0, then one side = 3x = 0, which is not possible.
Hence, we take x = 8
Therefore, the lengths of sides of the triangle are (x - 1) cm = 7 cm, 3x cm = 24 cm and (3x + 1) cm = 25 cm.
And,
Area of the triangle = ½ x 7 x 24 = 84 cm^2

4. The hypotenuse of a right-angled triangle exceeds one side by 1 cm and the other side by 18 cm; find the lengths of the sides of the triangle.
Solution:

Let the hypotenuse of the right triangle be x cm.
From the question, we have
Length of one side = (x - 1) cm
Length of other side = (x - 18) cm
By using Pythagoras theorem,
$x^2 = (x - 1)^2 + (x - 18)^2$
$x^2 = x^2 + 1 - 2x + x^2 + 324 - 36x$
$x^2 - 38x + 325 = 0$
$x^2 - 13x - 25x + 325 = 0$
$x(x - 13) - 25(x - 13) = 0$
$(x - 13) (x - 25) = 0$
$x = 13, 25$
But when x = 13, x - 18 = 13 - 18 = -5, which is negative and is not possible.
Hence, we take x = 25
Therefore, the lengths of the sides of the triangle are x = 25 cm, (x - 1) = 24 cm and (x - 18) = 7 cm.

5. The diagonal of a rectangle is 60 m more than its shorter side and the larger side is 30 m more

than the shorter side. Find the sides of the rectangle.
Solution:



Let's consider the shorter side of the rectangle to be x m.
Then, the length of the other side = (x + 30) m
Length of the diagonal = (x + 60) m
By using Pythagoras theorem,
$(x + 60)^2 = x^2 + (x + 30)^2$
$x^2 + 3600 + 120x = x^2 + x^2 + 900 + 60x$
$x^2 - 60x - 2700 = 0$
$x^2 - 90x + 30x - 2700 = 0$
$x(x - 90) + 30(x - 90) = 0$
$(x - 90)(x + 30) = 0$
$x = 90, -30$
As, x cannot be negative. Hence, x = 90 is only valid.
Therefore, the sides of the rectangle are 90 m and (90 + 30) m = 120 m.

6. The perimeter of a rectangle is 104 m and its area is 640 m^2. Find its length and breadth.
Solution:

Let's take the length and the breadth of the rectangle be x m and y m.
So, the perimeter = 2(x + y) m
$104 = 2(x + y)$
$x + y = 52$
$y = 52 – x$
And, given area = 640 m^2
So, $xy = 640$
$x(52 - x) = 640$
$x^2 - 52x + 640 = 0$
$x^2 - 32x - 20x + 640 = 0$
$x(x - 32) - 20(x - 32) = 0$
$(x - 32)(x - 20) = 0$
$x = 32, 20$
If x = 32 then, y = 52 - 32 = 20
Or if x = 20, y = 52 - 20 = 32

Therefore, the length and breadth of the rectangle are 32 m and 20 m.