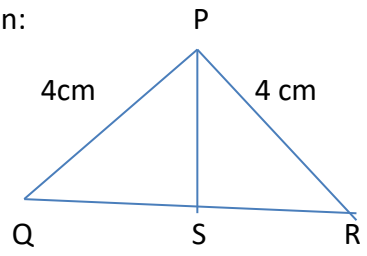
SCERT Kerala Class 10 Mathematics Textbook Solutions

Trigonometry – Chapter 5

Answer the following:

1. In the triangle shown, what is the perpendicular distance from the top vertex to the bottom side? What is the area of the triangle?

Solution:



Given PQ = PR = 4cm

Since two sides are equal, ΔPQR is an isosceles triangle.

<PQS + <PRS + <QPR = 180° (by angle sum property)

<PQS + <PRS + 120° = 180°

<PQS + <PRS = 180 – 120 = 60

Since $\Delta PQR$is an isosceles triangle, <PQS = <PRS

2<PQS = 60

<PQR = 30° $=< PRS$

Now <QPS = 180 – (30 + 90) = 180 – 120 = 60°

Now we have two right angled triangles with angle measures 30°, $60°, 90°$.

So they are proportional to 1:$\sqrt{3}$: 2

So we have PS: QS: PQ = 1: $\sqrt{3}$: 2

Let us take the length of sides be x, $\sqrt{3}$x, 2x

But given PQ = 2x = 4 cm

So x = 2 cm

Therefore, PS = 2cm and QS = 2$\sqrt{3}$ cm

Since QS = 2$\sqrt{3}$ cm, SR = 2$\sqrt{3}$ cm, QR = 4$\sqrt{3}$ cm

Area of ΔPQR = $\frac{1}{2}$bh = $\frac{1}{2} \times QR \times PS$ = $\frac{1}{2} \times 4\sqrt{3} \times 2$ = $4\sqrt{3}\ cm^2$.

2. In each of the following parallelograms, find the distance between the top and bottom side? Calculate the area of each parallelogram?

Solution:Type equation here.

In the first parallelogram, since one angle is given as 45° inΔADE , the other two angle measures will be 45° and 90°. Their sides are proportional to 1: 1:$\sqrt{2}$

Let the lengths of the sides be x, x, $\sqrt{2}$x

But it is given that $\sqrt{2}$x = 2 cm

x = $\frac{2}{\sqrt{2}}$ = $\sqrt{2}$ cm

So h = $\sqrt{2}$ cm

Area = base x height = 4 $\sqrt{2}cm^2$

In the second parallelogram, since one angle is given as 60°, the other two angle measures will be 30° and$90°$.

So we have 30°: $60°$: $90°$= 1:$\sqrt{3}$: 2

Let the length of sides be x, $\sqrt{3}$x, 2x

But given 2x = 2 cm

x = 1 cm

So h = $\sqrt{3}$ x = $\sqrt{3}$ cm

Area = bh = $4\sqrt{3}\ cm^2$

3. A rectangular board is to be cut along the diagonal and the pieces rearranged to form an equilateral triangle as shown below. The sides of the triangle must be 50 centimetres. What should be the length and breadth of the rectangle?

Solution:

Since it is an equilateral triangle, all angles must be 60°.

Here we can see two right angled triangles with angle measures 30°, 60°, 90°which are proportional to 1: $\sqrt{3}$: 2

Let the sides be x, $\sqrt{3}$x, 2x

But given 2x = 50cm

x = 25 cm

So the lengths of sides will be 25, 25$\sqrt{3}$, and 50

So length = 25 cm and breadth =25$\sqrt{3}$ cm.

4. Two rectangles are cut along the diagonal and the triangles got are to be joined to another rectangle to make a regular hexagon as shown below :(for figure, look at the textbook)

If the sides of the hexagon are to be 30 centimetres, what would be the length and breadth of the rectangles?

Solution:

Given figure is a regular hexagon and 4 equal right angled triangles are formed in the picture. The sides of the right angled triangles with angles 30°, 60°, 90°are proportional to 1:$\sqrt{3}$: 2.

Let the length of the sides be x, $\sqrt{3}$x, 2x

But 2x = 30 cm

x = 15cm

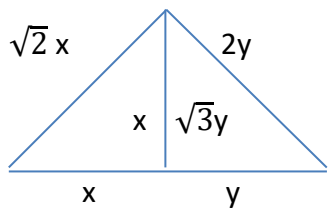
So lengths of the side of the triangles are 15, 15$\sqrt{3}$, 30.

So length of the rectangle is 15$\sqrt{3}$+15$\sqrt{3}$ = 30$\sqrt{3}$ = 51.96 cm

Breadth of the rectangle is 15 + 15 = 30 cm

5. Calculate the area of the triangle shown

Solution:



Angles of the first triangle are $45°, 45°, 90°$

So the sides are x, x, $\sqrt{2}$x

Angles of the second triangle are $30°, 60°, 90°$

So the sides are y, $\sqrt{3}$y, 2y

Given x + y = 4 cm

But x = $\sqrt{3}$y, so we have $\sqrt{3}$y + y = 4

y = $\frac{4}{(\sqrt{3}+1)} \times \frac{(\sqrt{3}-1)}{\sqrt{3}-1)}$ = $\frac{4(\sqrt{3}-1)}{3-1}$= 2($\sqrt{3} - 1$)

Area = $\frac{1}{2}$ bh = $\frac{1}{2}$ ×4 × $\sqrt{3}$ ×2($\sqrt{3} - 1$)= 4(3 - $\sqrt{3}$) = 5.072cm^2