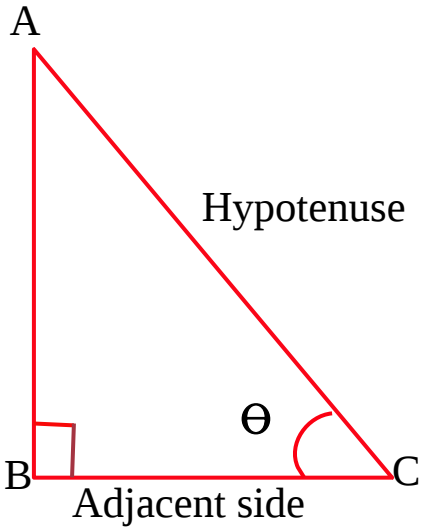
Chapter 5 , Trigonometry .

Bird's Sagacity View .

$$\text{Sin} = \frac{Opposite\ side}{hypotenuse}$$

$$\cos = \frac{adjacent\ side}{hypotenuse}$$

$$\tan = \frac{opposite\ side}{adjacent\ side}$$



One Ancient Teacher Of History Swore At His Class.

1) If the angles are 45^0 , 45^0 , 90^0 , then the ratio of the sides 1 : 1 : $\sqrt{2}$.
2) If the angles are 30^0 , 65^0 , 90^0 , then the ratio of the sides 1 : $\sqrt{3}$: 2 .

Values of trigonometric functions.

Functions	0	30	45	60	90	180
Sin	0	1/2	$1/\sqrt{2}$	$\sqrt{3}/2$	1	0
Cos	1	$\sqrt{3}/2$	$1/\sqrt{2}$	1/2	0	-1
Tan	0	$1/\sqrt{3}$	1	$\sqrt{3}$	Not defined	0

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Question 1.

In triangle ABC , AB = 8cm, BC = 10cm, ∠CBA 130^0 . Find the area of the ΔABC. (sin 50= 0.76, cos 50 = 0.64, tan 50 = 1.19)

Answer:-

Given , AB = 8cm, BC = 10cm, ∠CAB = 130^0 .

Area = $\frac{1}{2}ac\sin B$

$= \frac{1}{2} \times 10 \times 8 \times \sin 130^0 \quad \Rightarrow 5 \times 8 \times (180-130)$

$\Rightarrow \ 50 \times \sin 50 .$

$\Rightarrow 40 \times 0.76 = 30.4\, cm^2$

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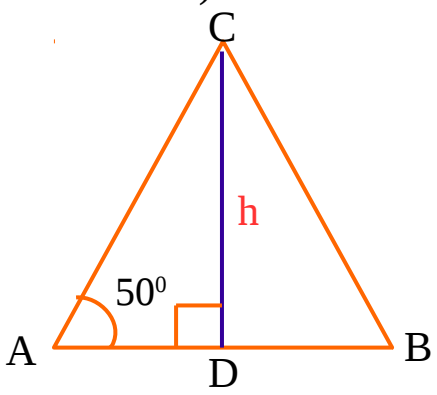
Question. 2.

To adjacent sides of a triangle are 10cm and 15cm long and ths angle b/w these sides is 50^0 . Compute its area. (sin 50 = 0.7660)

Answer:-



Area of the triangle $= \frac{1}{2} ac \sin B$

Triangle ADC is right angled triangle.

Let *h* be the height

$\sin 50 = \frac{h}{15}$

$0.7660 = \frac{h}{15}$

$h = 15 \times 0.7660 = 11.4900$

Hence the area $= \frac{1}{2} \times 10 \times 11.49 = 57.49\, cm^2$.

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Question 3

Find the radius of an equilateral triangle of side 6cm

Answer:-

$\cos 30 = \frac{3}{radius}$

$\frac{\sqrt{3}}{2} = \frac{3}{radius}$

$radius = \frac{3 \times 2}{\sqrt{3}} = 2\sqrt{3}$

Hence the radius of the circle $= 2\sqrt{3}\, cm$.

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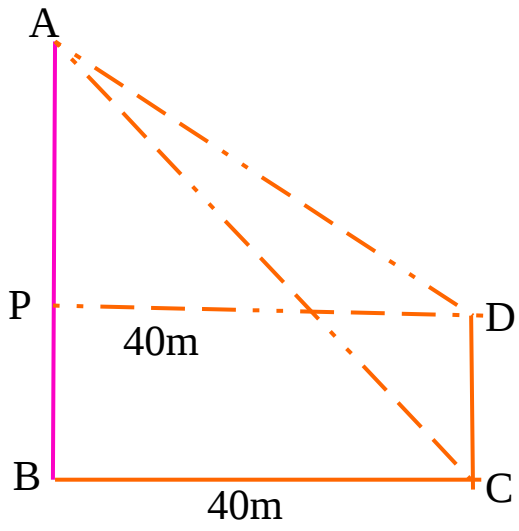
Question 4.

A man standing at the foot of a tower 40 meters away from a hill at an angle of elevation 60^0 clibing to the top of the tower, he sees the top of the hill at an angle of elevation 45^0. Compute the heigh of the tower. (sin 45 = 0.7071, cos 45 = 0.7071, tan 45 = 1.00, sin 60 = 0.8660, cos 60 = 0.5000, tan 60 = 1.7321.)

Answer:-



Let the height of the hill be AB,and the height of the tower be CD in ΔABC.

BC = 40m $\angle ACB = 60^0$.

$$\tan 60^0 = \frac{AB}{BC} \Rightarrow \tan 60^0 = \frac{AB}{40}$$

AB = 40 tan 60^0 .

= 40 × 1.7321

= 69.28……...(1)

Hence the height of the hill = 69.28m.

In ΔADP,

$\angle ADP = 45^0$, PD = 40.

$$\tan 45^0 = \frac{AP}{PD}$$

$$\Rightarrow 1 = \frac{AP}{40} \; ; \quad AP = 40$$

So, PB = AB – AP

= 69.28 – 40 = 29.28

PB = CD = 29.28.

Hence, the height of the tower = 29.28m.

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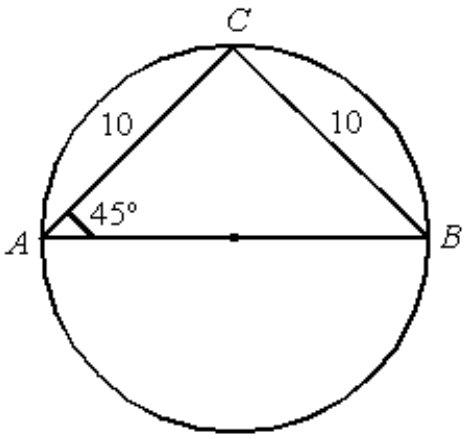
Question 5

AC and BC are two equal chords of a circle with diameter AB. If the equal chords have lengths 10cm find the area of the circle.

Answer:-

45^0		45^0		90^0
1	:	1	:	$\sqrt{2}$
↓		↓		↓
10		10		$10\sqrt{2}$



$$\text{Diameter AB} = 10\sqrt{2} \text{ cm}$$

$$\text{Radius} = 5\sqrt{2} \text{ cm}$$

$$\text{Area} = \pi r^2 = \pi \times \left(5\sqrt{2}\right)^2 = 50\pi \text{ sq.cm}$$

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Question 6.

Two sides of a triangle are 9cm and 10cm and the angle between those sides is 105°. find the area of the triangle.

[sin 75° = 0.97]

Answer

In ΔBDC $\angle CBD = 180° - 105° = 75°$

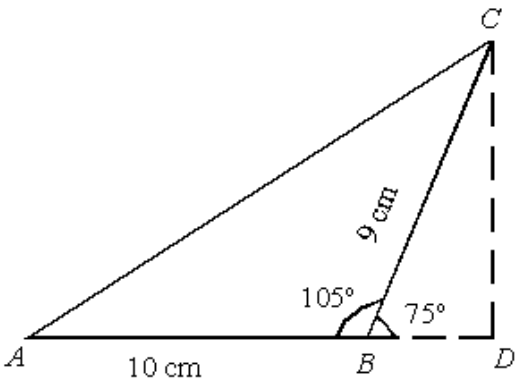
$$\sin 75° = \frac{CD}{9}$$

$$0.97 = \frac{CD}{9}$$

$$CD = 0.97 \times 9 = 8.73 \text{ cm}$$

$$\text{Area} = \frac{1}{2} \times 10 \times 8.77$$

$$= 43.65 \text{ sq.cm}$$



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Question 7.

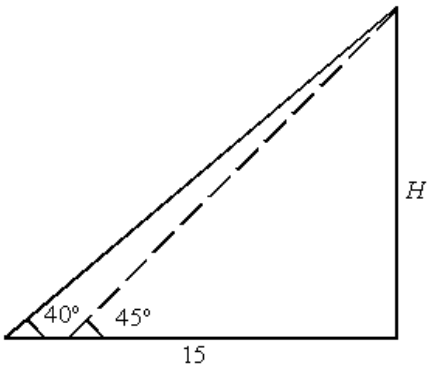
When the sun is at an elevation of 40°; the shadow of a flagpost is 15 metres.

(a) Find the height of the flagpost?

(b) What would be the length of the shadow, when the sun is at an elevation of 45°

[tan 40° = 0.84; sin 40° = 0.64]

Answer



Let H be the height of the flagpost

$$\tan 40^\circ = \frac{H}{15}$$

$$H = 15 \times \tan 40^\circ$$

$$= 15 \times 0.84 = 12.60 \text{ metre}$$

length of shadow when the sum is at an elevation of 45° $= H =$ 12.60 metre

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Question 8.

Two buildings in a plane ground are 20 metres apart. From the top of the smaller building, one sees the base of the building at a depression of 50° and its top at an elevation of 25°

(a) Draw a rough figure and mark the measurements

(b) Find the height of the smaller building

(c) Find the heights of the bigger building

[tan 50 = 1.2; tan 25 = 0.4]

Answer

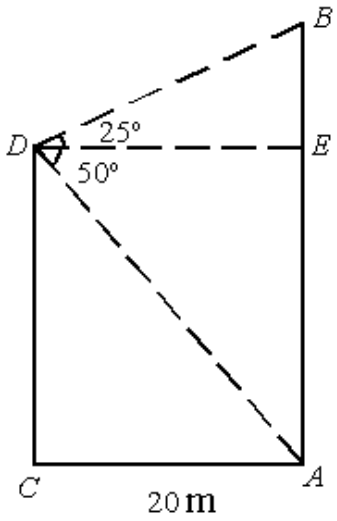
In ΔADE,

$$\tan 50^\circ = \frac{AE}{DE}$$

$$AE = 20 \times \tan 50^\circ$$

$$= 20 \times 1.2 = 24 \text{ m}$$

Height of the smaller building = 24 metre



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Question 9

A man sees the bottom and top of a building at a depression of 55° and 35° respectively from the top of a 40 metres high tower.

(a) Draw a rough figure using the given data and mark the measurements

(b) Find the distance from tower to the building

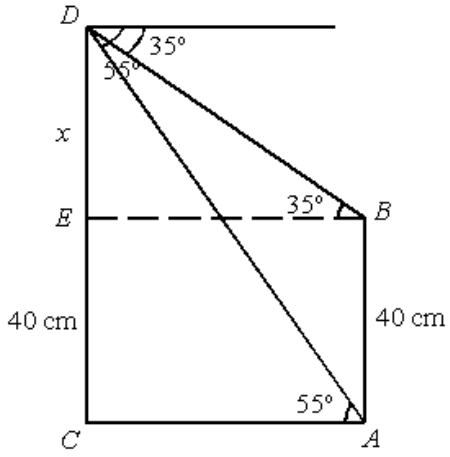
(c) Find the height of the tower.

[tan 55° = 1.43; tan 35° = 0.7]

Answer

Tower $\Rightarrow$ $CD = 40 + x$

building $\Rightarrow$ AB



In ΔBED,

$$\tan 35^\circ = \frac{x}{BE}$$

$$BE = \frac{x}{\tan 35^\circ}$$

In ΔACD,

$$\tan 55^\circ = \frac{40+x}{AC}$$

$$AC = \frac{40+x}{\tan 55^\circ}$$

$$BE = AC \Rightarrow \frac{x}{\tan 35^\circ} = \frac{40+x}{\tan 55^\circ}$$

$$x \tan 55^\circ = (40 + x) \tan 35^\circ$$

$$x(\tan 55^\circ - \tan 35^\circ) = 40 \tan 35^\circ$$

$$x = \frac{40 \times \tan 35^\circ}{\tan 55^\circ - \tan 35^\circ}$$

$$= \frac{40 \times 0.7}{1.43 - 0.7}$$

$$= \frac{28}{0.73} = 3835$$

Height of the tower $= CD = 40 + x$

$= 40 + 38.35 = 78.35$ metre

Distance from the tower to the building $= BE = \frac{x}{\tan 35^\circ} = \frac{38.35}{0.7}$

$= 54.8$ metre

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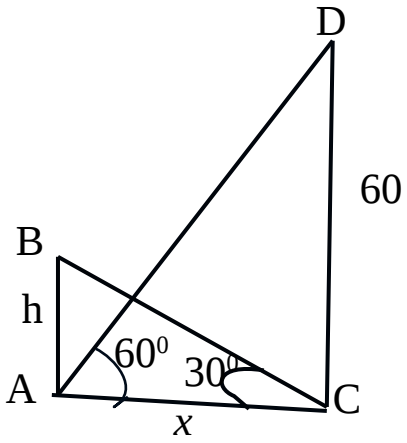
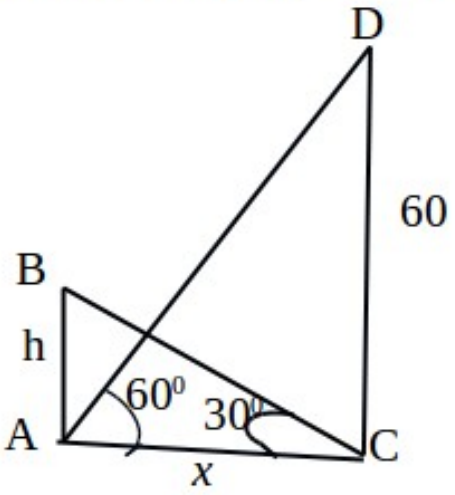
Question 10

The top of a building is seen at an angle of elevation 30^0 when viewed from the foot of a tower. When viewed from the foot of the building , the top of the tower is see at an angle of elementary 65^0 .



a) What is the distance b/w the tower and the building.
b) What is the height of the building.

Answer:-



AB = Building
CD = Tower.

$$\tan 65 = \frac{CD}{BD} \Rightarrow \tan 65^0 = \frac{60}{x}$$

$\Rightarrow 2.14 = 60/x$

$\Rightarrow x = 60/2.14 = 28.03$m

Hence the distance b/w the building and the tower = 28.03m .

b) $$\frac{h}{x} = \tan 30^0 \Rightarrow \frac{h}{28.03} = \frac{1}{\sqrt{3}} \Rightarrow h = \frac{28.03}{\sqrt{3}} = 9.34\sqrt{3}$$

Height of the building $= 9.34 \times 1.732 = 16.17$ m.

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The End of the Chapter – Trigonometry

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