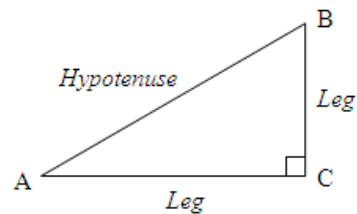


Worksheet 1-2: Solving a Right Triangle

To solve a right triangle means to find all the unknown sides and unknown angles of the right triangle.

Since each trigonometric ratio involves 3 pieces of information (one angle and two sides).  
Two of the three pieces of information must be given to find the unknown information.

Properties of Right Triangle

## I. Triangle Sum Theorem

$$\angle A + \angle B + \angle C = 180^\circ$$

## II. Complementary Angles

$$\angle A + \angle B = 90^\circ$$

III. Pythagorean Theorem:  $c^2 = a^2 + b^2$

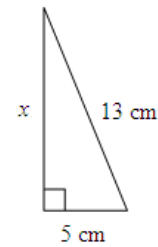
$c$  is the hypotenuse.

$a$  and  $b$  are the legs.

Practice:

1. Find the measure of the unknown side, round to the nearest tenth of a centimetre.

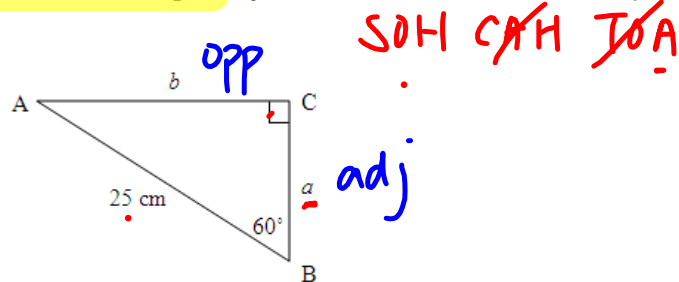
$$\begin{aligned}c^2 &= a^2 + b^2 \\13^2 &= 5^2 + b^2 \\13^2 - 5^2 &= b^2 \\ \sqrt{13^2 - 5^2} &= b \\ b &= 12 \text{ cm}\end{aligned}$$



Case 1: Solving a right triangle, given one side and one angle

Solve  $\triangle ABC$ . Find side lengths to the nearest tenth of a centimetre and angles to the nearest degree.

(Hint: Always try to use the known values that are given to find the unknown values to avoid errors.)



Find a

$$\frac{\cos 60^\circ}{1} = \frac{a}{25}$$

$$25 \cos 60^\circ = a$$

$$a = 12.5 \text{ cm}$$

Find b

$$\frac{\sin 60^\circ}{1} = \frac{b}{25}$$

$$25 \sin 60^\circ = b$$

$$b = 21.7 \text{ cm}$$

Find  $\angle A$

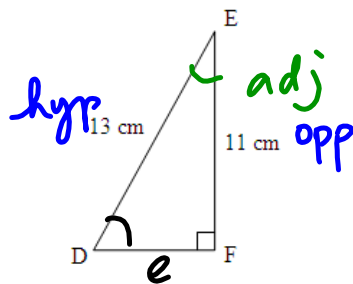
$$\angle A = 90^\circ - 60^\circ$$

$$= 30^\circ$$

Case 2: Solving a right triangle, given 2 sides

Solve  $\triangle DEF$ . Find side lengths to the nearest tenth of a centimetre and angles to the nearest degree.

(Hint: Always try to use the known values that are given to find the unknown values to avoid errors.)



SOH CAH TOA

Find  $e$

$$e = \sqrt{13^2 - 11^2}$$

$$= 6.9 \text{ cm}$$

Find  $\angle D$

$$\sin D = \frac{11}{13}$$

$$\angle D = \sin^{-1}\left(\frac{11}{13}\right)$$

$$= 58^\circ$$

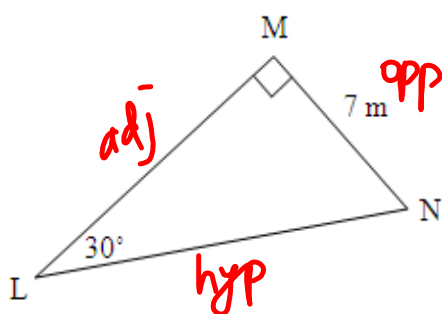
Find  $\angle E$

$$\cos E = \frac{11}{13}$$

$$\angle E = \cos^{-1}\left(\frac{11}{13}\right)$$

$$= 32^\circ$$

2. Solve  $\triangle LMN$ . Find side lengths to the nearest tenth of a metre and angles to the nearest degree.



Find  $LM$

$$\tan 30^\circ = \frac{7}{LM}$$

$$LM = \frac{7}{\tan 30^\circ}$$

$$= 12.1\text{ m}$$

Find  $LN$

$$\sin 30^\circ = \frac{7}{LN}$$

$$LN = \frac{7}{\sin 30^\circ}$$

$$= 14\text{ m}$$

$$\angle N = 90^\circ - 30^\circ$$

$$= 60^\circ$$

3. Find the measure of AD, to the nearest tenth of a metre. SOH CAH TOA

$$\text{In } \triangle ABC,$$

$$\tan 22^\circ = \frac{AC}{12}$$

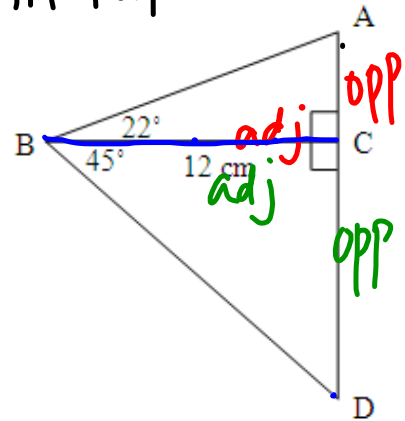
$$12 \tan 22^\circ = AC$$

$$\text{In } \triangle BCD,$$

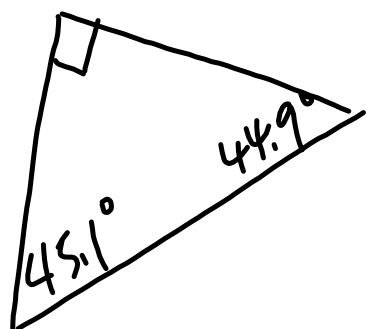
$$\tan 45^\circ = \frac{CD}{12}$$

$$12 \tan 45^\circ = CD$$

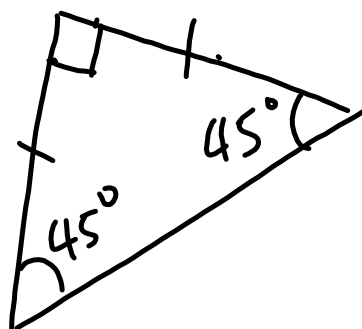
$$\begin{aligned} AD &= AC + CD \\ &= 12 \tan 22^\circ + 12 \tan 45^\circ \\ &= 16.8 \text{ cm} \end{aligned}$$



(A)



(B)



4. Find the measure of BC, to the nearest tenth of a metre.

In  $\triangle ABD \rightarrow BD$

$$\frac{\cos 50^\circ}{1} = \frac{17}{BD}$$

$$BD = \frac{17}{\cos 50^\circ}$$

In  $\triangle ACD \rightarrow CD$

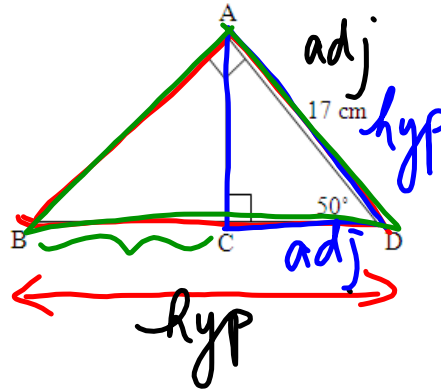
$$\frac{\cos 50^\circ}{1} = \frac{CD}{17}$$

$$17 \cos 50^\circ = CD$$

$$BC = BD - CD$$

$$= \frac{17}{\cos 50^\circ} - 17 \cos 50^\circ$$

$$= 15.5 \text{ cm}$$





5. Find the measure of AD, to the nearest tenth of a centimetre.

In  $\triangle ABC$

$$\tan 30^\circ = \frac{75}{AC}$$

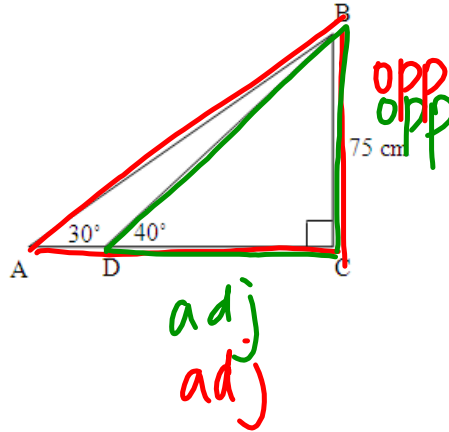
$$AC = \frac{75}{\tan 30^\circ}$$

In  $\triangle ADC$ ,

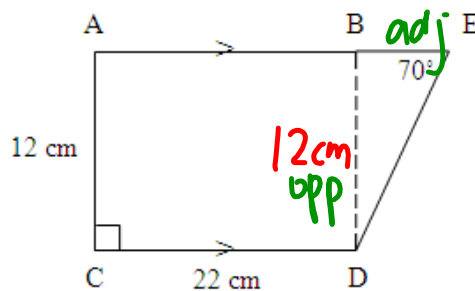
$$\tan 40^\circ = \frac{75}{CD}$$

$$CD = \frac{75}{\tan 40^\circ}$$

$$\begin{aligned} AD &= AC - CD \\ &= \frac{75}{\tan 30^\circ} - \frac{75}{\tan 40^\circ} \\ &= \end{aligned}$$



6. Find the area of the trapezoid, to the nearest square centimetre.



$$\begin{aligned} \text{In } \triangle BDE, \\ \tan 70^\circ &= \frac{12}{BE} \\ BE &= \frac{12}{\tan 70^\circ} \\ &\approx 4.37 \end{aligned}$$

$$\begin{aligned} \text{Total Area} &= A_{\square} + A_{\triangle} \\ &= 12 \times 22 + \frac{12 \times 4.37}{2} \\ &= 290.22 \\ &\approx 290 \text{ cm}^2 \end{aligned}$$

$\therefore$  The area is  $290 \text{ cm}^2$ .

Deduct  $\frac{1}{2}$  mark if missing answer statement.

Answers: 1. 12 cm; Case 1:  $\angle A = 30^\circ$ ,  $a = 12.5$  m,  $b = 21.7$  m; Case 2:  $DF = 6.9$  cm,  $\angle E = 32^\circ$ ,  $\angle D = 58^\circ$ ;  
2.  $\angle N = 60^\circ$ ,  $LM = 12.1$  m,  $LN = 14$  m; 3. 16.8 m; 4. 15.5 m; 5. 40.5 cm; 6. 290 cm<sup>2</sup>.

Assigned Work: WS 1-2; p. 14 #6-9