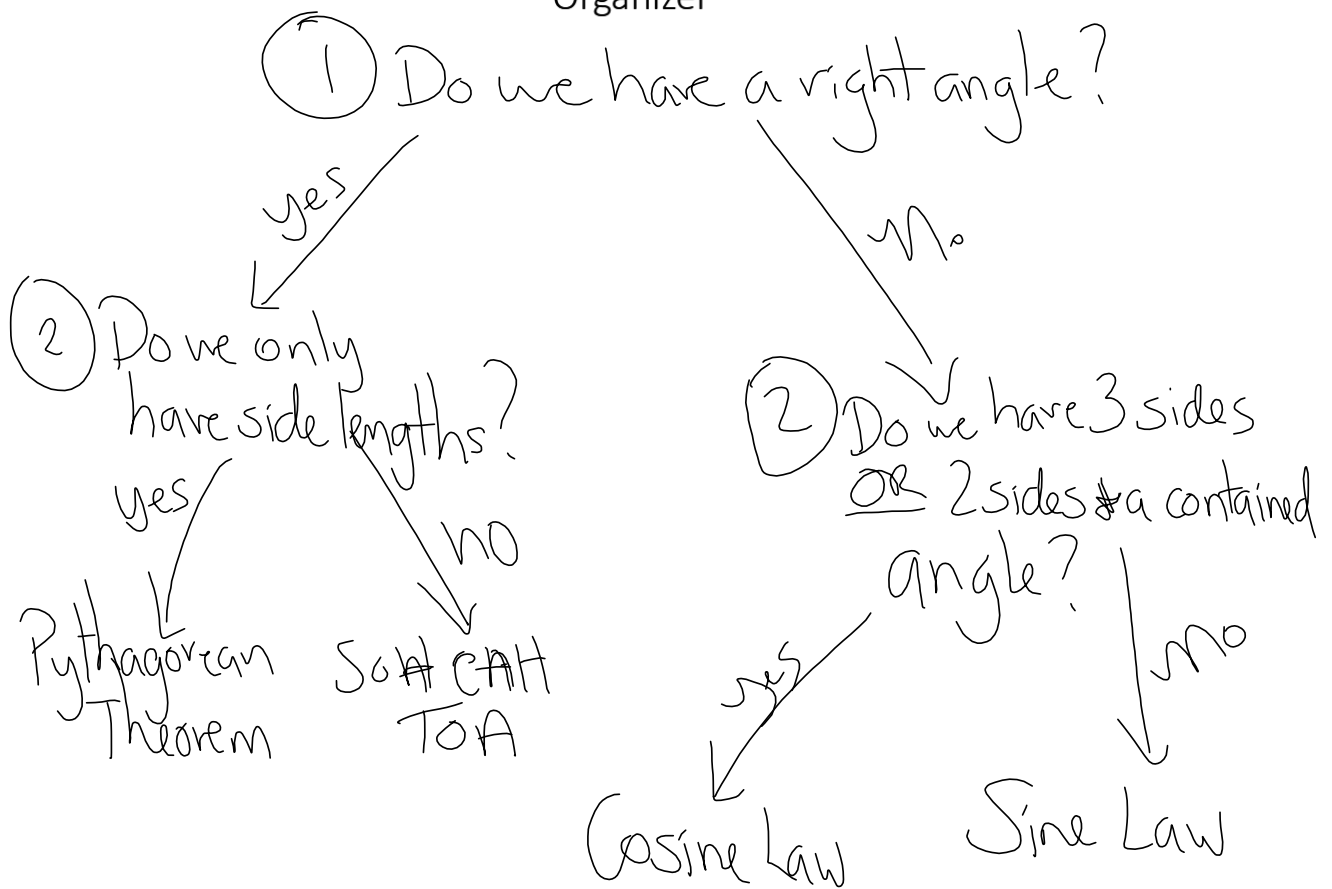


3D Trigonometry

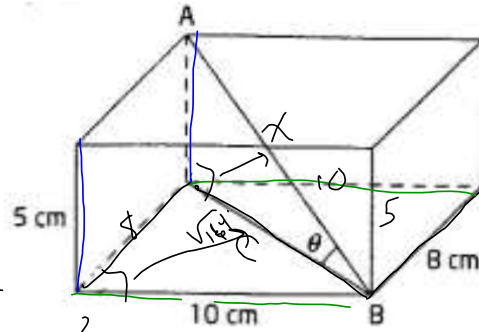
MCR 3U

Organizer



Example 1

Refer to the following diagram:



- a) What is the length of diagonal AB? Correct to two decimal places.
- b) What is the value of θ to two decimal places?

$$\begin{aligned}
 a) \quad 8^2 + 10^2 &= c^2 \\
 c^2 &= 164 \\
 c &= \sqrt{164}
 \end{aligned}$$

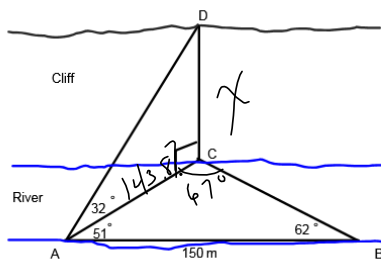
$$\begin{aligned}
 (\sqrt{164})^2 + 5^2 &= x^2 \\
 164 + 25 &= x^2 \quad \text{opp } 5 \\
 x^2 &= 189 \\
 x &= 13.75 \text{ cm}
 \end{aligned}$$



$$\boxed{x = 13.75 \text{ cm}}$$

$$\begin{aligned}
 b) \quad \tan \theta &= \frac{5}{\sqrt{164}} \\
 \tan \theta &= 0.39 \\
 \theta &= \tan^{-1}(0.39) \\
 \theta &= 21.33^\circ
 \end{aligned}$$

Example 2



A surveyor is on one side of a river. On the other side is a cliff of unknown height that she wants to measure. The surveyor lays out a baseline AB of length 150m. From point A, she selects point C at the base of the cliff and measures $\angle CAB$ to be 51° . She selects point D on top of the cliff directly above C and measures an angle of elevation of 32° . She moves to point B and measures $\angle CBA$ as 62° . Find the height of the cliff.

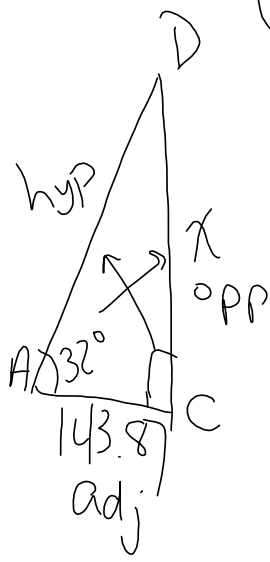
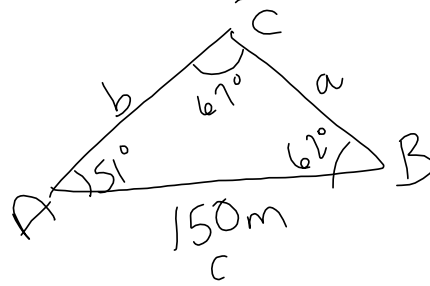
$$\angle C = 180^\circ - 51^\circ - 62^\circ = 67^\circ$$

~~$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$~~

~~$$\frac{b}{\sin 62^\circ} = \frac{150}{\sin 67^\circ}$$~~

~~$$b(\sin 67^\circ) = 150 \sin 62^\circ$$~~

~~$$b = 143.87 \text{ m}$$~~



$$\tan 32^\circ = \frac{x}{143.87}$$

$$x = 143.87 \tan 32^\circ$$

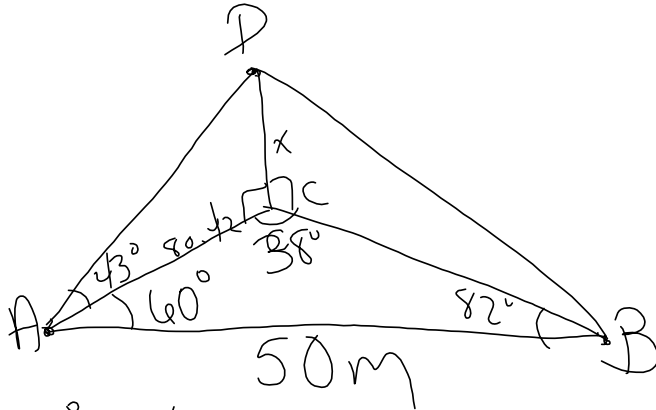
$$x = 143.87(0.6248)$$

$$x = 90 \text{ m}$$

Example 2 con't...

Example 3

- Kelly and Jake are standing 50m apart in front of the Peace Tower on Parliament Hill in Ottawa. The angle of elevation from Kelly to the top of the tower is 43 degrees. Kelly measures the angle between Jake and the base of the tower to be 60 degrees, while Jake measures the angle between Kelly and the base of the tower to be 82 degrees. Calculate the height of the Peace Tower, to the nearest metre.



$$\angle C = 180^\circ - 60^\circ - 82^\circ = 38^\circ$$

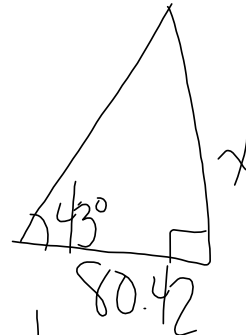
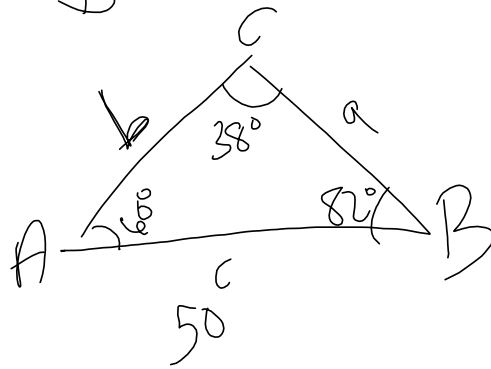
~~$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$~~

~~$$\frac{b}{\sin 82^\circ} = \frac{50}{\sin 38^\circ}$$~~

$$b(\sin 38^\circ) = \frac{50 \sin 82^\circ}{\sin 38^\circ}$$

$$b = 80.42$$

$\therefore \rightarrow$



~~$$\tan 43^\circ = \frac{x}{80.42}$$~~

$$x = 80.42 \tan 43^\circ$$

$$x \approx 75$$

Example 3 con't...

Homework

- Section 4.5, Page 265-266, #1,5,7

