



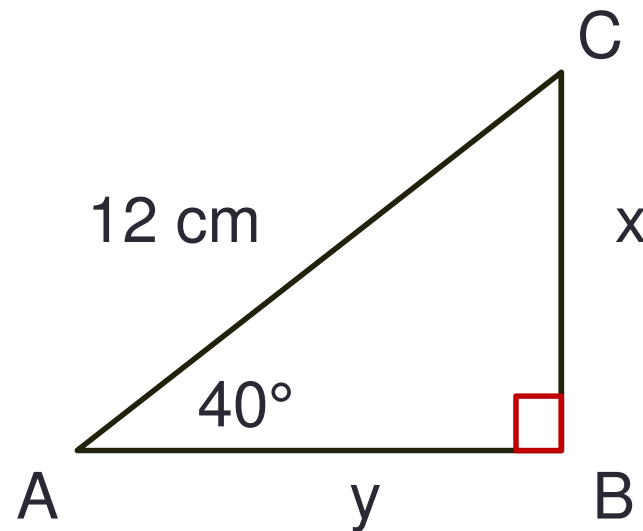
# SOH CAH TOA PROBLEMS

---

SOLVING RIGHT TRIANGLES

To SOLVE A TRIANGLE means to know all three sides and all three angles.

For example:



But this problem can't be solved using Pythagorean theorem because both  $x$  and  $y$  sides are unknown...

SOH CAH TOA , and of course trig functions,  
can help you..... Let's listen!



SOH CAH TOA

**Sohcahtoa** is an easy way to remember how Sine, Cosine and Tangent work:

**Soh...**

$$\mathbf{S}\sin(\theta) = \mathbf{O}\text{pposite} / \mathbf{H}\text{ypotenuse}$$

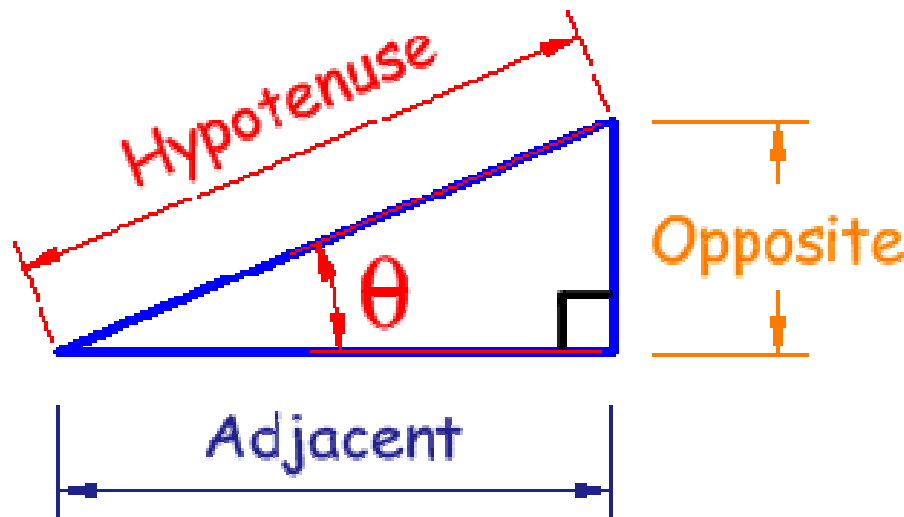
**...cah...**

$$\mathbf{C}\cos(\theta) = \mathbf{A}\text{djacent} / \mathbf{H}\text{ypotenuse}$$

**...toa**

$$\mathbf{T}\text{g}(\theta) = \mathbf{O}\text{pposite} / \mathbf{A}\text{djacent}$$

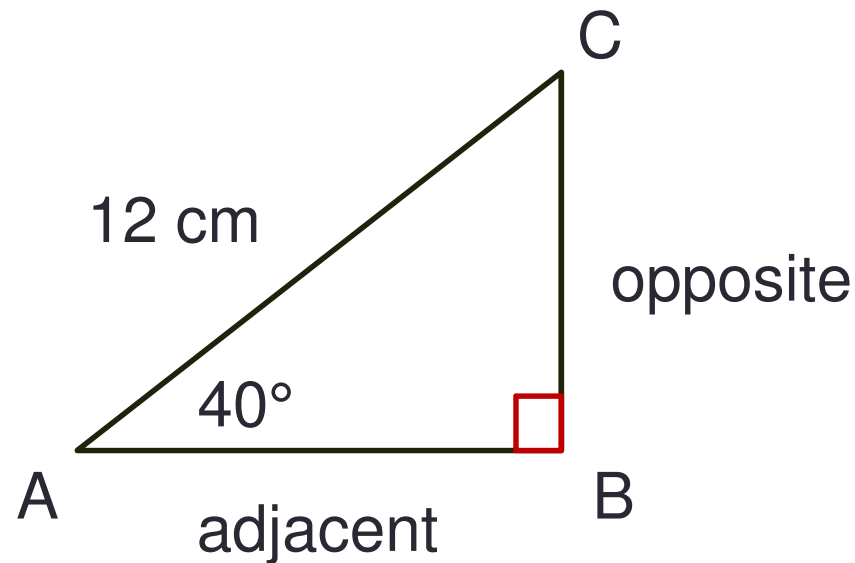
- Firstly, the names **Opposite**, **Adjacent** and **Hypotenuse** come from the right triangle



- "**Opposite**" is opposite to the angle  $\theta$
- "**Adjacent**" is adjacent (next to) to the angle  $\theta$
- "**Hypotenuse**" is the longest one

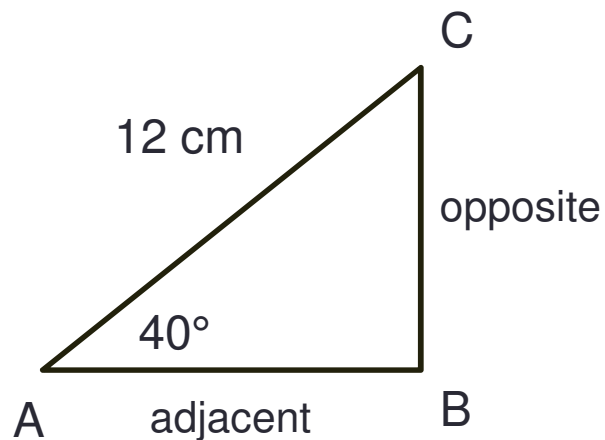
Pay attention to what is the angle you know and put “opposite” in front of it.

For example:



What is the opposite (side) ? And the adjacent?

Then you will choose soh, cah, or toa depending on what information you know. In this case you have hypotenuse and an angle so you can use **soh** and work out the **opposite**:



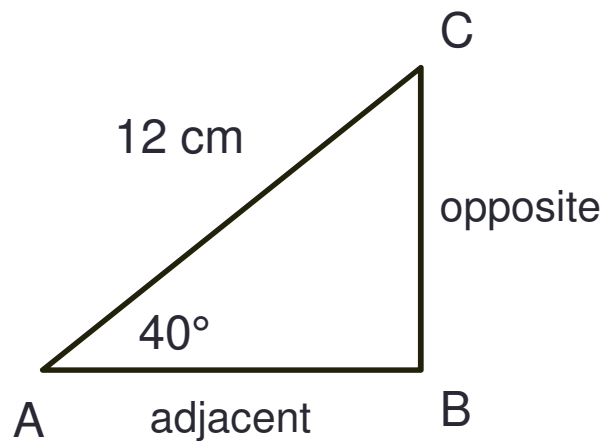
$$\sin 40^\circ = \frac{\textit{opposite}}{\textit{hypotenuse}}$$

$$\sin 40^\circ = 0.64 \quad (\text{calculator can help you...})$$



$$\textit{opposite} = 0.64 \cdot 12 = 7.71 \text{ cm}$$

...or you can use **cah** and work out the **adjacent**:



$$\cos 40^\circ = \frac{\text{adjacent}}{\text{hypotenuse}}$$

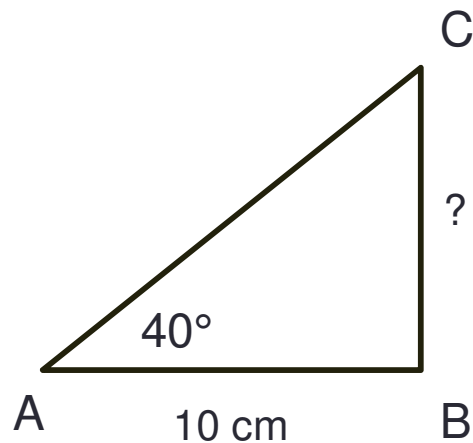
$$\cos 40^\circ = 0.76 \quad (\text{calculator can help you...})$$



$$\text{adjacent} = 0.76 \cdot 12 = 9,12 \text{ cm}$$



Finally, if you have an angle and one of the two catheti you will find the other side using **toa** :



$$\operatorname{tg} 40^{\circ} = \frac{\textit{opposite}}{\textit{adjacent}}$$

$$\operatorname{tg} 40^{\circ} = 0.84 \quad (\text{calculator can help you...})$$

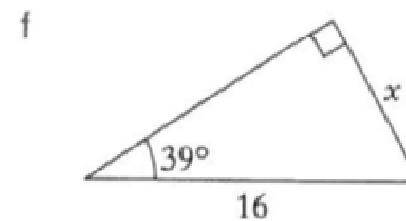
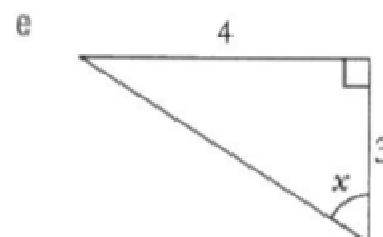
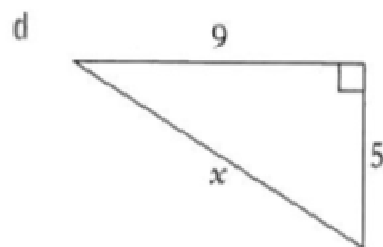
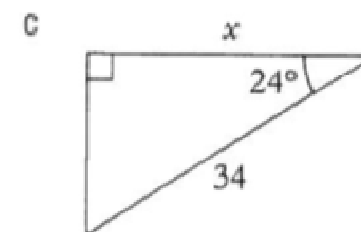
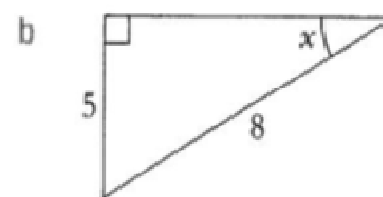
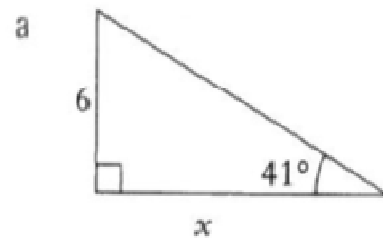


$$\textit{opposite} = 0.84 \cdot 10 = 8.4 \text{ cm}$$

## Exercises:

In this exercise all lengths are in cm.

1 Find the value of  $x$  for each triangle.





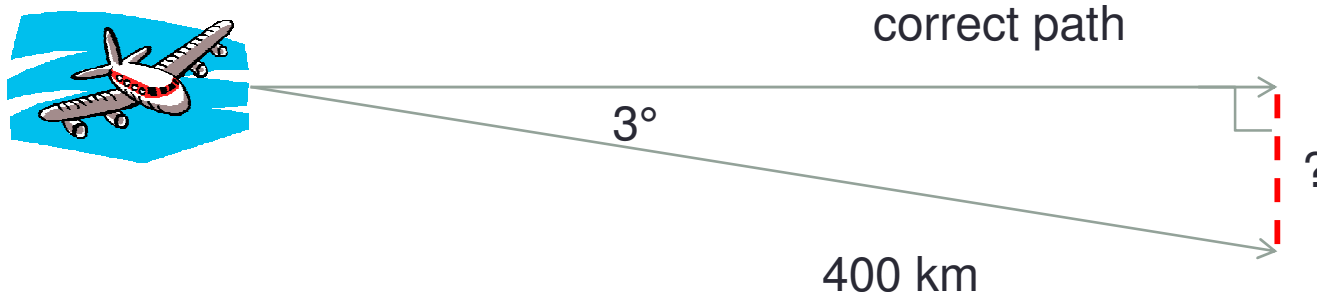
# SOHCAHTOA

---

around the world

Problem :

An airplane flies 3 degrees off course for 400 km, how far away from the correct path is the plane?

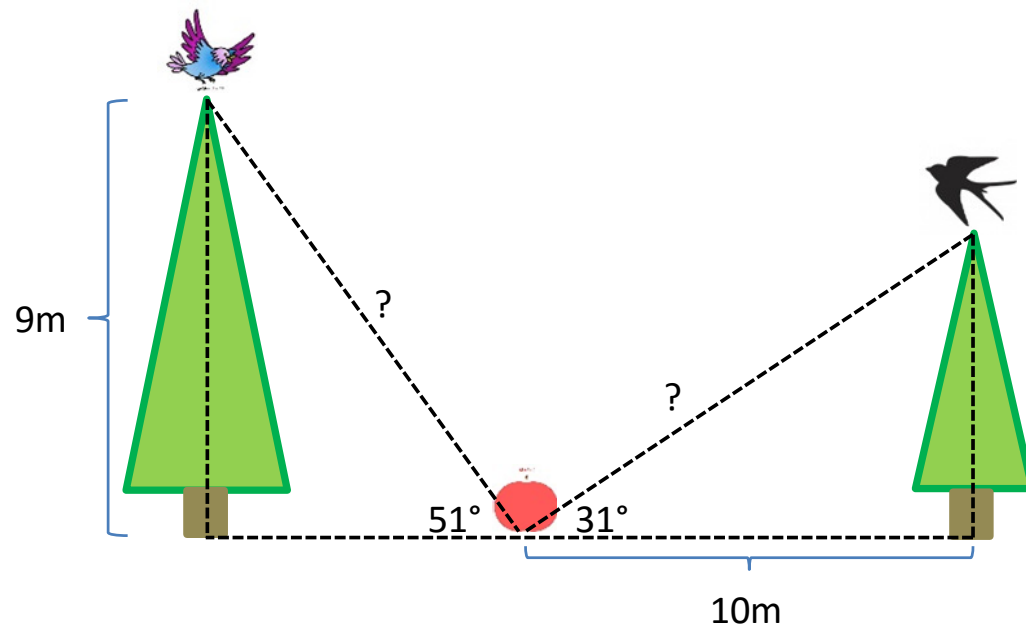


You know hypotenuse, the angle  $\theta$  and you have to find the opposite.

$$\sin 3^\circ = \frac{\text{opposite}}{\text{hypotenuse}} \quad \text{opposite} = \sin 3^\circ \cdot 400 = 20.9 \text{ Km}$$

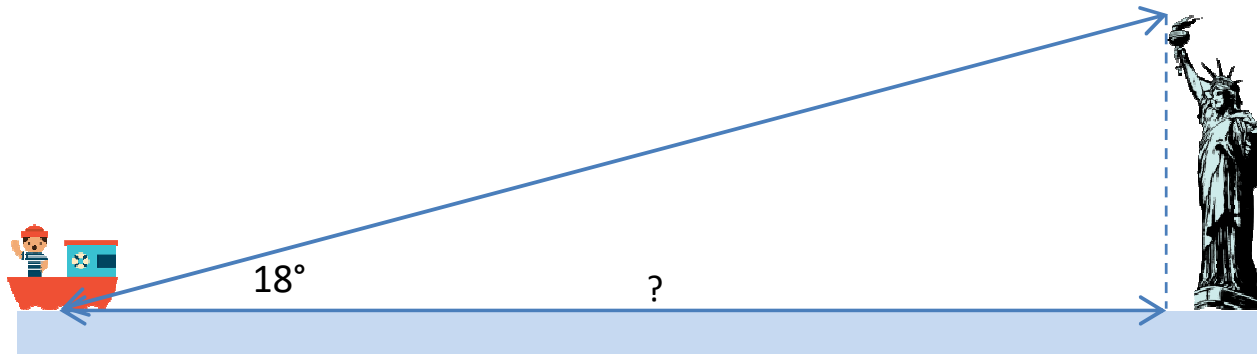
Problem:

A robin and a swallow are perched at the tops of two trees, as shown. Given the angles of inclination between the apple and the birds, which bird is closer to apple and by how much?



### 1. Statue of liberty

The height of the statue of liberty is about 92 m. A ship look at the top of the statue with an angle of  $18^\circ$ . How far is the ship from the statue of liberty?



### 2. The ladder

A ladder 5 m long is leaning against a wall. The ladder at ground-level has an angle of  $62^\circ$ . How far is the top of the ladder from the ground?

