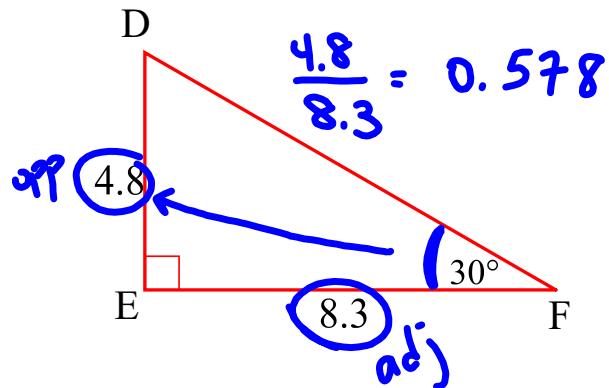
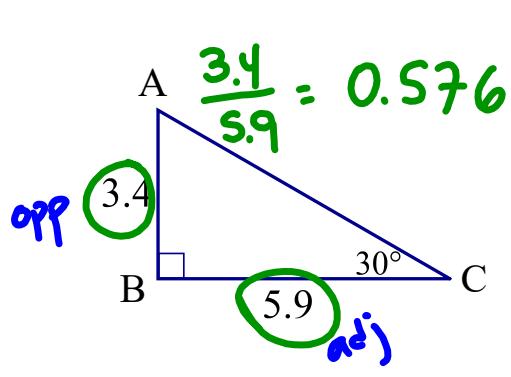
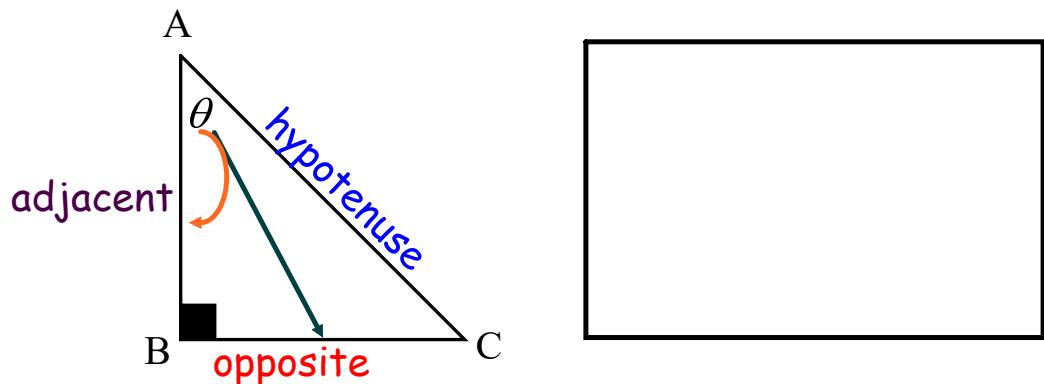


Trigonometry

Part 1: Applies Only to Right Triangles



$\triangle ABC \sim \triangle DEF$, which means their corresponding sides are proportional. Therefore, any ratios created with corresponding sides from two similar right triangles will always be equal.



There are three main trigonometric ratios;
they are:

$$\text{Sine } \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\text{Cosine } \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\text{Tangent } \theta = \frac{\text{opposite}}{\text{adjacent}}$$

For $\triangle ABC$, determine the following ratios.

$$\sin A = \frac{\text{opp}}{\text{hyp}} = \frac{a}{c}$$

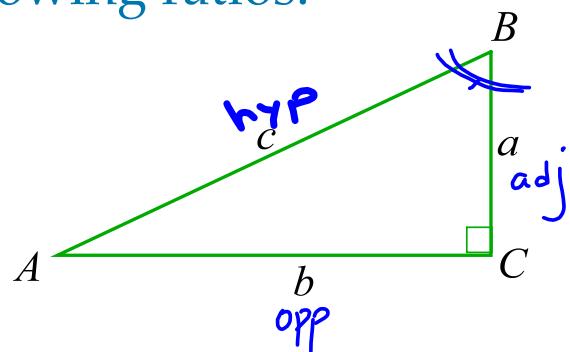
$$\cos B = \frac{a}{c}$$

$$\tan B = \frac{b}{a}$$

$$\sin B = \frac{b}{c}$$

$$\cos A = \frac{\text{adj}}{\text{hyp}} : \frac{b}{c}$$

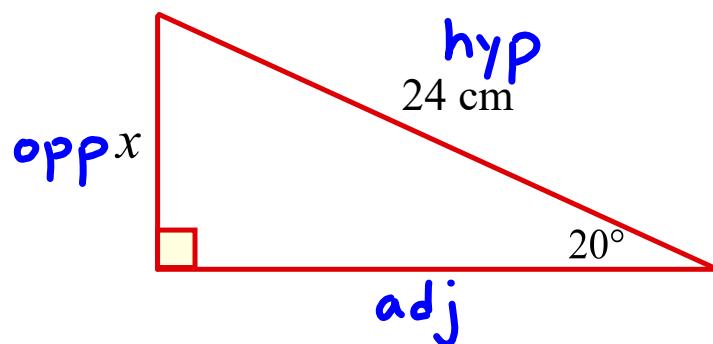
$$\tan A = \frac{\text{opp}}{\text{adj}} = \frac{a}{b}$$



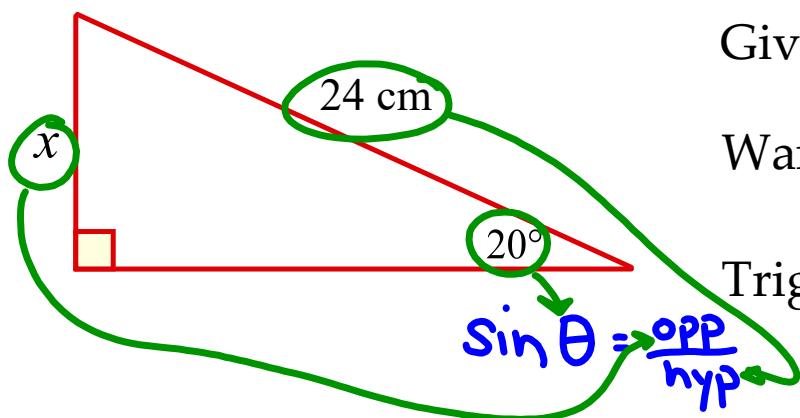
Trigonometry

Finding Missing Sides (given a side and an angle)

Example:



- With respect to the angle, determine which **side** you're **given** and which side you **want**.
- Determine which **trig ratio** uses these sides.
- Fill in** the ratio with the **given information**, then calculate the length of the missing side.



Given side: hyp

Wanted side: opp

Trig ratio: sin

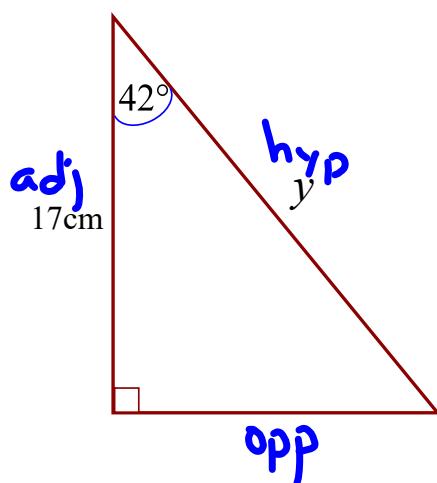
$$\sin 20^\circ = \frac{x}{24}$$

$$24 \cdot \sin 20^\circ = x$$

$$8.21 = x$$

$$x = 8.21 \text{ cm}$$

Example:



$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

Given side: adj

Wanted side: hyp

Trig ratio: cosine

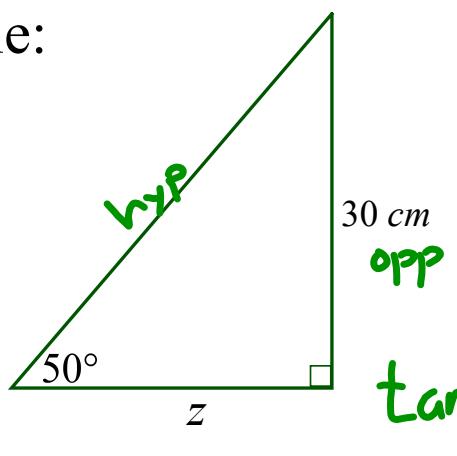
$$\cos 42^\circ = \frac{17}{y}$$

$$y \cos 42^\circ = 17$$

$$y = \frac{17}{\cos 42^\circ}$$

$$y = 22.88 \text{ cm}$$

Example:



Given side: opp

Wanted side: adj

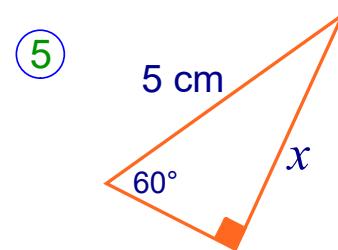
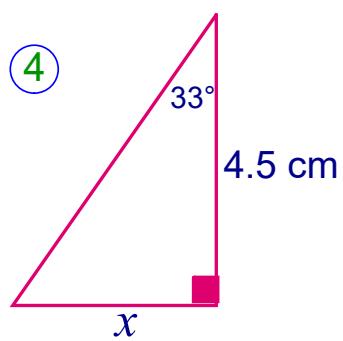
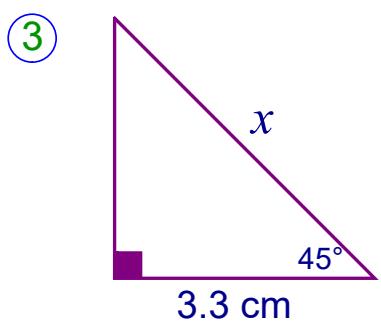
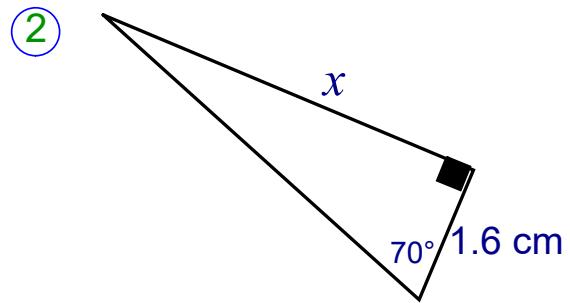
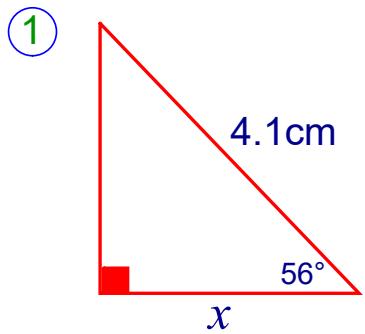
Trig ratio: tangent

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\tan 50^\circ = \frac{30}{z}$$

$$z = \frac{30}{\tan 50^\circ}$$

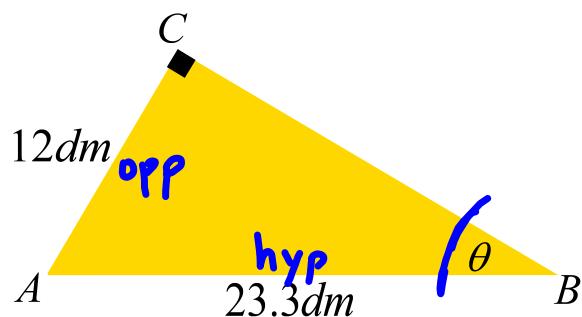
$$z = 25.17 \text{ cm}$$



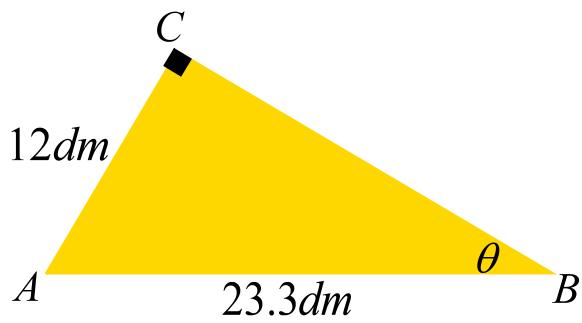
Trigonometry

Finding Missing Angles (given at least two sides)

Example:



- Locate the angle; determine, with respect to that angle, which sides you're given .
- Determine which trig ratio uses these sides.
- Set up the trig ratio, substituting the values in the appropriate places.
- Solve for the missing angle using **arccos**, **arcsin**, or **arctan** (\cos^{-1} , \sin^{-1} or \tan^{-1} on the calculator).



Wanted angle: $\angle B$

Given side: opp

Given side: hyp

Trig ratio: sine

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\sin \theta = \frac{12}{23.3} = 0.51502$$

$$\sin \theta = \sin^{-1}(0.51502)$$

$$\theta = 30.99888436^\circ$$

$$\theta = 31^\circ$$