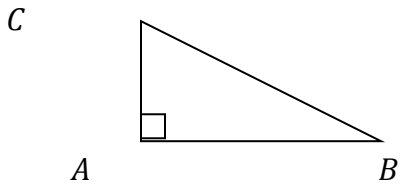
5.1 Trigonometric Ratios of Acute Angles

Part A: Introduction- Let's review

Labeling Triangles: Label the **sides** of the triangle a, b, or c.

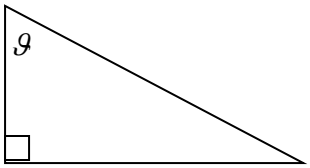


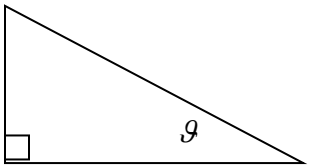
SIDES: lower case
ANGLES: upper case

*(The **hypotenuse** is always the side opposite the 90° angle and the longest side.)*

Primary Trigonometric Ratios: Sine, Cosine, Tangent

Label the triangles, opposite, adjacent, or hypotenuse, with relation to ϑ.





SOH CAH TOA

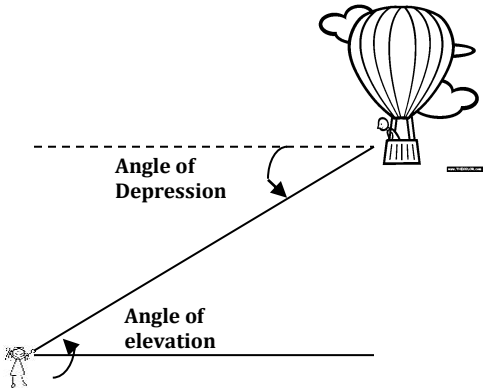
Used to find the side length or angle measure in a **RIGHT**-angled triangle

$\sin \vartheta =$ $\cos \vartheta =$ $\tan \vartheta =$

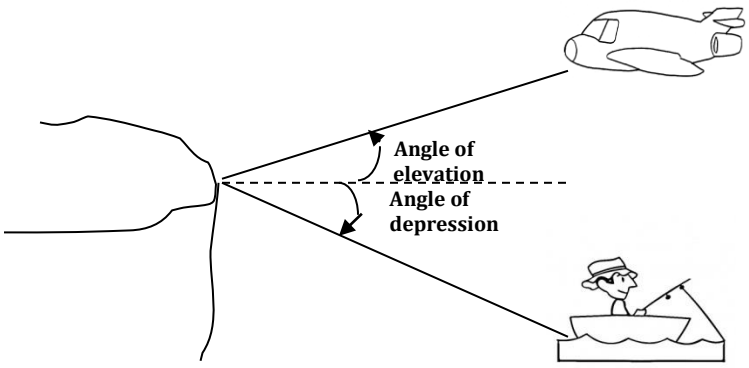
Angle of elevation/depression - the angle between the line of sight and the horizontal

Angle of elevation (angle of inclination) is the angle looking _____ from the horizontal.

Angle of depression (angle of declination) is the angle looking _____ from the horizontal.



angle of depression = angle of elevation

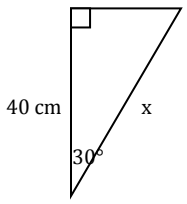


Part B: Using Primary Trigonometric Ratios

$$\sin\theta = \frac{opposite}{hypotenuse} \qquad \cos\theta = \frac{adjacent}{hypotenuse} \qquad \tan\theta = \frac{opposite}{adjacent}$$

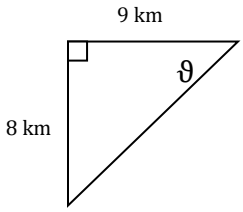
a) Determine a Side Length

Example 1: Determine the missing side to the nearest tenth of a unit.



b) Determine an Angle

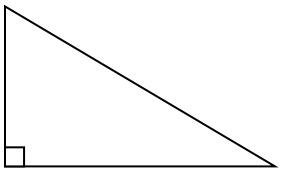
Example 2: Determine the missing angle to the nearest degree.



c) Solve a Right Triangle

Note: To solve a triangle means to determine **all** the unknown angles and side lengths.

Example 3: Solve ΔABC, given b = 4.5 cm, c = 2.0 cm and $\angle B = 90°$.



Part C: Introducing .... Reciprocal Trigonometric Ratios!

RECIPROCAL TRIG RATIOS

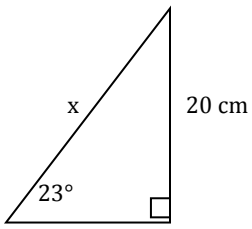
$$\csc\theta = \frac{1}{\sin\theta} = \frac{\text{hypotenuse}}{\text{opposite}} \qquad \sec\theta = \frac{1}{\cos\theta} = \frac{\text{hypotenuse}}{\text{adjacent}} \qquad \cot\theta = \frac{1}{\tan\theta} = \frac{\text{adjacent}}{\text{opposite}}$$

Ex ① Evaluate the following, to 4 decimal places or the nearest degree.

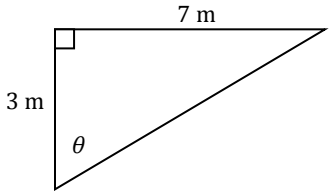
a) $\csc 35°$ b) $\sec\theta = 1.5874$ c) $\cot\theta = 1.4678$

Ex ② Use **reciprocal** trig ratios to determine the value of the unknown to the nearest tenth.

a)



b)



Ex ③ The angle of elevation to the top of the building is $74°$ from a point 65 m from the base of the building. Calculate the height of the building.

Note: The **sin** and **cos** ratios are always **less than one**, therefore **csc** and **sec** (their reciprocals) are always **greater than one**.
The **tan** ratio can be greater than or less than one, therefore **cot** ratio can also be greater than or less than one.