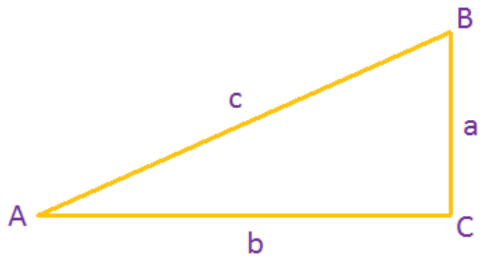
Applications and Models

Part A: Applications involving right triangles

The three angles of a right triangle are denoted by the letters A, B, and C(where C is the right angle), and the lengths of the sides opposite to these angles by the letters a, b, and c (where c is the hypotenuse)

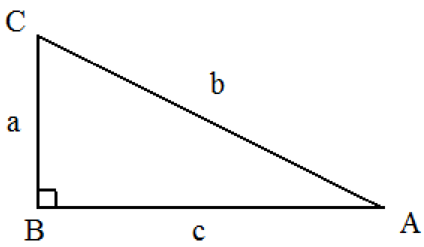


Example 1: Solve the right triangle ABC, given that $A = 35^\circ$, $a = 15$cm.

$m\angle B = 90^\circ$ (right angle)

To find the measure of angle C, we use the triangle sum theorem

$m\angle C = 180^\circ - 90^\circ - 35^\circ = 55^\circ$.



We will use the sin *ratio to find b*

$$\sin A = \frac{\text{opp}}{\text{hyp}} \Rightarrow \sin 35^\circ = \frac{15}{b} \Rightarrow b = \frac{15}{\sin 35^\circ} = 26.15\ cm$$

We will use the tan *ratio to find* c

$$\tan A = \frac{opp}{adj} \Rightarrow \tan 35^\circ = \frac{15}{c} \Rightarrow c = \frac{15}{\tan 35^\circ} = 21.42\ cm$$

1) Find a

We know angle A and the hypotenuse, so the sine function can be used to determine the length of side a.

$$\sin A = \frac{a}{c}$$

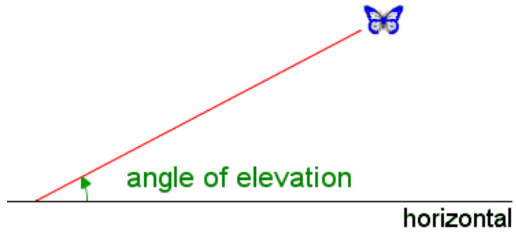
$$\Rightarrow \sin 51^0 = \frac{a}{150}$$

$$\Rightarrow a = 150\left(\sin 51^0\right)$$

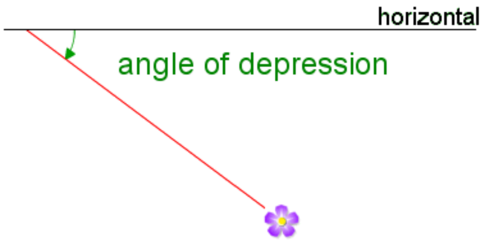
$$\therefore a \approx 116.6m$$

Angles of elevation and depression

In surveying, the **angle of elevation** is the angle from the horizontal looking **up** to some object:



The **angle of depression** is the angle from the horizontal looking **down** to some object:



Application involving Bearings

In surveying and navigation, directions are generally given in terms of bearings. A bearing measures the acute angle that a path or line sight makes with a fixed north – south line.
There are two methods for expressing bearing.

1) Single Angle Given: When a single angle is given, it is understood that the bearing is measured in a **clockwise** direction from **due north**. In general in air navigation, bearings are measured in degrees clockwise from north.