

Trigonometry Word Problems

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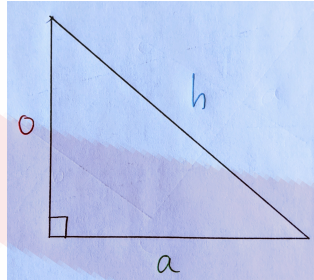
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## Trigonometry

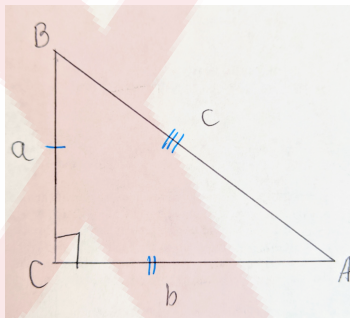
### What is trigonometry?

When I think of trigonometry I think of special trigonometric functions. There are three main trigonometric functions. We will define them using a right angled triangle and the angles within the triangle.



First some definitions. Our right angled triangle is a triangle with one  $90^\circ$  angle. The side opposite the  $90^\circ$  angle is called the *hypotenuse*,  $h$ . Let's choose one of the other angles in the triangle and label it as  $\theta$ . The side beside the angle  $\theta$  is called the *adjacent* side,  $a$ . The side opposite the angle  $\theta$  is called the *opposite* side,  $o$ . There is a relationship between the three sides of a right angled triangle called the *theorem of Pythagorus*.

### Pythagorean Theorem



### Pythagorean Theorem

$$a^2 + b^2 = c^2$$

### Trigonometric Ratios

Let's define the three main trigonometric functions in terms of a right angled triangle.

$$\begin{aligned}\sin \theta &= \frac{o}{h} \\ \cos \theta &= \frac{a}{h} \\ \tan \theta &= \frac{o}{a}\end{aligned}$$

The tangent can also be defined as,

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

## Exercises

1. From an observation tower near Lake Winnipeg, the angle of elevation of a weather balloon is  $68^\circ$ . In the same plane 35 km away, the balloon is sighted from another location with an angle of elevation of  $47^\circ$ . Calculate the distance from the weather balloon to the observation tower to the nearest tenth of a kilometre.
2. A football player is attempting a field goal. The angle formed by the player's position on the field and a line of sight to each upright is  $33^\circ$ . If the distances to the uprights are 7.5 m and 10.0 m, calculate the width of the uprights.
3. A forest ranger in a tower is 128.0 m high sights two fires in the same line of sight with angles of depression  $42^\circ$  and  $61^\circ$ . How far apart are the fires?
4. A 3.2 m ladder is resting against a wall. The base of the ladder is 1.7 m from the wall. What angle does the ladder make with the ground? At what height does the ladder meet the wall?
5. On a 360 yard golf hole a golfer drives 200 yards, but  $25^\circ$  offline. If he hits the ball 160 yards directly towards the hole in his second shot, how far short of the hole will he be?
6. The tallest sign on record is a 63 m tall sign of the Stardust Hotel, Las Vegas, Nevada. It is supported on one side by two guide wires, one to its top and one to a point just above the midpoint. Both wires are fastened to the ground at the same point and form an angle of  $13^\circ$  between them. If the angle of depression of the longer wire is  $53^\circ$ , find the length of the shorter wire.