Introduction to Trigonometry

***** Make sure that your calculator is in degree mode *****

Trigonometry – is a mathematical technique used to calculate angles and side lengths of right triangles.

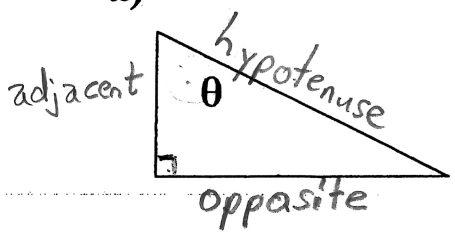
Defining Sides of a Right Triangle

Given an 'angle of interest' in a right triangle, the three sides of the triangle can be labeled as

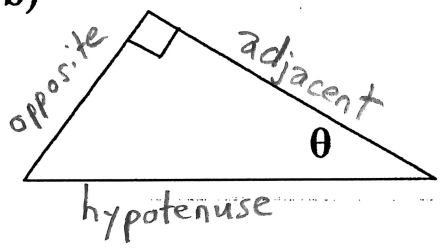
- **Hypotenuse – across from the right angle.**
- **Opposite – on the opposite side of the triangle.**
- **Adjacent - beside the angle of interest.**

Ex. 1 – Label the three sides of the each triangle as opposite, adjacent and hypotenuse relative to the 'angle of interest' Θ.

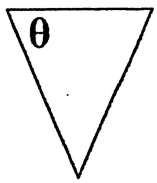
a)



b)



c)



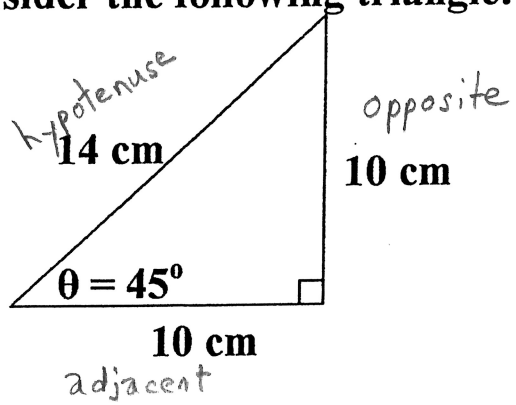
Can't label; not a right triangle.

Introducing the Tangent Function

For any right triangle,

$$\tan\theta = \frac{opposite}{adjacent}$$

Ex. 2 - **Consider the following triangle:**



a) Label the sides of this right triangle; hypotenuse, opposite, adjacent.
b) Calculate the tangent of angle θ using two methods.

Method 1

$\tan\theta = \tan(45°)$

$= 1$

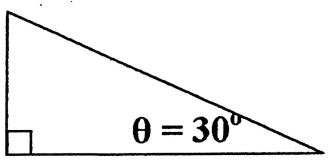
Method 2

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

$= \frac{10\text{cm}}{10\text{cm}}$ → $= 1$

Ex. 3 – Compute the tangent of θ in each diagram.

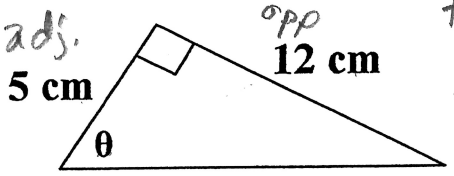
a)



$\tan\theta = \tan(30°)$

$\cong 0.577$

b)



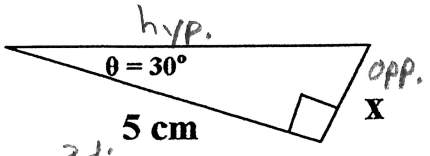
$\tan\theta = \frac{\text{opp.}}{\text{adj.}}$

$\tan\theta = \frac{12}{5}$

$\tan\theta = 2.4$

Ex. 4 – Use the tan function to determine the length of the unknown side length x.

a)



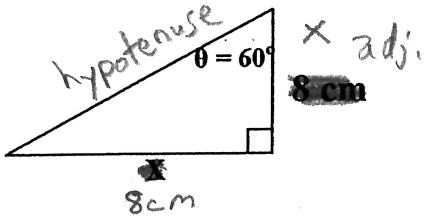
$\tan\theta = \frac{\text{opp.}}{\text{adj.}}$

$\frac{\tan(30°)}{1} = \frac{x}{5}$

$x = 5\tan(30°)$

$x \cong 2.9\text{cm}$

b)



opp

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

$\frac{\tan(60°)}{1} = \frac{x}{8}$

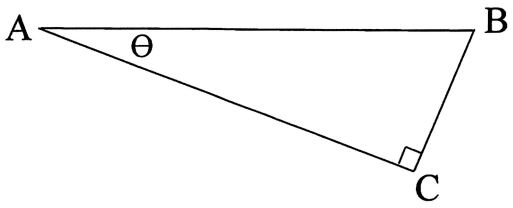
$x\tan(60°) = 8$

$\frac{x\tan(60°)}{\tan(60°)} = \frac{8}{\tan(60°)}$ → $x \cong 4.6\text{cm}$

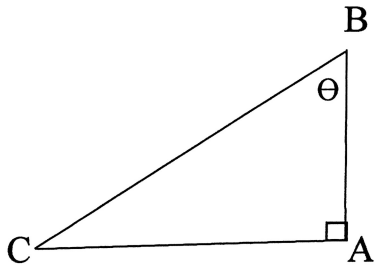
Introduction to Trigonometry – Practice

1. Consider the following triangles:

a)



b)



i) Determine, for each of the above triangles, which side would be the hypotenuse.

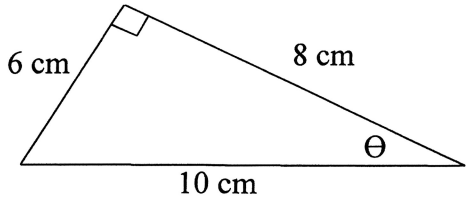
ii) Determine, for each of the above triangles, which side would be the opposite relative to angle Θ.

iii) Determine, for each of the above triangles, which side would be the adjacent relative to angle Θ.

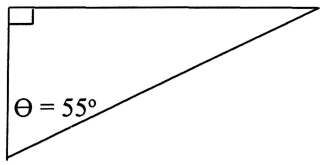
iv) Determine, for each of the above triangles, the ratio for tanΘ.

2. Determine the value of tanΘ in each triangle below; round all answers to two digits after the decimal.

a)

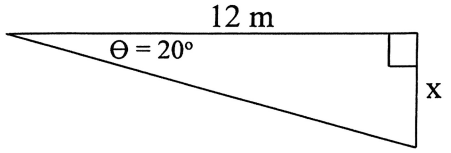


b)

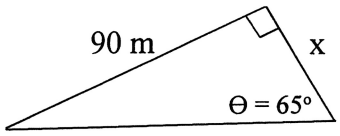


3. Determine the length of the side marked x in each diagram below.

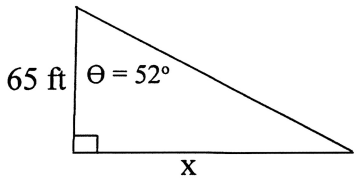
a)



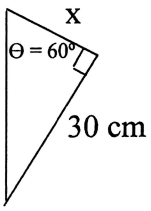
b)



c)



d)



Answers: 1. i a) AB b) BC ii) a) BC b) AC iii) a) AC b) AB iv) a) BC/AC b) AC/AB

2. a) 0.75 b) 1.43 2a) 4.4m b) 42.0 m c) 83.2 ft d) 17.3 cm