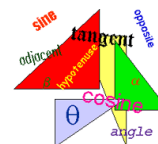


## Chapter 2 Trigonometry

↳ Sec 2.1 to 2.7



### Sec 2.1 The Tangent Ratio

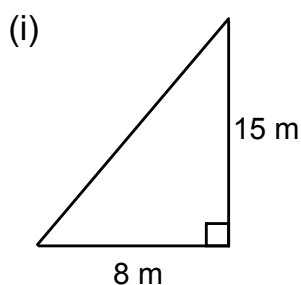
Trigonometry

- measuring the sides and angles of triangles.
- in grade 10 we will be dealing with right triangles only.

#### Example 1

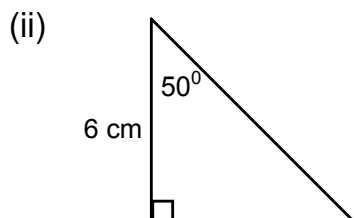
a) What do you remember about a right triangle?

b) Label the sides of the right triangle below. Find the length of the missing side to one decimal place.



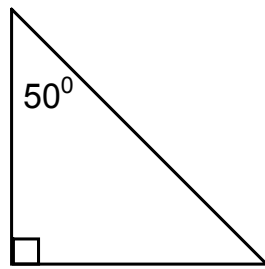
Pythagorean Theorem can be used in RIGHT TRIANGLES to find one side, when TWO SIDES ARE GIVEN!

Think about this triangle!



**Note:** We need to go over naming the sides! The name of the sides depend on the acute angle identified in the triangle.

Naming the sides of a right triangle, using the reference angle of  $50^\circ$ .



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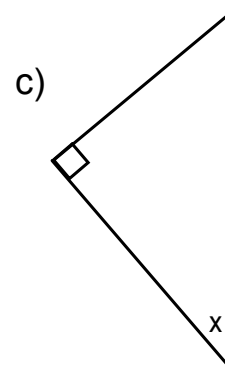
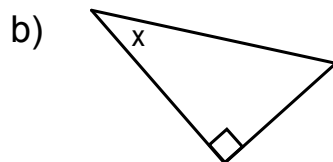
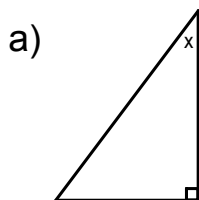
Being able to identify the three sides, hypotenuse, opposite and adjacent are VERY IMPORTANT for trigonometry.

The hypotenuse will never change, it is ALWAYS the side across from the  $90^\circ$  angle. But the opposite and adjacent sides will depend on the acute angle that is identified.

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### Example 2

Label the hypotenuse, opposite and adjacent sides, using  $\angle x$  as the reference angle.

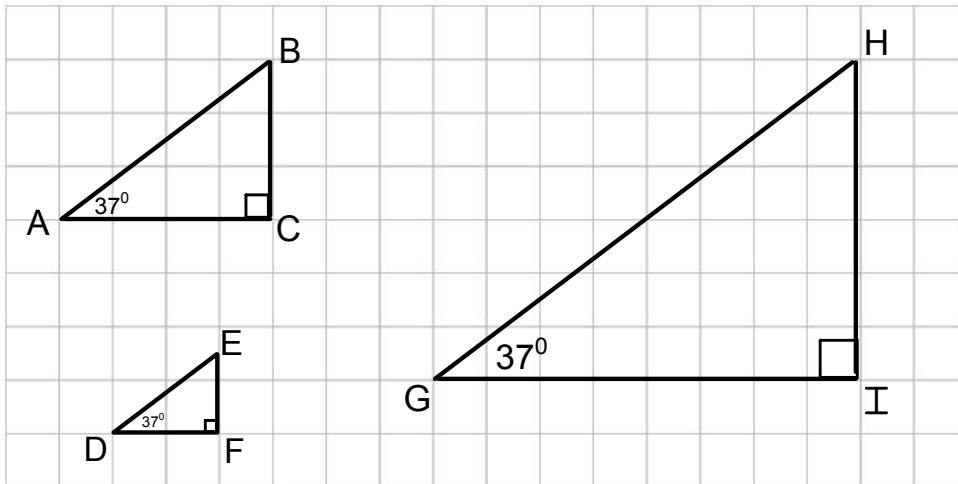


**Note:** the reference is the angle used to define the opposite and adjacent sides. We must know the reference angle in order to label the sides!

## Triangle Investigation

The 3 triangles below are the same shape and have the same angle measures. Let's investigate the ratio of their sides.

centimeter grid paper



## Questions

- What is the length of
  - BC? \_\_\_\_\_
  - AC? \_\_\_\_\_
  - What is the ratio  $\frac{BC}{AC}$  ?
- Refer to  $\angle 37^\circ$ , what is the name of
  - BC? \_\_\_\_\_
  - AC? \_\_\_\_\_
- What is the length of
  - EF ? \_\_\_\_\_
  - DF? \_\_\_\_\_
  - What is the ratio  $\frac{EF}{DF}$  ?
- Refer to  $\angle 37^\circ$ , what is the name of
  - EF? \_\_\_\_\_
  - DF? \_\_\_\_\_
- What is the length of
  - HI? \_\_\_\_\_
  - GI? \_\_\_\_\_
  - What is the ratio  $\frac{HI}{GI}$  ?
- Refer to  $\angle 37^\circ$ , what is the name of
  - HI? \_\_\_\_\_
  - GI? \_\_\_\_\_
- What do you notice?

### Investigation Summary

Each ratio (for the  $37^\circ$  angle ) is equal to :  $\frac{\textit{opposite}}{\textit{adjacent}}$

This trigonometric ratio is called **Tangent**.



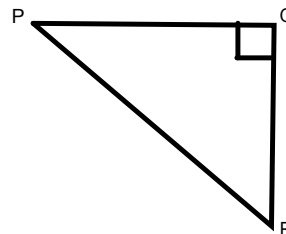
For the investigation:  $\tan 37^\circ = \frac{3}{4}$  or  $\tan 37^\circ = 0.75$

Try it on your calculator:

**IMPORTANT!** You must know how to use your calculator.  
**Calculators MUST be in DEGREE mode.**

**Example 3** Refer to  $\triangle PQR$ .

a) Write the ratio for  $\tan P$ .



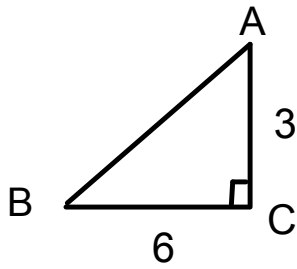
b) Write the ratio for  $\tan R$ .

Remember when the reference angle is changed it means renaming the sides!

c) What does it mean if  $\tan P = 1$ ? What would be the size of  $\angle P$ ?

## Example 4

- a) Determine  $\tan A$ . What does this number mean?

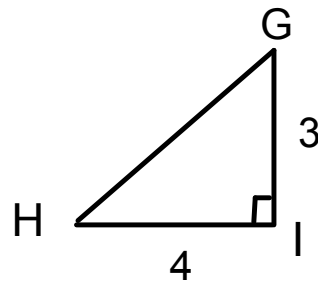


- b) Determine  $\tan B$ . What does this number mean?

- c) Why doesn't it make sense to ask for the  $\tan C$ ?

## Your Turn

- d) Determine  $\tan H$ .



- e) Determine  $\tan G$ .

## Think About This...

How do we find the measures of  $\angle H$  and  $\angle G$ ?

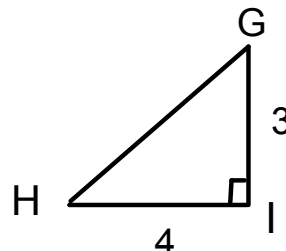
### Using Tangent to Find a Missing Angle

↳ To find a missing angle using trigonometry we must use the inverse or shift button on your calculator.

↳ **Calculator MUST be in DEGREES!**

#### Example 5

a) Determine the measure of  $\angle H$ .



b) Determine the measure of  $\angle G$ .

#### Example 6 Let's Practice!

Determine each missing angle. Round each angle to the nearest degree.

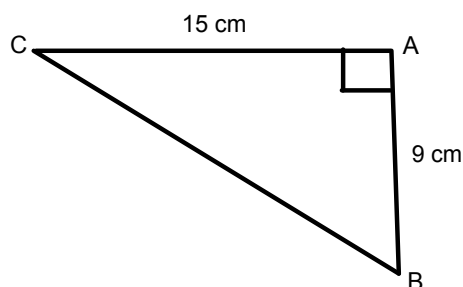
a)  $\tan A = \frac{2}{3}$

b)  $\tan B = \frac{3}{5}$

c)  $\tan C = \frac{9}{4}$

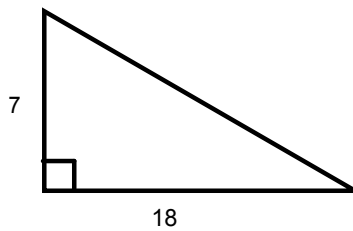
d)  $\tan D = 1.246$

#### Example 7 Determine the measures of $\angle B$ and $\angle C$ .

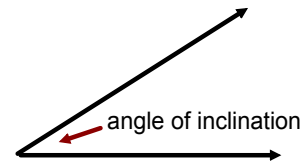


**Example 8**

Determine the angle of inclination to the nearest tenth of a degree.

**Note**

The angle of inclination is the acute angle formed with the line segment and the horizontal.

**Example 9**

The height of Holy Spirit High School is 10 meters. If Janelle is lying on the ground 4 meters from the school and looks up, what is the angle of inclination?

**Example 10**

A rectangle has dimensions 5 m by 12 m. What angle does a diagonal of the rectangle make with each side of the rectangle?

**Work Book Questions**

p.75 - 77 #3ab, 4ab, 5cd, 6ad,  
8a, 10ac, 14, 17, 21

**Extra Practice Questions**

p.75 - 77 #3cd, 4cd, 5ab, 6be, 8b,  
10bd, 15, 18