

# Right angled triangles: Part I

## - an introduction to trigonometry -

**Objective:** To determine unknown lengths in right angled triangles using similarity.






### Activity 1: Recall properties of similar triangles

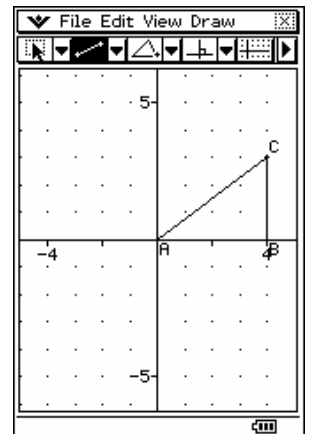


Tap  to open ClassPad's Geometry application.





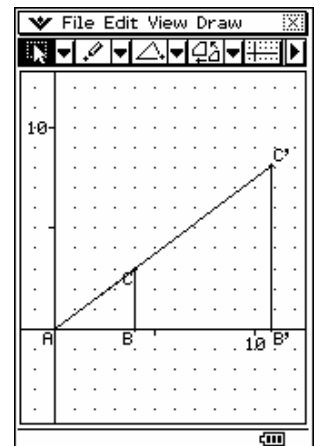
First draw a right angled triangle, 4 units wide and 3 units high:

1. On the Geometry toolbar, tap  three times to display a set of axes and grid points.
2. On the Geometry toolbar, tap the second down arrow  then select the point tool . Tap at (0,0), (4,0) and (4,3) to plot points A, B and C as shown.
3. On the Geometry toolbar, again tap the second down arrow . Now select the line segment tool . Click on point A, then on point C to join them with line segment AC. Then join C to B, and B to A, forming  $\triangle ABC$ .



Now enlarge  $\triangle ABC$ :

1. On the Geometry toolbar, tap the fourth down arrow  then choose the enlargement tool .
2. **Look closely!** At the bottom of the view window, ClassPad prompts you to "Tap dilation center"... tap at point A.
3. ClassPad also prompts for the dilation scale. Enter a number between 2 and 3.









Write your number here:

4. A second triangle ( $\triangle A'B'C'$ ) appears, bigger than the first. To see it more clearly, go to the View menu and choose "Zoom to fit".

# Right angled triangles: Part I



To measure the length of AC, choose the select tool , then tap on AC, then tap on the toolbar's right arrow  to display the measurement box. ClassPad confirms it is measuring a length  and displays the value.

To measure  $\angle ACB$ , use the select tool , tap line segments AC and BC, then tap on the toolbar's right arrow  to display the measurement box. ClassPad confirms it is measuring an angle  and displays the value.

Record your measurements here:

**$\Delta ABC$ :**

AB = 4      BC = 3      AC = \_\_\_\_       $\angle ACB =$  \_\_\_\_       $\angle CBA = 90^\circ$        $\angle BAC =$  \_\_\_\_

**$\Delta AB'C'$ :**

AB' = \_\_\_\_      B'C' = \_\_\_\_      AC' = \_\_\_\_       $\angle AC'B' =$  \_\_\_\_       $\angle C'B'A =$  \_\_\_\_       $\angle B'AC' =$  \_\_\_\_

Next compare the proportions of the two triangles:

$$\frac{AB'}{AB} =$$

$$\frac{AC'}{AC} =$$

$$\frac{B'C'}{BC} =$$

$\Delta ABC$  and  $\Delta AB'C'$  are **similar**.  $\Delta AB'C'$  is an **enlargement** of  $\Delta ABC$ .

Their corresponding angles are equal and their corresponding sides are in proportion.

You can also compare the proportions in a different way:

$$\frac{BC}{AC} =$$

$$\frac{AB}{AC} =$$

$$\frac{BC}{AB} =$$

$$\frac{B'C'}{AC'} =$$

$$\frac{AB'}{AC'} =$$

$$\frac{B'C'}{AB'} =$$

What do you notice?

**Checkpoint**

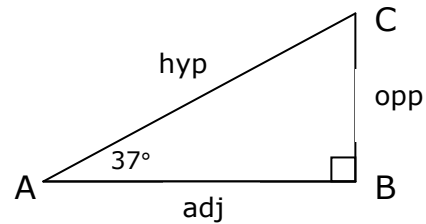


# Right angled triangles: Part I

## Activity 2: Apply the properties of similar triangles

Looking at the  $37^\circ$  angle, we see that

- side BC is **opposite** this angle
- side AB is **adjacent** to this angle
- side AC is the triangle's **hypotenuse**



Look back at your previous calculations for this triangle. Complete these statements .

$$\frac{BC}{AC} = \frac{\text{opp}}{\text{hyp}} = 0.6 \quad \text{so length of opposite side is } \mathbf{60\%} \text{ of hypotenuse}$$

$$\frac{AB}{AC} = \frac{\text{adj}}{\text{hyp}} = \quad \text{so length of adjacent side is } \underline{\quad} \text{ of hypotenuse}$$

$$\frac{BC}{AB} = \frac{\text{opp}}{\text{adj}} = \quad \text{so length of opposite side is } \underline{\quad} \text{ of adjacent side}$$

### How can we use these ratios?

If  $\triangle ABC$  is enlarged so that the hypotenuse is 70cm,  
then the side *opposite* the  $37^\circ$  angle is 60% of 70cm, or 42cm  
and the side *adjacent* to the  $37^\circ$  angle is  $\underline{\quad}\%$  of 70cm, or  $\underline{\quad}$ cm.



1. If  $\triangle ABC$  is enlarged so that the hypotenuse is 90cm,
  - a) how long is the side *opposite* the  $37^\circ$  angle?
  - b) how long is the side *adjacent* to the  $37^\circ$  angle?
2. If  $\triangle ABC$  is enlarged so that the hypotenuse is 160cm,
  - a) how long is the side *opposite* the  $37^\circ$  angle?
  - b) how long is the side *adjacent* to the  $37^\circ$  angle?
3. If  $\triangle ABC$  is enlarged so that the side adjacent to the  $37^\circ$  angle is 250cm,
  - a) how long is the side *opposite* the  $37^\circ$  angle?
  - b) how long is the *hypotenuse*?
4. If  $\triangle ABC$  is enlarged so that the side opposite the  $37^\circ$  angle is 600cm,
  - a) how long is the side *adjacent* to the  $37^\circ$  angle?
  - b) how long is the *hypotenuse*?



**Checkpoint**