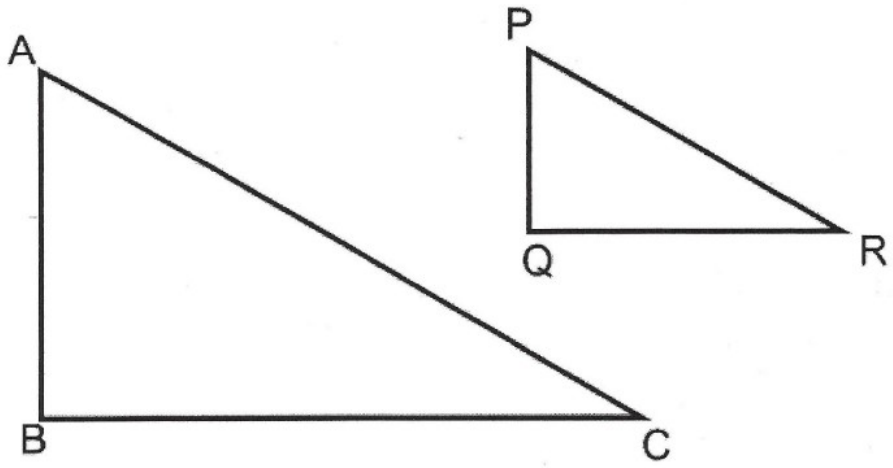
1.1 Similar Triangles

Investigate Similar Triangles



1. Using a protractor, measure the angles in △ABC and △ PQR. Record your measurements in the table below.

2. Using a ruler measure the lengths of each side. Record your measurements in the table below.

△ABC		△PQR		Ratios
Angles	Lengths	Angles	Lengths	
$\angle A =$ 60°	$\overline{AB} =$ 4.7cm	$\angle P =$ 60°	$\overline{PQ} =$ 2.5cm	$\frac{\overline{AB}}{\overline{PQ}} = \frac{4.7}{2.5} = 1.88$ ~1.9
$\angle B =$ 90°	$\overline{BC} =$ 8cm	$\angle Q =$ 90°	$\overline{QR} =$ 4.2cm	$\frac{\overline{BC}}{\overline{QR}} = \frac{8}{4.2} = 1.9$ ~1.9
$\angle C =$ 30°	$\overline{AC} =$ 9.3cm	$\angle R =$ 30°	$\overline{PR} =$ 5cm	$\frac{\overline{AC}}{\overline{PR}} = \frac{9.3}{5} = 1.86$ ~1.9

3. How are the angles in the triangles related?

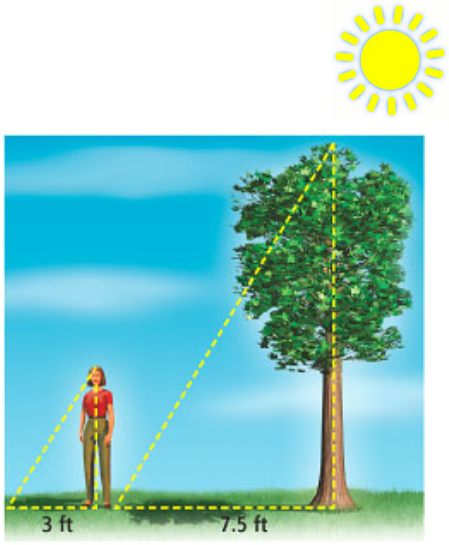
Angles are the same!

4. Evaluate the ratios in the third column of the table. What do you notice?

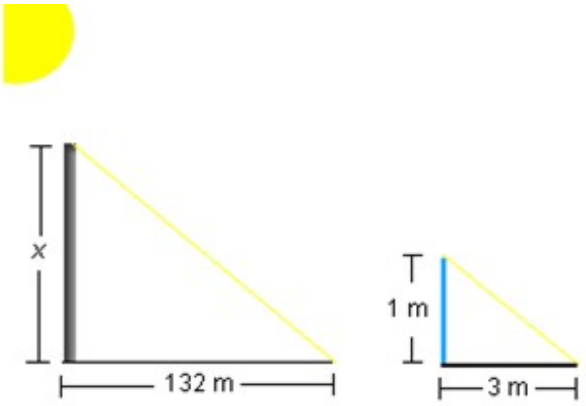
Same! (when accounting for measurement error)

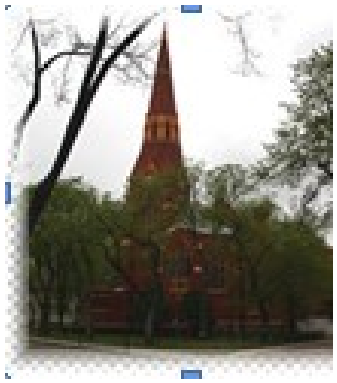
Shadows and Similar Triangles

At any given time of day, the sun's rays meet objects on earth at the same angle, forming shadows. Similar triangles are formed as shown in the diagram.



Ex. 1 Saskatoon's St. John's Anglican Cathedral has the highest church spire in Western Canada. The illustration shown below gives you some of the necessary dimensions to determine the unknown height of the church steeple and spire.



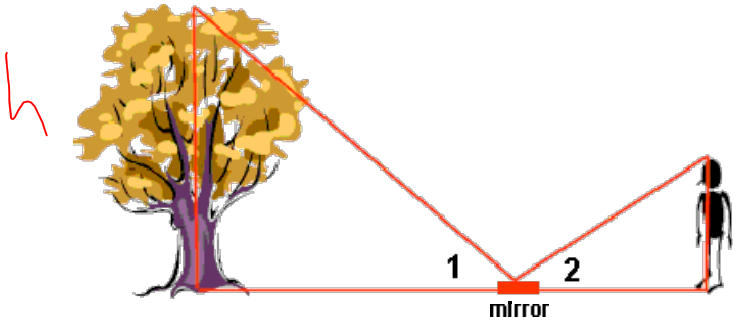


$\frac{x}{1} = \frac{132}{3}$

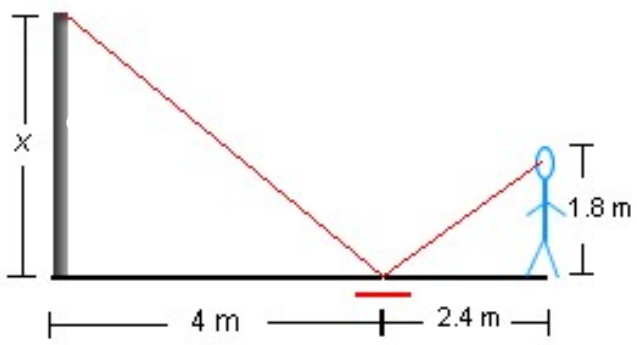
Big △ side / Small △ side

Mirrors, Reflections and Similar Triangles

When you see an image in a mirror, two equal angles are formed.
Similar triangles are formed as shown in the diagram.



Ex. 2 This statue can be found in Saskatoon. Use the information below to determine the unknown height of the statue (including base).

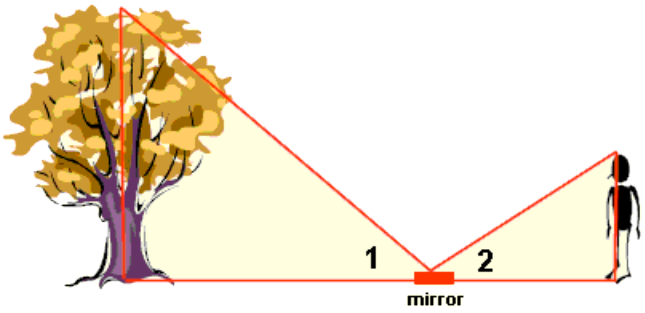


(Explain verbally)

Activity for measuring heights using similar triangles.

Materials: mirror, tape measure

You are going to be using a mirror to measure the height of a tree (or any object).
When you see an image in a mirror, two equal angles are formed (< 1 = < 2)
-- these angles are called the angles of incidence and reflection.

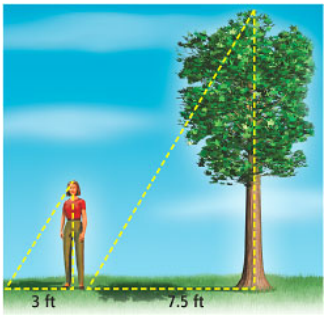


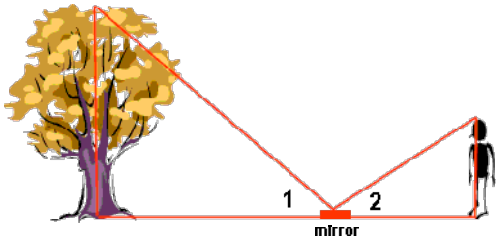
Using the manipulative:

1. Work with a partner.
2. Place the mirror on the ground between you and the tree (or object).
3. Move back from the mirror until you can see the top of the tree (or object) in the mirror.
4. Measure and record the distance from your feet to the top of the tree (or object) in the mirror.
5. Measure and record the distance from the top of the tree (or object) in the mirror to the foot of the tree (or object).
6. Measure and record your height.

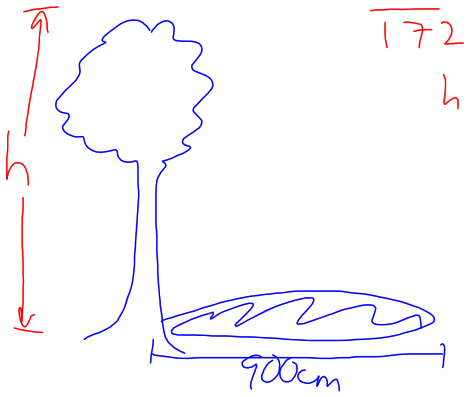
1.2 Similar Triangles

1. Use similar triangles to determine the heights of 4 items that would normally be difficult to measure.
2. Include a labeled diagram for each example. Determine the height of the object. Show your work.
3. You must include two examples using shadows and two examples using a mirror.





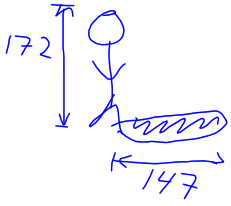
Example 1 (shadow)



$\frac{h}{172} = \frac{900}{147}$

$h = \frac{900(172)}{147}$

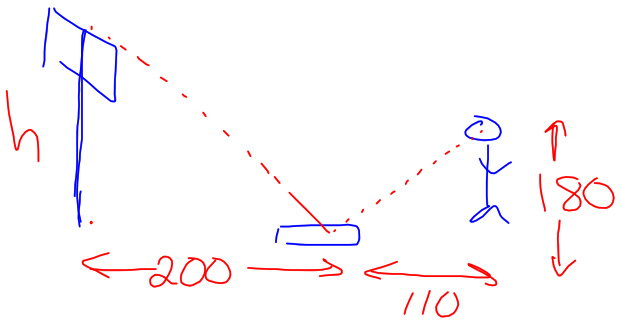
$= 1053\text{ cm}$



∴ Tree is ~10m tall

Example 2 (shadow)

Example 3 (mirror)



$\frac{h}{180} = \frac{200}{110}$

$h = \frac{180(200)}{110}$

$= 327\text{ cm}$

$\therefore$ Sign is 3.2 m tall

Example 4 (mirror)