

Measuring the Inaccessible

THREE METHODS FOR INDIRECT MEASUREMENT

Shadow Method

Assume:

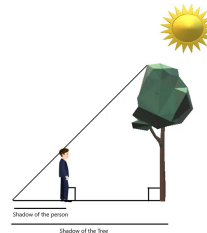
Triangular similarity — by AA~

Reasoning:

Proportion to set up:

person height / person shadow = object height / object shadow

Picture:



Example:

A student who is 1.5 m tall casts a shadow 2 m long. At the same time, a lamppost casts a shadow 10 m long.

- Draw a diagram.
- Find the height of the lamppost.
- State why the triangles are similar.

Mirror Method

Assume:

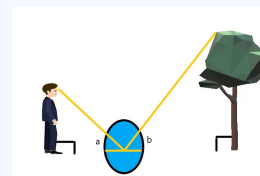
Triangular similarity — by AA~

Reasoning:

Proportion to set up:

eye height / distance to mirror = object height / object distance from mirror

Picture:



Example:

A mirror is placed on the ground 2.5 m from a wall. A student stands 1.25 m from the mirror and sees the top of the wall. The student's eye height is 1.6 m.

- Draw and label the triangles.
- Find the height of the wall.
- Which similarity shortcut applies?

Angle Method — Line of Sight

Assume:

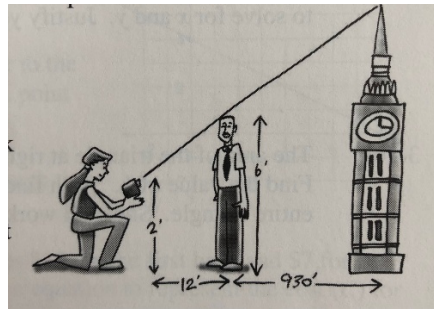
Triangular similarity — by AA~

Reasoning:

Proportion to set up:

distance to unknown / unknown height =
distance to known / known height

Picture:



Example:

Use the picture to solve for the height of Big Ben.

add Big Ben angle-of-sight image here

a) Solve for the height.

b) State your assumptions.

THE LAW OF REFLECTION — *derived from similarity*

Law of Reflection — Derived from Similar Triangles

The two triangles formed in the mirror task are similar by AA~ because:

Therefore, the corresponding angles at the mirror are:

This is the Law of Reflection:

Angle of incidence = Angle of reflection