Geometry A
6.4: AA~ Applications

Name: ___________________________
Date: _________________ Period: ____

- I can use AA~ to set up and solve proportions.
- I can use AA~ to solve indirect measurement problems in the real world.

The heights of very tall structures or structures that would be impossible to measure in a traditional manner can be measured indirectly using similar figures and proportions. This method is called ***indirect measurement.***

Example 1: Shadow reckoning
This method is credited to Thales, a Greek scientist, engineer, and mathematician. Legend says that he was the first to determine the height of the pyramids in Egypt by examining shadows made by the sun. Here is an example of this technique:

A building casts a shadow 174 meters long. At the same time, a pole 5 meters high casts a shadow 15 meters long. What is the height of the building?

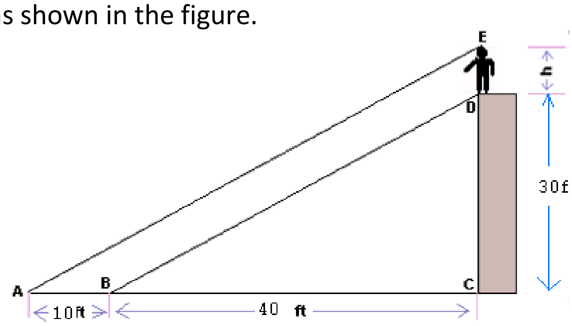
a) Draw and label a diagram to represent the scenario described.

b) Since the shadows were formed at the same time, the angles formed by the shadow and the sun's ray are congruent. What other angles can we say are congruent?

c) Are the triangles similar? If so, can we set up a proportion to find the height of the building? What is the height of the building?

Example 2: Shadow technique with a twist

A building height is 30 ft. A man is standing on the building of height *h* ft. The shadow of the building is 40 ft and shadow of man is 10 ft. So find the height of man as shown in the figure.



Example 3: Using a mirror

We can place a mirror on the ground to help us estimate the height of tall objects. Here is an example of this technique:

Raymond wanted to estimate the height of a tall tree. He placed a mirror on the ground 26 feet from the tree, and walked backwards until he could see the top of the tree in the center of the mirror. Raymond is now 6.5 feet from the mirror, and his eye level is about 5.5 feet above the ground. What is the height of the tree?

a) Draw a diagram to represent the scenario.

b) Since the angle of reflection is equal to the angle of refraction, the two angles at the mirror are congruent. What other angles can we state are congruent?

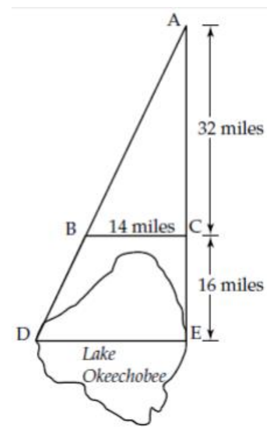
c) Are the triangles similar? If so, can we set up a proportion to find the height of the tree? What is the height of the tree?

Example 4: Distance across a lake

A surveyor used the map to the right to find the distance across Lake Okeechobee. In the diagram, $\overline{BC} \parallel \overline{DE}$.

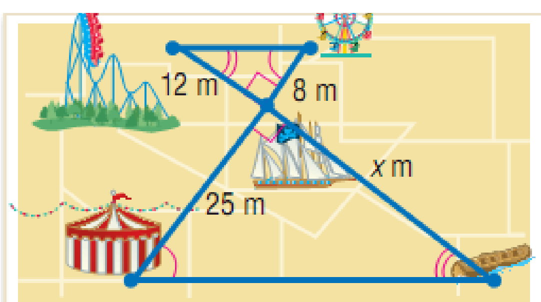
a) Explain why $\Delta ABC \sim \Delta ADE$

b) Set up and solve a proportion to find the length of Lake Okeechobee.



Example 5:

How far is it from the log ride to the pirate ship?

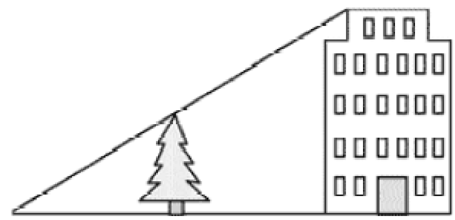


Geometry A
Section 6.4 AA~ Applications Homework

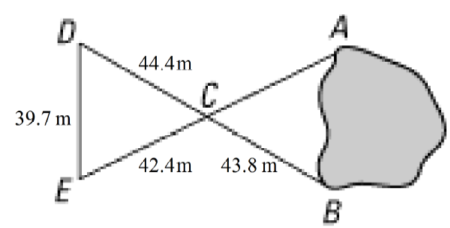
Name : ___________________________________
Date : _______________________ Period : ____

1. A woman who is 5' 4" tall casts a shadow that is 40 inches long. A child who is 58 inches tall is standing next to the woman. How long is the child's shadow?

2. Moody wants to find the height of the tallest building in his city. He stands 422 feet away from the building. There is a tree 40 feet in front of him, which he knows is 22 feet tall. How tall is the building? Round to the nearest foot.



3. Points A and B are located almost at opposite ends of a lake. A survey crew plotted lines AE and BD such that $\angle CDE \cong \angle ABC$ and made the measurements shown in the diagram.
   a. What reason can you give to justify that ΔDCE is similar to ΔBCA?

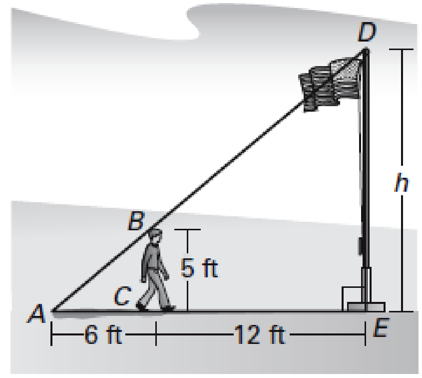


   b. Which side of ΔDCE corresponds to the 43.8 m side of ΔBCA?

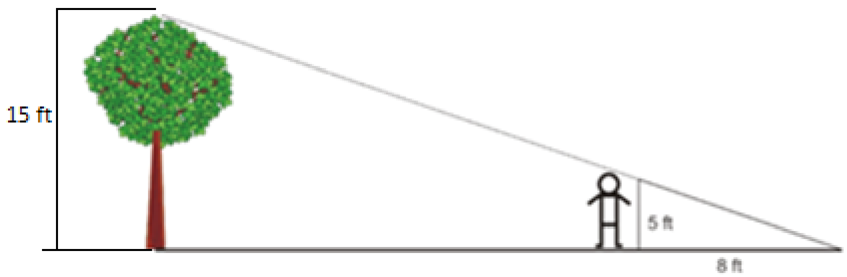
   c. Write and solve a proportion to find the distance between point A and B. Round to the nearest tenth.

4. In order to estimate the height *h* of a flagpole, a 5 foot tall male student stands so that the tip of his shadow coincides with the tip of the flagpole's shadow. This scenario results in two similar triangles as shown in the diagram.
   a) Why are the two overlapping triangles similar?

   b) What is the height *h* (in feet) of the flagpole?



5. Please find the distance from the person to the tree.



Answer Key:

1) 36.25 inches
2) 232 feet
3) a. Angle-Angle Similarity b. DC = 44.4 m c. AB = 39.2 m
4) a) They are similar by AA~. Both triangles are right triangles and have $\angle$A in common.
   b) 15 ft
5) 16 feet