Grade 8 Mathematics
Geometry: Lesson 12

Read aloud to the students the material that is printed in **boldface type** inside the boxes. Information in regular type inside the boxes and all information outside the boxes should **not** be read to students. Possible student responses are included in parentheses after the questions.

NOTE: The directions read to students may depend on the available materials. Read only those parts of the lesson that apply to the materials you are using.

Any directions that ask you to do something, such as to turn to a page or to hand out materials to students, will have an arrow symbol ( ) by them.

Purpose of Lesson 12:

- In this lesson, the tutor and the students will
  - ✓ demonstrate conceptual and practical understanding of similarity.

Equipment/Materials Needed:

- Copies of Student Sheets 111 and 112
- Paper and pencils
- Chalkboard

Preparations before beginning Lesson 12:

- Run one copy of Student Sheets 111 and 112 for each student.
- Have paper and pencils available.
- You should cover Lesson 14 of Number Relations before beginning this lesson.

Lesson 12: Geometry

Say:

In Lesson 4 of Geometry, you briefly looked at similar figures. Similar figures have to have the same shape, but do not have to be the same size. In Lesson 11 of Geometry, you looked at reductions and enlargements. Both reductions and enlargements produce figures similar to the original figure.
In this lesson, you will learn more about what it means to have the same shape. When you were in lower grades, you learned that all three-sided figures have the same shape – that of a triangle. That definition was all that you needed at the time; but if you look at different triangles, you know that they don't all have exactly the same shape. You are going to refine your definition of *same shape.*

Give students Student Sheet 111. Have the students discuss in detail the first two questions.
Answers.
1. All of the triangles have three sides and three angles. They are all closed figures. They are all polygons.
2. They look different. The sides are not all the same lengths. The angles have different measures.

Say:

Even though all of the figures are triangles, they are not similar figures. Similar figures must have the following:
a. corresponding (or matching) angles that are congruent (have the same measure), and
b. corresponding (or matching) sides that are proportional.

Let's look at the two rectangles on Student Sheet 111. Which are matching, or corresponding, angles? (∠A and ∠E, ∠B and ∠F, ∠C and ∠G, and ∠D and ∠H. If we flipped one figure over, the corresponding angles could be ∠A and ∠F, ∠B and ∠E, ∠C and ∠H, ∠D and ∠G.) **Do the corresponding angles have the same measure?** (yes) **How do you know?** (All of the angles in a rectangle measure 90°.) **Are the corresponding sides proportional?** (yes) **How do you know?** (I can make equivalent ratios. $\frac{4}{12} = \frac{8}{24}$ The figures are similar.)

Say:

Let's look at the two triangles on Student Sheet 111. Which are matching or corresponding angles? Be careful. One triangle has been rotated. (∠A and ∠E, ∠B and ∠F, ∠C and ∠D) **How could you tell which angles were matching or corresponding?** (∠A and ∠E are both right angles, ∠B and ∠F have the symbols on them that show that their measures are equal, so ∠C and ∠D have to be matching angles. **Do the corresponding angles have the same measure?** (Yes.) **How do you know?** (Since two sets of angles are congruent, the third set must be.) **Are the corresponding sides proportional?** (Yes.) **How do you know?** (I can make equivalent ratios. $\frac{4}{16} = \frac{3}{12}$ or $\frac{4}{16} = \frac{5}{20}$ or $\frac{5}{20} = \frac{3}{12}$, etc. The figures are similar.)

Say:

If you know that two figures are similar, you can use the ideas of proportions or equivalent ratios to find the lengths of unknown sides. Look at the two rectangles at the bottom of Sheet 111. You know the lengths of the two sides of the first rectangle, but you know only one length in the second rectangle. Set up a proportion.

$\frac{2}{6} = \frac{x}{18}$ **Solve the proportion for *x*.** ***x* = 6**

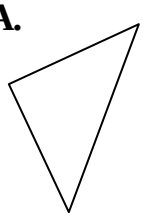
Give students Student Sheet 112.

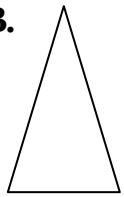
Answers:

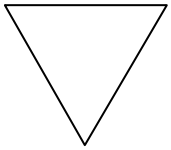
1. No. $\frac{2}{4} \neq \frac{6}{8}$
2. No. $\frac{5}{15} \neq \frac{3}{10}$
3. 4 m
4. 10 m
5. 8 m
6. 12 m
7. 20 m
8. 6 ft.
9. 9 m

Have one student summarize today's lesson. Similar triangles allow you to find lengths of missing sides of triangles.

Student Sheet 111 (Geometry: Lesson 12)

A. 

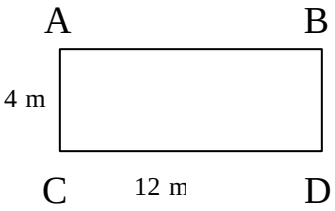
B. 

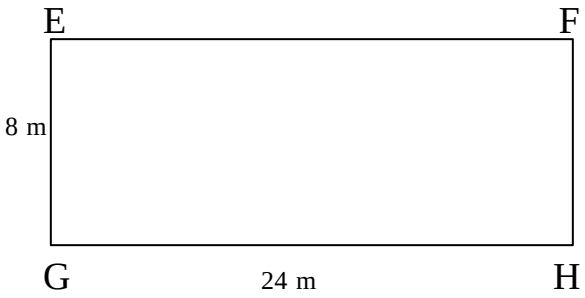
C. 

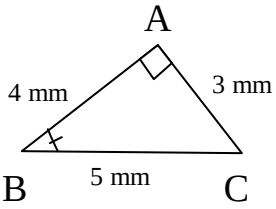
D. 

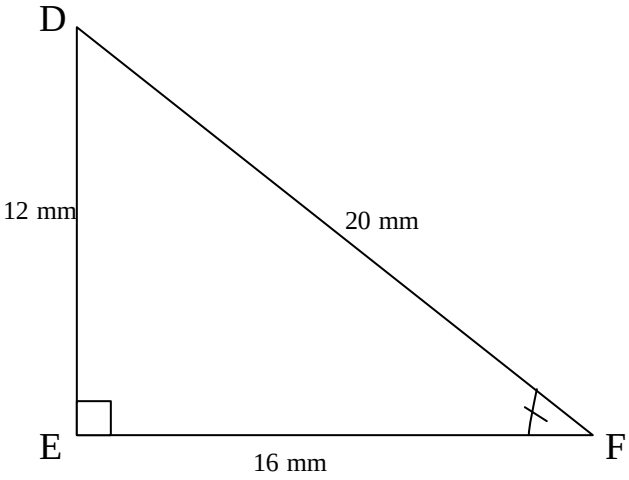
1. How are the above triangles alike?

2. How are the above triangles different?

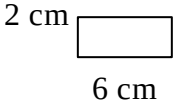




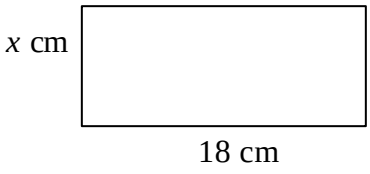




A.



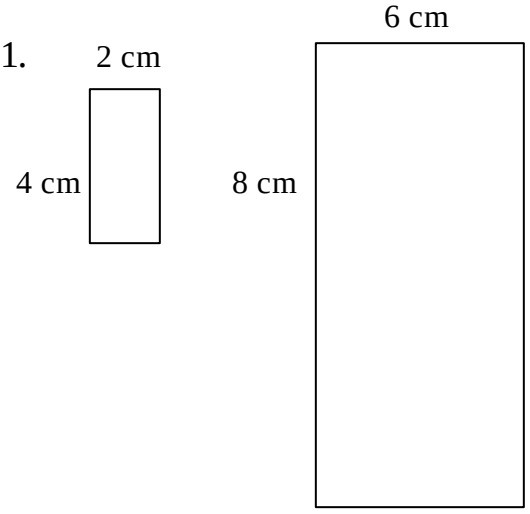
B.



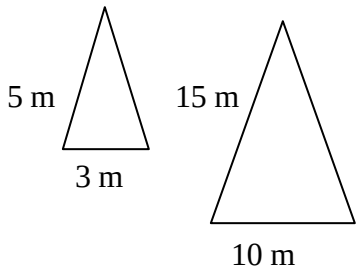
Student Sheet 112 (Geometry: Lesson 12)

Tell whether each pair of polygons is similar. Justify you answer. Assume all corresponding angles have the same measure.

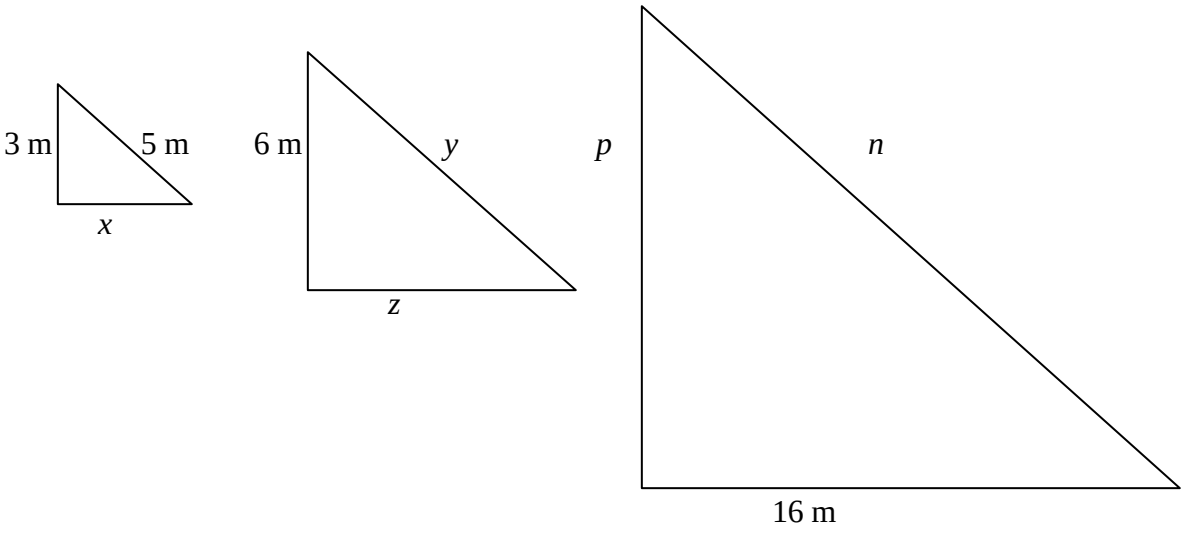
1.



2.



The figures shown are similar figures. Answer Questions 3 – 7 about them.



What is the length of each of the following sides?

3. x = _____

4. y = _____

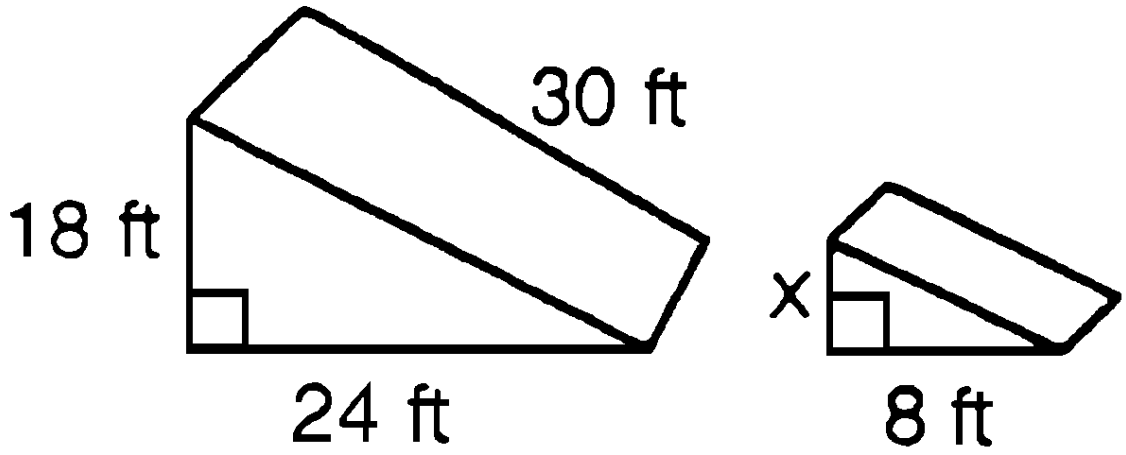
5. z = _____

6. p = _____

7. n = _____

Student Sheet 112 (Geometry: Lesson 12) continued

8. If the water skiing ramps shown contain similar triangles, what is the height of the smaller ramp?



9. A surveyor uses the similar triangles shown to find the distance, *d*, across the lake. What is this distance?