

Objective

Construct figures using scale factors of 2 and 3.

Common Core State Standards

- **7.G.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

Geometry

Scale Factor

The concept of proportionality is a key concept for students in the 7th and 8th grades. Students are expected to develop facility with ratios, rates, and proportions. This includes solving problems related to scale and the properties of similar figures. Students also need to develop their computational skills with rational numbers.

Try It! Perform the Try It! activity on the next page.

Talk About It

Discuss the Try It! activity.

- **Ask:** Which AngLegs piece will complete the right triangle?
- **Ask:** What are the dimensions of the second ramp? What is the scale factor when compared to the first ramp?
- **Ask:** What are the dimensions of the third ramp? What is the scale factor when compared to the first ramp?
- **Ask:** What is the scale factor if you compare the third ramp to the second ramp that Jonathan and his friends built?

Solve It

Reread the problem with the students. Ask students to describe the relationship between the first and second triangles. Have students write a paragraph identifying what they know about the lengths of the sides of the three triangles and what they know about the angles of the triangles.

More Ideas

For other ways to teach about scale factors—

- Students can use the XY Coordinate Pegboard to “grow” triangles with a given scale factor. They can also create square and rectangular structures on the board.
- Challenge students to build additional similar triangle triples with other AngLegs® pieces. (They do not have to be right triangles.) Have them compute the dimensions of the sides of the similar triangles.
- Have students make a large triangle on a Geoboard. Tell them to add a segment (rubber band) parallel to one side of the original triangle. Have them measure the corresponding sides of the two triangles and find the scale factor. Caution students that the scale factor will probably not be a whole number.

Formative Assessment

Have students try the following problem.

Amanda is building a $\frac{1}{12}$ scale model of an ultralight airplane. If the actual airplane has a wingspan of 30 feet, what will the wingspan of the model be?

- A. 2.5 feet B. 3 feet C. 4 feet D. 12 feet

Try It! 30 minutes | Pairs

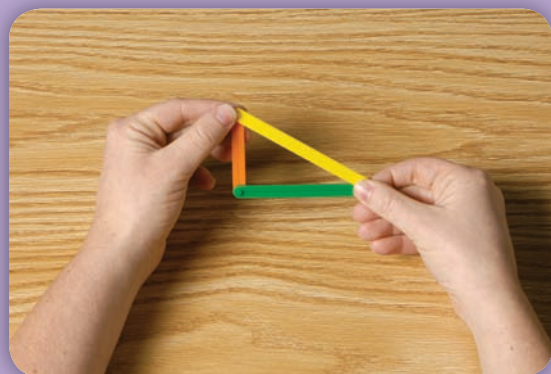
Here is a problem about scale.

Jonathan and his friends are designing and building a dirt bike course. They want to construct three takeoff ramps that are different sizes but that are similar in shape. The length (slanted portion) of the first, and smallest, ramp will be 1.87 meters. What will be the lengths of the second and third ramps if the friends use scale factors of 2 and 3 to build them?

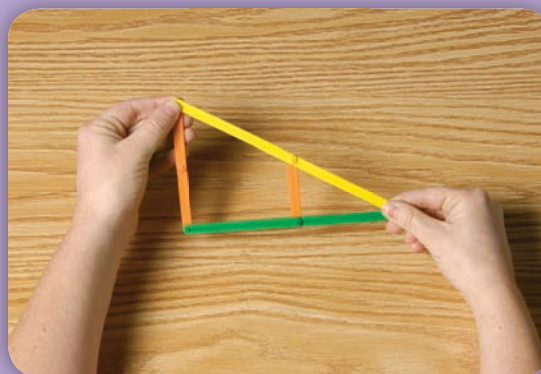
Introduce the problem. Then have students do the activity to solve the problem. Distribute the materials.

Materials

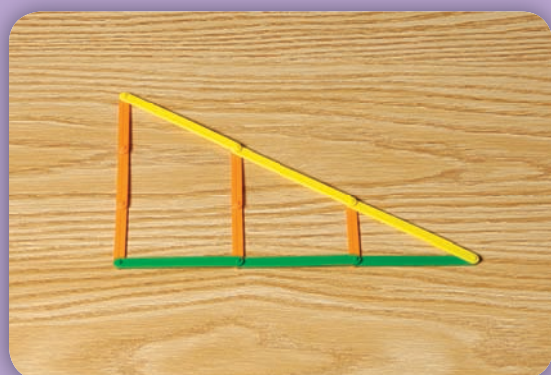
- AngLegs® (at least 3 green, 3 yellow, and 6 orange)



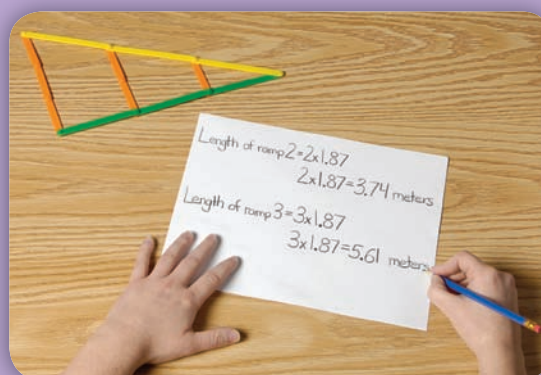
1. Say: Construct a right angle with a green AngLegs piece as the base and an orange piece as the "upright." Have students find the AngLegs piece that completes the right triangle (yellow). **Say:** Now you have constructed the smallest ramp.



2. Say: Extend each of the sides of the ramp with AngLegs pieces of the appropriate color. Be sure students realize that they will need two orange pieces to form the "upright" of the larger triangle. **Say:** The scale factor of this larger triangle is 2 because each side of the triangle is two times the original. Remind students that the dirt bike ramps are like these similar triangles.



3. Say: Extend each side again by adding another AngLegs piece of the same color as the others on that side. This forms another, larger triangle whose dimensions have a scale factor of 3.



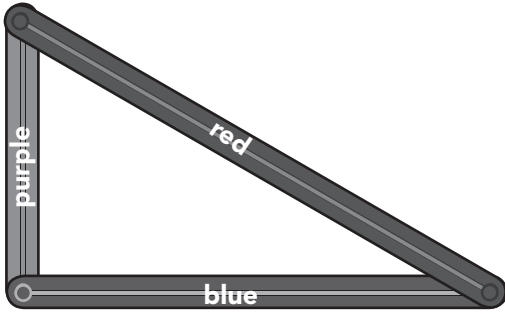
4. Say: You have constructed models of three different, but similar, ramps. **Ask:** In the story problem, what is the length of the first ramp? **Ask:** What is the scale factor for the second ramp? What is its length? **Ask:** What is the scale factor for the third ramp? What is its length?



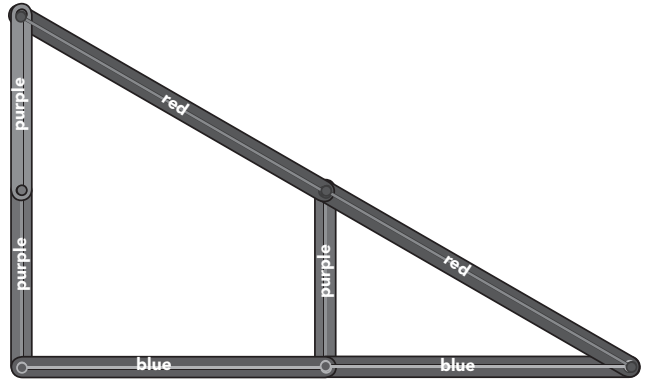
Use AngLegs to model the triangles shown. Write the scale factor for Triangle 2.

(Check students' work.)

1. Original Triangle



Triangle 2



The scale factor of Triangle 2 is 2.

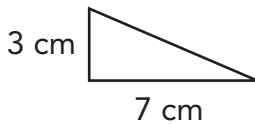
Using AngLegs, build a triangle with the legs named. Then build a triangle with a scale of 3:1. Sketch the models.

2. orange, yellow, and purple

Check students' models.

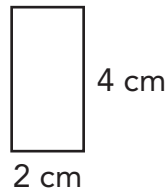
Draw each figure using the scale factor given.

3. scale factor of 2



The triangle has height 6 cm and base 14 cm.

4. scale factor of 3



The rectangle has length 6 cm and width 12 cm.

Answer Key

Challenge! Triangle B has a scale factor of 2:1 to Triangle A. Which triangle is larger and by how much? Draw a picture.

Challenge: (Sample) Triangle B is 2 times bigger than Triangle A.

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