

# Scaling Up!

## A Lesson for Grades 6–8

**Kathy Melanese, Luz Chung, and Cheryl Forbes**  
(Education Studies Program, University of California, San Diego)

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### Overview of Lesson

In this lesson students work on multiple measurement concepts, including measuring length, scale, ratio, and proportion. Students apply all the concepts in an activity that involves enlarging a picture to scale so that it fits on a piece of graph paper. Students must take measurements, determine the ratio they will need to enlarge the picture, and finally, ensure that the drawing is proportional. At the end of the lesson, students discuss and write about the steps they took to create their scaled-up drawing.

### Lesson Objective

Students will be able to solve problems involving scale factors, using ratio and proportion as measured by a scaled-up drawing of a figure.

### Language Objective

Students will sequence the steps they used to solve the problem of creating a scale drawing using math vocabulary and sequence words.

### References

- Adapted from the lesson “Scaling Up and Down” (145) in *Sizing Up Measurement: Activities for Grades 6–8 Classrooms* by Ann Lawrence and Charlie Hennessy (2007).

### Materials

- Scaling Up! Recording Sheet (Reproducible 6–1A), 1 per student
- Scaling Up! Directions (Reproducible 6–1B), 1 per pair of students
- Sample scaled-up drawing and directions (for display; a cartoon character works well)
- Pictures for students’ scaled up drawings, 1 per pair of students (these pictures can be student-made or they can be obtained from various media sources including clipart, google images, cartoon stocks, etc.)
- Scaling Up! Table for Converting Measurements (Reproducible 6–1C), 1 per pair of students (optional)



- Grid paper, 34 × 27 inches (or any other large- size grid paper) with 1-inch squares, 1 piece per pair of students
- Paper ruler, 2 × 27 inches, cut from the grid paper (Figure 6.4), 1 per pair of students

## **Reviewed Vocabulary**

proportion, proportional, ratio, scale, scale factor, similar figures



## Lesson Outline

### 1. Introducing academic language

- Hand out *Scaling Up! Recording Sheet* (Reproducible 6–1A).
- Have students work in pairs.
- To tap into students’ prior knowledge, ask students to fill out the *Scaling Up! Recording Sheet* with as much information as possible. A possible prompt could be:

Use your own words, written explanations, drawings, or examples to illustrate what you know about each concept.

- Ask students to share out.
- As students share out, record students’ responses for everyone in the classroom to see.
- Before moving on to the next step of the lesson, be sure that students are able to give concrete examples of each of the concepts presented in the *Scaling Up! Recording Sheet*.

### 2. Introducing the activity

- Let students know that they will be **scaling up** a picture. Be sure to emphasize that the scaled-up picture should be **proportional** to the original picture. If necessary, review the concepts presented in step 1.
- Show students the “paper ruler” (Figure 6.4), and explain that this is the tool students will be using to do all their measurements in this activity.

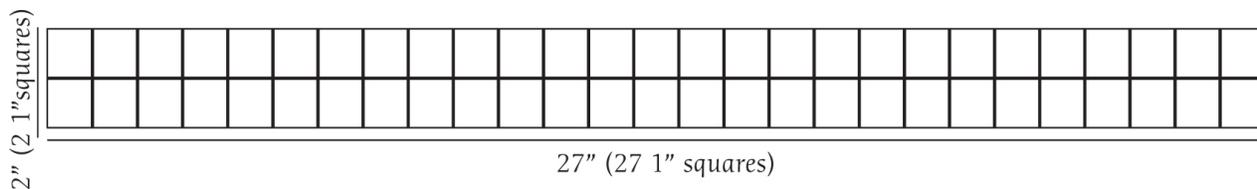


Figure 6.4

- Have a discussion with students as to how they could use these nonstandard rulers to measure a picture.
- Distribute and explain the written directions, *Scaling Up! Directions*, to help students with the next task (Reproducible 6–1B).



### 3. Modeling academic language

- Model each step of the *Scaling Up* activity by explaining each step you followed to scale-up a picture. Show students the original, and your scaled up version of the picture.
- While demonstrating each step, make reference to the sentence starters (sequence words) and the academic terms that you want students to use in their descriptions of how they made their scale drawings later in the lesson. This is a suggested chart:

Key Vocabulary	Sentence Starters (Sequence Words)
Scale	First, In the beginning, At first
Scale drawing	Then, Next, After that, Following____
Similar figures	Finally, At the end, Lastly

- Model how you would use the sentence starters to explain each of the steps you took to scale up your picture.
- Important:** The purpose of modeling is not to give students too much direction as to how to create proportions, but to elicit students' use of academic language within the context of this activity.

### 4. Making scale drawings

- Distribute a variety of pictures, one per pair of students (these pictures can be student-made or they can be obtained from various media sources including clipart, google images, cartoon stocks, etc.)
- Circulate around the room, and pay particular attention to how students use academic language when making decisions during the activity.

### 5. Writing directions

- When students have completed their scaled drawings, let students know that they will be writing the directions explaining how they completed the task.
- Model first by showing your own written example explaining how you scaled up your picture. Refer to the Key Vocabulary and Sentence Starters chart.
- Have students work with their partners in writing the directions using the sentence starter sequence of their choice.



- d. Have students read their written directions to another pair of students.
- e. Have students share out their written directions.

## Summary

- 6. As students share out their written directions, take note of the ways in which students utilized the key vocabulary and the mathematical concepts integrated in this lesson.
- 7. To close the lesson, revisit the key mathematical concepts, and help students identify how they used these concepts when scaling up their pictures.

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## Reproducible 6-1A **Scaling Up! Recording Sheet**

The following recording sheet can be reproduced for use during Part 1: Introducing Academic Language, of the lesson.

Scale (think ratio):
Scale drawing:
Similar figures:
Proportions:

See Figure 6-2 for an example of how a student filled out a section.

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Reproducible 6-1B **Scaling Up! Directions**

1. The **goal** is to **scale up** the original picture, and to draw its **larger version (as exact as possible)** on the graphing paper.
  
2. With your partner, figure out **a scale/ratio** that will make you draw a picture big enough to cover most of the graphing paper.
  
3. The **scaled up (larger)** picture has to be **proportional** to the original picture.
  
4. **Measure at least five** parts of the original picture so that you can draw its larger version.

## Scale Table

### Scale Factor

Part 1 original size	Part 1 new size (scaled up)
Part 2 original size	Part 2 new size (scaled up)
Part 3 original size	Part 3 new size (scaled up)
Part 4 original size	Part 4 new size (scaled up)
Part 5 original size	Part 5 new size (scaled up)

This recording sheet is an optional tool for students to use during the lesson.

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