# Scale Ella

## Guide and Answer Key for Instructors

The *Scale Ella* animation is available on iTunes U (search "Math Snacks") and at mathsnacks.org

## Goals/Standards

The Scale Ella video is about scale factor. By watching the video and completing the activities in the Learner Guide will help students learn that:

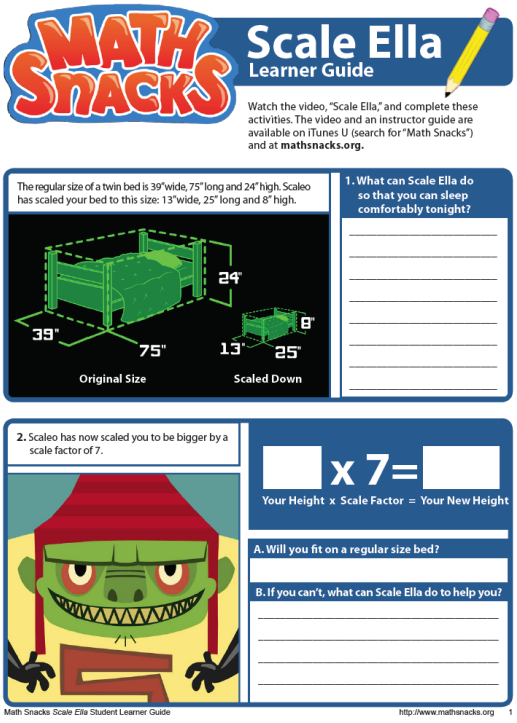
- There is a number (the scale factor) that creates the relationship between two items that are being compared to one another.
- Multiplication and division are inverse operations.
- If the scale factor is less than one, the size of an object or a number is being decreased.
- If the scale factor is greater than one, the size of an object or a number is being increased. The scale factor can be represented as a decimal, whole number or rational number.

## Learning Processes

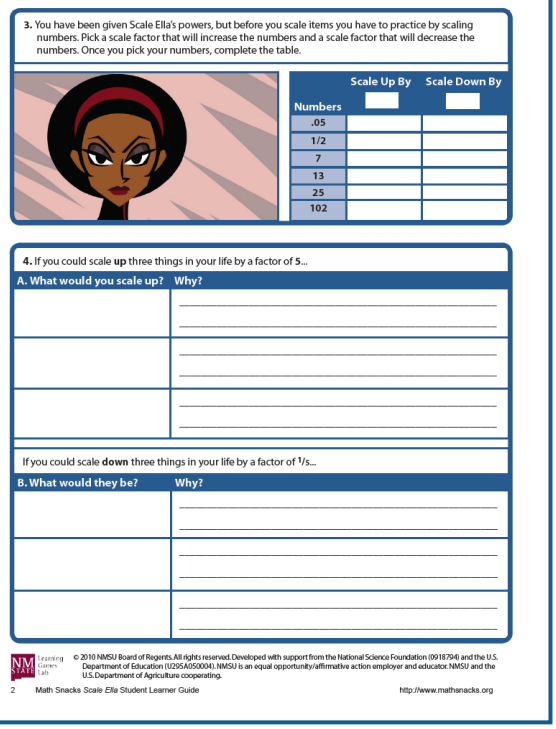
With your students, watch the 10-minute video *Scale Ella* at http://www.mathsnacks.com and spend about 10 minutes discussing the big ideas or key points in the video. Ask:

- In what ways are Scale Ella and Scaleo's powers the same? How are they different? Can you provide an example from the video?
- Think of examples in the video where something was scaled up or made bigger. Think of examples where something was scaled down or made smaller. How would you describe the numbers that scale things up? How would you describe the numbers that scale things down?
- Would you rather have the power to scale things up or down? Why? Give an example of something you would scale in your own life.

## Learner Guide Page 1




## Learner Guide Page 2



## Vocabulary

Scale factor, rational number

## Bonus Activities

Select one or more of these for your students to do after completing the activities in the *Learner Guide*.

**1.** ART WORK: Give students a piece of blank paper. Have them measure a 4x4 in. square.

- Have them draw a picture inside the square. It can be as simple or complex as you like but it would be better if it covered the entire square.
- Have students draw the 4 x 4 in grid over their picture (could also fold it to get the lines)
- Have students pick a scale factor. For example, if they scale it up by 2, the new picture will be 8 x 8 in or scaling down by ½ would be 2 x 2.
- Using the scale factor, have students create a grid with the new dimensions, including the small squares inside the frame.
- Have students redraw their picture by copying each individual square. This can be done as a large group or individually.

**2.** Create a puzzle from a picture. Give each student a small piece of the puzzle and have them scale it up by a factor of 3. If they increase their piece using the same scale factor as everyone else, they should be able to put the "big" puzzle back together.

**3.** Research the increase (or decrease) in population of their city or state from the 2000 census to the 2010 census. Have them calculate the scale factor that accounts for the increase or decrease. Make predictions for the next two censuses using this scale factor.

**4.** YOUR HOUSE: (Supplies: 1 cm grid paper, rulers, poster board or butcher paper)

- Have students design a rectangular house on a 1 cm grid piece of graph paper.
- Have students pick a scale factor between 3 and 6.
- Have students recalculate the dimensions of their house using the scale factor.
- Have students redraw their house on a piece of butcher paper or a poster board.
- Have students share their houses with the class.

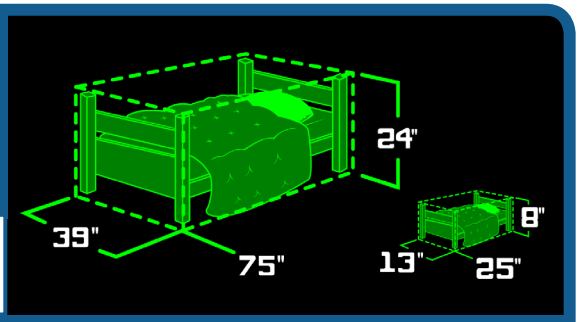
**5.** YOUR BRIDGE: (Supplies: 1 cm or 1 in grid paper, rulers, balsa wood, glue)

- Have students design the bottom and sides of a bridge with dimensions you provide for height, width and length.
- Have students pick a scale factor to adjust their bridge. (sf>1 will increase size, sf<1 will decrease size).
- Have students draw their scaled bridge on graph paper.
- Have students cut balsa wood into proper dimensions and have them assemble their bridges using the scaled drawings. They can work in teams of two and one student can build the initial bridge and the other can build the scaled model.
- Have students present their bridges to the class.

**6.** Have students discuss questions 3–5 from the *Learner Guide* in small groups. Have them draw a picture to represent the increase or decrease of the items they selected. This will add a visual element to these problems.

## Page 1 Answer Key

1. **The regular size of a twin bed is 39" wide, 75" long and 24" high. Scaleo has scaled your bed to this size: 13" wide, 25" long and 8" high.**




**a. What can Scale Ella do so that you can sleep comfortably tonight?**

*Answers will vary, but should include some discussion about scaling the bed or your height.*

2. **Scaleo has now scaled you to be bigger by a scale factor of 7. What is your new height?**

*Answer: ____ x 7 = _____ Your Height x Scale Factor = Your New Height. (Answers will vary)*

**a. Will you fit on a regular-sized bed?**

*Answers will vary: If new height is greater than 75", the answer would be no, but if new height is less than 75", the answer would be yes.*

**b. If you can't, what can Scale Ella do to help you?**

*Answers will vary: Scale Ella can scale you down or scale the bed up; scale factors will vary, but final height should be less than 75", or the bed size should be larger than the student's height.*

## Page 2 Answer Key

3. **You have been given Scale Ella's powers, but before you scale items you have to practice by scaling numbers. Pick a scale factor that will increase the numbers and a scale factor that will decrease the numbers. Once you pick your numbers, complete the table.**

*Note: Before having students do this problem, have a discussion with them about which scale factors SCALE UP and which scale factors SCALE DOWN. (sf > 1 scales up and sf < 1 scale down).*

| Numbers | Scale Up by | Scale Down By |
|---|---|---|
| .05 | *Answers will vary* | *Answers will vary* |
| 1/2 | *Answers will vary* | *Answers will vary* |
| 7 | *Answers will vary* | *Answers will vary* |
| 13 | *Answers will vary* | *Answers will vary* |
| 25 | *Answers will vary* | *Answers will vary* |
| 102 | *Answers will vary* | *Answers will vary* |

*Answers should be multiples of the numbers the students selected and the numbers from column 1 in the table.*

4. **If you could scale up three things in your life by a factor of 5, What would you scale up? Why?**

*Answers will vary depending on student choices.*

5. **If you could scale down three things in your life by a factor of 1/5, What would you scale down? Why?**

*Answers will vary depending on student choices.*