



Overruled!

Guide and Answer Key for Instructors



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

Learning Objectives: The *Overruled!* animation is about ratios and proportions and, more specifically, about converting measurements using ratios and proportions. By watching the animation, completing the activities in the *Learner Guide*, and completing at least one bonus activity, students learn that:

- Various mathematical techniques are helpful in finding the missing part of a proportion, including tables, graphs, measurement and equations.
- Graphing proportions on a coordinate plane results in a graph that is linear.
- Proportions are multiplicative situations.
- Given an application problem, using the units can help to set up the correct proportion.

Animation Discussion

With your students, watch the 6-minute animation *Overruled!* at: <http://www.mathsnacks.org> and spend about 10 minutes discussing the big ideas or key points in the animation. Ask:

- What tool did the characters in the animation use to explain and solve their problem? (Answer: Graph.)
- Why was this tool useful? (Answer: They could see the pattern and make the conversions using the graph.)
- Can you suggest other ways to solve the problem? (Answers will vary; a table would be an option.)
- Can you think of other situations in which proportions might be used to convert measurements or solve measurement problems? (Answer: Standard to metric, cooking, distance, or money exchanges.)

Learner Guide Page 1



Overruled!

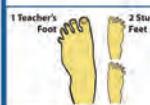
Learner Guide

Watch the video, *Overruled!*, and complete these activities. The video and an instructor guide are available on iTunes U (search "Math Snacks") and at mathsnacks.org

The official for the kingdom who is in charge of measuring made the following table comparing the number of teacher feet to student feet.

Student	Teacher
3	1
4	2
7	5

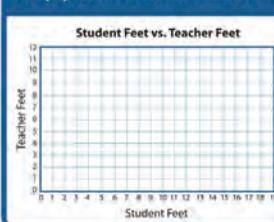
1A. Is the official doing a good job? Why or why not?



B. If the official was doing his job correctly, what would the table look like?

Student	Teacher

C. Graph your table of foot measurements below.



D. How can you tell if someone is doing a good job of measuring feet?

Learner Guide Page 2

The queen decided that she wanted a new royal purple banner to fly over the new bridge.

2. The banner will require 6 queen's feet of purple silk fabric. By looking at the chart, can you tell how many duke's feet of silk will be needed for the banner?

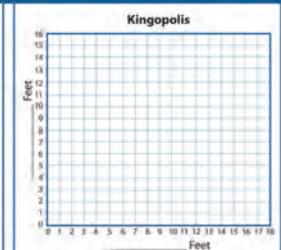
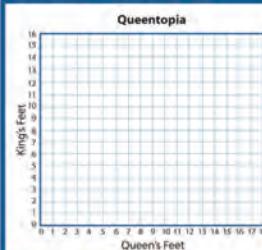


Queen's Feet	Duke's Feet
3	2
4	
6	

In the fictional kingdoms of Kingopolis and Quentopia, engineers had to convert king's feet to queen's feet, and vice versa, to build a bridge between the two countries. They had to know that 2 queen's feet = 3 king's feet.



3. Fill in the graphs and charts so that people in the two kingdoms can easily convert one form of measurement to the other.



Queen's Feet	A. King's Feet
1	
2	3
3	
4	6
5	
10	

King's Feet	B. Queen's Feet
1	
2	
3	2
4	
5	
10	

Vocabulary

Proportion, convert, measurement, ordered pairs, plot, graph, line, units

Bonus Activities

Select one or more of these activities to do with your students after they have completed the *Learner Guide*.

1. Everyone is happy that the bridge will be built. However, the hot dog vendor is frustrated that the hot dogs are 1 king's foot long while the buns are 1 queen's foot long. Ask students to draw a picture of one of the hot dogs in its bun.

King	Queen
2.5	1
5	2
7.5	3
10	4

2. Ask students to imagine that hands instead of feet were used as measurements in the two countries, and a king's hand is $2\frac{1}{2}$ times as long as a queen's hand. Ask them to make graphs or charts so that the citizens can easily make the conversion from king's hands to queen's hands.
3. Ask students to assume roles of various citizen-workers in either Queentopia or Kingopolis. Ask them to think of a measurement problem that came up during the course of work and write a story about it and how they solved it.

(Note: For example, a tiler laying tile in the queen's royal hall finds that she has taken the floor area measurement in queen's feet, but the tiles are coming from Kingopolis and they are measured in king's feet. Did she order too many or too few tiles, and how does she solve the problem?)

4. MEASURE IT.

- Have students select 3-4 things in the classroom to measure.
- Pass out 3 in. by 5 in. cards.
- Have some groups draw a foot that is 3 in. long (the short side).
- Have some groups draw a foot that is 5 in. long (the long side).
- Have students measure the items using these feet.
- Create a table of data using these measurements.
- Using the table data, have the students figure out the ratio of the short feet to the long feet. (Answer: 3 by 5.)
- Discuss with the students the importance of having a standard unit of measurement, including metric and standard measurement systems.

1. The official for the kingdom who is in charge of measuring made the following table comparing the number of teacher feet to student feet.

1 teacher foot = 2 student feet

Student	Teacher
3	1
5	2
7	5

a. Is the official doing a good job? Why or why not?

Answer: No he is not, because... [answers will vary but should relate to the fact that the given proportion 1:2 does not match the proportions given in the left table.]

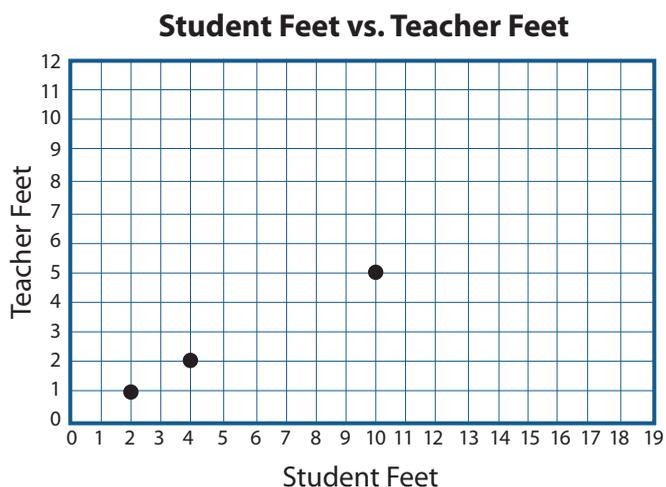
b. If the official were doing his job correctly, what would the table look like?

1 teacher foot = 2 student feet

Student	Teacher
2	1
4	2
10	5

Note: These are sample answers – any answer reflecting a proportion of 1:2 would be acceptable.

c. Graph your table of foot measurements below. Student Feet vs. Teacher Feet. The points plotted should represent a pattern that looks like the line $y = 2x$ and should match the table of values in part B.



d. How can you tell if someone is doing a good job of measuring feet?

Note: Converting 4 queen's feet to duke's feet may be difficult for younger students. There are multiple ways to do this. Students can set up a ratio problem and solve it, students can draw a picture, or students may come up with a new way to make this calculation. If they are confused, it may be valuable to do this in small groups or as a whole class.

Answers will vary, but should include some discussion about proportional relationships.

2. The queen decided that she wanted a new royal purple banner to fly over the new bridge.

The banner will require 6 queen's feet of purple silk fabric. By looking at the chart, can you tell how many duke's feet of silk will be needed for the banner?

3 queen's feet = 2 duke's feet

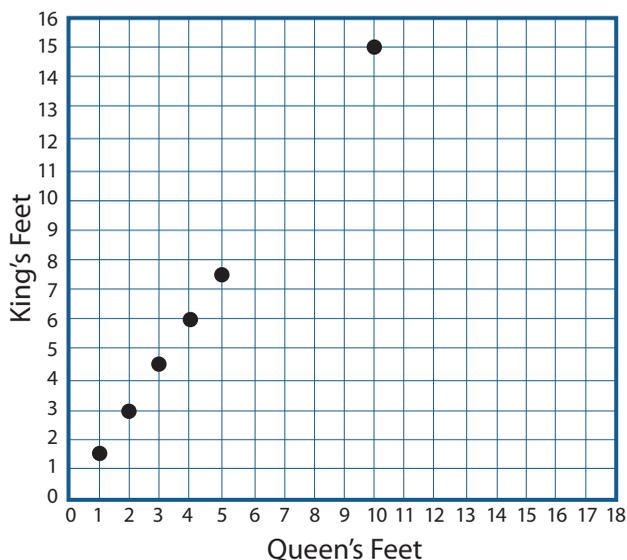
Queen's Feet	Duke's Feet
3	2
4	$\frac{8}{3}, 2\frac{2}{3}, 2.66$
6	4

3. In the fictional kingdoms of Kingopolis and Queentopia, engineers had to convert king's feet to queen's feet, and vice versa, to build a bridge between the two countries. They had to know that 2 queen's feet = 3 king's feet.

Fill in the graphs and charts so that people in the two kingdoms can easily convert one form of measurement to the other.

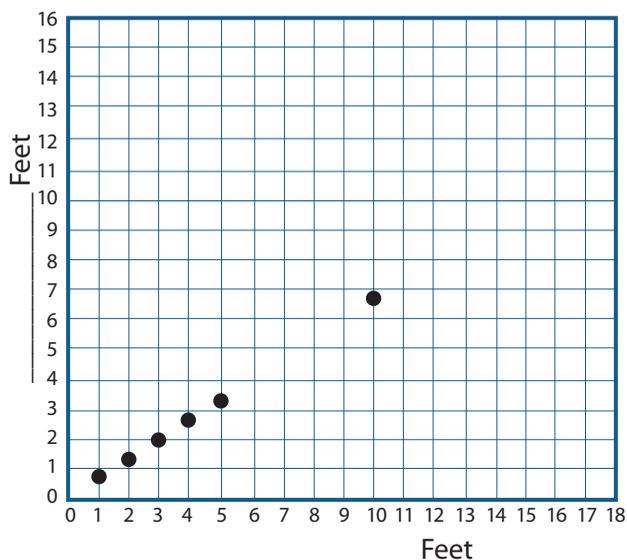
Note: Converting from king's feet to queen's feet may be difficult for younger students. There are multiple ways to do this. Students can set up a ratio problem and solve it, students can draw a picture, students can use addition by adding $\frac{2}{3}$ repeatedly, or students may come up with a new way to make this calculation. If they are confused, it may be valuable to do this in small groups or as a whole class.

Queentopia



Queen's Feet	A. King's Feet
1	1.5
2	3
3	4.5
4	6
5	7.5
10	15

Kingopolis



King's Feet	B. Queen's Feet
1	$\frac{2}{3}$
2	$\frac{4}{3}$
3	2
4	$\frac{8}{3}$
5	$\frac{10}{3}$
10	$\frac{20}{3}$

Common Core State Standards of Mathematics

4.MD.1	Know relative sizes of measurement units within one system of units including km, m, cm.... Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table.
5.MD	Convert like measurement units within a given measurement system.
5.MD.1	Convert among different sized standard measurement units within a given measurement systems, and use these conversions in solving multi-step, real world problems.
6.RP	Understand ratio concepts and use ratio reasoning to solve problems.
6.RP.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
6.RP.2	Understand the concept of a unit rate a/b associated with the ratio $a:b$ with b not equal to 0, and use rate language in the context of a ratio relationship.
2.MS.2	Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of unit chosen.
4.MD	Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
7.G	Draw, construct, & describe geometrical figures & describe relationships between them.
7.G.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths & areas from scale drawing & reproducing a scale drawing at a different scale.

Math Snacks animations, games and support materials address all of the Common Core State Standards for Mathematical Practices when used as recommended in the teacher guide.