

# Proportional Reasoning

## Penny Stacking

ACTIVITY

4.2

**SUGGESTED LEARNING STRATEGIES:** Guess and Check, Quickwrite, Debriefing, Think/Pair/Share, Use Manipulatives, Marking the Text

My Notes

People use ratios and proportions to solve all kinds of problems in the real world. For example, ratios and proportions are used in cooking to double recipes, by travelers to find distances on maps, and by architects when making scale models.

Some people have even investigated the relationship between numbers of stacked pennies and their height in millimeters.

1. Without using pennies or rulers, predict the height of a stack of 150 pennies, and explain why you made this prediction.

a. Make your prediction below. Be sure to include units.

A stack of 150 pennies is \_\_\_\_\_ tall.

b. What reasons did you have for making your prediction? Clearly explain your thinking.

2. It has been found that on average the ratio of the number of pennies in a stack to the height of the stack in millimeters is 5:7. In your own words, explain what this means.

3. Explore this finding by measuring and recording the height of a stack of each number of pennies.

Number of Pennies	10	15	25	35
Height of Stack (in mm)				

4. Write a ratio in fraction form that relates the number of pennies to the height of a stack that has:

a. 10 pennies   b. 15 pennies   c. 25 pennies   d. 35 pennies

**SUGGESTED LEARNING STRATEGIES:** Look for a Pattern, Create Representations, Quickwrite, Think/Pair/Share

### My Notes

5. What is true about the ratios in Question 4? Does this confirm or disprove the original finding? Explain.

6. This time use the ratio 5:7 and proportional reasoning to complete the table below.

<b>Number of Pennies</b>	10	15	25	35
<b>Height of Stack (in mm)</b>				

7. Consider your data in Question 6.

- Write two ratios in fraction form relating the number of pennies to the height of the stacks.
- Write these ratios as an equation.
- What is your equation called? Explain.

8. How could you find the height of a stack of 60 pennies without measuring? Find a reasonable estimate and explain your method.

9. How could you find the height of a stack of 372 pennies? Find a reasonable estimate and explain your method.

# Proportional Reasoning

## Penny Stacking

### ACTIVITY 4.2

**SUGGESTED LEARNING STRATEGIES:** Quickwrite, Discussion Group, Self Revision/Peer Revision, Create Representations, Group Presentation

My Notes

10. Compare your methods for answering Questions 8 and 9.

11. Why might the value you determined for height in Questions 8 and 9 be different than the actual measured height of a stack of 60 pennies or 372 pennies?

12. Write and solve a proportion to determine the number of pennies,  $p$ , in a stack that is 100 mm high. Use numbers, words, or both to explain your method.

13. Graph the data from Question 6 on the grid in My Notes.

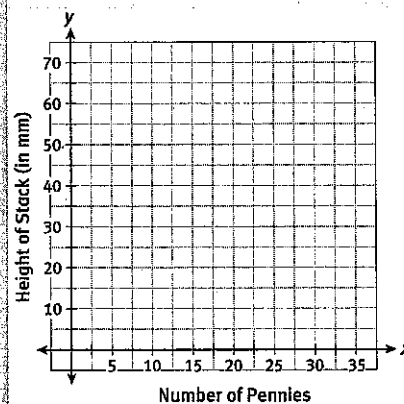
14. Use the graph to predict the height of a stack of 20 pennies. Explain.

15. Use the graph to predict the number of pennies in a stack that is 60 mm high. Explain.

16. How accurate are your predictions in Question 14 and Question 15? Why?

### MATH TIP

Remember to think about whether or not you should connect the points on your graph.



SUGGESTED LEARNING STRATEGIES: Create Representations, Quickwrite, Debriefing

My Notes

17. Look back at your original prediction for the height of a stack of 150 pennies.

- a. Use a proportion to make a better estimate than your original prediction. Explain how you determined your estimate.
- b. Is your new estimate an exact height for the stack of 150 pennies? Why or why not?
- c. How close was your original prediction at the beginning of the activity to your new estimate?

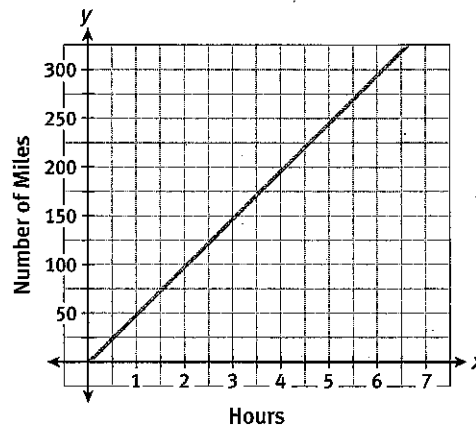
CHECK YOUR UNDERSTANDING

Write your answers on notebook paper. Show your work.

1. The commonly accepted ratio of a human's hand span to total body height is 1 to 8.5.
  - a. Use a proportion to predict Tia's height. She has a hand span of 7 inches.
  - b. When actually measuring, Tina found her height to be 60 inches. How close is the actual ratio to the commonly accepted ratio? Does using a commonly accepted ratio give a reasonable estimate of height?
  - c. Why are the values found in Parts a and b not the same?
2. Solve the proportion  $\frac{4}{5} = \frac{28}{x}$  using two different strategies. Explain each.
3. Complete the ratio table to show ratios equivalent to 9:33.

45	3			63
		330	132	

4. Use the following graph to make predictions.



- a. Use the graph to predict the number of miles driven in 5 hours. Explain
  - b. Use the graph to predict the number of hours it would take to drive 300 miles. Explain.
5. Is the ratio 35 to 10 proportional to the ratio 7 to 5? Explain.
  6. **MATHEMATICAL** Why are proportions useful? Give an example.