

Note to user of this activity: The questions on page 2 of part 2 are written for two gears which have 6 and 10 teeth. Adjust for other gear sizes. This is adapted from *Developing Essential Understandings of Ratios, Proportions, and Proportional Reasoning* in the NCTM Essential Understanding series.

Names: _____

Exploring the Gears

1. How many teeth does the smaller gear have?
2. How many teeth does the larger gear have?
3. If the small gear turns clockwise (the direction in which the hands on a clock turn), what direction does the big gear turn?

Why?

4. If you turn the small gear a certain number of times, does the big gear turn more revolutions, fewer revolutions, or the same number of revolutions?

How can you tell?

Exploring the Gears: Part 2

Turn the gears until each black dot on a gear matches with a black dot on the base.

Select student roles and record names below.

Student Role	
*Turner	Name: _____
*Counter	Name: _____
*Recorder	Name: _____
If there are just two students in a group, the counter should record.	

Make sure the dots are aligned. Read these instructions before you begin.

Round 1: Starting with the dots aligned, the Turner should turn the **small gear** until the dots line up again. The Turner should keep up with the number of turns the small gear has made, and the Counter should watch carefully and count the number of turns of the **big gear**. Record the information in the first row of the table.

Round 2: Starting with the counts from the round 1, the Turner should turn the small gear until the dots line up again, and keep up with the number of turns the small gear has made, making sure to start the count with the number from round 1. The Counter should watch carefully and count the number of turns of the big gear, starting the count with the number from round 1. Record the information in the second row of the table.

Rounds 3,4,5: Continue in the same manner as above.

Round	Number of turns of the Small Gear until the dots line up	Number of turns of the Large Gear until the dots line up
1		
2		
3		
4		

Without turning and counting, predict the numbers that would result if you did round 5.

Prediction for Round 5:

Number of turns of the small gear until the dots line up _____

Number of turns of the large gear until the dots line up _____

Test your prediction by turning. Were you correct? _____ If not, what was the result?

More Predictions:

- a. When the small gear turns 75 times, how many times will the big gear turn? _____

Explain your thinking.

- b. When the small gear turns 180 times, how many times will the big gear turn? _____

Explain your thinking.

- c. How many times will the small gear have to turn to make the large gear turn 150 times?

Explain your thinking.

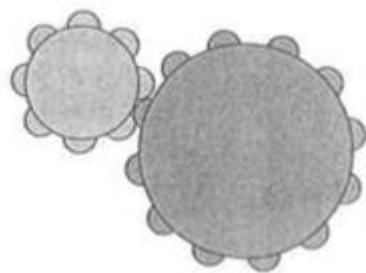
- d. How many times will the small gear have to turn to make the large gear turn 195 times?

Explain your thinking.

Exploring the Gears: Part 3

Explain how the results in your table from the previous exploration relate to the number of teeth in the gears.

Predict. If you had the gear apparatus in the picture below, predict the results in the table.



Round	Number of turns of the Small Gear until the dots line up	Number of turns of the Large Gear until the dots line up
1		
2		
3		
4		

Now ask your teacher for the gears in the picture and test your predictions.

Were your predictions correct?

If not, how were they different?

Predict: When the small gear has turned 96 times, how many times will the large gear have turned?

Explain your thinking.

Predict: How many times will the small gear have to turn to make the large gear turn 150 times?

Explain your thinking.

