Name: _____ Date: _____

Skill and Practice

7E Gear Ratios

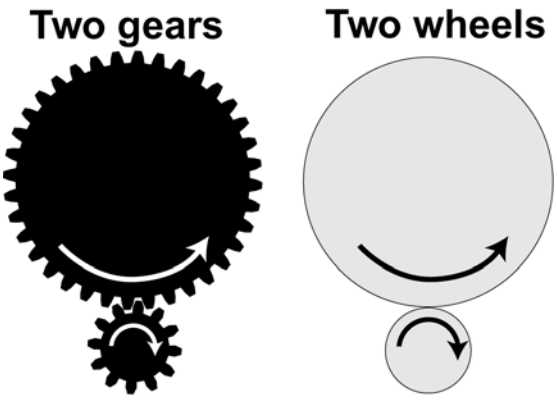
Read:

A gear ratio is used to figure out the number of turns each gear in a pair will make based on the number of teeth each gear has.

To calculate the gear ratio for a pair of gears that are working together, you need to know the number of teeth on each gear. The formula below demonstrates how to calculate a gear ratio.

Notice that knowing the number of teeth on each gear allows you to figure out how many turns each gear will take.

Why would this be important in figuring out how to design a clock that has a minute and hour hand?



Gears act like touching wheels, but gears have teeth to keep them from slipping as they turn togeher.

Gear ratio

$$\frac{\text{Turns of output gear} \rightarrow T_o}{\text{Turns of input gear} \rightarrow T_i} = \frac{N_i \leftarrow \text{Number of teeth on input gear}}{N_o \leftarrow \text{Number of teeth on output gear}}$$

Example:

A gear with 48 teeth is connected to a gear with 12 teeth. If the 48-tooth gear makes one complete turn, how many times will the 12-tooth gear turn?

$$\frac{\text{Turns of output gear?}}{\text{One turn for the input gear}} = \frac{\text{48 input teeth}}{\text{12 output teeth}}$$

$$\text{Turns of output gear?} = \frac{\text{48 teeth} \times \text{1 turn}}{\text{12 teeth}} = \text{4 turns}$$

Practice:

1. A 36-tooth gear turns three times. It is connected to a 12-tooth gear. How many times does the 12-tooth gear turn?

_____

2. A 12-tooth gear is turned two times. How many times will the 24-tooth gear to which it is connected turn?

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3. A 60-tooth gear is connected to a 24-tooth gear. If the smaller gear turns ten times, how many turns does the larger gear make?

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4. A 60-tooth gear is connected to a 72-tooth gear. If the smaller gear turns twelve times, how many turns does the larger gear make?

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5. A 72-tooth gear is connected to a 12-tooth gear. If the large gear makes one complete turn, how many turns does the small gear make?

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6. Use the gear ratio formula to help you fill in the table below.

Input Gear (# of teeth)	Output Gear (# of teeth)	Gear ratio (Input Gear: Output Gear)	How many turns does the output gear make if the input gear turns 3 times?	How many turns does the input gear make if the output gear turns 2 times?
24	24			
36	12			
24	36			
48	36			
24	48			

7. The problems in this section involve three gears stacked on top of each other. Once you have filled in Table 2, answer the questions that follow. Use the gear ratio formula to help. Remember, knowing the gear ratios allows you to figure out the number of turns for a pair of gears.

Setup	Gears	Number of teeth	Ratio (top gear: middle gear)	Ratio 2 (middle gear: bottom gear)	Total gear ratio (Ratio 1 x Ratio 2)
1	Top gear	12			
	Middle gear	24			
	Bottom gear	36			
2	Top gear	24			
	Middle gear	36			
	Bottom gear	12			
3	Top gear	12			
	Middle gear	48			
	Bottom gear	24			
4	Top gear	24			
	Middle gear	48			
	Bottom gear	36			

8. As you turn the top gear to the right, what direction does the middle gear turn? What direction will the bottom gear turn?

9. How many times will you need to turn the top gear (input) in setup 1 to get the bottom gear (output) to turn once?

10. If you turn the top gear (input) in setup 2 two times, how many times will the bottom gear (output) turn?

11. How many times will the middle gear (output) in setup 3 turn if you turn the top gear (input) two times?

12. How many times will you need to turn the top gear (input) in setup 4 to get the bottom gear (output) to turn 4 times?