

The Wheels Go Round and Round

- Shift the bicycle into its lowest gear using the smallest front sprocket and the largest rear sprocket.



Largest Rear Sprocket

Smallest Front Sprocket

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Keep Front Gear Constant - Change Rear Gear

FRONT	F	REAR	R	REVOLUTIONS	W

- Count the number of teeth on the front and rear sprockets in use. Record them in table 1 on *The Wheels to Round and Round Template*.

Keep Rear Gear Constant-Change Front Gear

FRONT	F	REAR	R	REVOLUTIONS	W

- Line up the air valve on the tire of the rear wheel with part of the bike frame. This is the starting point. Rotate the pedal through one complete revolution and stop the wheel immediately. Estimate the number of wheel revolutions to the nearest tenth and enter it in the table.

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The Wheels Go Round and Round Template

- Shift gears so the change moves onto the next rear sprocket. Do not change the front sprocket. Repeat the last two steps.
- Continue to change the rear sprocket and repeat the data collection.
- Plot the data in your calculator to confirm the relationship. Define the variables as $R(L1)$ and $W(L2)$.
- Create a list L3 to confirm the relationship.
- Write an equation that relates the two variables.
- Explain the meaning of the constant in the equation.
- Shift the bicycle into its lowest gear again.
- Using the second table, record the number of teeth on the sprockets used.
- Record the number of wheel revolutions for one revolution of the pedals.
- Keep the chain on the same rear sprocket and shift the chain to the next front sprocket. Collect the data for each front gear sprocket.
- Describe how the number of teeth on the front sprocket affects the turning of the wheel.
- What type of variation models this relationship?
- Place the data in your graphing calculator: $L4 = \text{Front Wheel (F)}$ and $L5 = \text{Revolutions (W)}$
- Plot the data in your calculator to verify your answer.
- Define the variables as F and W . Write an equation that relates the gears in the front gear and the number of wheel revolutions.
- Create a list L6 to find the value of k .
- What is the meaning of the constant in this equation?
- Find a proportion relating
 - Number of front teeth
 - Number of rear teeth
 - Number of wheel revolutions
 - Number of pedal revolutions

- Use your proportion to predict the number of wheel revolutions for a gear combination you have not tried. Test your prediction.
- Explain why different gear ratios result in different numbers of rear wheel revolutions. Why is it possible to go faster in a high gear?
- Find the circumference of the rear wheel in centimeters. How far will the bicycle travel when the wheel makes one revolution? How many revolutions will it take to travel 1 kilometer without coasting?
- For the lowest and highest gear, how many times do you need to rotate the pedal for the bike to travel 1 kilometer? 1,200 km race?