

Solar Vehicle

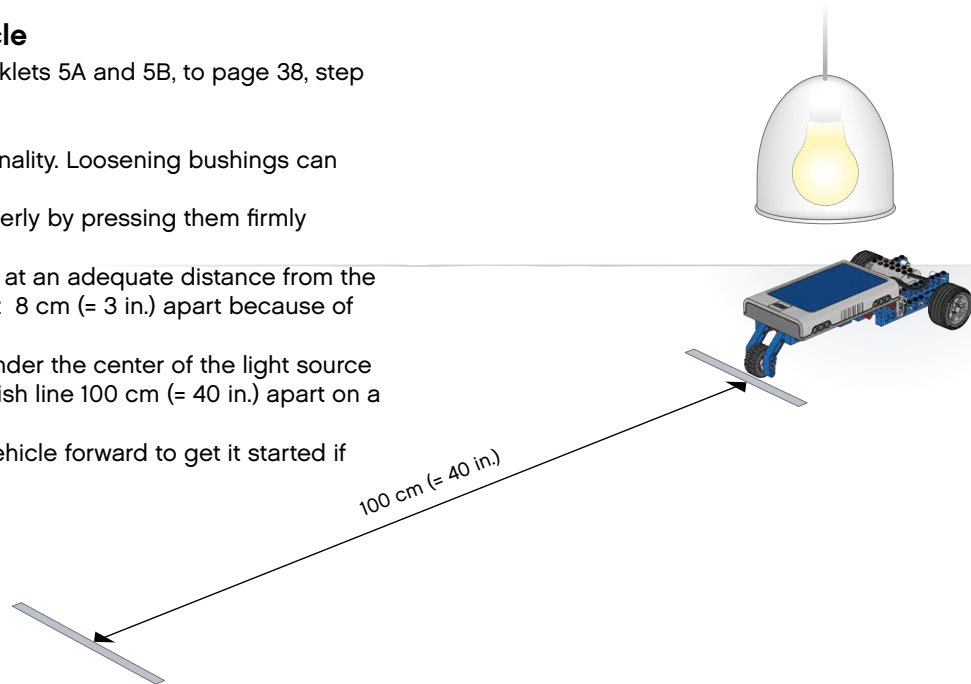
Name(s): _____

Date and subject: _____

Build the Solar Vehicle

(building instructions booklets 5A and 5B, to page 38, step 24)

- Test the model's functionality. Loosening bushings can reduce friction
- Connect the plugs properly by pressing them firmly together
- Position the Solar Panel at an adequate distance from the light source, but at least 8 cm (= 3 in.) apart because of heat
- Place the Solar Panel under the center of the light source
- Mark a start line and finish line 100 cm (= 40 in.) apart on a smooth flat surface
- Gently push the solar vehicle forward to get it started if needed



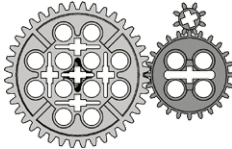
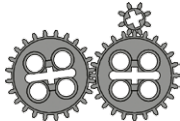
Traveling with Different Gear Ratios

First, predict with which speed the solar vehicle will travel the track with a gearing of 5:1.

Then, investigate with which speed the solar vehicle will travel the track with the gearing of 5:1, where speed is measured in meters per second (m/s), by using this formula:

$$\text{Speed} = \frac{\text{Distance traveled}}{\text{Time taken}}$$

Next, rebuild the solar vehicle and follow the same procedure for the new solar vehicle with a gearing of 3:1. (building instructions booklets 5A and 5B, to page 42, step 4)

		
My Prediction	sec.	sec.
My Findings	sec.	sec.
My Calculations	(m/s)	(m/s)

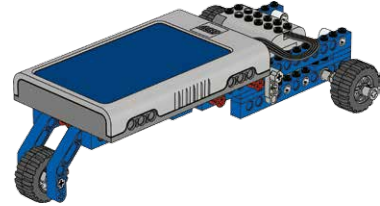
Traveling with Smaller Wheels



(building instructions booklets 5A and 5B, to page 44, step 6)

First, predict with which speed the solar vehicle will travel the track with a gearing of 3:1 and three identical small wheels.

Then, investigate and calculate the speed of the rebuilt solar vehicle.

Next, compare how the rebuilt solar vehicles findings compare to the prior test findings, where the solar vehicle had a 3:1 gearing and two larger rear wheels. Collect your findings below.



		
My Prediction	sec.	sec.
My Findings	sec.	sec.
My Calculations	(m/s)	(m/s)

Look carefully and analyze your findings. Draw a conclusion and write it down.





Identifying Variables

Identify and write down at least three variables, explaining clearly how these affect the efficiency of the solar vehicle.

Solar Vehicle

Name(s): _____

Date: _____

NGSS GOALS	 BRONZE	 SILVER	 GOLD	 PLATINUM
1. Student work related to this Crosscutting Concept: In this project, we built a solar vehicle and investigated how changes in the vehicle's gears and wheels affected its speed.				
Systems and system models: Systems may have sub-systems and be a part of a larger complex system. Use models to represent systems and their interactions.	<ul style="list-style-type: none"> We built our solar vehicle. We tested our models functionality to make sure it moved smoothly. <input type="checkbox"/>	<ul style="list-style-type: none"> We met Bronze. We completed our predictions and measurements for the gear ratio experiment. <input type="checkbox"/>	<ul style="list-style-type: none"> We met Silver. We completed our predictions and measurements for the wheel size experiment. <input type="checkbox"/>	<ul style="list-style-type: none"> We met Gold. We used the phrases 'system' and 'sub- system' correctly when referring to the gears, wheels, and solar vehicle in our written conclusion. <input type="checkbox"/>
2. Student work related to this Practice: In this project, we compared the similarities and differences in the data from two experiments. We drew a conclusion from our findings.				
Analyzing and interpreting data: Analyze and interpret data to determine similarities and differences in findings.	<ul style="list-style-type: none"> We completed our experiments with two different gear ratios and wheel sizes. <input type="checkbox"/>	<ul style="list-style-type: none"> We met Bronze. We compared the results from our two gear ratio experiments. We described the similarities or differences in our conclusion. <input type="checkbox"/>	<ul style="list-style-type: none"> We met Silver. We compared the results from our two wheel size experiments. We described the similarities or differences in our conclusion. <input type="checkbox"/>	<ul style="list-style-type: none"> We met Gold. We compared all of our results. We drew a conclusion about which had more of an effect on our car: changing wheel size or changing gear ratio. <input type="checkbox"/>
3. Student work related to this Practice: In this project, we predicted and calculated from measurements the speed of our solar vehicle.				
Using mathematics and computational thinking: Apply mathematical concepts such as ratio and rate to scientific and engineering questions.	<ul style="list-style-type: none"> We built and tested 5:1 and 3:1 gear ratios. <input type="checkbox"/>	<ul style="list-style-type: none"> We met Bronze. We calculated the speed of our solar vehicle in all experiments. <input type="checkbox"/>	<ul style="list-style-type: none"> We met Silver. We used ratios and rates (speed) in our written conclusion. <input type="checkbox"/>	<ul style="list-style-type: none"> We met Gold. We used ratios and rates (speed) in our explanation of how different variables affect the efficiency of our solar vehicle. <input type="checkbox"/>
Notes:				