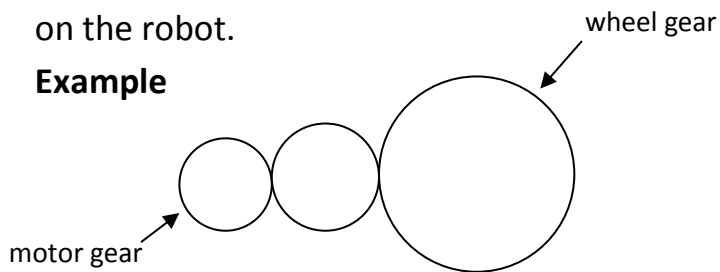# Pod Racer

Activity Workbook

Example

Experiment #1

Using the "gearing up" pod racer

1. Use the space below to draw, to the best of your ability, the arrangement of the gears on the robot.

   Example

   wheel gear

   motor gear

2. On your drawing, **identify** the gear directly connected to the motor. Draw an arrow to the gear and label "**motor gear**."
3. On your drawing, **identify** the gear directly connected to the wheel. Draw an arrow to the gear and label "**wheel gear**."
4. With your groups, carry out the following experiments.
   a. Turn ON your pod racer, and pick the following:
      My Files → Software files → pod_racer → Run
   b. GENTLY PLACE the racer on the floor by the starting line. Make sure the touch sensor is touching the floor.
   c. DECIDE on the start and finish lines for your race.
      2-3 members of your group should be at the start line.
      2-3 members of your group should be at the finish line, ready to lift the robot off the group when it crosses.
   d. When you are ready to race, PRESS the ORANGE ENTER button
   e. LIFT the racer off the ground **immediately** after crossing the finish line.
   f. RECORD your *distance*, *time*, and *speed* results in the table below.
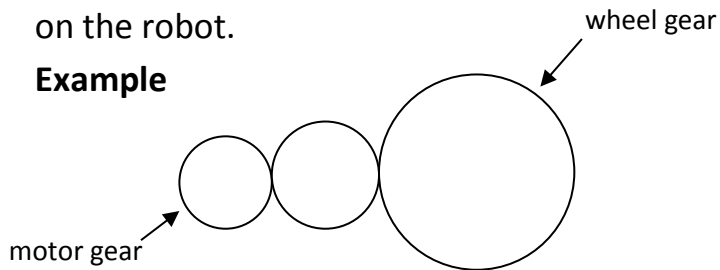
Results Table #1

Test #	Distance Traveled (*in inches*)	Time Traveled (*in seconds*)	Average Speed (*in inches per second*)
1	**22**	**2**	**11**
2	**24**	**2**	**12**
3	**26**	**2**	**13**
4	**22**	**2**	**11**
5	**14**	**2**	**7**
6	**26**	**2**	**13**
7	**24**	**2**	**12**
8	**24**	**2**	**12**

Experiment #2

Using the "gearing down" pod racer

1. Use the space below to draw, to the best of your ability, the arrangement of the gears on the robot.

   Example

   wheel gear

   motor gear

2. On your drawing, **identify** the gear directly connected to the motor. Draw an arrow to the gear and label "**motor gear**."
3. On your drawing, **identify** the gear directly connected to the wheel. Draw an arrow to the gear and label "**wheel gear**."
4. With your groups, carry out the following experiments.
   a. Turn ON your pod racer, and pick the following:
      My Files → Software files → pod_racer → Run
   b. GENTLY PLACE the racer on the floor by the starting line. Make sure the touch sensor is touching the floor.
   c. DECIDE on the start and finish lines for your race.
      2-3 members of your group should be at the start line.
      2-3 members of your group should be at the finish line, ready to lift the robot off the group when it crosses.
   d. When you are ready to race, PRESS the ORANGE ENTER button
   e. LIFT the racer off the ground **immediately** after crossing the finish line.
   f. RECORD your *distance*, *time*, and *speed* results in the table below.

Results Table #2

Test #	Distance Traveled (*in inches*)	Time Traveled (*in seconds*)	Average Speed (*in inches per second*)
1	**20**	**5**	**4**
2	**18**	**6**	**3**
3	**16**	**4**	**4**
4	**10**	**5**	**2**
5	**24**	**6**	**4**
6	**20**	**5**	**4**
7	**15**	**3**	**5**
8	**18**	**6**	**3**

Experiment #3

Using BOTH racers

1. ADD the same amount of weight to each of the racers.
2. RUN the **pod_racer** program again.
3. RECORD your observations below. Is one racer able to travel with weight added? Is one racer **NOT** able to travel with weight added?
4. Continue to add weight to both racers until one is unable to move forward. *Which robot is capable of moving with more weight?*

Observation 1

Both racers can move with 80 weights attached.

Observation 2

Both racers can move with 113 weights attached.

Observation 3

Only Racer #2, "gearing down" racer, is able to move with 200 weights attached.

Conclusions/Reflections

1. Which racer – "gearing up" or "gearing down" – went faster?
   Gearing up racer went faster.

2. What made the racers perform at different speeds?
   The racers performed differently because of the different ways we used gears. Gearing up had a big gear attached to a little gear to make it go *faster*. Gearing down had a little gear attached to a big gear to make it go slower.

3. What was the **approximate** <u>difference</u> in speeds between the two pod racers? SHOW your work.

   Gearing up
   11+12+13+11+7+13+12+12 = 91
   91/8 = 11.375 average speed

   Gearing down
   4+3+4+2+4+4+5+3 = 29
   29/8 = 3.625 average speed

   11.375-3.625 = 7.75 speed difference
   Units: inches per second ← extra credit for remembering to include

4. Write **2** ways to make the "gearing up" racer go FASTER.
   Gearing up can go faster by
   1) Making the small gear smaller
   2) Making the big gear bigger