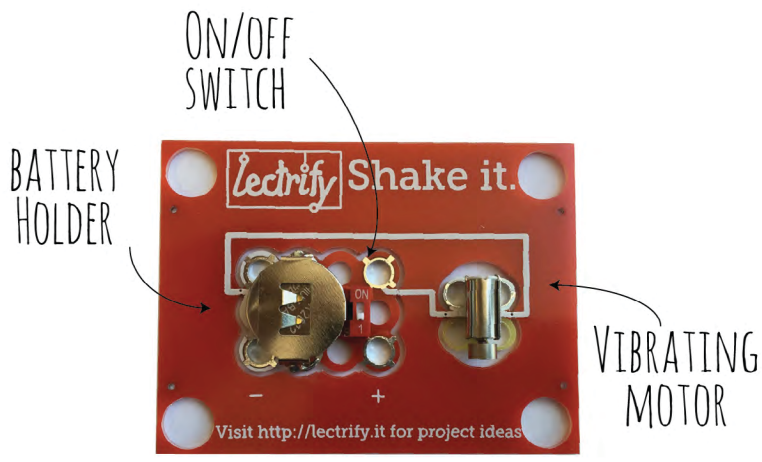
Shake it Turkey Racer

The kit includes a battery, switch, and a vibrating motor. The board has a functioning circuit that allows students to explore basic electronics concepts including simple circuits, circuits in series, resistance, and when removed from the board, conductivity.
The kit also lends itself to projects that explore the engineering process as well specific engineering concepts including: friction, transfer of energy, the relationship between force and mass, and centripetal force (from the eccentric rotating mass motor).



Lesson Scope & Concepts:
The kits allow learners to explore a broader range of engineering concepts. The scope and complexity can scale to the age, grade, and skill level of the learners. This lesson will cover:

- Circuit Basics
- Motors
- Transfer of Energy
- Testing Ideas & Prototyping
- Engineering Systems & Variables

Duration:
2 hours

Review the basics of circuits

- Ask students what they remember about batteries and circuits from their LED projects. Here are
- some sample questions for review:
- How do circuits work?
- What does a battery do?
- What were the steps in creating a paper clip circuit?
- What role did the paper clip play in the circuit?
- Ask students to describe scenarios when their circuit didn't work. Why?

For this project you'll want to provide some additional materials. We recommend:

- Copies of the turkey template
- Paper
- Markers
- Scissors
- Straws
- Pipe Cleaners
- Popsicle sticks
- Cardboard

Other Preparation:
Create a designated area either a table or on the floor for students to test their turkeys. You can use painter's tape to mark a start/finish line and milestones such as a half way point. You can also vary the surfaces some smooth and rough for students to test their assumptions.

Explore the Board:
The Shake it kit comes with a battery pack and a vibrating motor. We recommend watching this video to learn more about vibrating motors.

Place the Shake It board onto a hard surface and use the on/off switch to turn it on. You'll see the board vibrate. You can harness this motion and make projects that move around. The board has holes in all four corners for straws, pens and pencils, or LEGO bricks.

You'll notice that there is a circuit outlined in white. The red corner of the battery connects to the tinned side of the motor. The white corner of the battery is connected to the other tinned side of the motor.

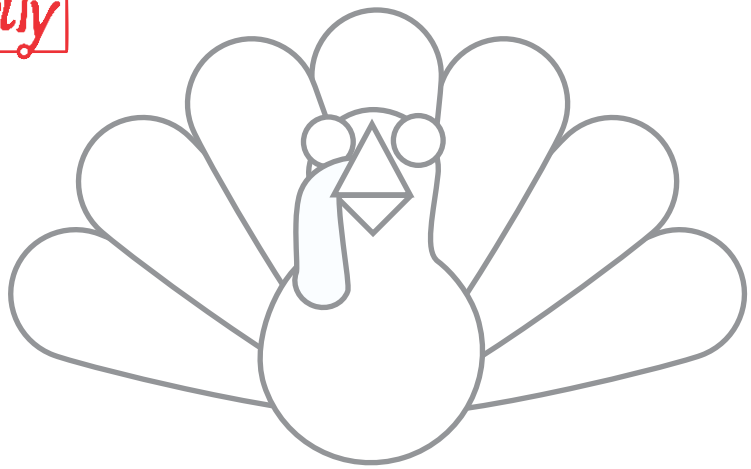
Build your first prototype
Students can use the provided template to make their turkey racer or create their own. Take a look at this video to see an example. After making their turkey, students should experiment with putting different 'legs' on their racer. This is where the engineering process and design comes into play. Students should come up with a hypothesis of how their turkey will move based on their design. You can ask students to document what happens each time they tweak their racer.

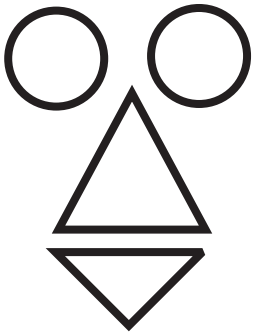
Test and iterate
There are a number of engineering challenges students can explore with this kit. Sample prompts include:
- Can you design something that moves very quickly?
- Can you make a robot that moves straight forward?
- Can you make one that moves backwards?
- Could you design one that runs in circles?

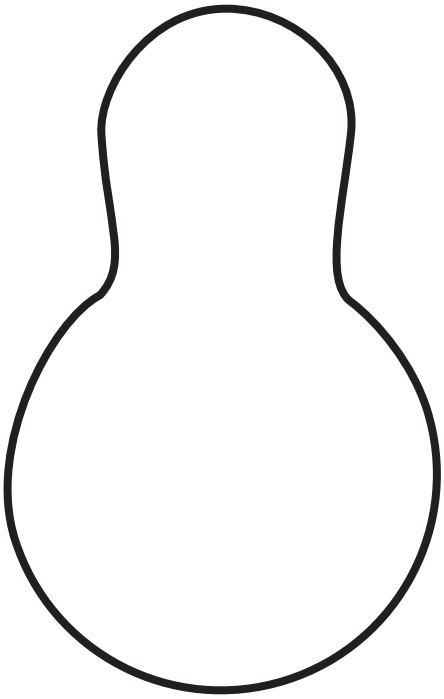
Here are some ways to tinker with your design that might yield interesting results. Change the surface material to see how that affects how the robots move. Have students document the differences between smooth and rough surfaces. Ask them to consider how the force of friction affects the movement. Make some of the "legs" on your design shorter than others. Ask students to observe what happens when the board is off-balance.

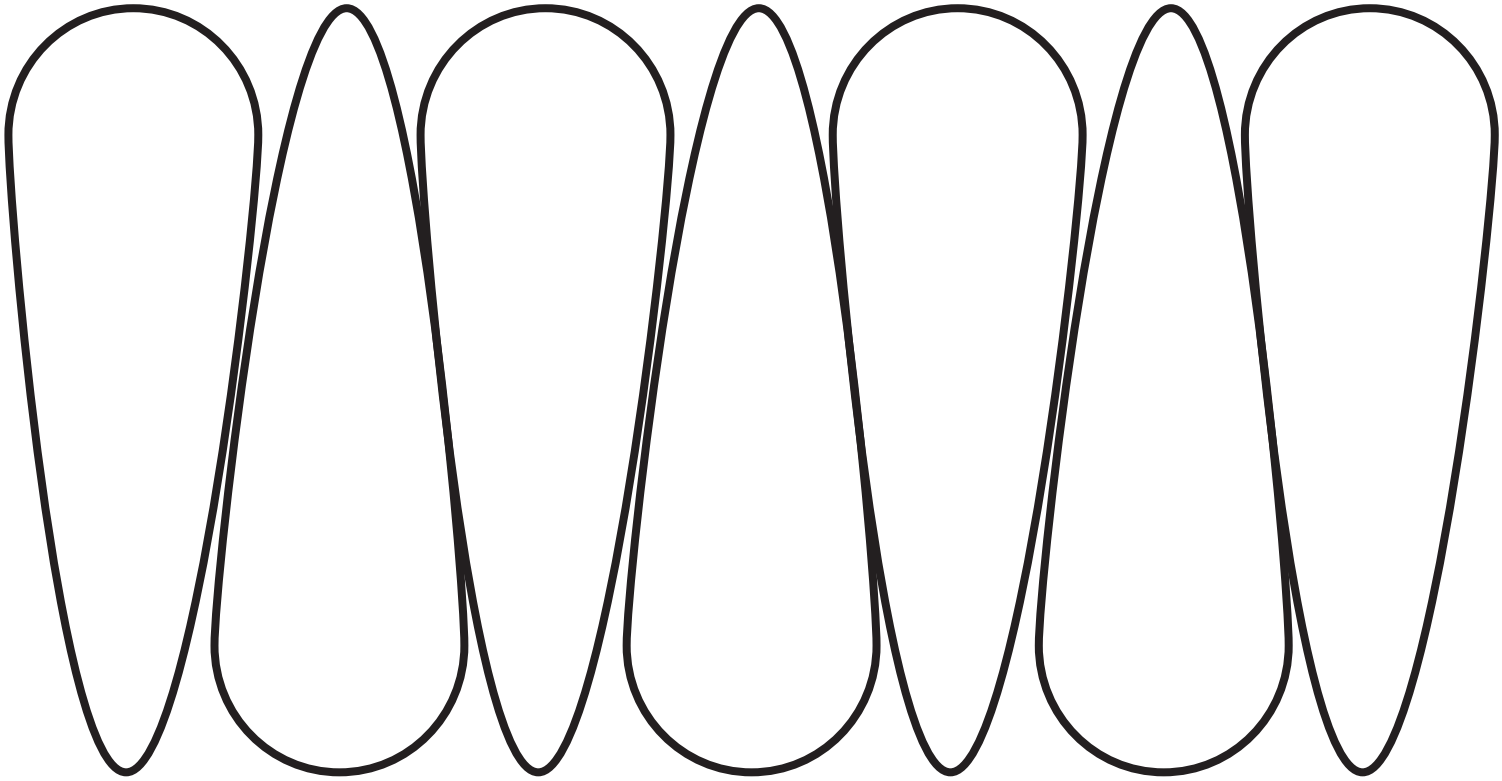
Vary the weight of your project and see if that has any effect on the strength of the vibration or the speed of the movement. Ask students if they can observe how the center of gravity affects movement and speed.

Related Standards:
- Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- Plan and conduct an investigation to provide evidence of balanced and unbalanced forces on the motion of an object.
- Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
- Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
- Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.









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Student Worksheet

Name: _____

Describe and sketch out 4 ideas for designing your robot. What materials did you use and why?

What did you notice when you tested each idea?

Which idea was most successful and why?

How could you change your design to make your robot go faster? forward? backward?