



# Speed It Up

How fast can you make your car go?! Design a paper towel roll vehicle and observe the forces needed to power your car. Does your car move faster or slower the farther you pull the strings apart?

## TEKS:

SCI 5.6D: The student is expected to design an experiment that tests the effect of force on an object

SCI 6.8B: The student is expected to identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces.

## Materials:

- Markers
- Paper towel tube
- 30-ft piece of string (or longer)
- 4 16-oz plastic cups (the cups should be big enough that your hand can fit inside)
- Scissors
- Optional: Construction paper, stickers, or any other craft supplies for decorations

## How To:

### *Making your Vehicle*

1. Decorate the paper towel roll to look like a vehicle! Add wheels, rocket fins, etc., making sure both ends of the paper towel roll stay open and uncovered.
2. Decorate all 4 plastic cups. These will be your hand guards.
3. Poke a small hole in the bottom of each 16-oz cup with scissors. You'll need a friend for this activity, so you will make four hand guards total.
4. Cut the string in half so you have two equal pieces (approximately 15-feet each) and thread both pieces of string through the paper towel roll.
5. Insert the end of one piece of string through the hole of one of the cups so that the string is inside the cup and the bottom of the cup is the part facing the paper towel roll.
6. Tie a knot at the end of the string to prevent it from slipping through the hole in the cup.
7. Repeat steps 5 and 6 to attach each of the three remaining cups to each loose end of string to finish your hand guards!

**31 Days of STEM FUN!**

[www.destember.org](http://www.destember.org) | [#deSTEMber](https://twitter.com/deSTEMber) | © 2017 by Girlstart [www.girlstart.org](http://www.girlstart.org)

DeSTEMber is a trademark of Girlstart

### Testing your vehicle:

1. With a friend, stand across from each other and hold an end of the string in each hand, with your hands inside the cups for protection.
2. Do not cross or twist the strings and be sure to hold the strings so they are taut and parallel to the floor. Your own hands should be close together with little or no space between them. Position the paper towel tube vehicle so it is really close to the hand guards on one end.
3. To make the paper towel roll go, move your hands apart quickly—the vehicle should move along the string. The faster the strings are pulled apart, the quicker the vehicle will go!
4. By alternating turns, the vehicle can move back and forth between people.

\*If you are trying this by yourself, don't cut the string. Instead, fold it in half and tie the folded end to something firmly anchored like a doorknob on a closed door. Stand back with the string taut and parallel to the floor, and make the vehicle move away from you by quickly pulling your hands apart.

### STEM Explanation:

Mechanical energy can be defined as an objects' ability to do work, whether it is in the form of potential or kinetic energy. That is, its mechanical energy enables that object to apply a force to another object in order to cause it to be displaced. In the paper towel roll car, the mechanical energy of the string gives the string the ability to apply a force to the paper towel tube in order to make it move. The quicker you pull the strings apart, the greater the force that is put on the tube and faster it moves forward.

### Career Connection:

*Automotive engineers* design the vehicles we use in our daily lives. They follow the engineering design process from design to final product. Automotive engineers work to design and produce vehicles that meet safety, style, comfort, handling, and other consumer needs.

### Resource:

[https://www.msichicago.org/fileadmin/assets/online\\_science/summer\\_brain\\_games/2017/SBG17\\_activity\\_guide.pdf?utm\\_source=Summer+Brain+Games&utm\\_campaign=a9c1db048f-sbg17wk1&utm\\_medium=email&utm\\_term=0\\_e1a5ba93b3-a9c1db048f-88200721](https://www.msichicago.org/fileadmin/assets/online_science/summer_brain_games/2017/SBG17_activity_guide.pdf?utm_source=Summer+Brain+Games&utm_campaign=a9c1db048f-sbg17wk1&utm_medium=email&utm_term=0_e1a5ba93b3-a9c1db048f-88200721)

**31 Days of STEM FUN!**

[www.destember.org](http://www.destember.org) | [#deSTEMber](https://twitter.com/deSTEMber) | © 2017 by Girlstart [www.girlstart.org](http://www.girlstart.org)

DeSTEMber is a trademark of Girlstart