



LESSON 8

# MAKE YOUR OWN GRAVITY RACER

## BEFORE YOU BEGIN

**NOTE TO PARENTS/CAREGIVERS:** Here are some ideas for a successful activity:

- Have all materials gathered before you begin including pennies to add weight.
- Only adults should use the hot glue gun.
- Allow for experimentation, innovation, and mistakes. Your child will have opportunities to make adjustments to the design. That's the fun of learning!
- Have a ramp set up for a test run if possible. Ramps can be constructed from a cardboard box, piece of wood, or even the leaf of a table. Stairs or books can be used to add height on one end.

**TIPS:**

- You are the "coach" or "guide on the side." It's important to let children do the work themselves as much as possible.
- Your child will come up with ideas that don't work. Finding out what doesn't work is an important learning experience. In fact, when real-world scientists and engineers spend their time trying to solve problems, they experience a lot of trial and error. Let your child know when they encounter frustrations and ideas that don't work, they are acting like a real scientist or engineer.

**FOR A SMALL GROUP:** If you have more than one child, each can build their own race car, or together they can build a "team" car. If building a team car, it's important to divide up the tasks. The following roles can be combined depending on the number of children:

- Supply Engineer: gathers materials to build the Gravity Racer
- Chief Engineer: reads directions
- Design Engineer: lays out all the pieces for construction and selects materials
- Construction Engineer: makes sure all steps are followed in the right order



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## OBJECTIVES

**Your child will:**

- Build on vocabulary and concepts from the previous 7 lessons!
- Follow written directions and illustrations to build a race car
- Learn about the effect of weight and distance on speed

**You will need:**

- “Make Your Own Gravity Racer” Kid Scoop News worksheet
- Materials for constructing Gravity Racer (see worksheet)
- Engineer’s Journal

## START YOUR ENGINES!

**ASK:** *What kind of cars do we have in our family? What parts of all cars are the same? What parts are different?* **OPTION:** Bring your child to the front window and identify things that are the same or different about the cars they see parked or passing by?

**SAY:** *There are certain features that are the same for all cars—a body, engine, wheels, and windows—and things that are different— size, color, shape, and style. Today you will begin building and testing your own Gravity Racer!*

**FIND** the “Make Your Own Gravity Racer” worksheet. **Do not distribute materials yet!**

**USE** the chart below to look for answers (shown here) to the questions as you read the first section of the worksheet. Read each question aloud and have your child circle or underline answers as they find them.

QUESTIONS	ANSWERS
What do <i>engineers</i> do?	<i>Invent, design and create things</i>
What materials do you need?	<i>See list</i>
How many steps to build your Racer?	<i>Seven</i>
What can you use to add weight to make your car roll farther down the ramp?	<i>Pennies or other weights</i>

## GO!

**SAY:** *Now that you’ve read how to make your racer, let’s get started. What do you need to do first?*

**FOLLOW** the seven steps.

**PROVIDE** 30 to 45 minutes to complete the initial design and testing.

STUDENT NAME: \_\_\_\_\_



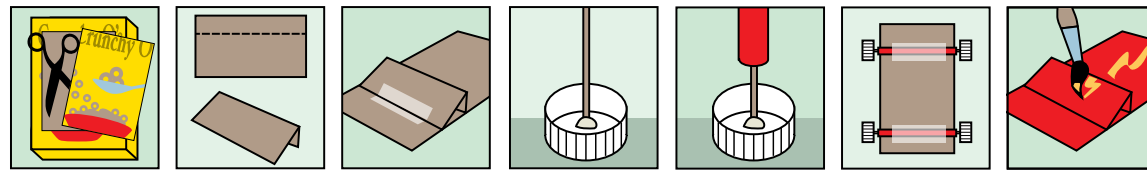
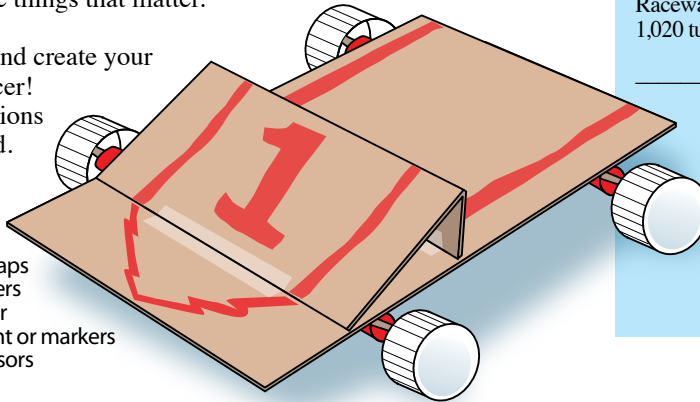
THE SCIENCE OF RACING  
**Make your own Gravity Racer!**

The **E** in **STEAM** is for **engineering**. Engineers are changing the world all of the time. They dream up creative, practical solutions and work with other smart, inspiring people to invent, design and create things that matter.

Be an engineer and create your own Gravity Racer! Here are instructions to get you started.

**YOU'LL NEED:**

- cereal box
- 4 plastic bottle caps
- 2 bamboo skewers
- 2 straws
- ruler
- hot glue
- paint or markers
- tape
- scissors



Cut a 6" x 9" rectangle out of a cardboard cereal box.

Cut another rectangle, 6" x 4" and fold as shown.

Tape the angled hood onto the larger rectangle.

Hot glue a bamboo skewer to the inside center of a plastic bottle cap.

Insert skewer through straw to create an axle. Hot glue bottle cap to other end of skewer.

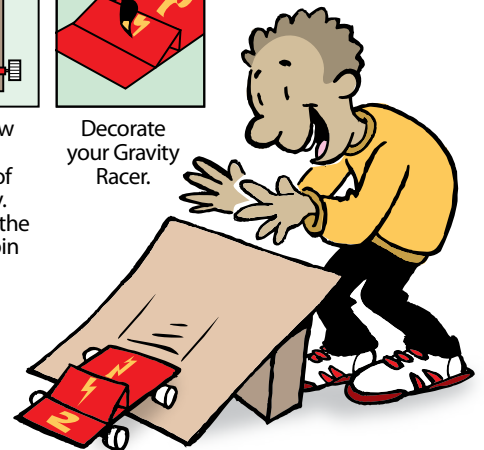
Tape straw axles to bottom of car body. Make sure the wheels spin freely.

Decorate your Gravity Racer.

**Engineering Success**

Roll your gravity racer down a ramp. Measure how far it rolls. What happens if you add weight to your racer, such as taping pennies to it? What else can you do to make it roll farther?

Thank you to Ed Sobey for ideas on how to make a Gravity Powered car.



**STEAM at Sonoma Raceway**



**A Note to Parents**  
 Help your child build Gravity Racers for the whole family and have a night of races.

The **M** in **STEAM** stands for **math**. Race car drivers think a lot about math. Here is a race car driver challenge for you, straight from Sonoma Raceway!

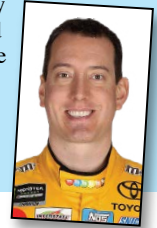
Drivers who complete the Toyota/Save Mart 350 at Sonoma Raceway will make 85 laps around the race course with a total of 1,020 turns. **How many turns is that per lap?**

\_\_\_\_\_ turns per lap

**Sonoma Raceway Math Challenge**

A driver will travel nearly 215 miles by the end of the race. If the average speed was 80 mph, about how long will it take to complete the race?

\_\_\_\_\_ hours \_\_\_\_\_ minutes





## STEAM RACE CAR CHALLENGE ULTIMATE CHALLENGE

Now that you’ve built and tested your own Gravity Racer, it’s time to think creatively and go wild with a design of your own! Use the guidelines below and let your creativity and scientific exploration explode! **We would love to see your car(s).** Go to [sonomaraceway.com/STEAM](http://sonomaraceway.com/STEAM) and post your pictures and videos.

### MATERIALS

Your gravity-powered race car should be built from recycled materials using “clean trash.” Here are some things you might use to stock your home “Pit Stop” area:

cardboard	construction paper	tissue paper	milk cartons	¼" dowels
paper clips	pipe cleaners	straws	wheels	glue
tape	small weights	styrofoam trays	spools	scissors
craft sticks	bottles	bottle caps	cds	lids
sandpaper	wooden wheels	toothpicks	axle & wheels from a toy car	

### SPECIFICATIONS FOR VEHICLES

- WIDTH: Overall width of the vehicle is not to exceed 9 inches.
- LENGTH: Overall length of the vehicle is not to exceed 12 inches.
- HEIGHT: Clearance between the chassis and the track should be a minimum of  $\frac{3}{8}$  of an inch.
- WEIGHT: The weight of the vehicle is not to exceed 8 ounces.

### RESTRICTIONS

- The race car must have 4 wheels.
- The race car shall not ride on springs.
- Decorations and attachments may be added providing they are securely fastened and do not exceed the maximum length and width specifications.
- Race cars are subject to inspection by an official inspection committee to determine eligibility and safety.

### CHALLENGE BUILDING GUIDELINES

- If race cars are built by more than one child, only one child will be identified as the “official driver” of the vehicle.
- Race cars should have wheels securely attached to the body or have the body securely attached to a wheeled platform.
- Measure your car to make sure the overall size meets the requirements. Being disqualified can be very disappointing!
- Race cars must be entirely student built. Adults may assist with drilling and electrical tools used in the making of the cars.



STEAM RACE CAR CHALLENGE  
**ULTIMATE CHALLENGE**

**TRACK INFORMATION**

A track is a ramp with enough of an incline for cars to move downwards, powered by gravity and with wheels to help them move.

- A cardboard box on a set of stairs
- A plank of wood held up on one end with some books. Try changing the incline of the plank to see how it affects the race car's speed.
- Leaf of a table propped up on a chair, or other raised object
- Experiment and share your ideas at [sonomaraceway.com/STEAM](http://sonomaraceway.com/STEAM)

