

# STEERING MECHANISMS

Tech  
Activity #4



**Design Brief:**

A car is one of the most complicated machines that a person or a family is likely to possess. The underlying principle governing the car is simple: power is transferred from the engine to the wheels to make the car move. But this transfer of power, together with the need to make driving easy, safe, and comfortable, involves many highly complex systems. In fact, a car is not one machine at all, but a whole collection of machines and systems working in concert, each contributing a vital function to make the car perform well.

**Design Problem:**

Build a model of a rack-and-pinion steering mechanism used by most cars. When the steering wheel is turned, a pinion (toothed wheel) on the end of the wheel shaft moves a rack, (a toothed shaft) to one side or the other. The rack is linked to the wheel hubs and swivels the wheels.

**Research / Historical References:**

Research how vehicle steering mechanisms have changed in the last 100 years. You may use books, magazines, or the Internet to find information on this topic. Be sure to write down the sources of your information.

**Materials:**

Steel ruler  
Ruler  
Cutting Surface  
Foamcore strips 1" (3 cm) and 1/2" (1.5 cm) wide  
Foamcore circles, one 1 inch (3 cm) and four  
2 inch (5 cm) diameter  
Screwdriver  
1/8 inch (3 mm) nuts and bolts  
Thin Nails  
Ridged Plastic Bottle Top

Scissors  
Craft Knife  
Drill and 3/16 inch (5 mm) bit  
Skewer  
Round File  
C-clamp  
Glue  
Pencil  
Rubber Band  
2 3/8" x 1/2" (6 x 1.5 cm) sandpaper strip  
Double-sided Tape

**Criteria:** (Limitations)

You must use only the materials that have been provided by the teacher.

**Communicate & Present:**

You should be able to explain either in a show and tell or by writing three or four sentences about what each of the parts of your model are and how they work.

**Evaluation:**

Solution performance—1) Did your steering mechanism work? 2) Aesthetics—does your steering mechanism look well made or just thrown together? 3) Communicate your solution—explain how you made your steering mechanism. 4) What was the hardest part? 5) How does this steering mechanism work?

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## Make Your Own Steering Mechanism

**Step 1:** Cut out the shapes G – J and M from 1/8 - inch (1.5-cm) foamcore (or cardboard), and the rest from 1-inch (3-cm) foamcore (or cardboard), as shown in diagram to (wherever it ends up). With a skewer, make holes large enough for a bolt to pass through in pieces G – L, where dots are marked. Each hole is 1/8 inch (3-mm) from the nearest short edge of the foamcore or cardboard.



**Step 2:** Glue the rack guidelines (B, C) to the chassis (A). Then glue the steering column supports (D, E, F) to the chassis. Glue the front axle (G) beneath piece B. Ensure the steering rack (H) slides easily between its guides. Use nuts and bolts to connect the rack, track rods (I, J), steering arms (K, L), and front axle.



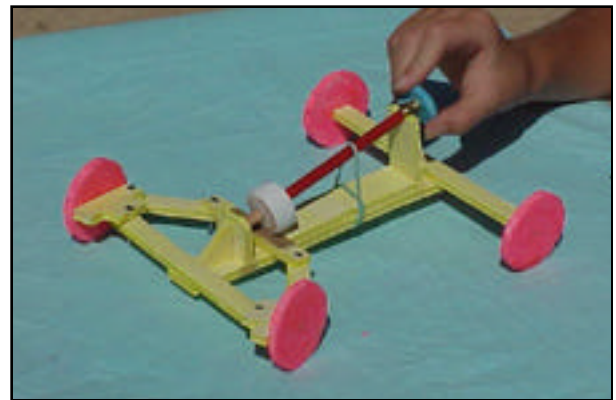
**Step 3:** Drill a hole through the center of the bottle top. Using a round file, enlarge the hole until a pencil can be fitted tightly through the hole to make a steering column. Glue the rear axle (M) beneath the rear of the chassis.



**Step 4:** Tape the sandpaper to the rack using the two-sided tape. Place the steering column on its supports so that the bottle top pinion contacts the sandpaper rack, and secure it to the chassis with a rubber band.



**Step 5:** Nail the 2-inch (5-cm) diameter wheels to the ends of the front and rear axles. Attach a 1-inch (3-cm) diameter foamcore (or cardboard) steering wheel to the steering column. The steering mechanism is now ready to use



**NOTE:** Fabricate and assemble your project following all steps as demonstrated by the teacher.

# Exploded View of all Parts

