Maplewoodshop
63 Glenwood Place
East Orange, New Jersey 07017

p. 844-WOODSHP / 844-966-3747
info@maplewoodshop.com
www.maplewoodshop.com

Cardboard Car

Learn how to make a Dome or a Sphere using only found objects in a home.

NOTE: STORE CARDBOARD 1-3 DAYS BEFORE USE

About Maplewoodshop

Maplewoodshop is on a mission to help educators develop creativity, build confidence, and foster community in students through woodworking. As of March 2020, **over 55 camps and schools use the Maplewoodshop program** to train, equip, and support their staff to teach woodworking.

Why woodworking?

Woodworking is engaging. It sparks creativity and develops problem solving skills. Working with hand tools and wood gives students the opportunity to **practice patience, foster collaboration, and learn responsibility**. The end product is a keepsake that kids are proud to bring home and say, **"I made that!"**

This project

This project uses only objects you have in your home. Please be safe with scissors and watch your children to avoid accidents. You can make the parts larger or smaller. You can also make out of paper which is easier to cut.

Related Subjects

- Design using classic ratios
- Geometry proving how the circumference is related to a radius
- Engineering using an iterative design approach

Resources for Parents

Learn more on our site

https://start.maplewoodshop.com/wfpab

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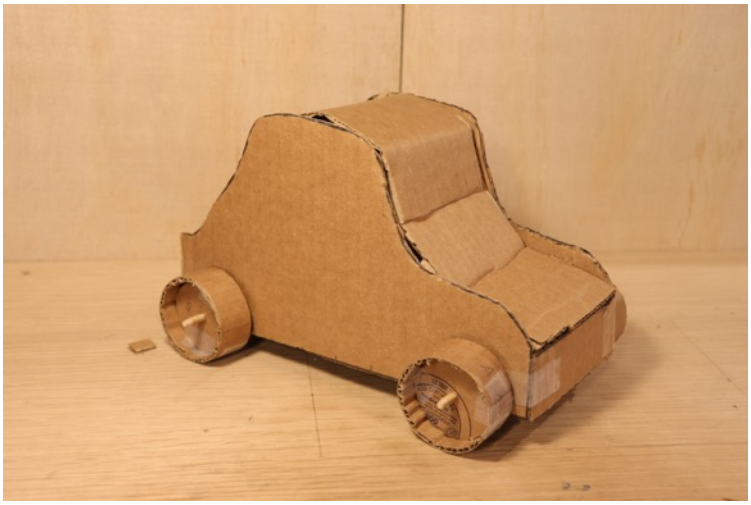

2 The finished project

Materials/Tools

For each woodworker:

- Roughly 18” x 14” piece of cardboard
- Roughly 4” x 16” piece of cardboard
- Dowel or pencils
- Packing or regular tape
- Triangle
- Pencil
- Sharpie or pen
- Scissors
- Ruler

Optional:

- Decorative supplies

1 A wood version you make in Maplewoodshop

Vocabulary

- Proportion
  The visual relationship between various objects. Greek and Roman proportions influence many Western buildings and furniture design.
- Rhythm
  A repeated pattern in design.
- Radius
  The distance between the center of a circle and the circumference.
- Circumference
  The distance around a circle.
- Diameter
  The distance across the center of a circle.
- Template
  A template is an example you use to make multiple pieces the same size.
- Axle
  A rod passing through the center of a group of wheels.

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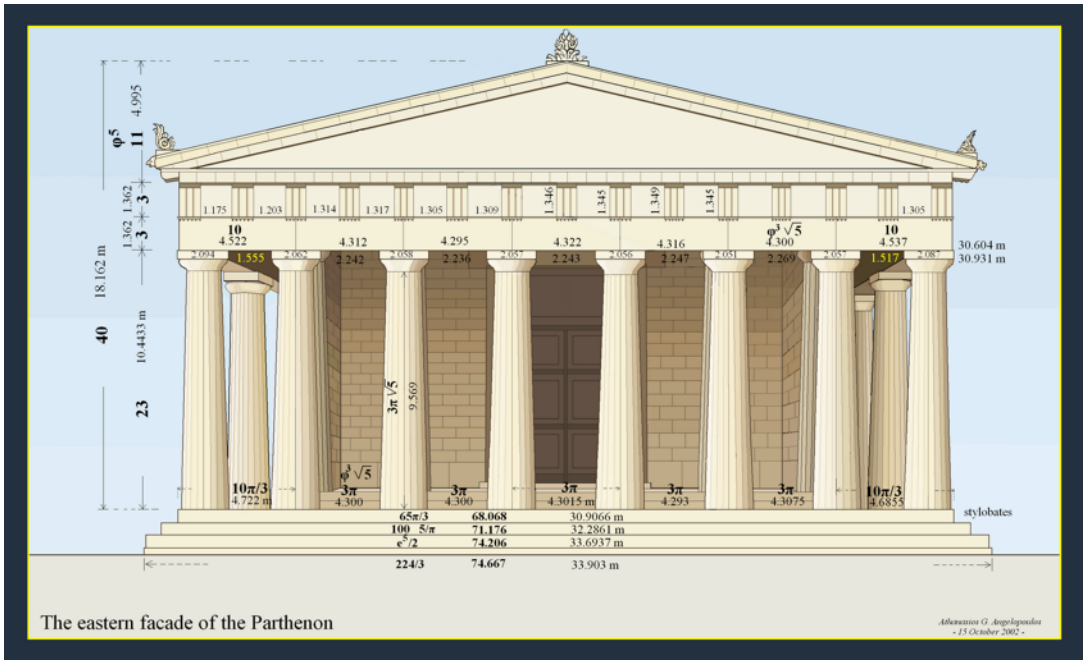
Proportions:

Why is it that some buildings look elegant? It is because the proportions and rhythms of the design appear to our eyes as pleasing. An example is the Parthenon in Greece.

Note the distance between the columns and decorative elements above the columns. Those repeating patterns are called Rhythm.

For our car, we will make the car a 2:3:5 ratio and you will see that we simply double that ratio to get our 4” wide by 6” tall by 10” long car.



Geometry

Why is the circumference of a circle 2ΠΠr?
Let’s break this down.
Π is 3.1416
In our car, the radius will be 1” so
2 times Π times r = 2 x 3.1416 x 1”
And that is 6.28
When you get to step 20, you can try this for your self.

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Step one Gather your supplies. NOTE: if you want to add a top to the car, you will need extra cardboard	
Step Two Divide your cardboard into an area for the wheels (6” x 14”) and for the body 12” x 14”. For the body, you want two sections each 6” wide and 14” tall.	

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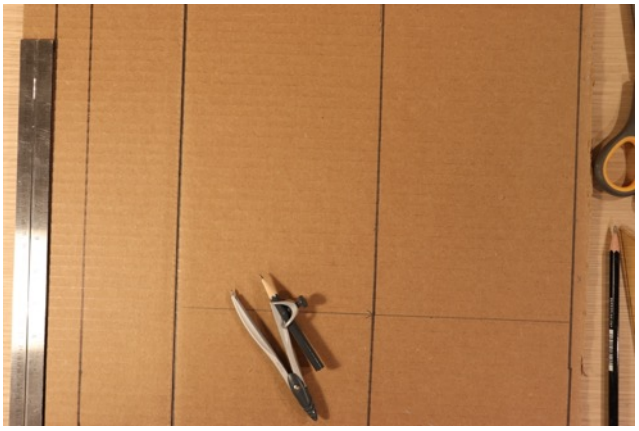
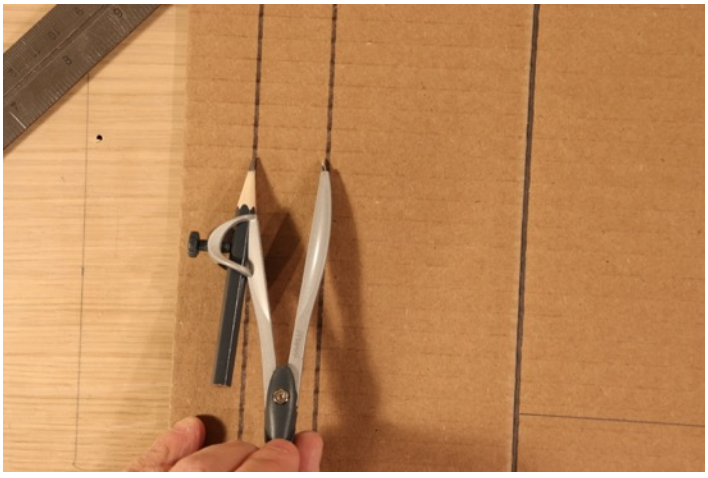
Step Three Divide your body area so that you have two, 10” long rectangles and two, 4” long rectangles. The triangle in the photo is at the 10” mark.	
Step Four In the wheel area, make two lines each 1” wide and 14” long. These long strips will become the circumferences of your wheels.	
Step Five Set your compass to 1” To learn how to use a compass, watch this video. https://youtu.be/0y0VZutjf3U	

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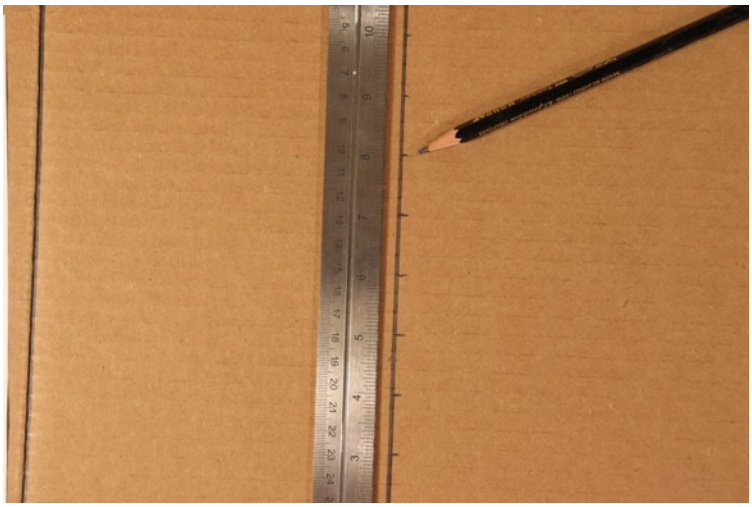
Step Six Make four circles, each with a radius of 1”. The diameter of each circle is 2”. Use your ruler to prove this.	
Step Seven Back on the body section of your cardboard, make ‘tick’ marks at each inch. We will use these to explore a nice proportion for your car.	
Step Eight Count 2” inches from the top and make a mark as shown. Do this again on the bottom. You will have 6” in the middle. The top 2” and the bottom 2” will be the front and back of your car. The main body will be the 6” in the middle. This is an example of rhythm.	

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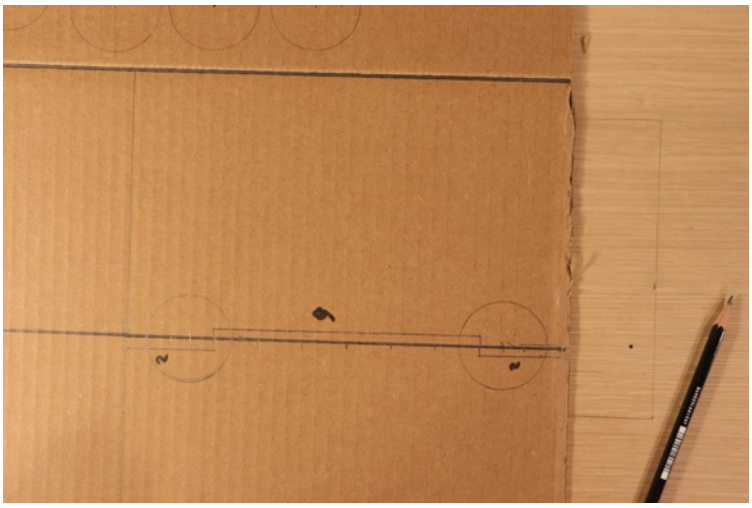
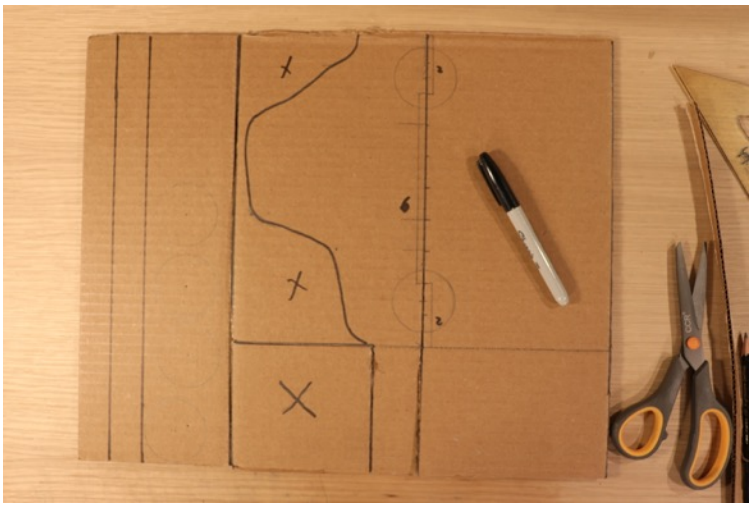
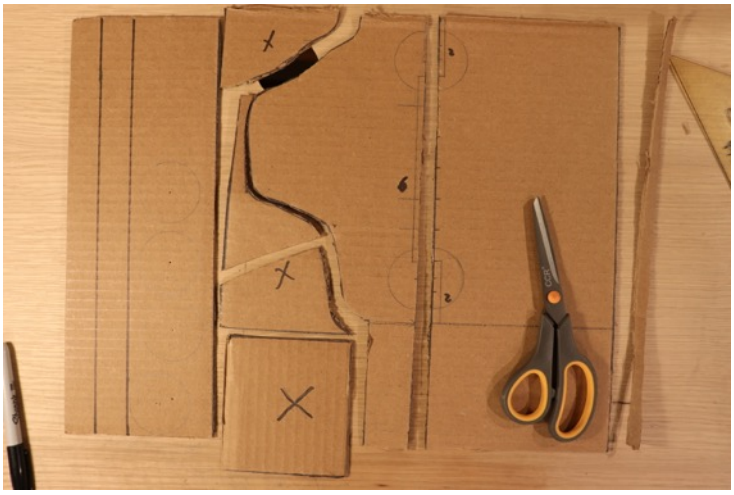
Step Nine Plan where you wheels will go. I put mine 1.5” from each end. Check that your compass is set to 1” radius and make circles. NOTE: Do not cut out this area. You need somewhere for the axles.	
Step Ten Use a marker or sharpie to show where you will cut. Make X’s to show what is waste and what you will keep. NOTE: when you cut, you can add “relief cuts” around your shape which helps cut curves in cardboard. This means cutting in from the edges every few inches. The cuts ‘relieve’ pressure on the scissors.	
Step Eleven When you have cut out one side (and front) of the car, you now have a template you can use to copy the shape to the other side (and back).	

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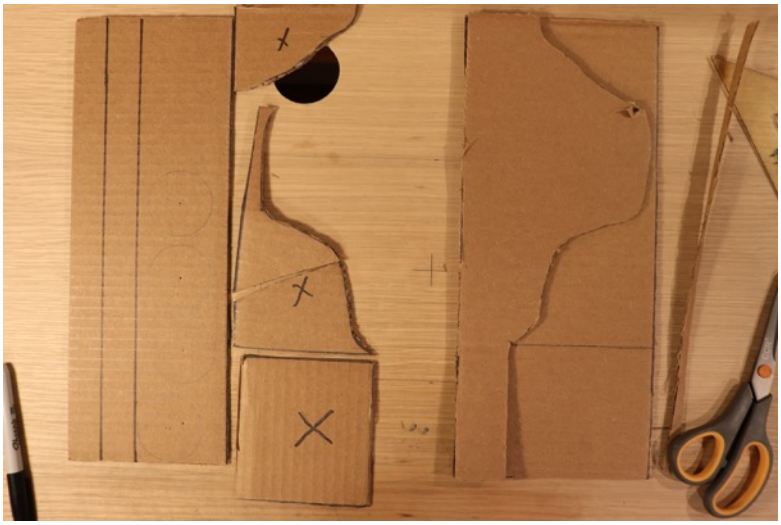
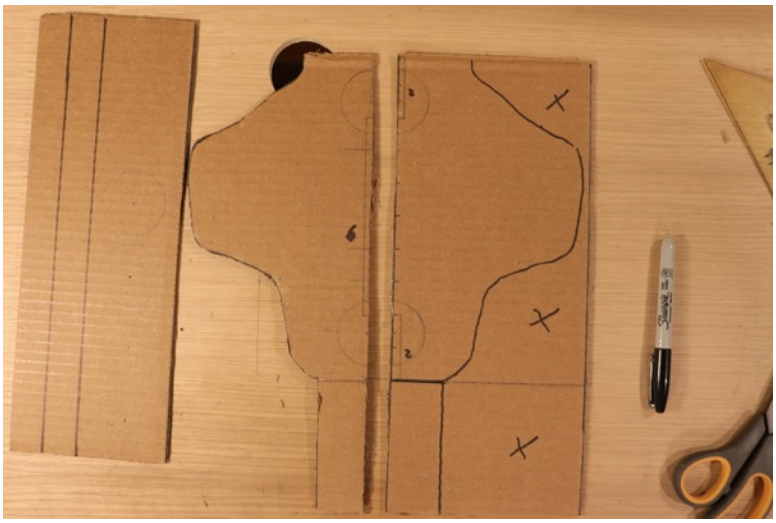
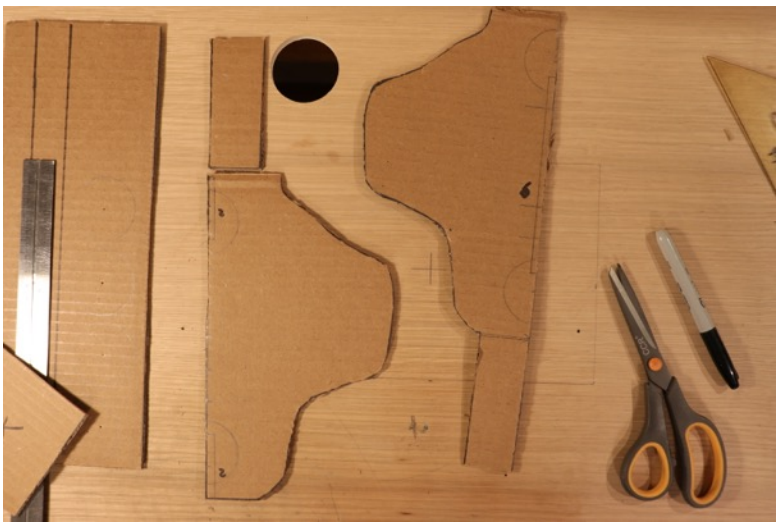
Step Twelve Lay the cut out side on the other side.	
Step Thirteen Trace around the template and mark your waste with X's.	
Step Fourteen Cut out your wheel strips and wheels.	

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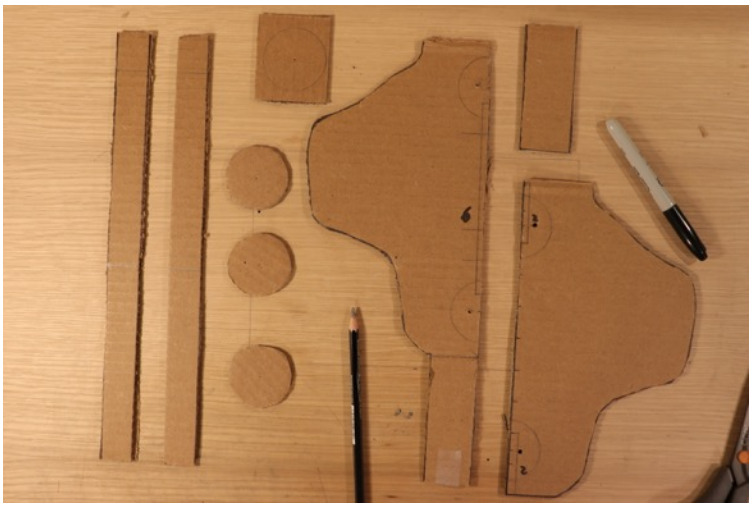
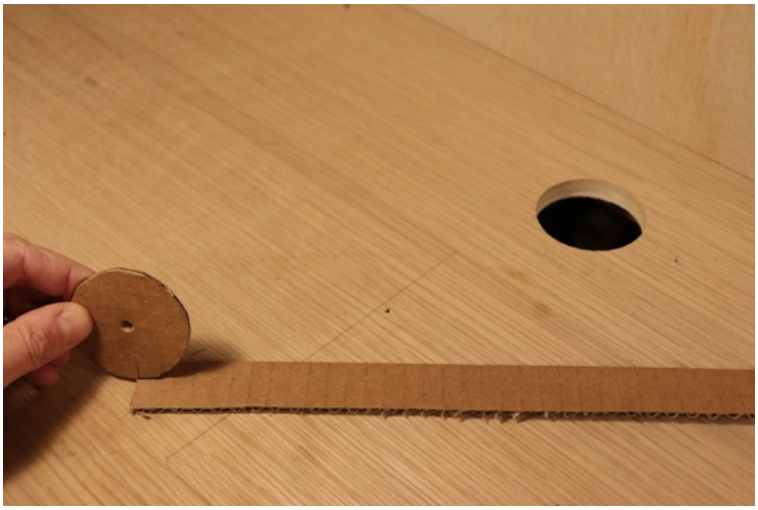
Step Fifteen
You will have these pieces.

NOTE: I made a mistake with the back and had to cut it off.



Step Sixteen
Make a pencil mark anywhere on the circumference of the wheel.

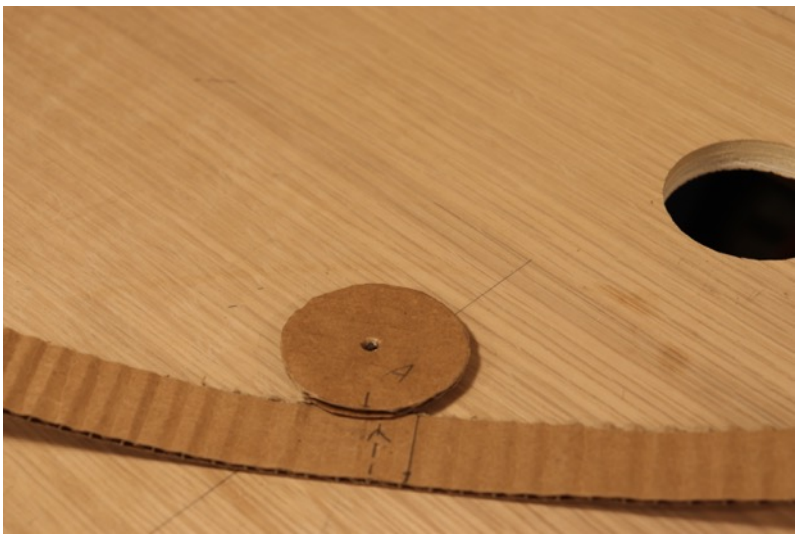


Step Seventeen

Roll the wheel along the strip and see if your circumference is really $2\Pi r$.

ENGINEERING NOTE: Do not cut your wheel strips to this length. Why? Because due to how the cardboard bends, you will need longer than the circumference.

The dotted line is the circumference. The solid line is what size the wheel needs.



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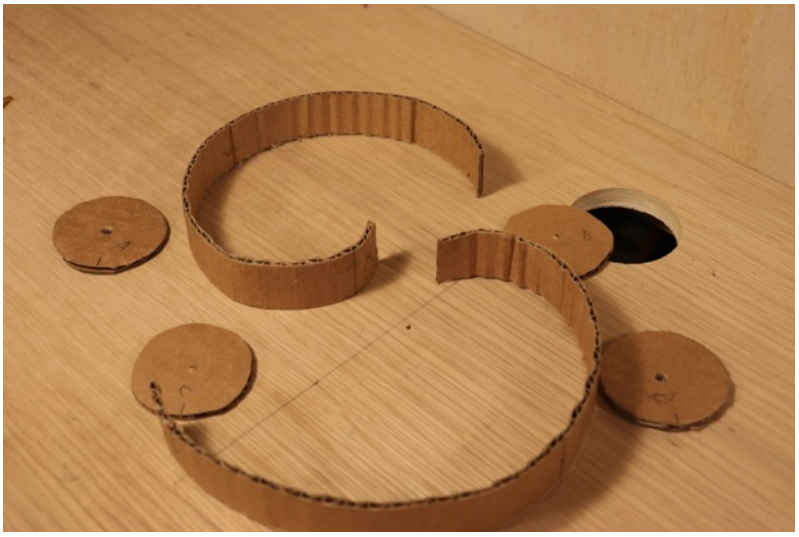
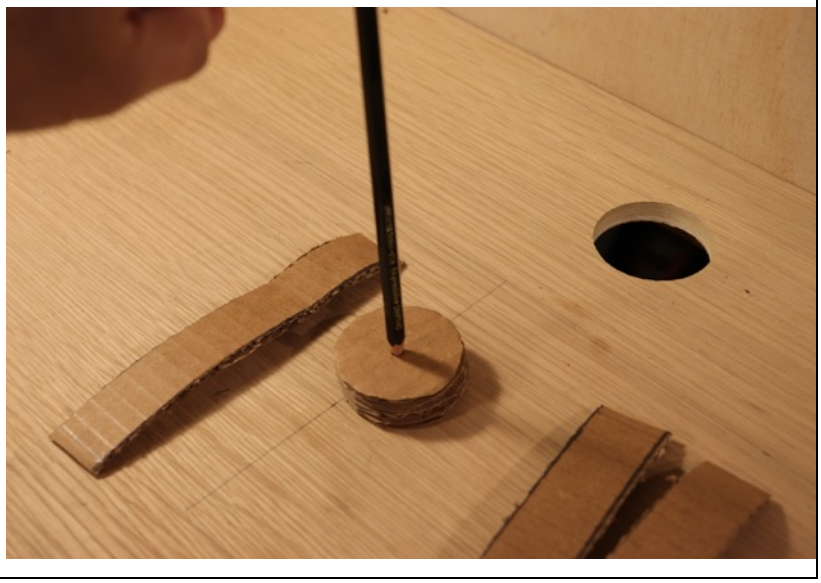
NOTE – Pull the strips along the edge of your table to make them curved.	
Step Eighteen Punch holes in your wheels through the cardboard on both sides for your axles.	

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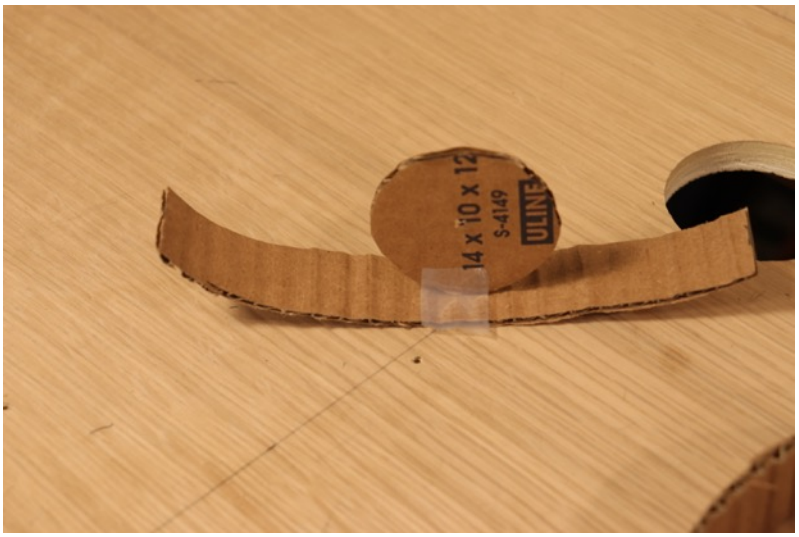
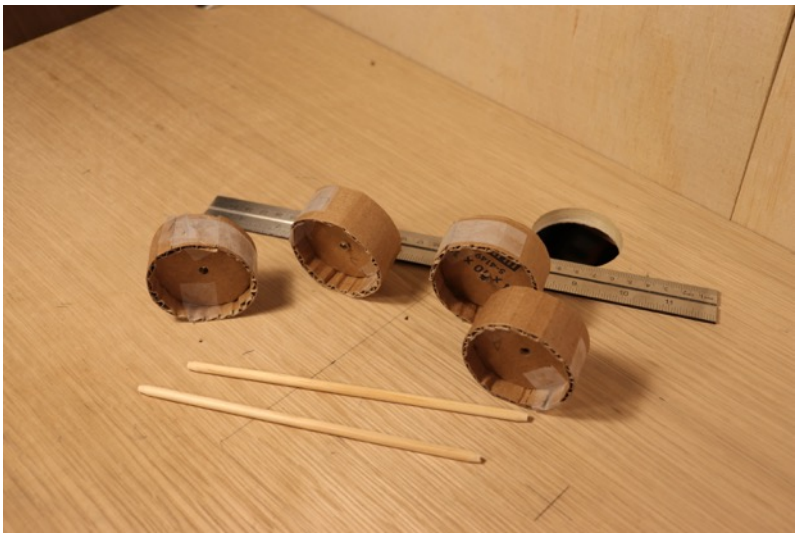
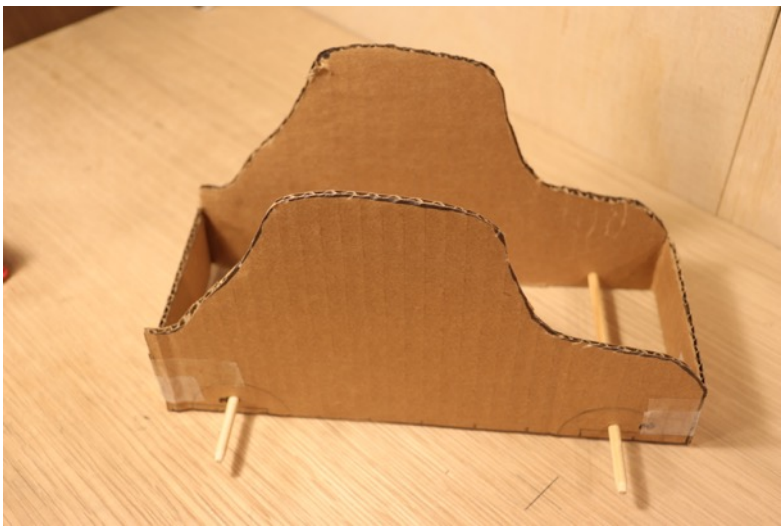
Step Twenty-one Tape the wheel to the strip. Then close the strip.	
Step Twenty-two Make the axles about 7” long. 4” for body width 2 x 1” for wheel width 1” for space between car and wheel	
Step Twenty-three Push the axels through the body. Make the holes in the body a tiny bit bigger so the wheels turn easily.	

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Step Twenty-four If you want to add a top, make a long strip 6” wide. You can score the cardboard 1” on either side to make tabs that will hold it to the body.	
Step Twenty-four Roll this cardboard on both sides to make it more flexible.	
Step Twenty-four Cut tabs into both sides then cut out every other tab. This will help you fold it into the car.	

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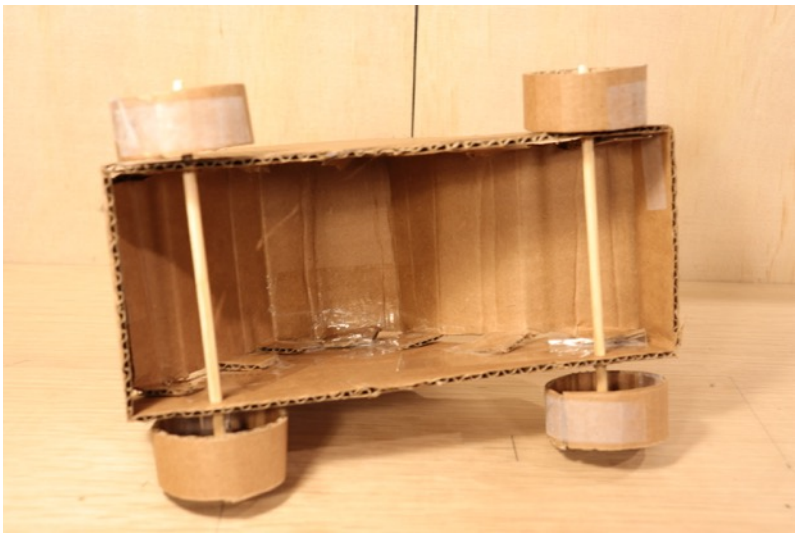
Step Twenty-four Slowly work your way from the back to the front, taping each pair of tabs as you go.	
Step Twenty-four This is what the car will look like from the bottom.	

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