

Gears

Gears are absolutely essential for a cyclist. How do gears work.

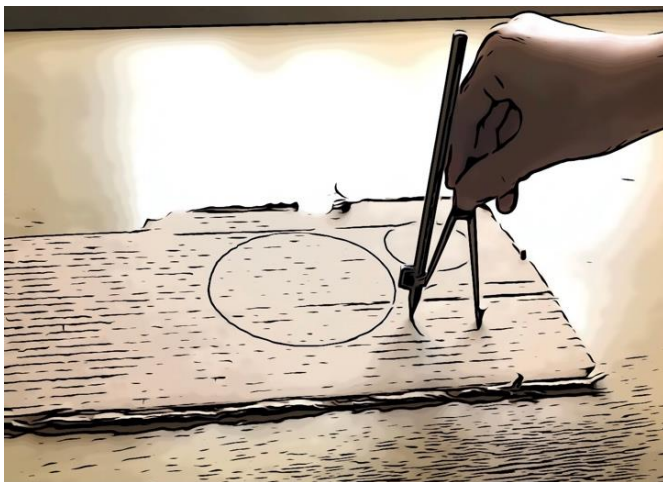
You will need:

- Cardboard box made of corrugated cardboard. Corrugated cardboard has the ridges inside. Most shoe boxes are not made of corrugated cardboard.
- Ruler
- Pencil
- Compass (the kind you draw circles with)
- Sharp scissors
- Glue
- Permanent Marker
- Pins



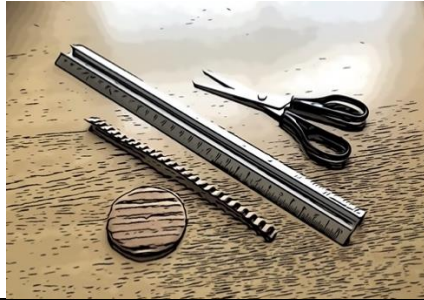
1. Cut out a piece of cardboard that is at least 25cm x 25cm. This will be your base.

2. On another piece of cardboard, use the compass to trace out at least four circles with 2cm, 3cm, 6cm and 7cm diameters. Remember that a radius is half the diameter, so if you set the compass radius at 1cm, you will get a circle with a 2cm diameter.



3. You may need to ask a grown-up to help cut out the circles you traced. The rounder your circles are, the better they will work.

4. Calculate the circumference of each of your circles by multiplying the diameter by π . For example, for the 3cm circle, the circumference would be about 9.42cm.



5. Next, you are going to give each of your gears toothed edges. Making sure to cut along the corrugates, cut a long strip of cardboard 0.8cm wide.

6. With your corrugated cardboard, carefully remove the brown paper on one side. You should be left with lots of bumps, without any paper still stuck on. This can be tricky, so be patient!

7. Using the circumferences you calculated, cut out a piece of stripped corrugated cardboard for each of your circles.
 8. Spread glue around the edge of your first circle.
 9. Roll the correctly measured piece of corrugated cardboard around the circle, making sure the bumps are on the outside
 10. Secure the stripped corrugated cardboard with a push pin or painter’s tape until dry.
 11. Repeat for each of your other circles.



12. Use a black permanent marker to make a black mark at one tooth of each of your gears. This way you will be able to track when each has made a rotation.

13. Attach the 6cm and 2cm gears to your board, using pushpins at the center of each and making sure that the gears’ teeth interlock.

14. Rotate the 6cm gear clockwise. *Which way does the 2cm gear turn?*
 15. Using the black marks to keep track, turn the 6cm circle once. *How many times does the 3cm gear turn?*
 16. Now, turn the 3cm gear once. How many times does the 6cm gear turn?
 17. Arrange the other gears as you want, and experiment!