



Learning Lab°

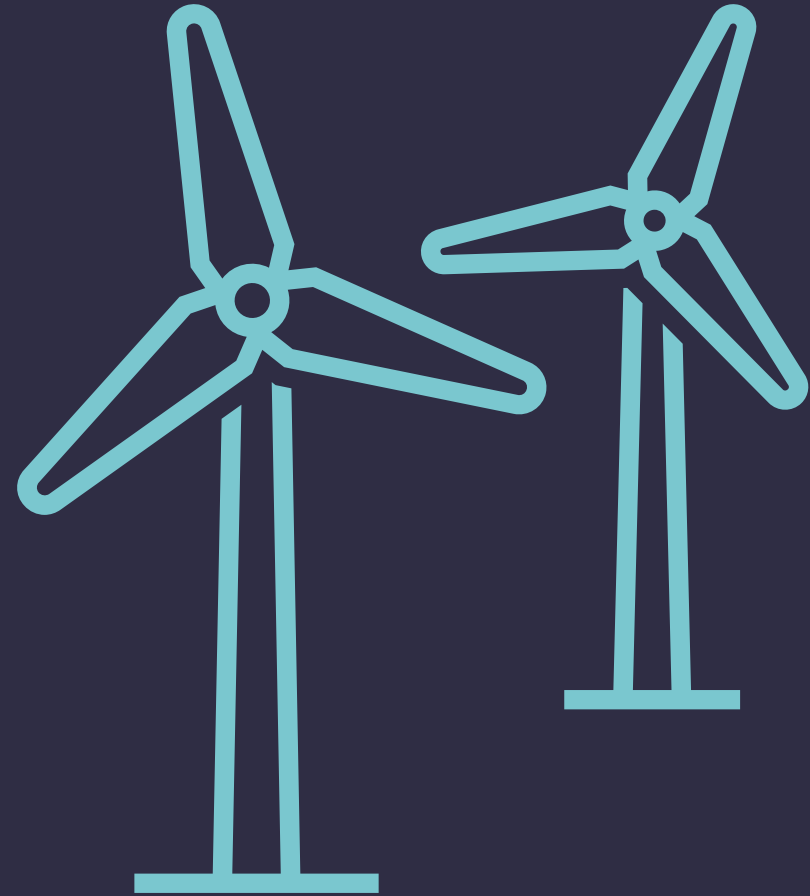
POWERING THE FUTURE

Electricity 1

Turbines & Gears

The blades on a wind turbine slowly rotate when they are moved by the wind.

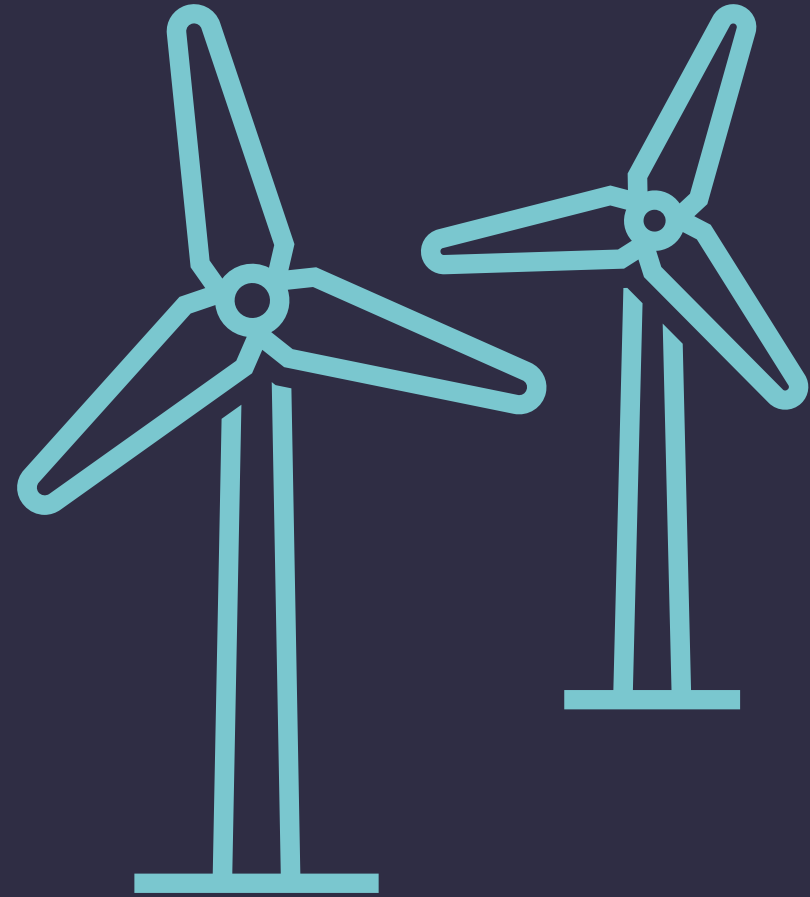
There is a generator attached to the turbine blades.



When the wind spins the turbine blades, magnets are spun inside the generator.

This creates a flow of electricity.

The faster the magnets spin, the more electricity flows.

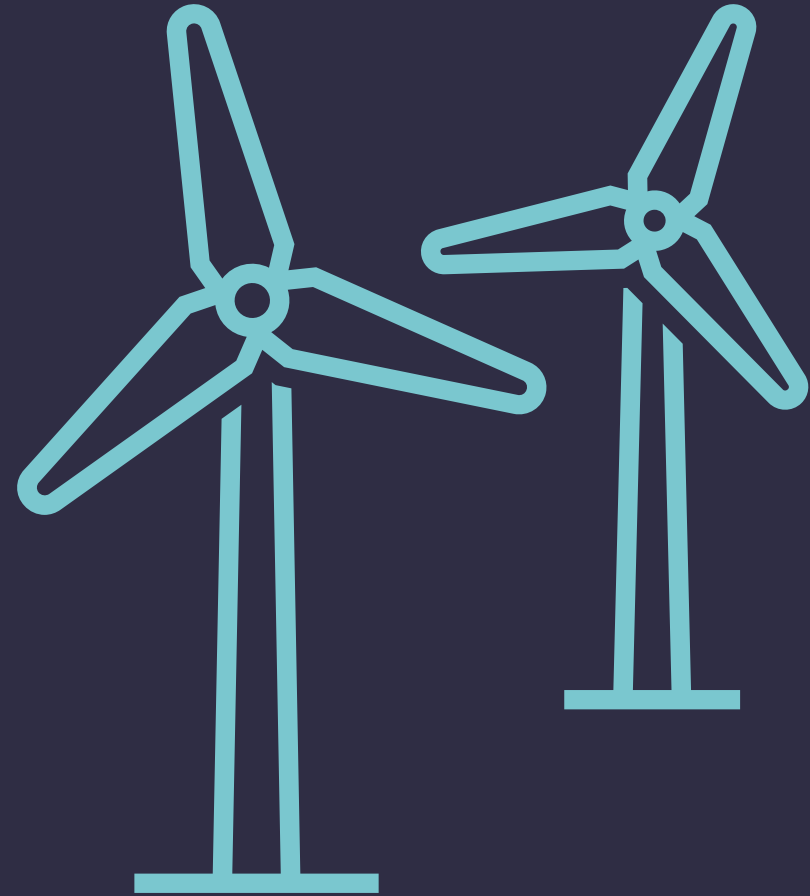




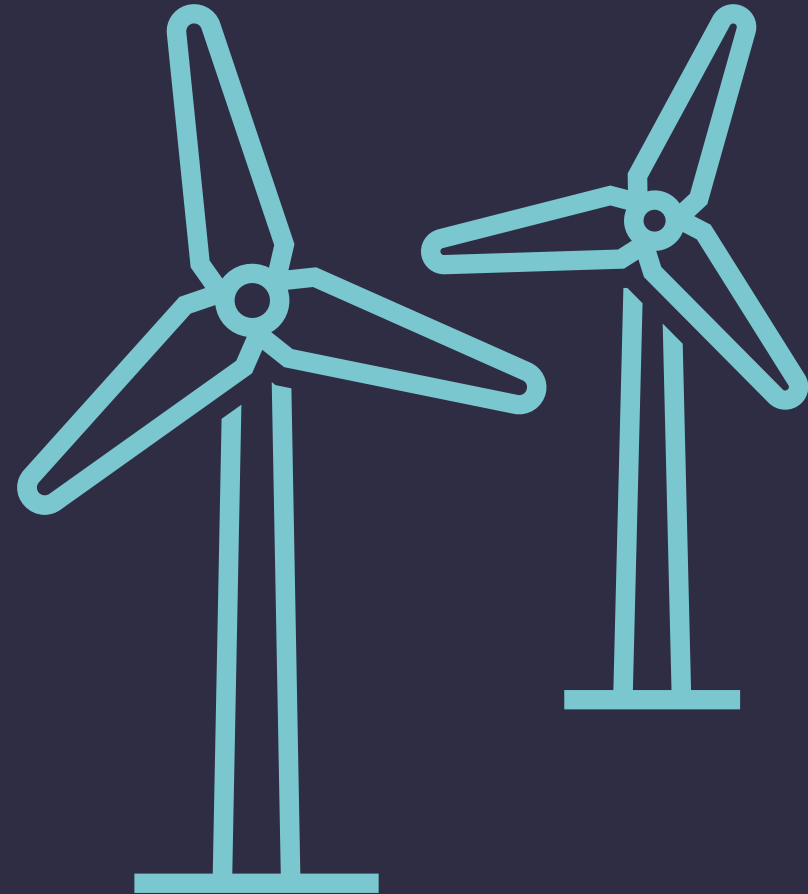
But wind turbines often look like they are spinning slowly. How do they generate enough electricity?

Between the spinning turbine blades and the generator is a gearbox.

Gears inside the gearbox can take the slow spin of the turbine blades and transform this into a fast spin for the generator.



In this activity, you are going to explore how this gearbox works.



You will need

- 2 x Gear Template sheets
- Corrugated cardboard
- Scissors
- Glue stick
- Blu tack/plasticine
- Pencil
- 4 x split pins
- Paper



For each gear you are making, roughly cut out the template on both Gear Template sheets.



Using a glue stick, glue the gear templates onto a piece of cardboard.



Carefully cut out
the gear shapes.



Place a ball of blu tack or plasticine on the desk. Place the centre of one gear shape on top.



Using a pencil, make a small hole in the centre of the gear shape.

Do this for both gear shapes.



Using the glue stick, glue one gear shape on top of the other, to make one thicker gear.

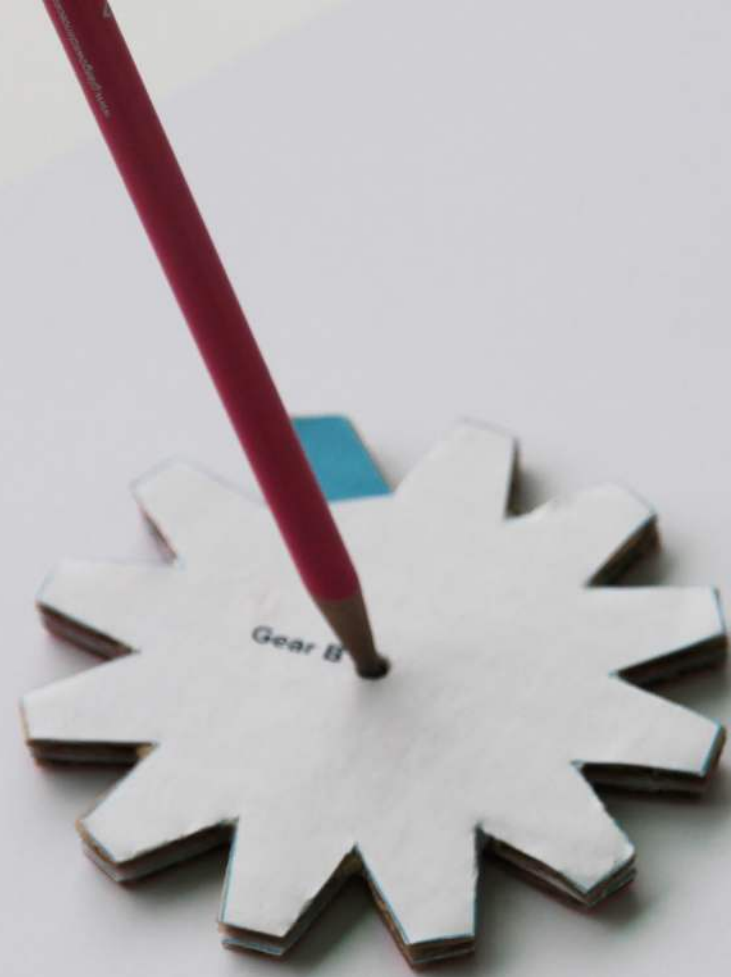


Measure the thickness of the gear. It should be at least half a centimetre thick.

If it's not thick enough, another layer will be needed.

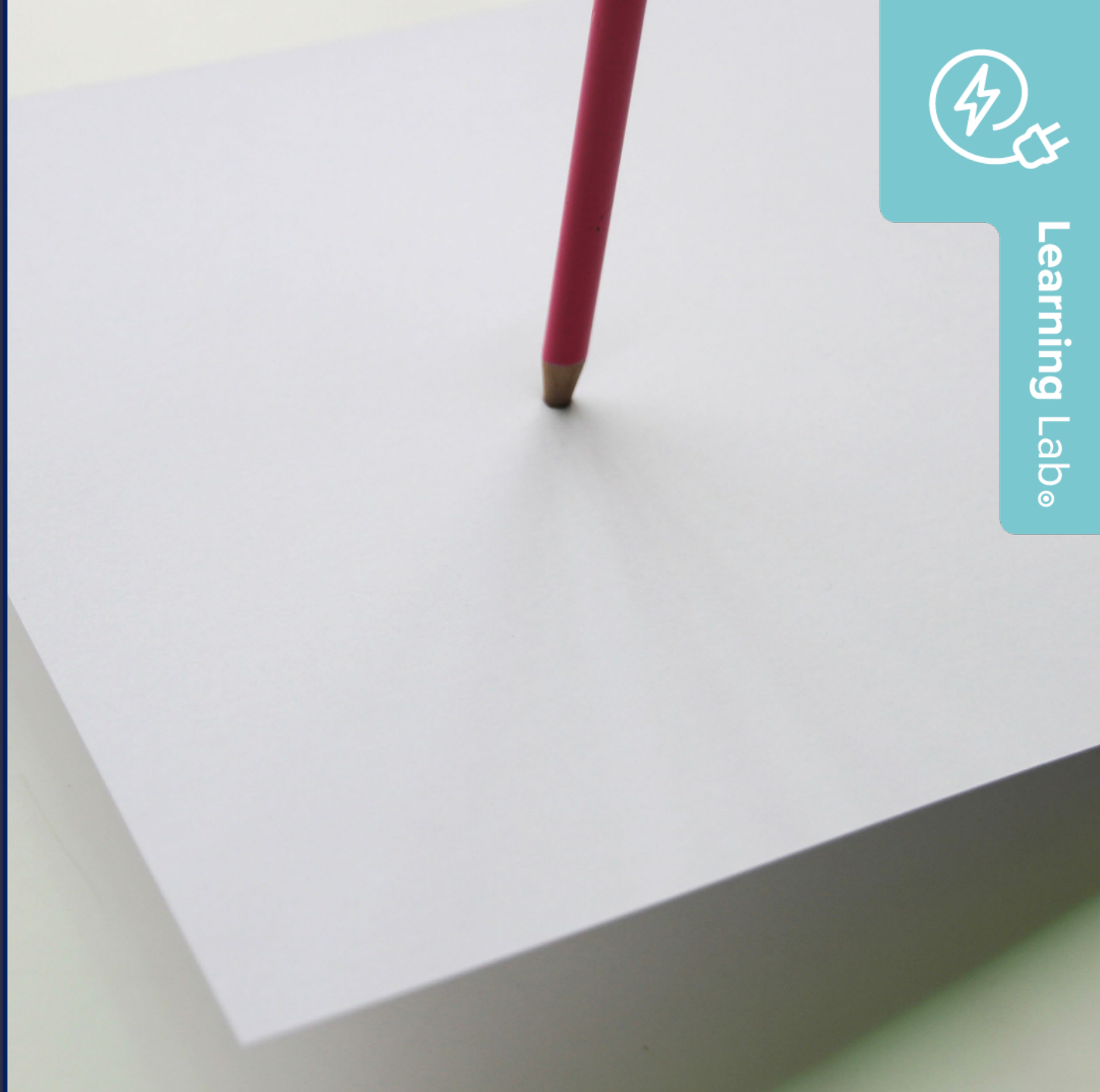


Place the gear onto a piece of paper. Use a pencil to make a mark through the hole.



Place a ball of blu tack or plasticine on the desk.

Place the mark on the paper over this and use a pencil to make a hole.



Push a split pin through the gear and hole in the paper.



Secure the gear by bending back the legs of the split pin.



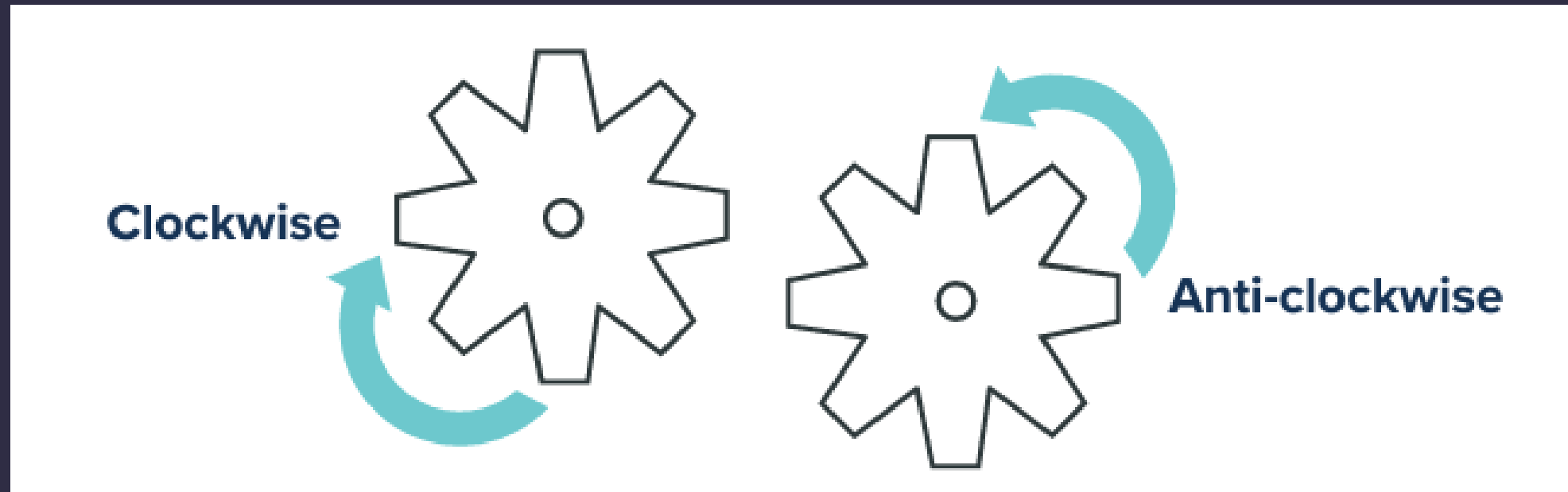
To use gears together,
make sure the teeth of the
gears interlock and rotate.



1. a) Connect any two gears.

Rotate the first gear clockwise.

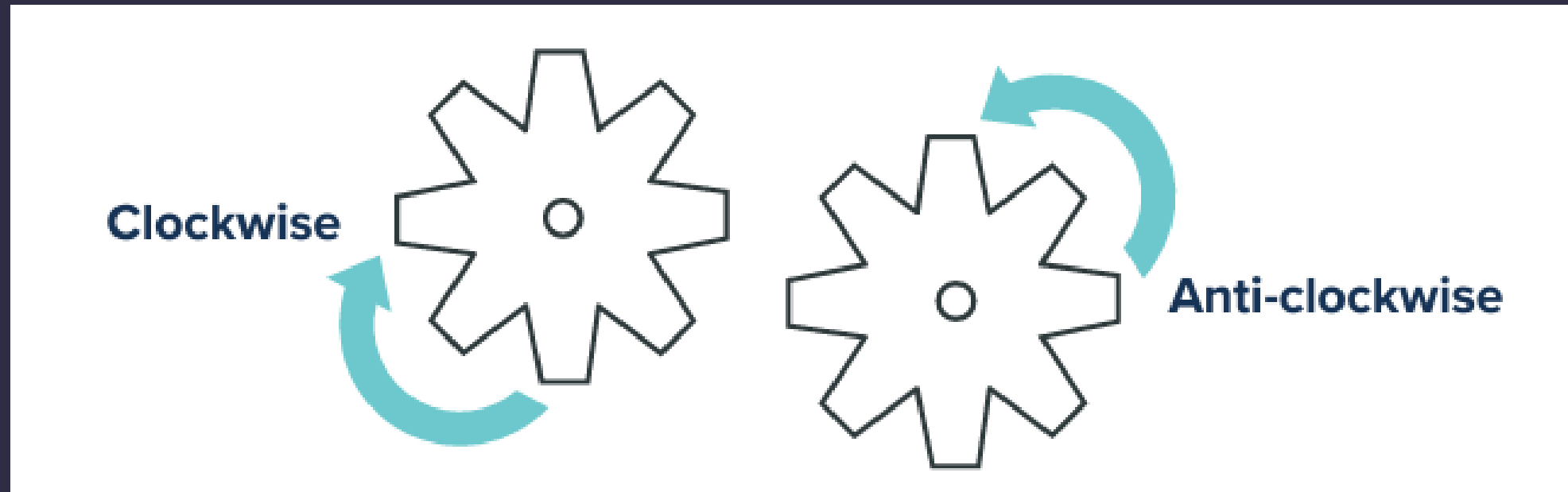
Which direction does the second gear rotate?





1. b) Connect a third gear and watch the direction it rotates when you turn the first gear.

If there were 75 gears in a line and the first gear was rotating anti-clockwise, which direction would the last gear rotate?





2. We can use 'rotations per minute' to measure the speed of a rotating object.

You are going to investigate the speed of each gear.

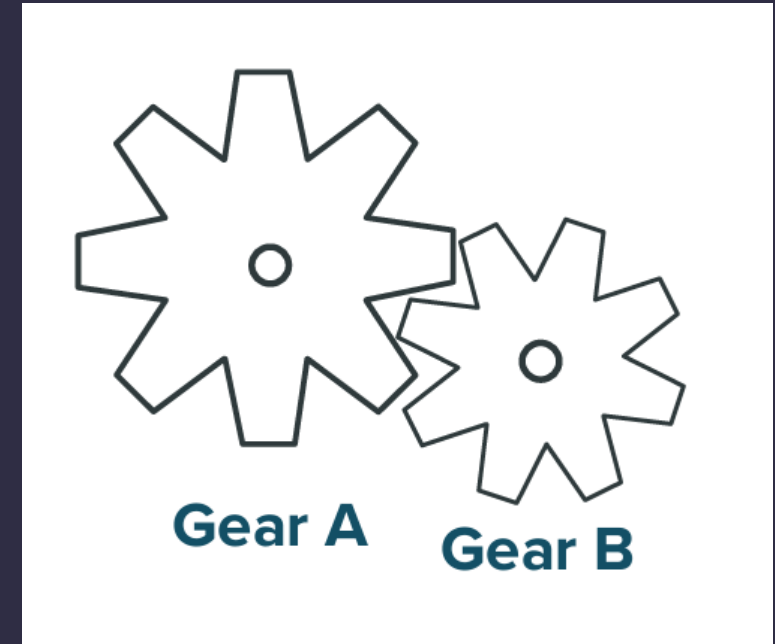
2. Put **Gear A** and **Gear B** together like the picture below.

Your teacher will count 60 seconds with a stopwatch or timer.

One person in your group will spin **Gear A** and count how many rotations **Gear A** completes.

One person in your group will count how many rotations **Gear B** completes.

Write your answers on your worksheet.





3. Try the activity again using **Gear A** and **Gear C**.



4. Try the activity again using **Gear A** and **Gear D**.

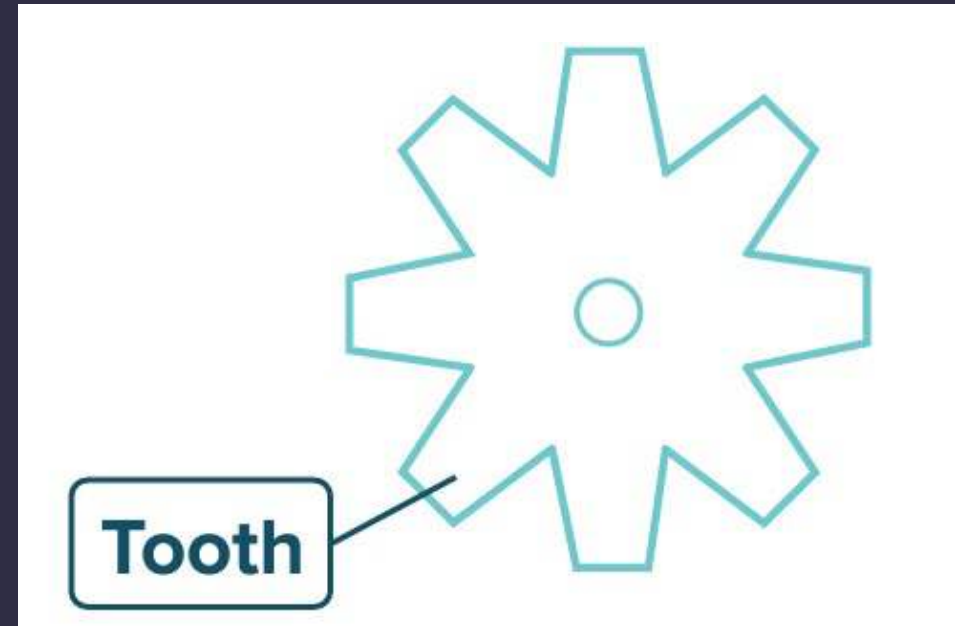


5. When connected to **Gear A**, which gear made the most rotations per minute?



Count the number of teeth
on each gear.

Write the number of teeth
on the gear.





1. a) Connect **Gear D** and **Gear C**.

How many times do you need to rotate **Gear D** for **Gear C** to make one full rotation?

Write your answer in the first row of the table.



1. b) Repeat this by connecting **Gear D** to **Gear A** and then with **Gear B**.

How many times do you need to rotate **Gear D** for **Gears A** and **B** to each make one full rotation?

Write your answers in the table.



2. Using the word bank, complete the sentence on your worksheet.

Word bank: **Bigger** **Smaller**



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