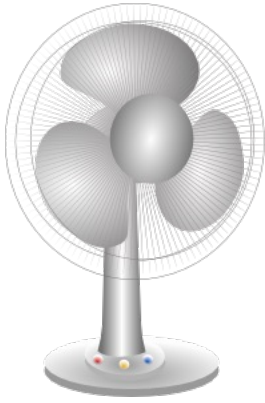


How does a wind turbine work?



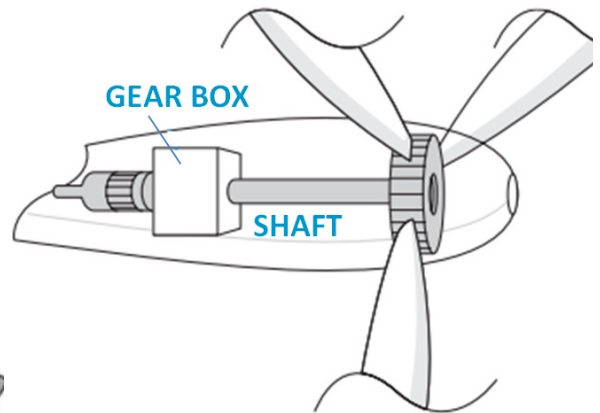
Simply stated, a wind turbine is the opposite of a fan.

Instead of using electricity to make wind (like a fan), wind turbines use wind to make electricity.

To start operating, the wind needs to be blowing at 4-5 metres per second. Maximum power can be reached when the wind blows at around 15 metres per second.

Most large wind turbines have 3 **blades** which turn the **rotor** they are attached to.

Rotor blades are usually between 30 and 80 metres long.



WIND SPEED AND DIRECTION MONITOR

BLADES

YAW MECHANISM

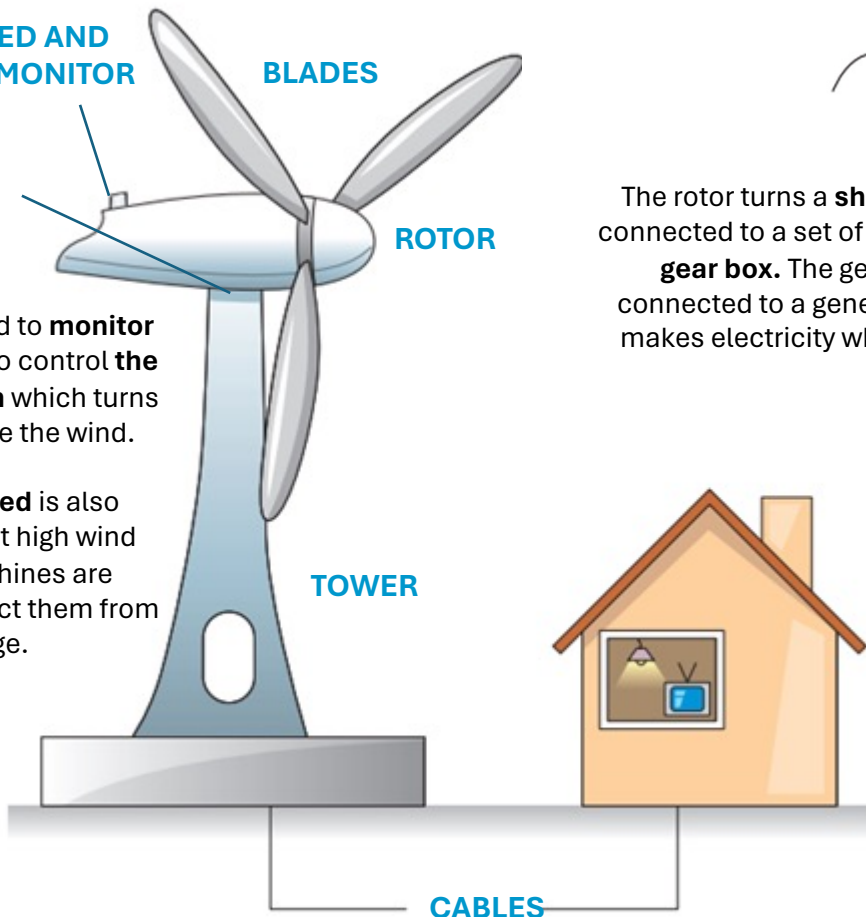
ROTOR

Sensors are used to **monitor wind direction** to control the **yaw mechanism** which turns the rotor to face the wind.

The **wind speed** is also monitored as at high wind speeds, machines are stopped to protect them from damage.

The rotor turns a **shaft** which is connected to a set of cogs called a **gear box**. The gear box is connected to a generator which makes electricity when it turns.

TOWER



The electricity is then sent down **thick cables** which take it to the National Grid to be distributed to power our homes and industry.

Wind energy in the UK



A single 2.5 megawatt wind turbine working at full power can generate enough electricity to meet the annual needs of over 1,400 households, make 230 million cups of tea, or run the average computer for well over 2,000 years!

Wind energy is now the UK's largest source of renewable energy generation.

The UK's first commercial wind farm was built in North Cornwall in 1991. There are now **5,083** onshore wind turbines in the UK and a further **1,452** offshore wind turbines.

It is estimated that 32,410,089 megawatt hours of electricity is generated by wind turbines each year – enough electricity to supply over 7 million homes!

Energy research at STFC Rutherford Appleton Laboratory

The Energy Research Unit (ERU) at the Rutherford Appleton Laboratory researches new and renewable energy technologies. The ERU, established in 1978, is working on projects with aims to:

- reduce the costs of offshore wind energy
- improve the reliability of turbines
- look at new ways of storing the energy generated by wind turbines



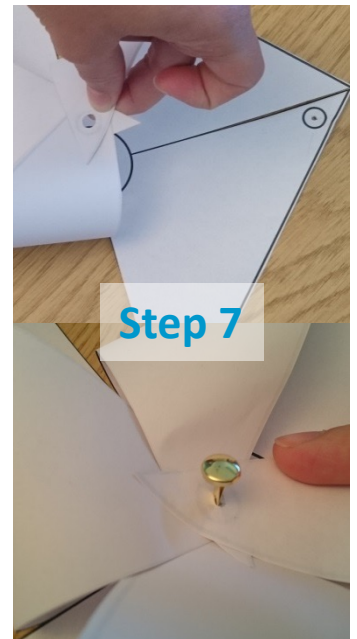
The building-integrated wind turbine test facility at RAL



The 30kW Windharvester turbine at RAL

Make your own Wind Turbine!

1. Decorate inside the square.
2. Cut around the edge of your template, along the lines.
3. Cut diagonal lines from the corners to the outside of the circle. DO NOT cut the circle. These are your wind turbine blades.
4. Ask an adult to help you punch holes in the corners of the three blades.
5. Ask an adult to poke a hole through the last blade and the centre where the circle is drawn, using a pencil and tack.
6. Gently bend the blades with holes towards the centre. DO NOT FOLD; the paper should be curved.
7. Line up the four holes with the pencil poked hole on top and fasten to the centre of the paper using a paper fastener.
8. Add a bead to your paper fastener.
9. Attach the arms of the paper fastener to the stick – make sure your blades will spin!
10. Blow on your wind turbine.



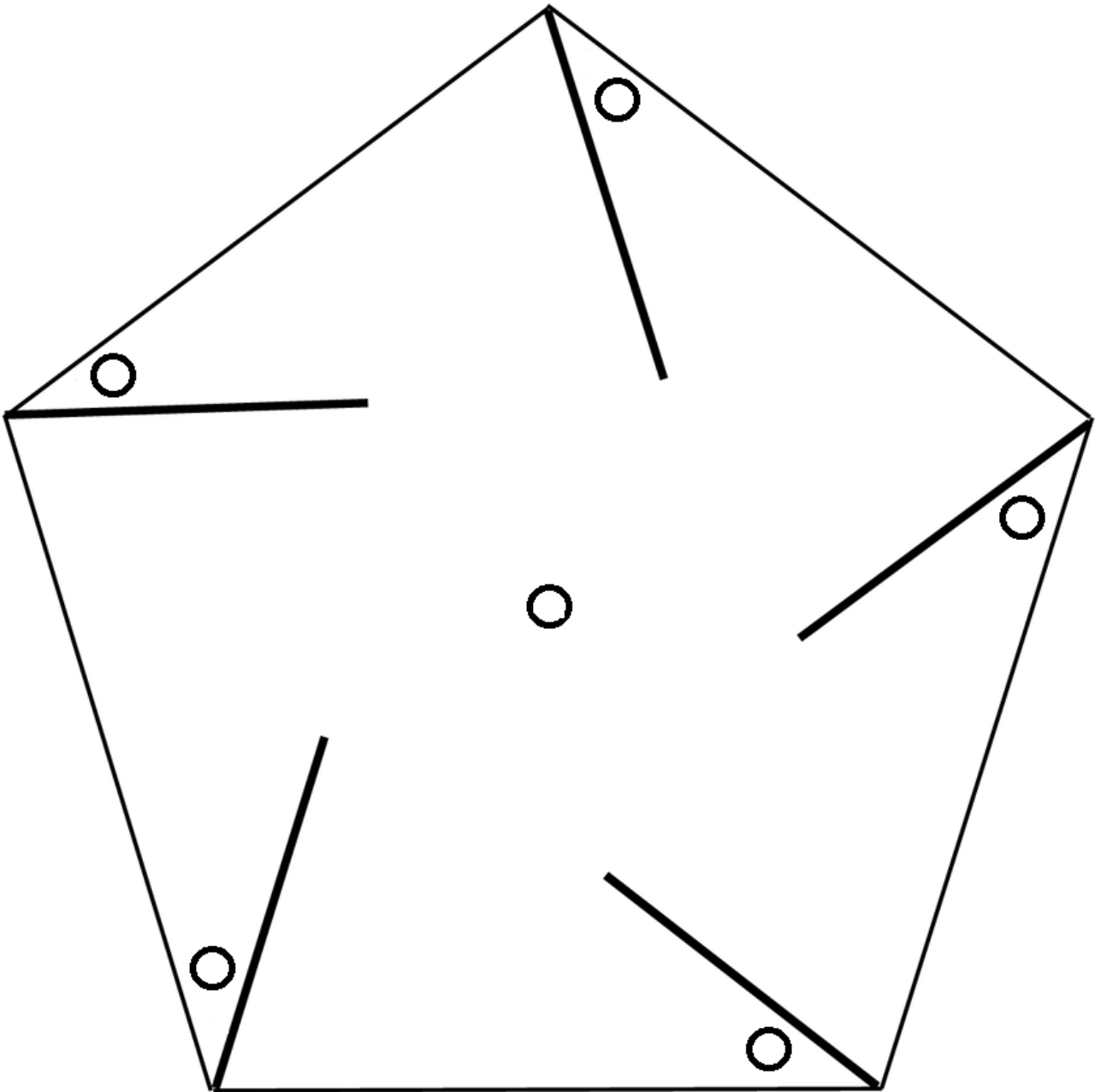
Want to try more?

What do you think would happen if you make your wind turbine:

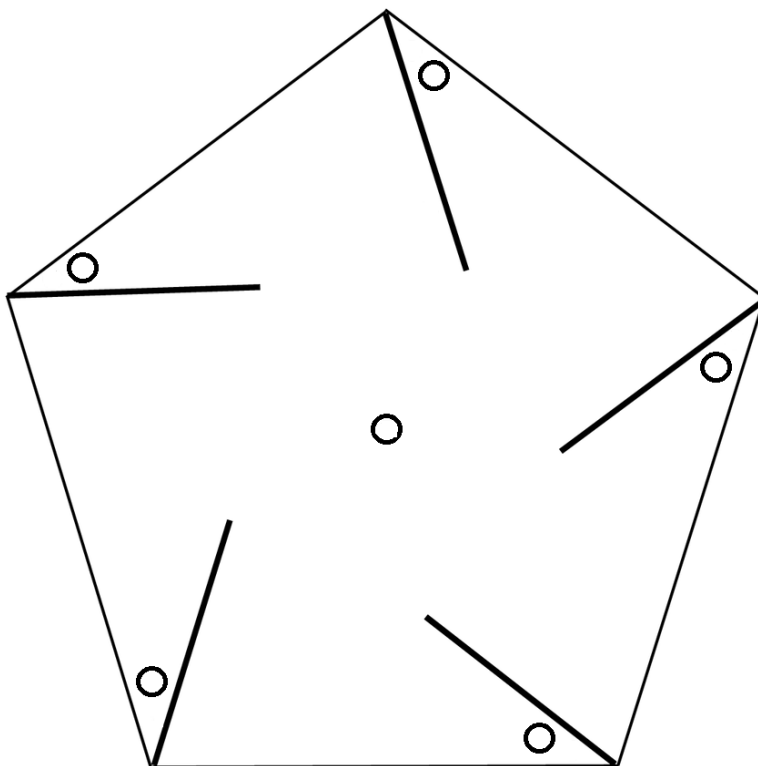
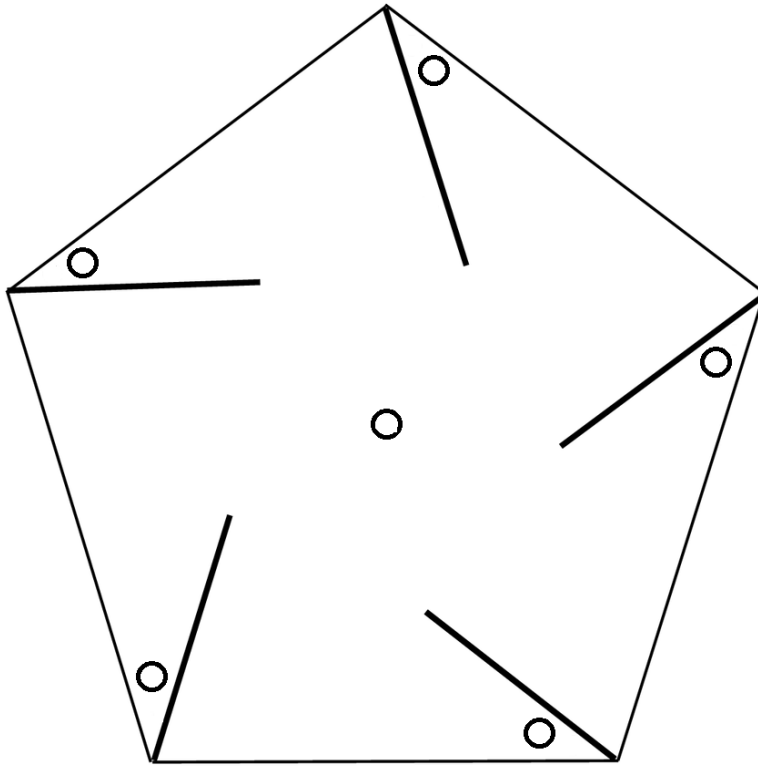
- out of a different material?
- with more/fewer blades?
- with bigger/smaller blades?

Have a go – we've provided some additional blade designs with different sizes.

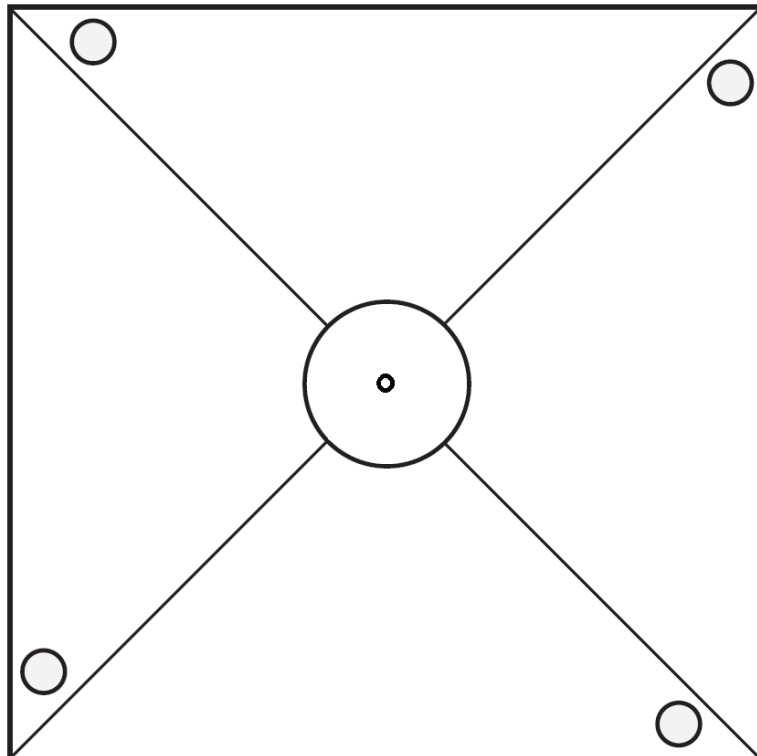
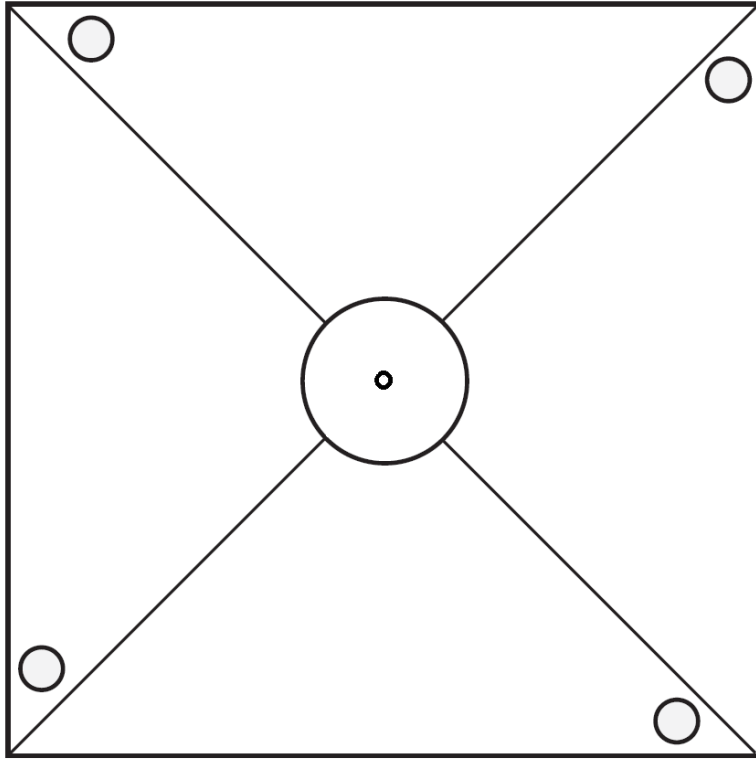
5 Blade Pattern Large



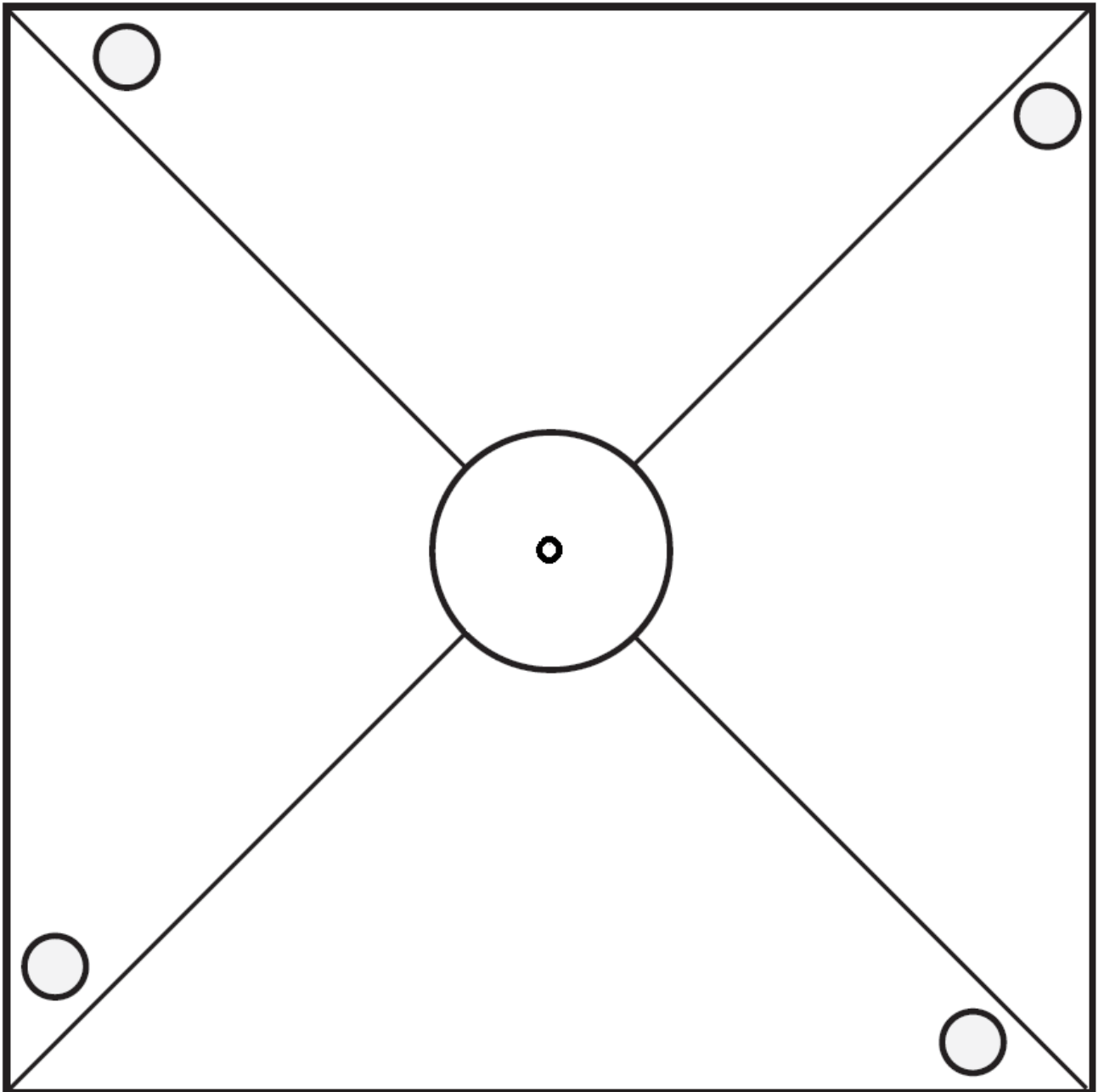
5 Blade Pattern Small



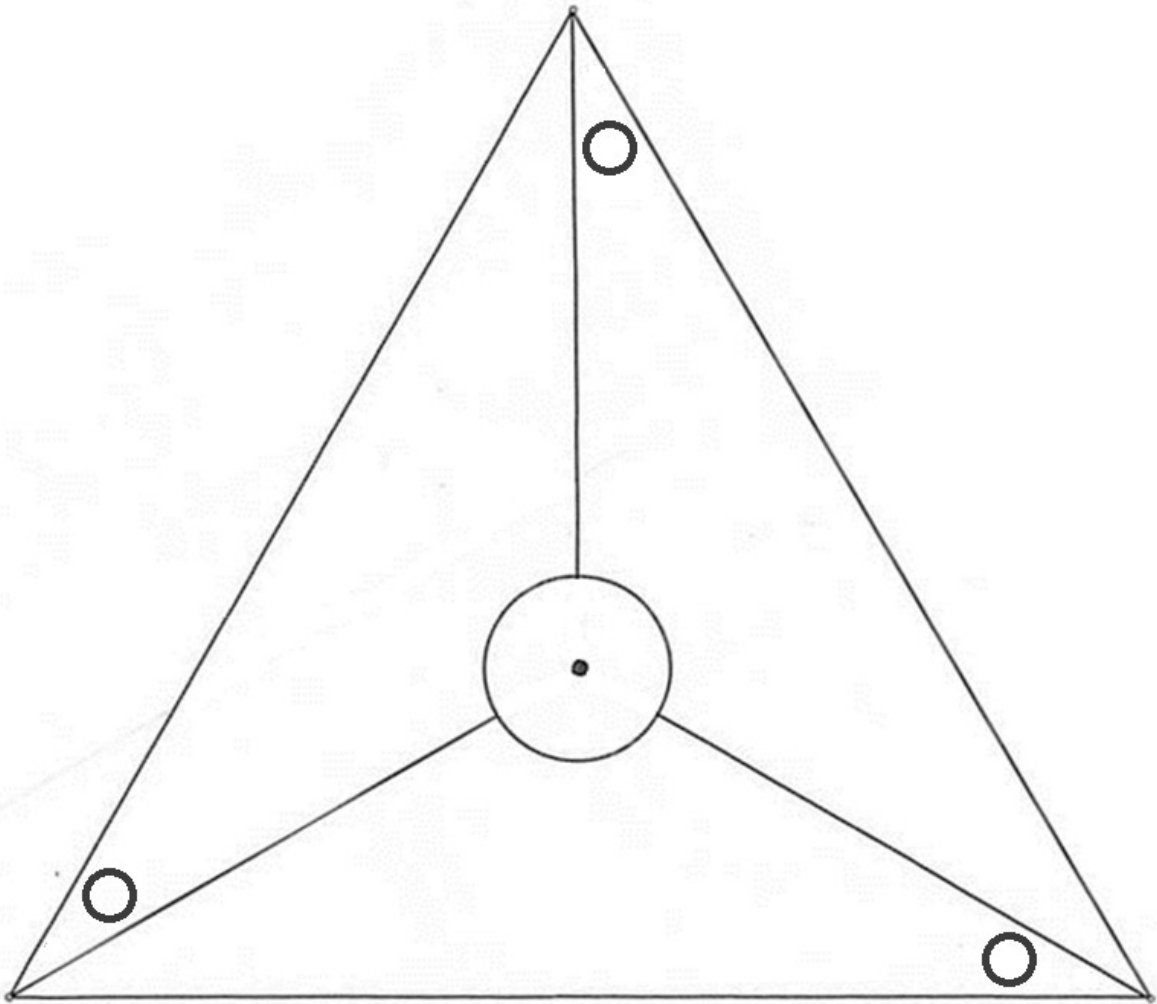
4 Blade Pattern Small



4 Blade Patter Large



3 Blade Pattern Large



3 Blade Pattern Small

