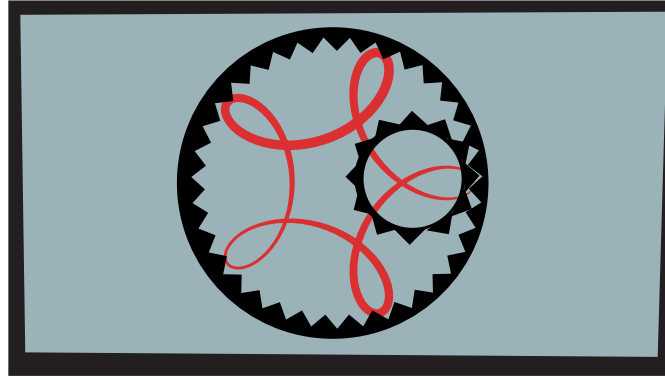


tiny tinkering tasks

Task theme

Gears



Task title

How does a spirograph work?

Learning outcomes

- To understand how simple machines such as gears make work easier.
 - To identify how gears are used in many familiar products.
- To discover a relationship between the different sizes of gear and the turning force.



SYSTEMS THINKING

Create an object or tool requiring the successful interaction between components and subsystems.

EHoM link



ADAPTING

Embrace an iterative approach alternating between plan and create.



IMPROVING

Make objective judgements against success criteria and constraints. Explore specific points of failure for ways in which to improve object or tool acknowledging possible trade off within constraints.

EDP link



Key Stage/Year Group LKS2 (Years 3 and 4)

Resources required

- A selection of objects/photos of objects that contain gears: rotary whisk (you may be able to get hold of one of these), bicycle, car, washing machine, mechanical clock, hand drill, manual tin opener, hand crank pencil sharpener, electric food mixer.
- Corrugated Cardboard – you will need a number of large boxes.
- Scissors
- Glue guns or PVA
- Felt tip pens

How to run the task

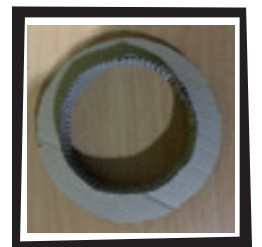
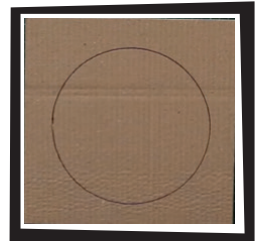
1. Engage the children by asking them what they already know about gears. Do they know of any machines that contain gears? (They will probably name bicycles and cars) Show them some pictures of more unusual objects such as a rotary whisk. Do they know how gears help in this piece of equipment?

2. Explain what gears are and how they can make our lives easier

DEFINITION: gears are basically wheels with teeth around the outer rim. When they are used in a gear system, they can make things easier to move. The teeth on the two gears fit together allowing one gear to turn the other. In a simple two gear system, when you rotate one of the gears clockwise, the other gear will rotate in the opposite direction. As well as being able to change the direction of rotation, gears can also change the rate of rotation.

3. Show the children some patterns drawn by a spirograph. Tell the children that different gears have created this design. Allow the children to explore gears by following these steps to make their own version of a spirograph:

- Place a paper plate on top of a square of corrugated cardboard and draw around the edge. Make sure there is at least 2 cm of cardboard left as a frame.
- Cut out the circle with sharp scissors (children may need help with this).
- Repeat and stick the two pieces of cardboard together firmly. This can be done with PVA or a glue gun.
- Peel the paper off a small strip of corrugated card (about 1cm wide) to reveal the corrugations. Stick this to the inside of the circle so that the corrugations are facing inwards. This is best done with a glue gun. Adult help may therefore be required for this part.
- Cut out a small circle from the spare card and cover the outer edge with another strip of corrugated card so that the corrugations are on the outside. Again, a glue gun is the best way of fixing this.
- Make two holes with a sharp implement anywhere on the circle. Different positions will give you different patterns.
- Test your spirograph by inserting a coloured pencil in one of the holes and drawing on a sheet of white paper.
- Extend the task by challenging the children to create different sized gears to draw with.
- Encourage the children to evaluate their patterns. Can they improve the quality by changing the height of the corrugated card?



Top Tips

- You may wish to prepare two gears on a piece of cardboard to show the children how they turn in opposite directions. Or this gif : https://bournetoinvent.com/projects/9-SC-Mechanisms/pages/5_Lesson.html is useful to show rotating gears.

Evaluate learning

- How do the corrugations help you make the pattern?
- Would it work with smooth surfaces? Why not?
- What patterns do you get if you put your hole in the centre of the circle?
- What different patterns can you make with larger and smaller circles?
- Can you predict what the pattern will be?

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As a practising teacher, Julie has written these 12 tasks to encourage more children to engage in engineering in primary schools. They have been stimulated by real-world engineering and inspirational ideas shared by others. They are linked to the Tinkering for Learning research and development project run by SEERIH.



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