Forces: Marvellous Mechanisms

Aim:	**Success Criteria:**	**Resources:**
To recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect by exploring and designing a simple mechanism. To explore and design mechanisms.	I can explain how different mechanisms work. I can investigate a simple mechanism. I can design my own mechanism for a given purpose.	**Lesson Pack**
	Key/New Words: Mechanism, lever, gear, cog, pulley, machine, force.	**Preparation:** **Mechanism Facts Activity Sheet** – one per group, pre-cut into jigsaw pieces and mixed up **Machine Aim Cards Activity Sheet** – one per group, pre-cut **Mechanisms Jigsaw Activity Sheet** – one per child Differentiated **Marvellous Machines Activity Sheet** – one per child You may wish to look for a video clip of a machine working for the children to watch.

Prior Learning: The children will have learnt about forces in Lesson 1.

Learning Sequence

	**Talk about It:** Display the images of different mechanisms on the **Lesson Presentation**. In pairs, children discuss anything that they might already know about these mechanisms and how they might be related to the topic of forces.	
	**What Are Mechanisms?** Using the **Lesson Presentation**, briefly explain what a mechanism is. Organise the children into groups of three. These three children will work together to find out about three different sorts of mechanisms. Give each group a set of pre-cut jigsaw pieces from the **Mechanism Facts Activity Sheet**. Ask one child in each group of three to find the jigsaw pieces about levers, one child to look for gears and the third child in the group to look for the pulleys jigsaw pieces. Children read the facts and piece their jigsaw back together, making notes on their **Mechanisms Jigsaw Activity Sheet**. They then work together to teach the rest of their group what they have found out. As they share their findings, they complete the other sections of their activity sheet with the new information from their group members. Can children explain how different mechanisms work?	
	**Identifying Mechanisms:** Children identify the type of mechanisms used in the objects shown on the **Lesson Presentation**. Share the answers with the children.	
	**Cracking Contraptions:** Discuss the different machines shown on the **Lesson Presentation**. Point out that the machines use many different mechanisms to achieve a simple purpose. If you wish, children could watch a video clip of a machine working at this point in the lesson.	
	**Marvellous Machines:** Children design their own crazy machine that uses many different mechanisms to achieve a simple aim. Children can choose a card from the pre-cut **Machine Aim Cards Activity Sheet** to select an aim for their machine or they can think of their own aim. Children draw and explain their designs on the differentiated **Marvellous Machines Activity Sheet**. Can children include some of the mechanisms they have investigated in their own machine designed for a given purpose?  Children use the sentence starters and key words to structure and scaffold their explanation and evaluation.  Children explain and evaluate independently.	
	**Time to Evaluate:** Children share their machine designs with a partner of similar ability. They then swap activity sheets and write an evaluation of each other's machines.	

Taskit

Investigateit: Set up an investigation about levers. Use a ruler, two erasers and some weights of different sizes. Place one eraser on the end of the ruler and use the other eraser as a pivot. Place the ruler on the pivot and place a weight on the other end of the ruler to push it down, causing the ruler to lift the eraser. Experiment with the position of the pivot, moving it nearer to or farther away from the weight that is pushing the ruler down. What is the smallest weight you can use to make the ruler lift the eraser? How does the position of the pivot affect this?

Makeit: Use these **Forces Writing Frames** to explain how the mechanisms in the pictures are working.

Science

Forces

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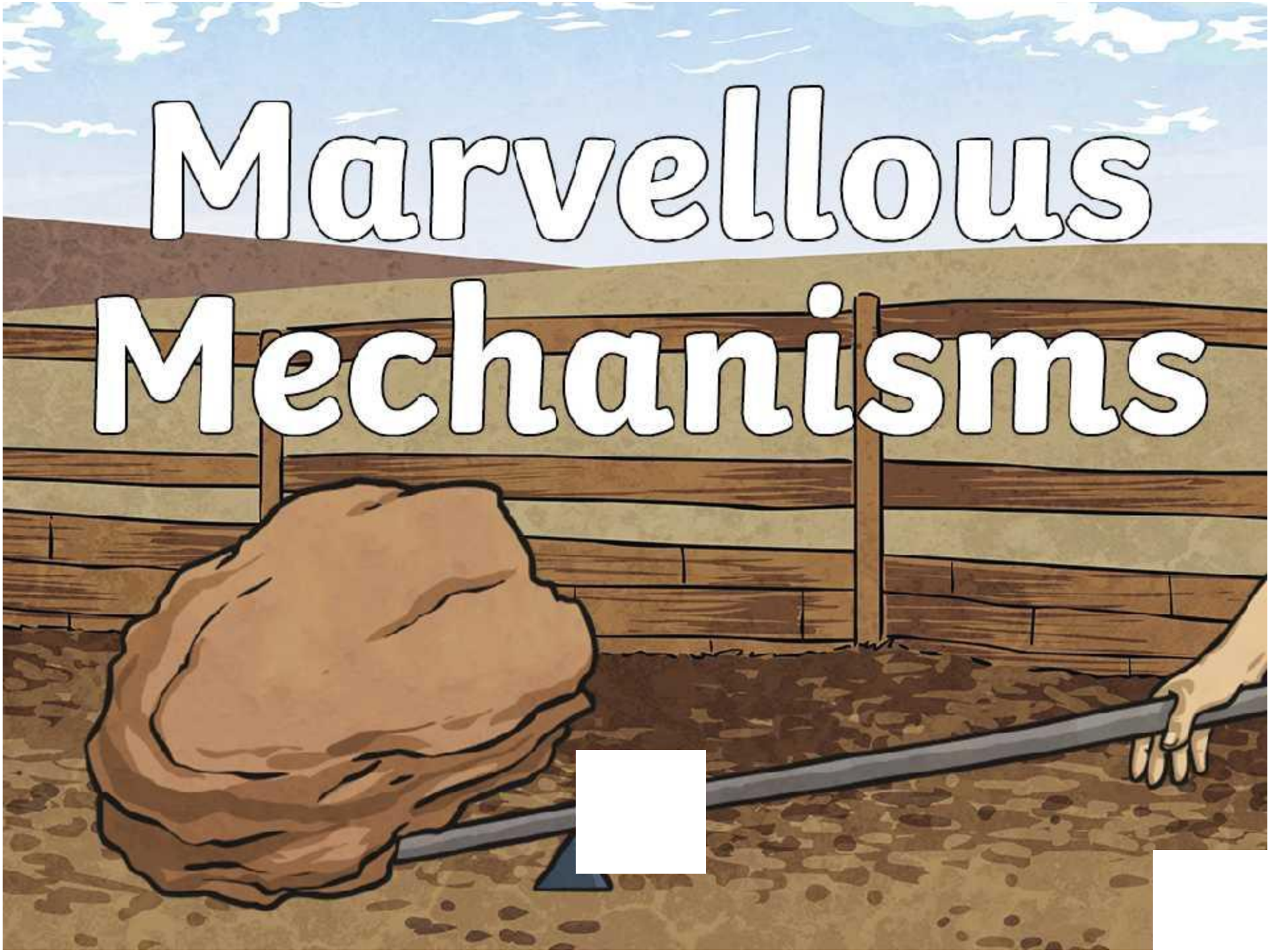
Marvellous
Mechanisms

Aim

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Success Criteria

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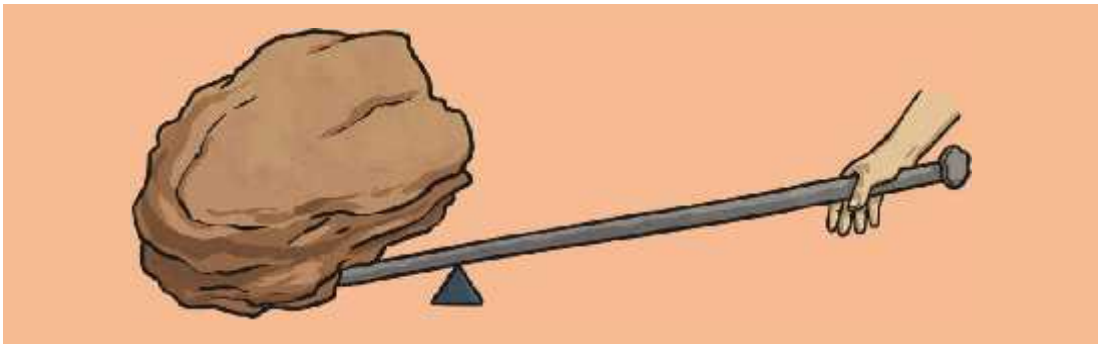
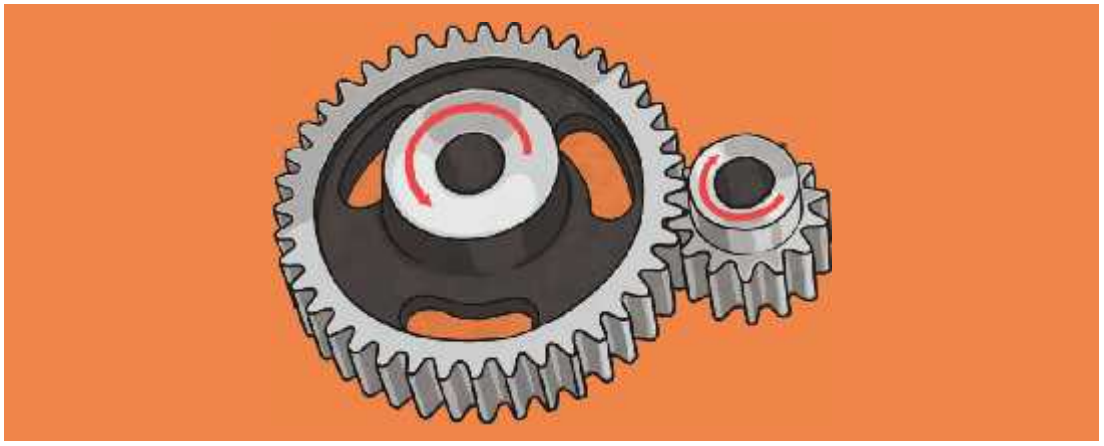
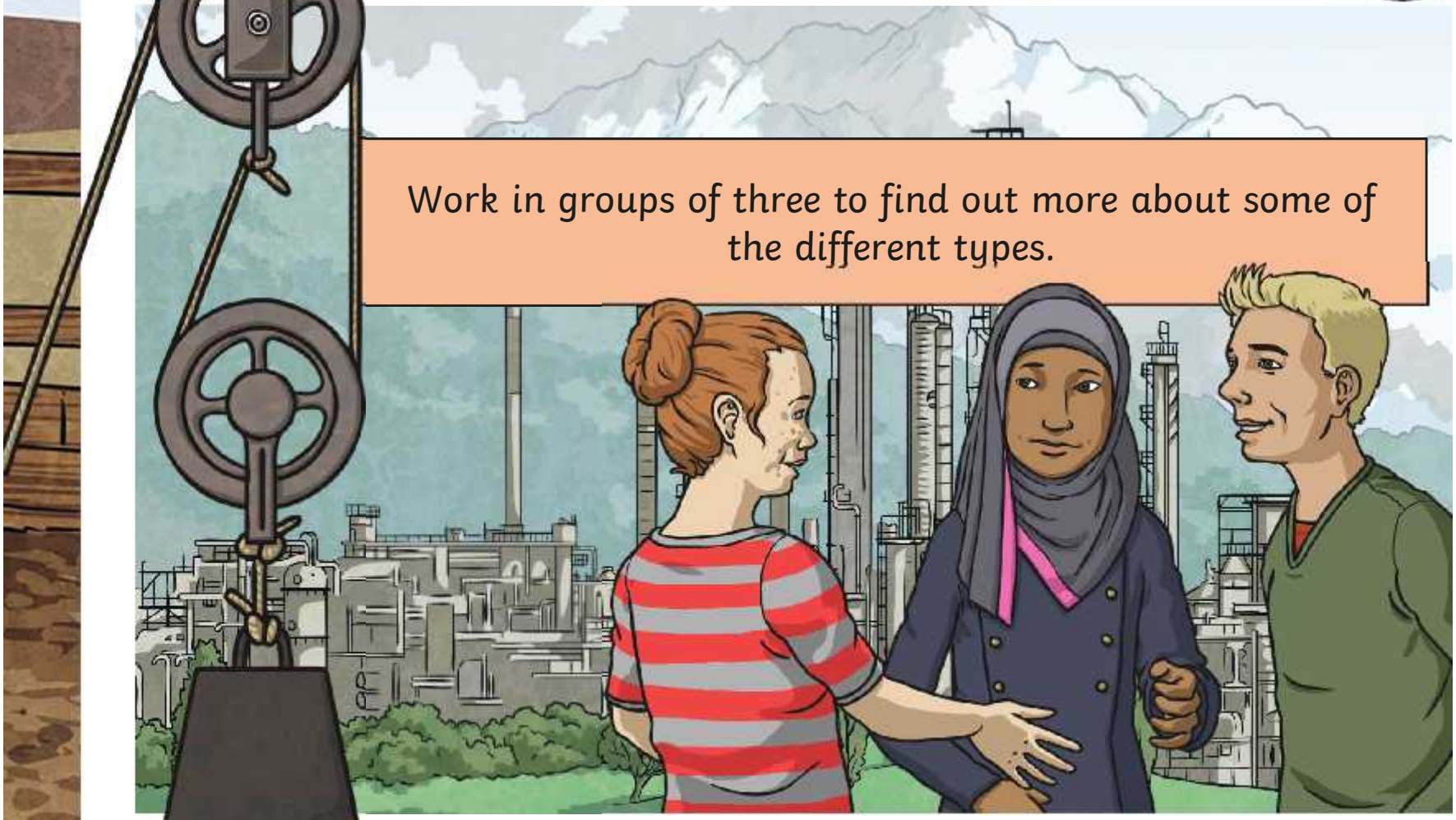
Talk about It

Discuss your ideas with a partner.



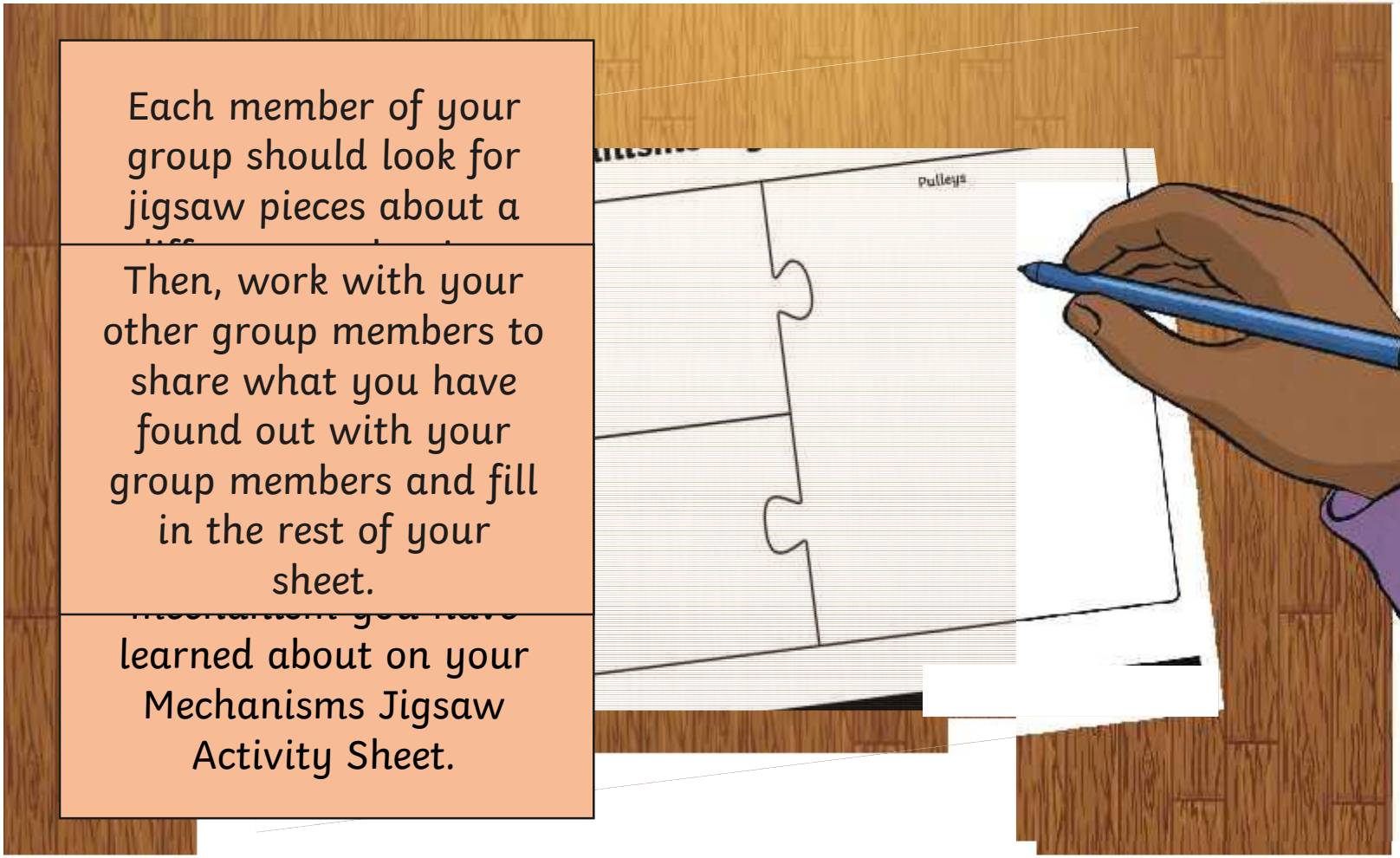


What Are Mechanisms?



Work in groups of three to find out more about some of the different types.

What Are Mechanisms?



Each member of your group should look for jigsaw pieces about a

Then, work with your other group members to share what you have found out with your group members and fill in the rest of your sheet.

learned about on your Mechanisms Jigsaw Activity Sheet.

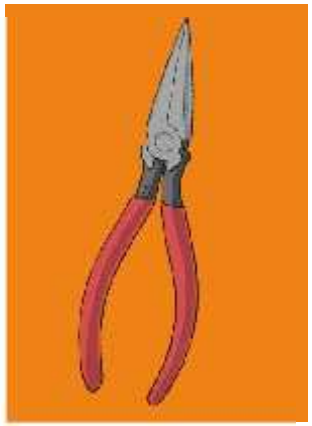
Identifying Mechanisms

Whole Class

Can you identify whether these objects use **levers**, **pulleys** or **gears**?





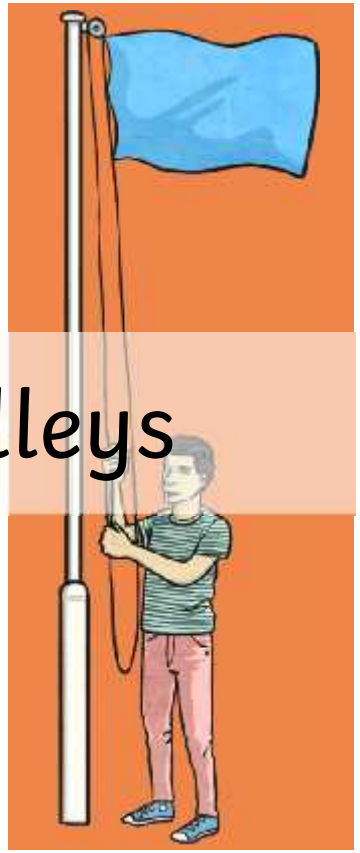




Identifying Mechanisms

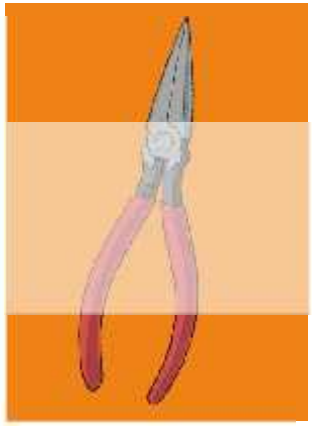
Whole Class

Can you identify whether these objects use **levers**, **pulleys** or **gears**?

Levers



Pulleys



Gears

Cracking Contraptions

Look at the mechanisms inside a watch.

Which mechanisms can you see?

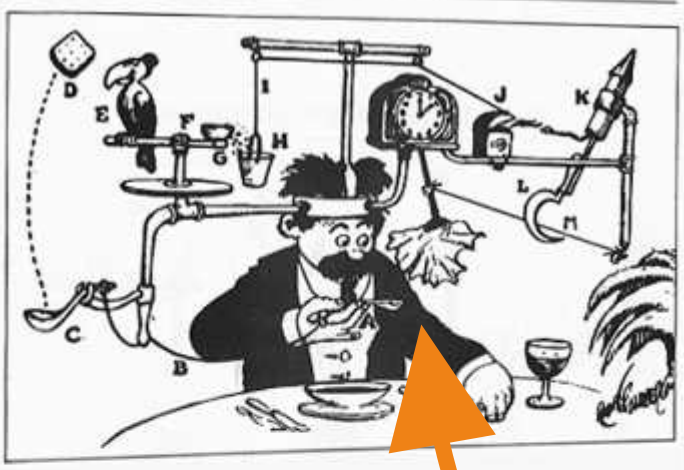
The gears turn to move the hands around the clock face.

Cracking Contraptions

Which mechanism do you think might be used in a bike brake?

...o you think ...a bike brake?

Cracking Contraptions



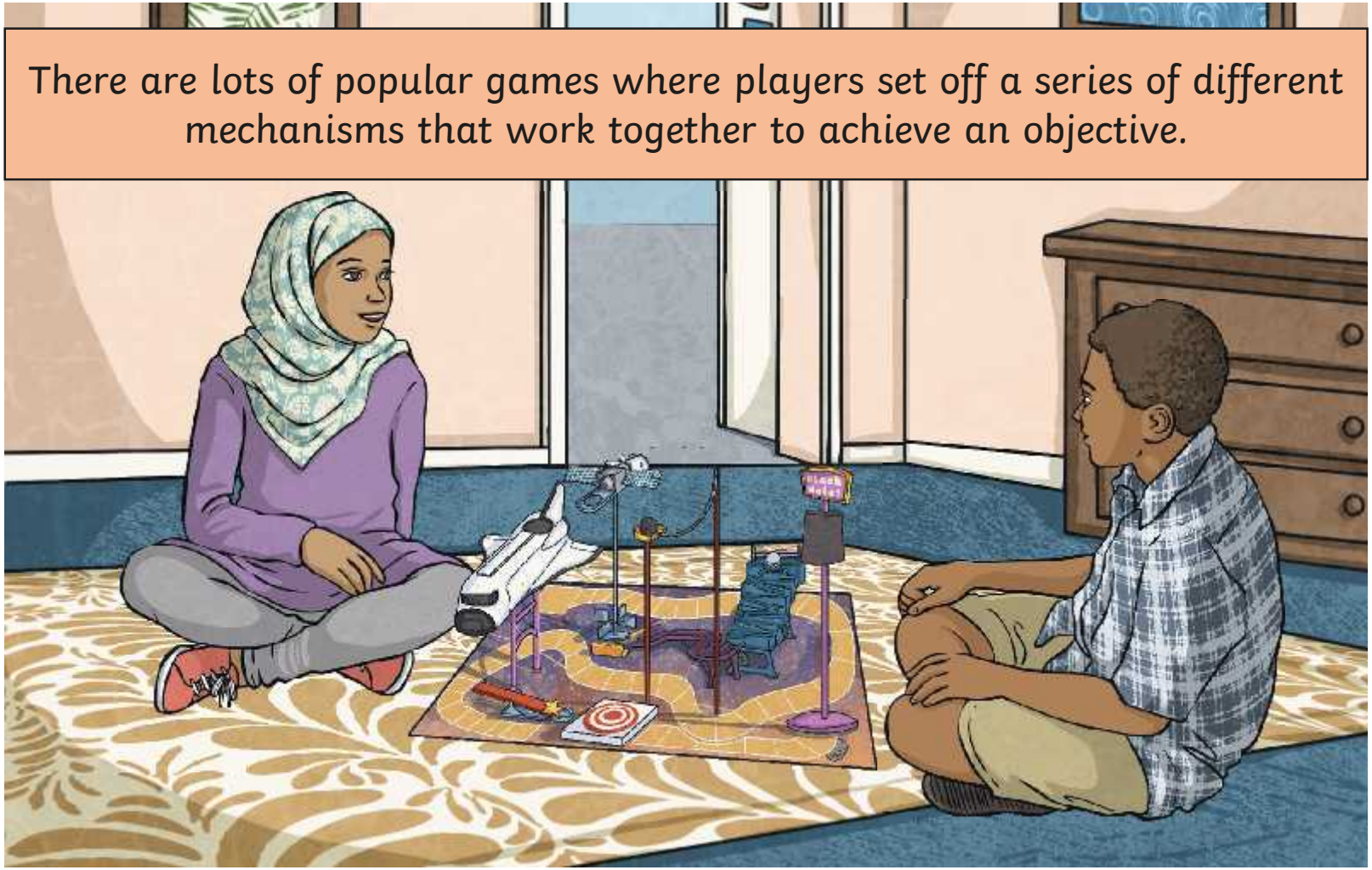
Some designers and cartoonists have fun drawing and creating crazy machines that use lots of mechanisms to achieve a simple task.

This is an invention drawn by Rube Goldberg, a famous cartoonist.

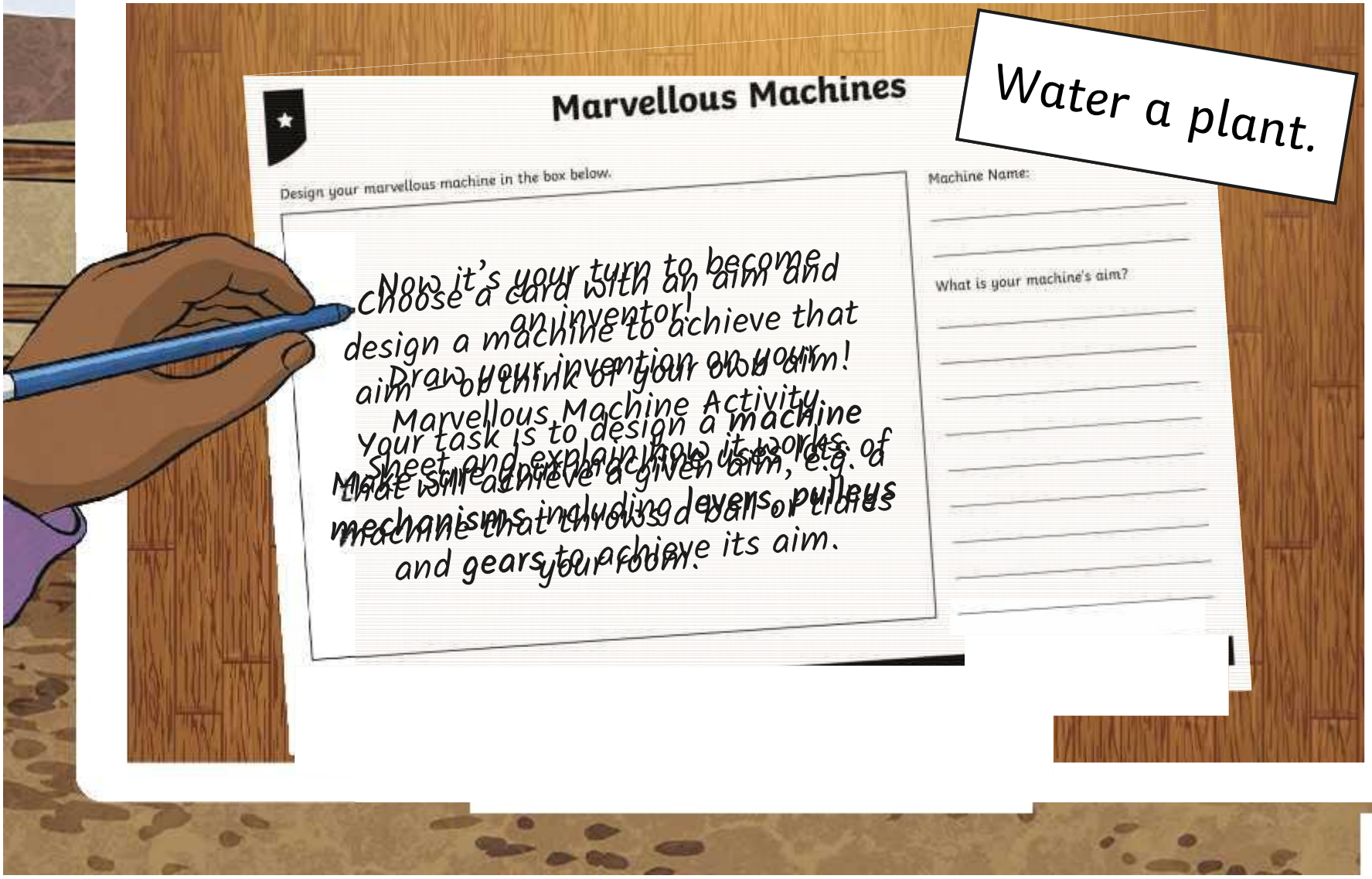
He has designed a 'Self Operating Napkin', so that when the man in the picture lifts his spoon, it sets off a series of mechanisms that eventually work together to lift the napkin to wipe his mouth!

Cracking Contraptions

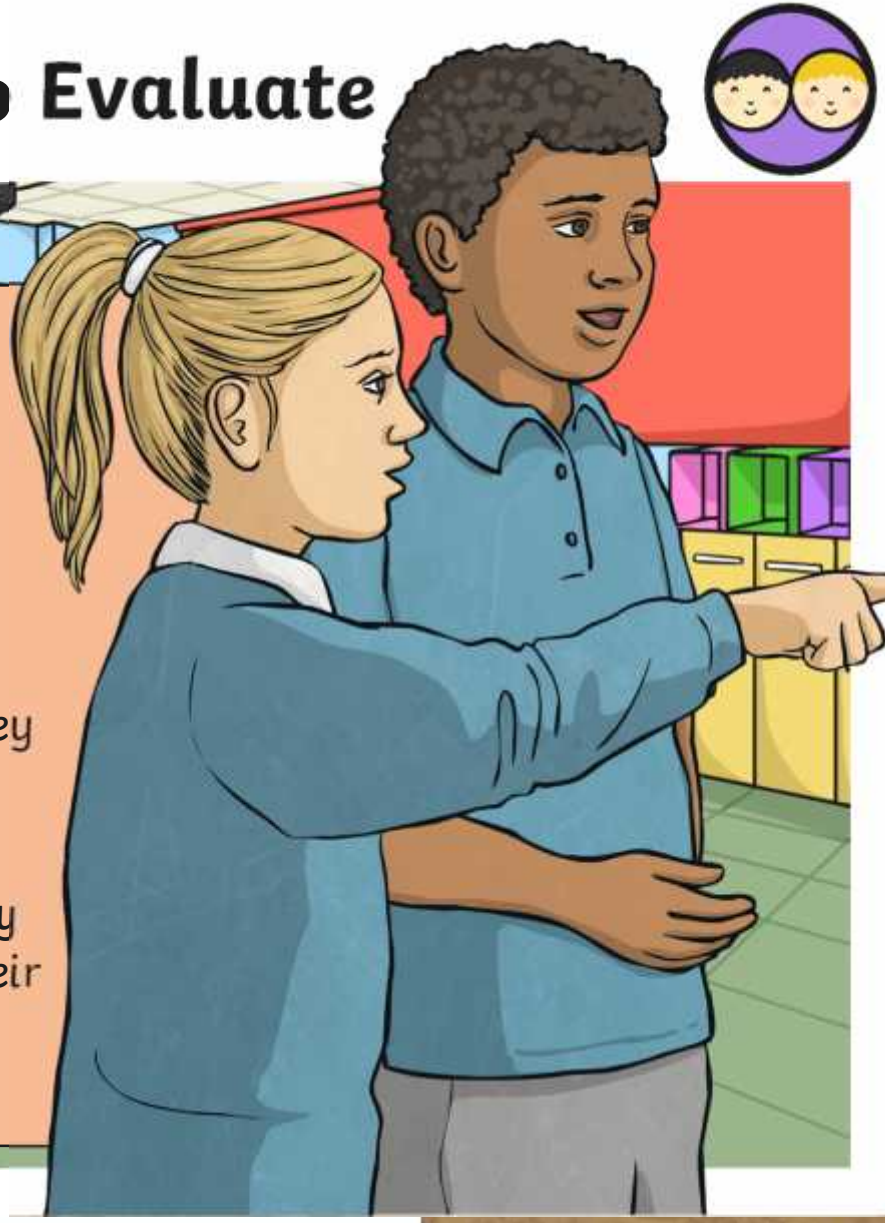
There are lots of popular games where players set off a series of different mechanisms that work together to achieve an objective.



Marvellous Machines



Time to Evaluate



Share your Marvellous Machine with your partner.

Explain the aim of your machine, and how it works. Point out the different mechanisms your machine uses.

Then **listen** to your partner as they explain their machine.

Evaluate your partner's work on their Marvellous Machines Activity Sheet. What do you like about their machine? Is there anything you would change or improve? Why?

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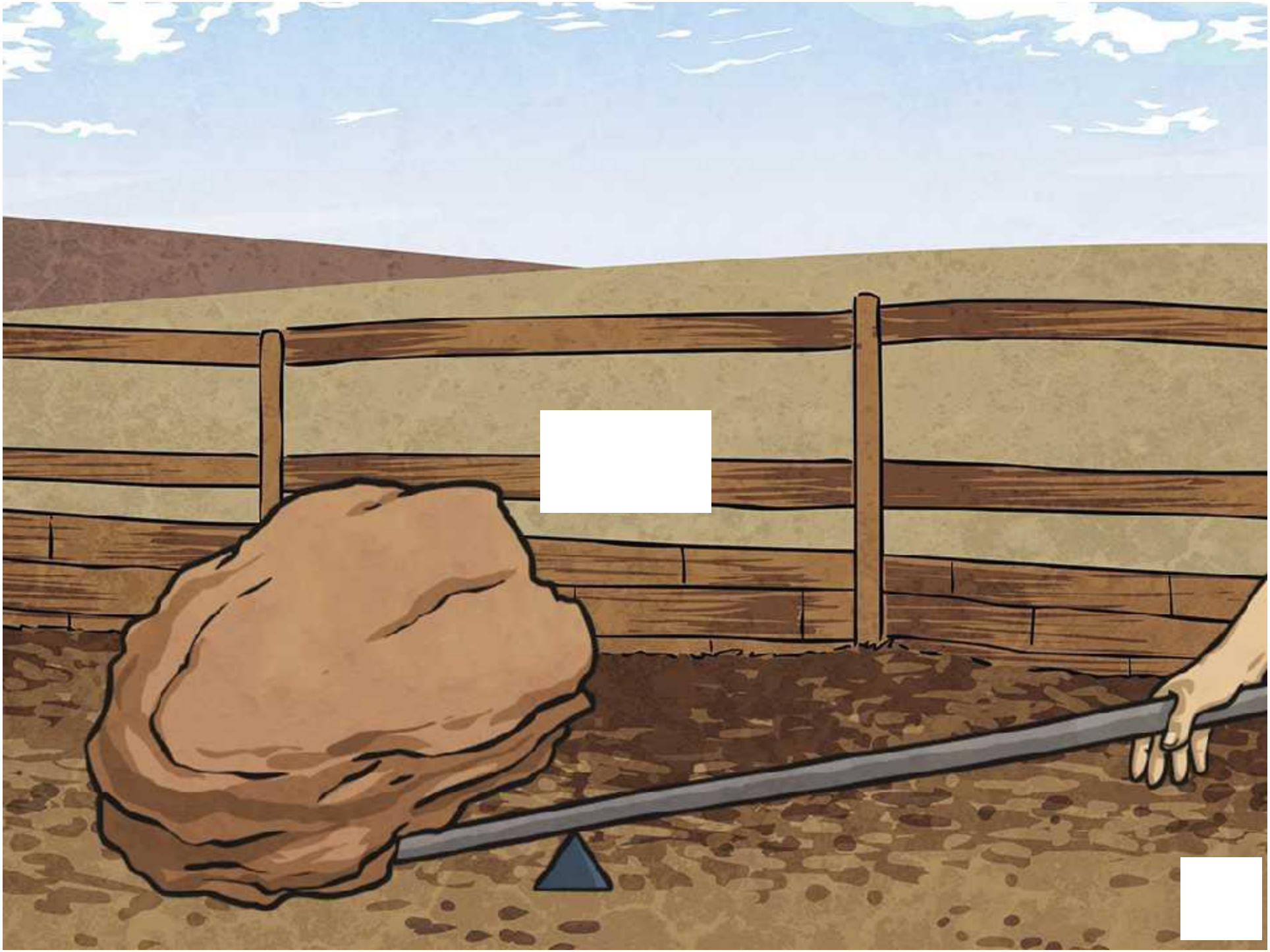

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				Delivered By:			**Support:**		
Success Criteria	**Me**	**Friend**	**Teacher**	**T**	**PPA**	**S**	**I**	**AL**	**GP**
I can explain how different mechanisms work.				**Notes/Evidence**					
I can investigate a simple mechanism.									
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Next Steps

- _____
- _____

T	Teacher	**I**	Independent
PPA	Planning, Preparation and Assessment	**AL**	Adult Led
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Next Steps

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T	Teacher	**I**	Independent
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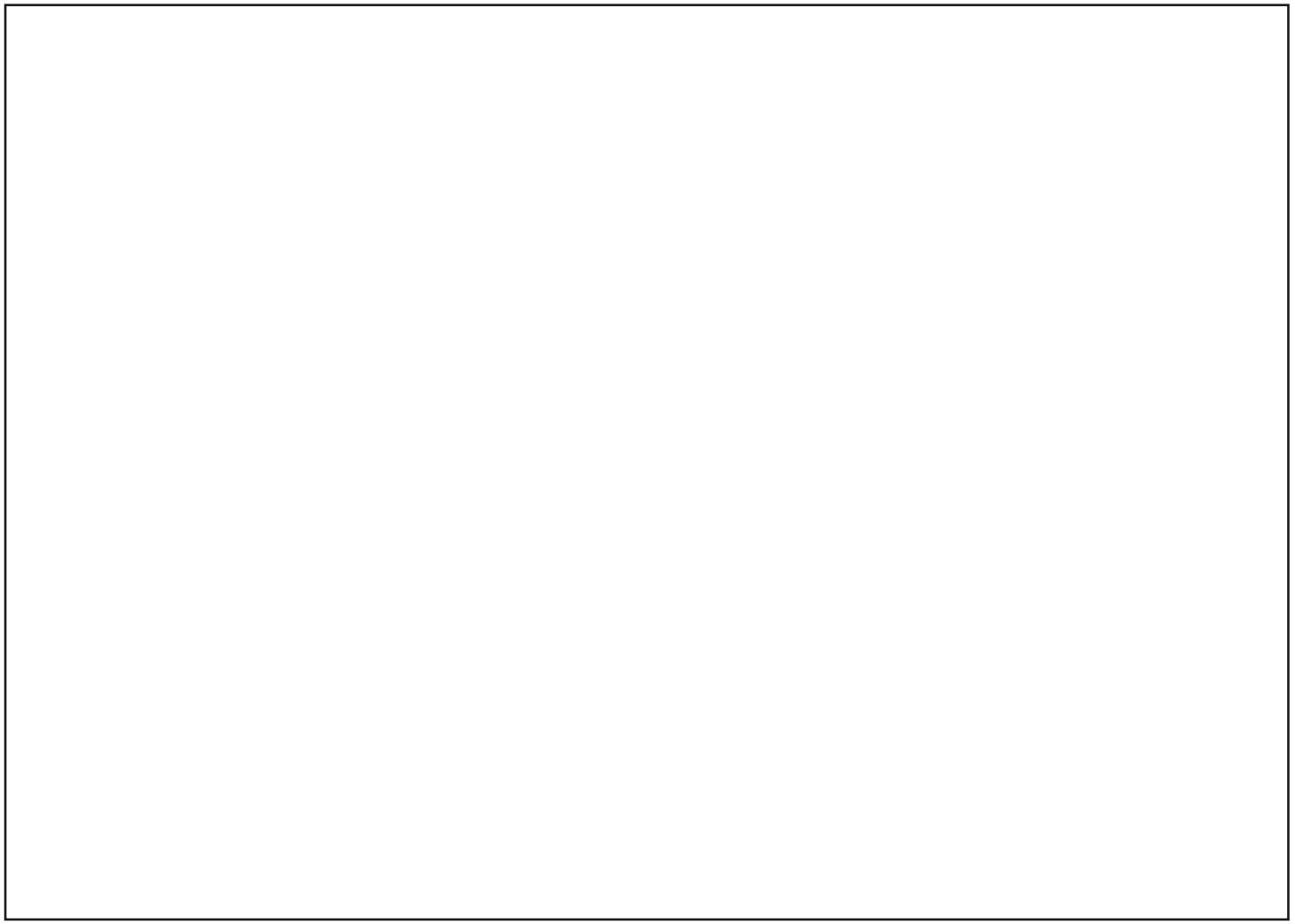
Machine Aim Cards

Water a plant.	Run a bath.
Make a drink.	Hang a coat up.
Pack a bag.	Tie a pair of shoelaces.
Put toothpaste on a toothbrush.	Turn a light off.
Find a missing pen lid.	Tidy a table.
Collect mail from the letterbox.	Tie a tie.
Make a bed.	Peel an apple.
Set a table.	Write a card.

Marvellous Machines

Design your marvellous machine in the box below.



Machine Name:

What is your machine's aim?

How does your machine work?

Firstly: _____

_____

Then: _____

_____

Next: _____

_____

Finally: _____

_____

Your partner should write in this section to evaluate your machine and your explanation of how it works.

_____

_____

_____

_____

Use these words to help you explain and evaluate the machine.

pulley	lever	gear	move	pull	push	lift	speed	slow	fast	force	spin	turn	around

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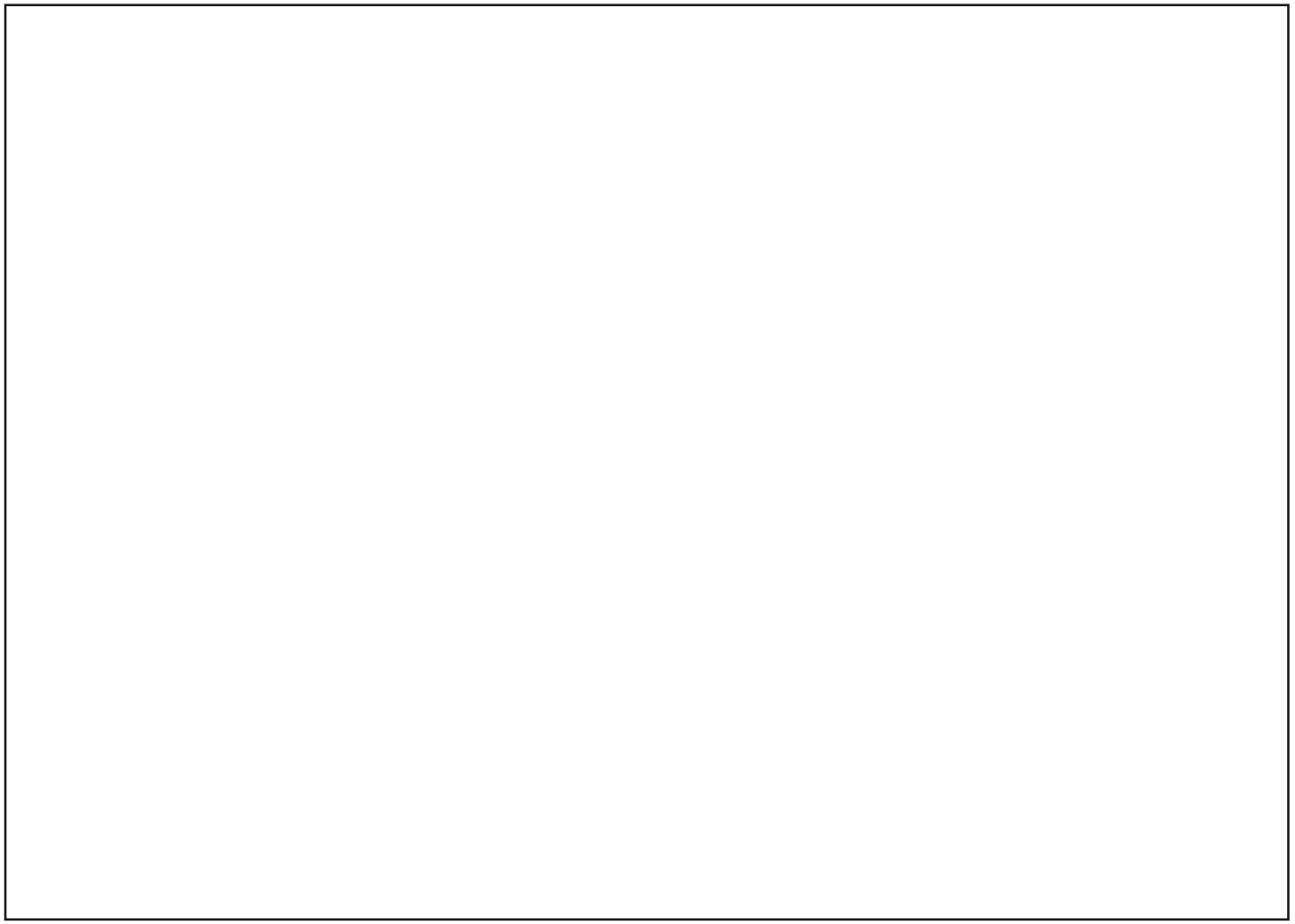

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What is your machine's aim?

How does your machine work?

Your partner should write in this section to evaluate your machine and your explanation of how it works.

Mechanism Facts

Pulleys can be used to make a small force lift a larger load.

A pulley is a wheel or a collection of wheels over which a rope is looped.

A pulley with a single wheel and a rope helps you change the direction of the lifting force. To lift the weight, you pull the rope downwards.

The more wheels a pulley has, the more it reduces the force needed to lift the weight. With two wheels, you can lift the weight using half as much force. With four wheels, you can lift the weight using only a quarter as much force!

The more wheels you have in the pulley, the longer rope you need. So, even though you reduce the amount of force you need to use to lift the weight, you have to apply the force over a longer period of time as you pull the longer rope.

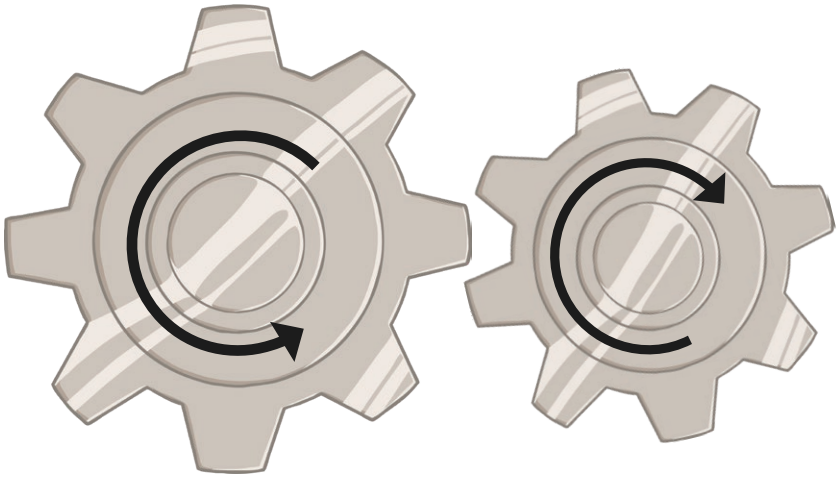
Gears or cogs can be used to change the speed, force or direction of motion.

Gears are wheels with teeth, or indentations, which lock together and turn one another.

If you connect two gears together, and the first gear is larger than the second, the second gear will turn much faster than the first. This way you can increase the speed of the motion.

If the second wheel in a pair of gears is larger, it will turn much more slowly than the first, but with more force.

When two gears are connected, they always turn in opposite directions to each other. This is how gears can change the direction of motion.



Levers can be used to make a small force lift a larger load.

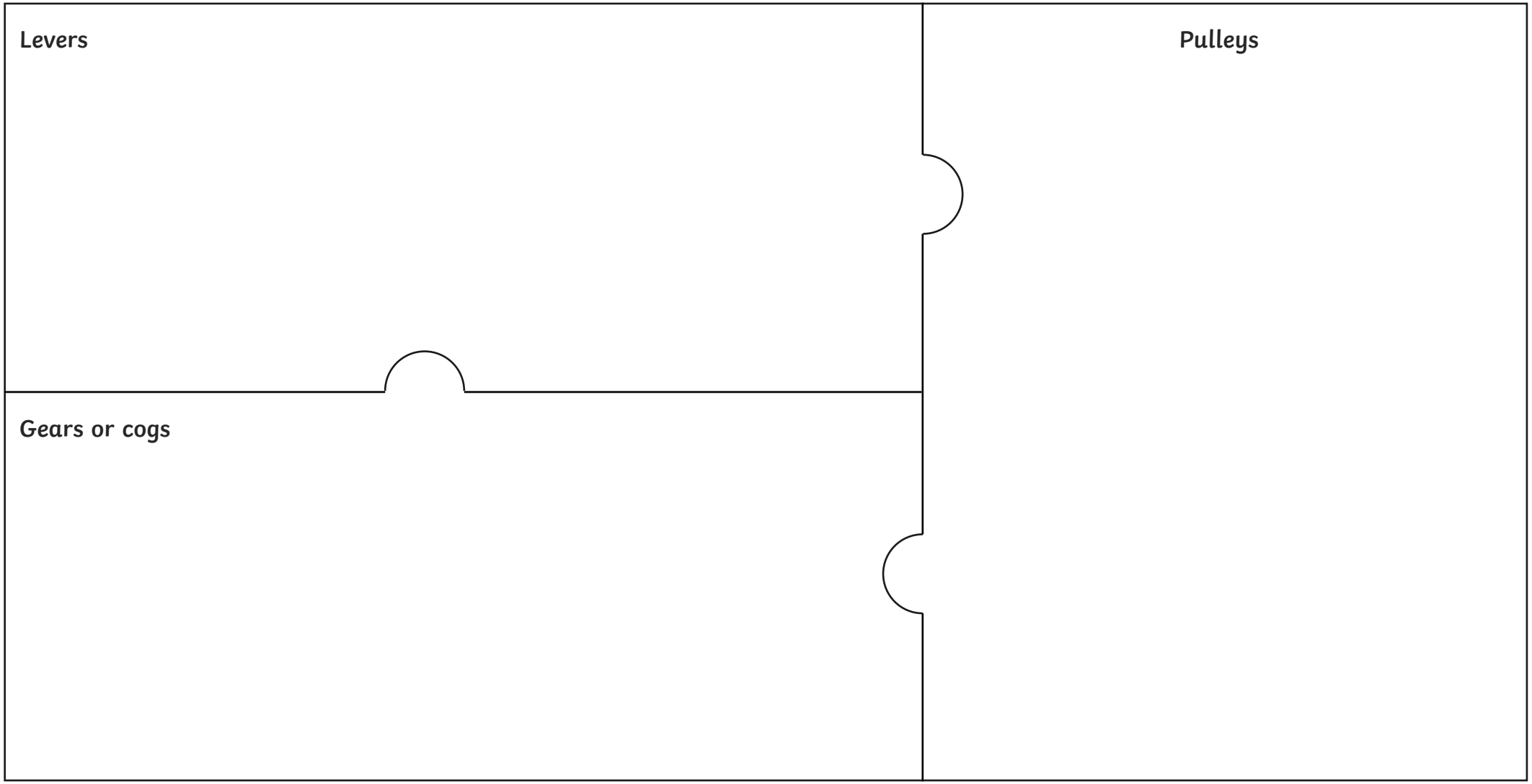
A lever always rests on a pivot.

A lever has three parts – the place where you apply a pushing or pulling force, the point where it pivots and the place where the work, usually lifting, is done.

The distance between the pivot and the place where the person pushes affects how easy or hard it is to lift a load with the lever.

Levers were used in ancient Egypt to lift stones to construct the pyramids.

Mechanisms Jigsaw



Avery Template: Name Badge Label, 8 per sheet | **Compatible Products**: 15395, 25395, 42395, 45395, 48395, 5395, 8395, 88395, 85395.

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