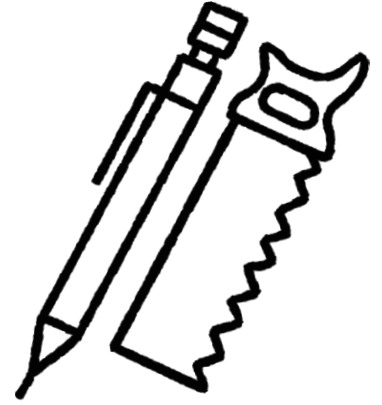


Parallel and push-pull linkages



Design and technology

Unit Levers and linkages: interactive books

Outcome

I can make parallel and push-pull linkages.



Keywords

parallel linkage

a linkage that creates movement in the same direction using two pairs of levers

input

something that goes into a system

output

something that comes out of a system

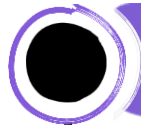
push-pull linkage

a linkage that uses short levers to push and pull three other levers in the same direction



Lesson outline

Parallel and push-pull linkages



Key features of a parallel linkage



Making a parallel linkage



Key features of a push-pull linkage

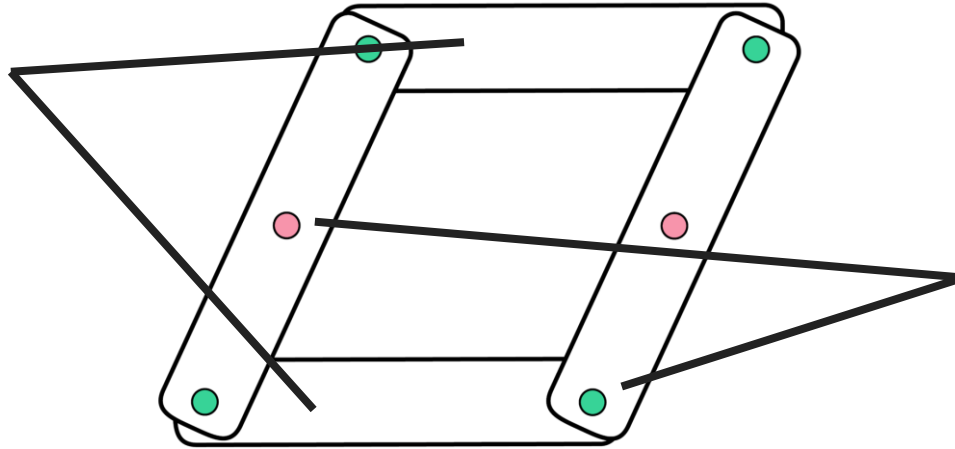


Making a push-pull linkage



This is a **parallel linkage**.

one pair of
parallel levers

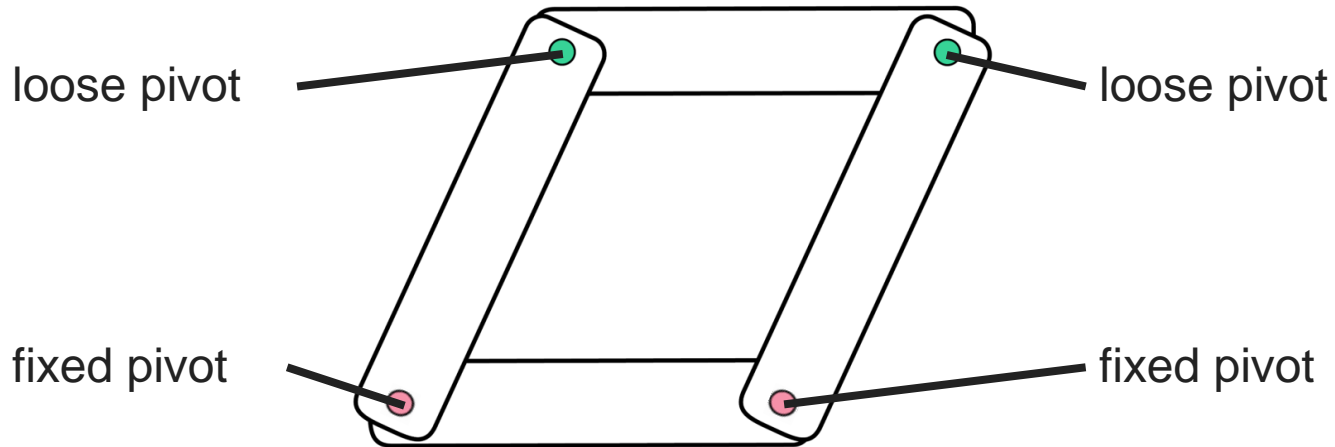


second pair of
parallel levers

Two pairs of levers work parallel (opposite) each other.
It also creates a **parallelogram**.



This **parallel linkage** has two fixed and two loose pivot points.



Key features of a parallel linkage



Check

To create movement a **parallel linkage** must have ...

- a** all loose pivots
- b** fixed and loose pivots ✓
- c** all fixed pivots

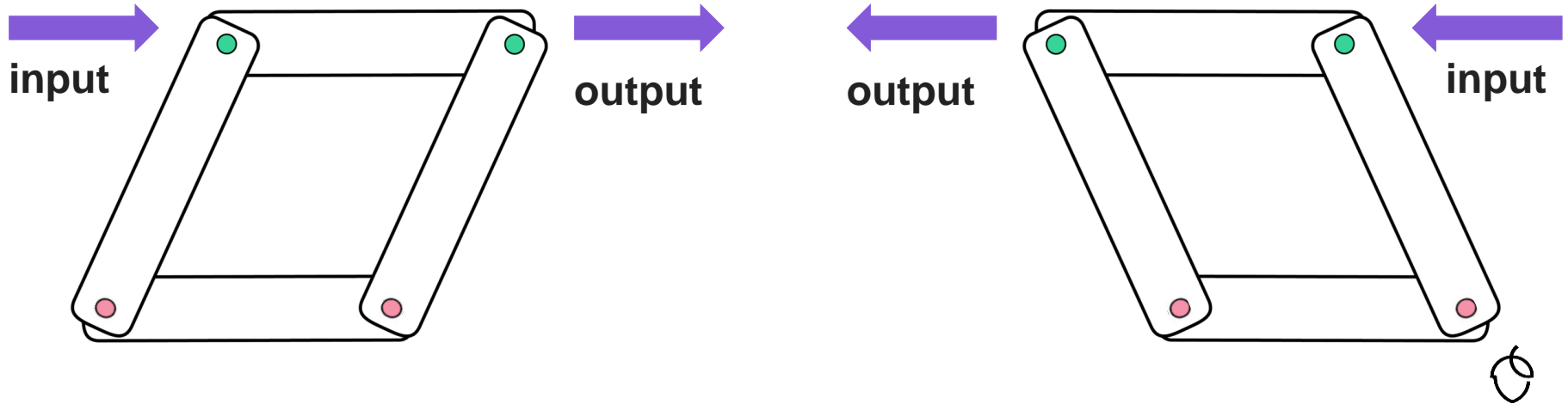


Key features of a parallel linkage

In a mechanism, there are **inputs** and **outputs**.

An **input** is the movement to start the mechanism.

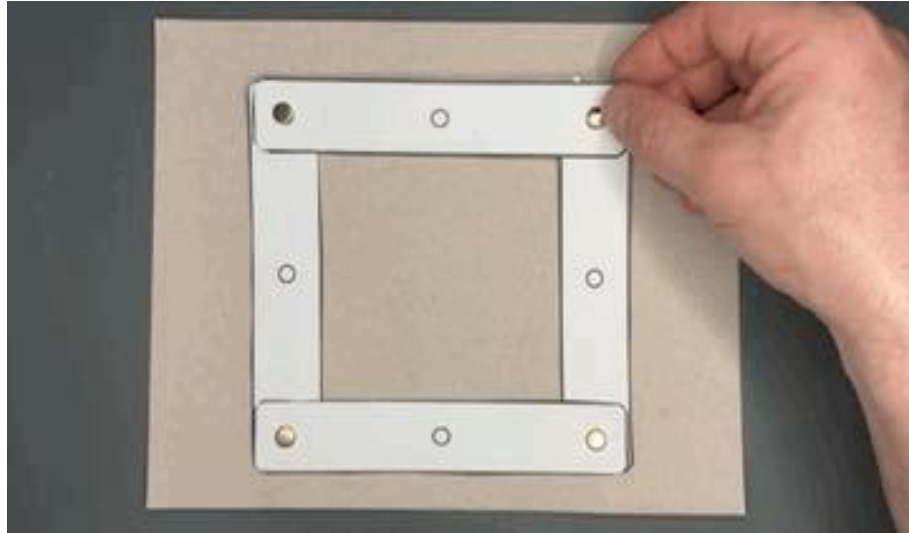
An **output** is the movement that happens as a result of the **input**.



Key features of a parallel linkage



movement



movement

In a **parallel linkage**, the **input** moves in the same direction as the **output**.





How does a **parallel linkage** move?

- a** side-to-side, with the **input** and **output** being still
- b** side-to-side, with the **input** and **output** moving in the same direction ✓
- c** side-to-side, with the **input** and **output** moving in opposite directions



Key features of a parallel linkage



Explanation

Parallel linkages can be found in a tool box.

input
handles are pulled apart



output
parallel linkages open the tool box



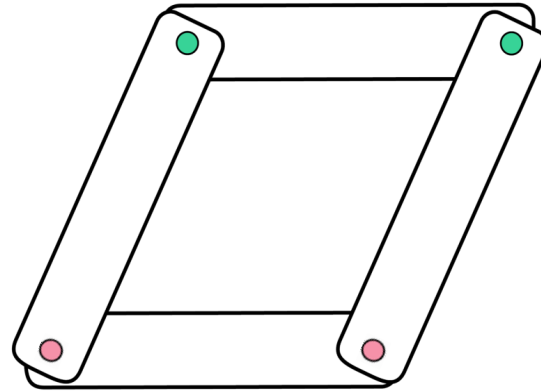
parallel linkage



1) Label a **parallel linkage** with the correct **pivot** points, adding arrows to show the movement.

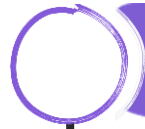
Check you have included:

- loose **pivots**
- fixed **pivots**
- movement



Lesson outline

Parallel and push-pull linkages



Key features of a parallel linkage



Making a parallel linkage



Key features of a push-pull linkage



Making a push-pull linkage



Making a parallel linkage

Equipment and resources to make the linkage:

pencil

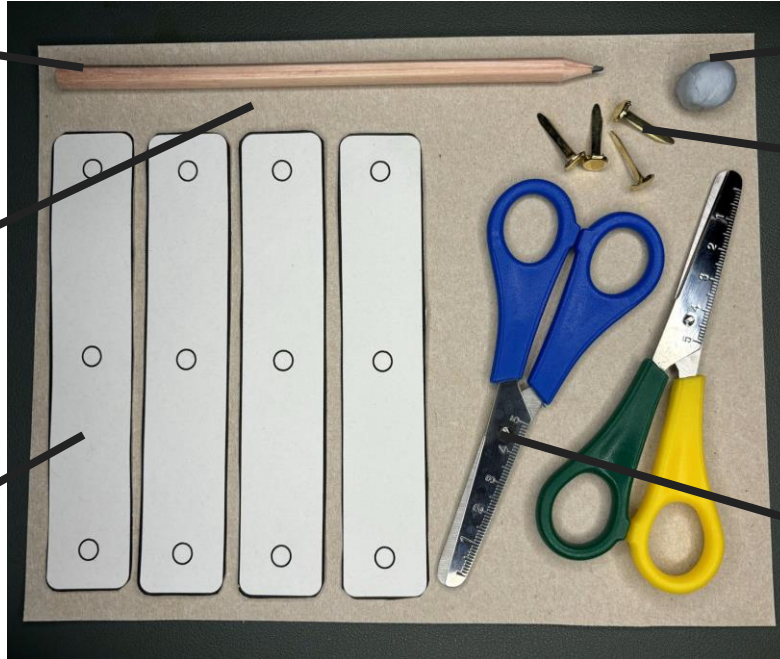
sticky tack

card from a
cereal box

split pins

strips of card

scissors



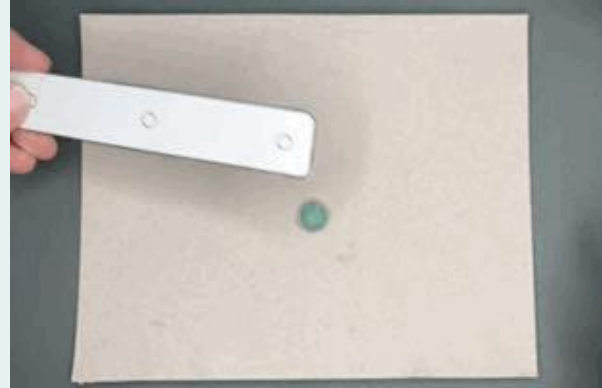
Making a parallel linkage

To safely and accurately make a hole in paper or card for split pins to go through:

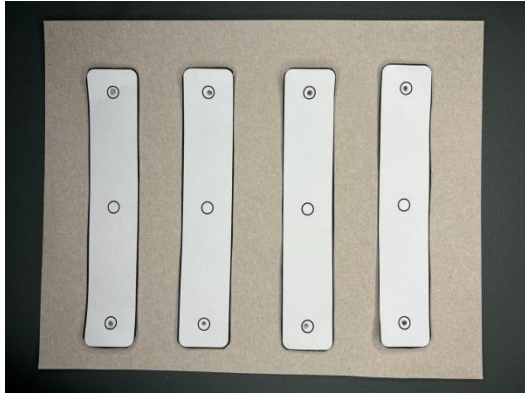
- place sticky tack underneath
- use a pencil to make the pilot hole

If the linkage doesn't run smoothly, when you have added the split pin, try turning the split pin slightly to loosen it.

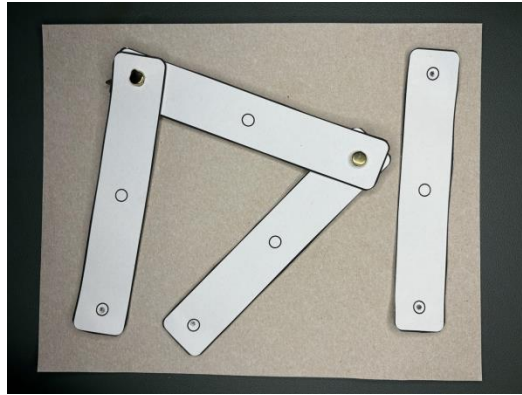
Your turn to practise



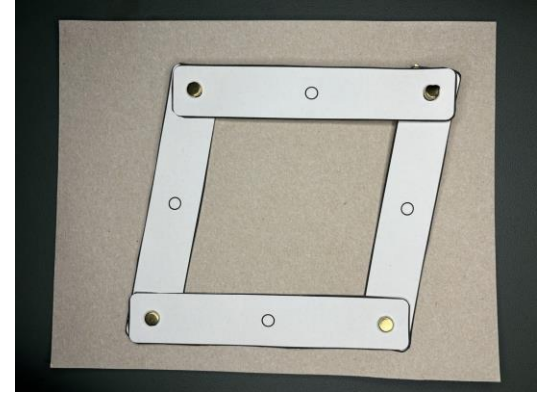
Stages of assembling a parallel linkage



Prepare holes carefully.



Create the loose pivots.



Attach the fixed pivot to the card.



Making a parallel linkage



Check

If the pivot is not turning freely in the pivot hole,
you can ...

a make the hole bigger with a pair of scissors.

b make the hole bigger by twisting the split pin. ✓

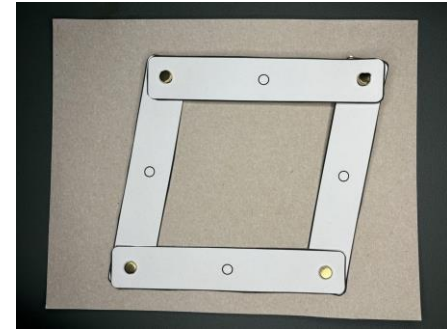
c make the hole bigger with a bigger pencil.



1) Make the **parallel linkage**.

I can ...

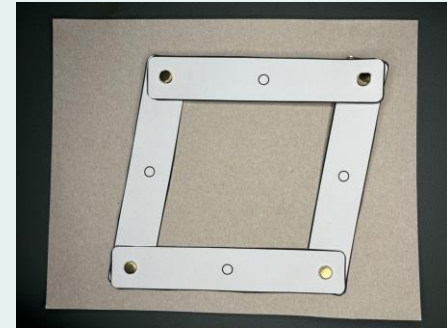
- include two loose pivots
- include two fixed pivots
- create holes safely
- attach the **parallel linkage** to another piece of card



1) Making the **parallel linkage**

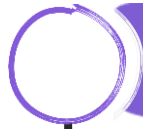
I can ...

- include two moving **pivots**
- include two fixed **pivots**
- create holes safely
- attach the **parallel linkage** to another piece of card



Lesson outline

Parallel and push-pull linkages



Key features of a parallel linkage



Making a parallel linkage



Key features of a push-pull linkage

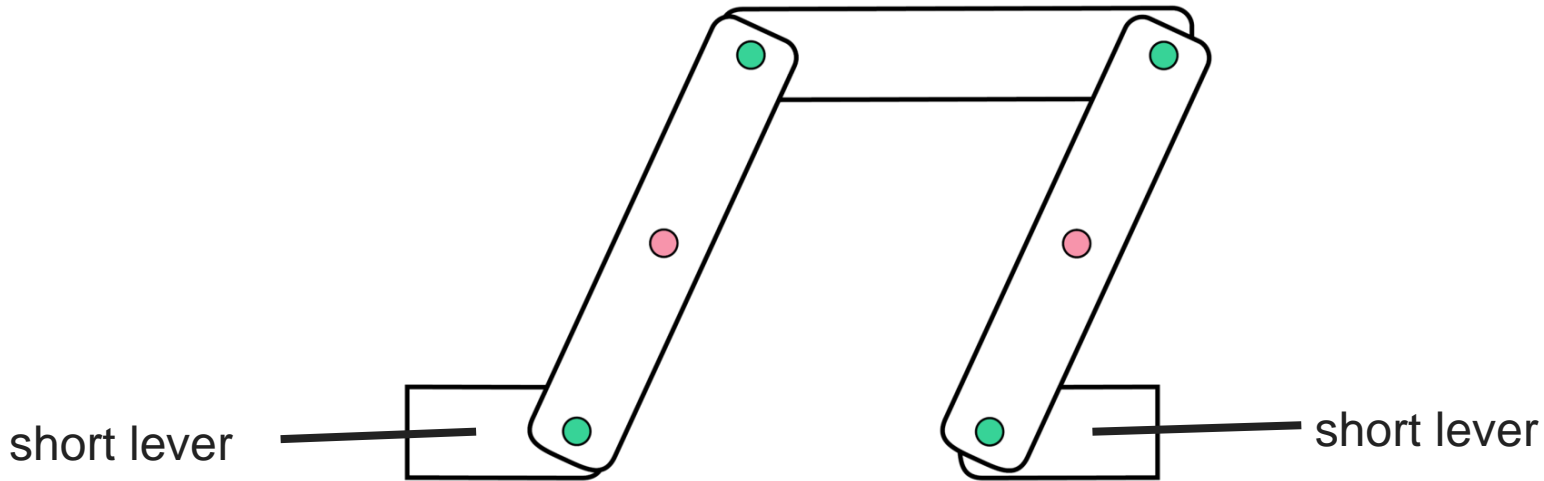


Making a push-pull linkage



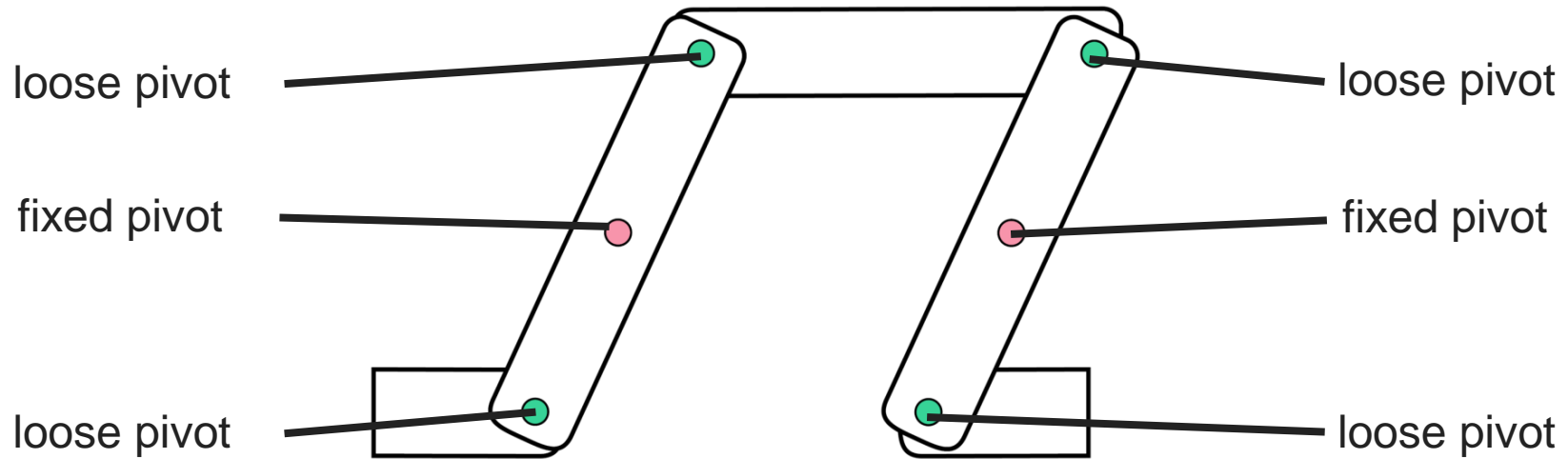
Key features of a push-pull linkage

This is a **push-pull linkage**. This is called a **push-pull linkage** because the short levers at the bottom of the linkage are pushed and pulled to create movement.



Key features of a push-pull linkage

This **push-pull linkage** has two fixed and four loose pivot points.

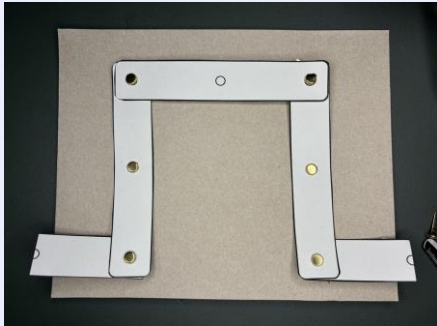


Key features of a push-pull linkage

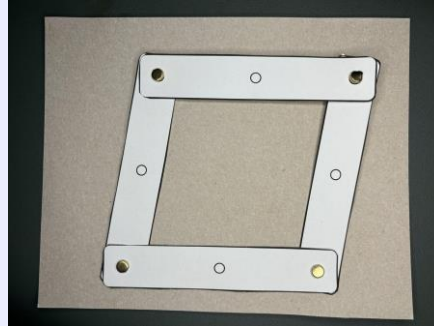


Check

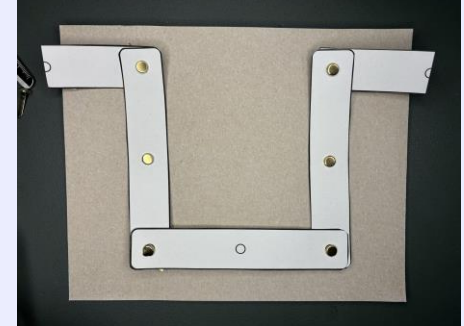
Which of these are **push-pull linkages**?



a ✓



b



c ✓

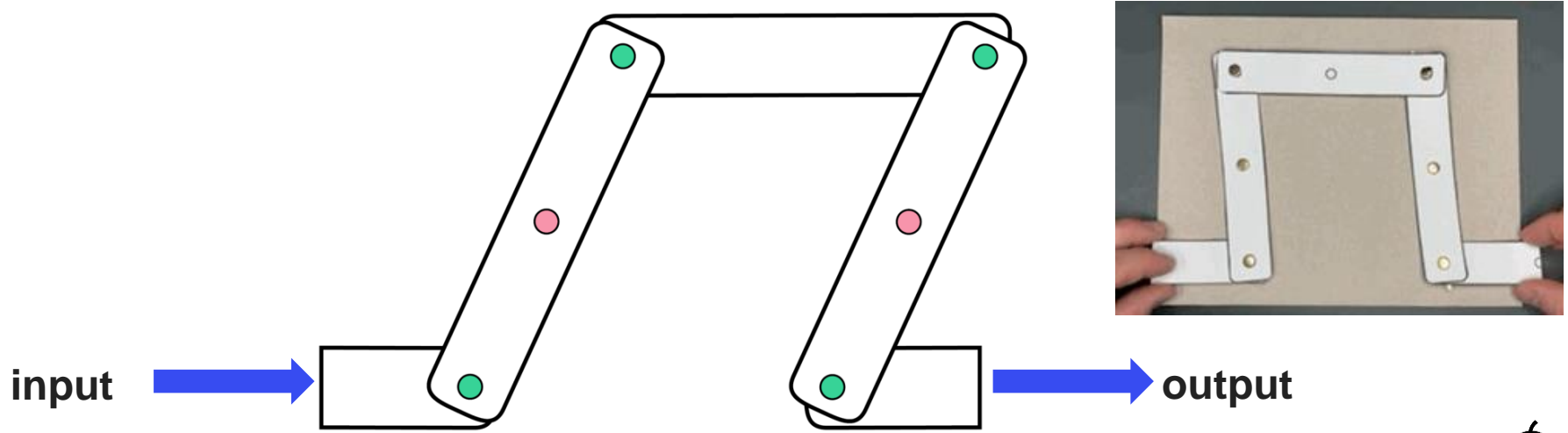


Key features of a push-pull linkage



Explanation

In a **push-pull linkage**, the **input** creates movement in the same direction as the **output**. This is similar to the **parallel linkage**.





What happens to the **input** and **output** movements on a **push-pull linkage**?

a They move in opposite directions.

b They move apart.

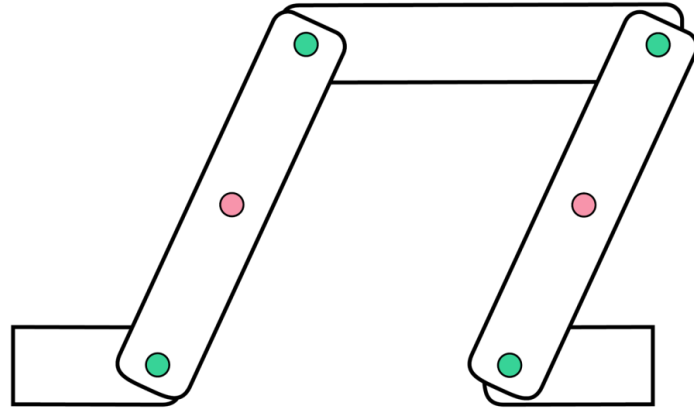
c They move in the same direction.



1) Label a **push-pull linkage** with the correct **pivot** points, adding arrows to show the movement.

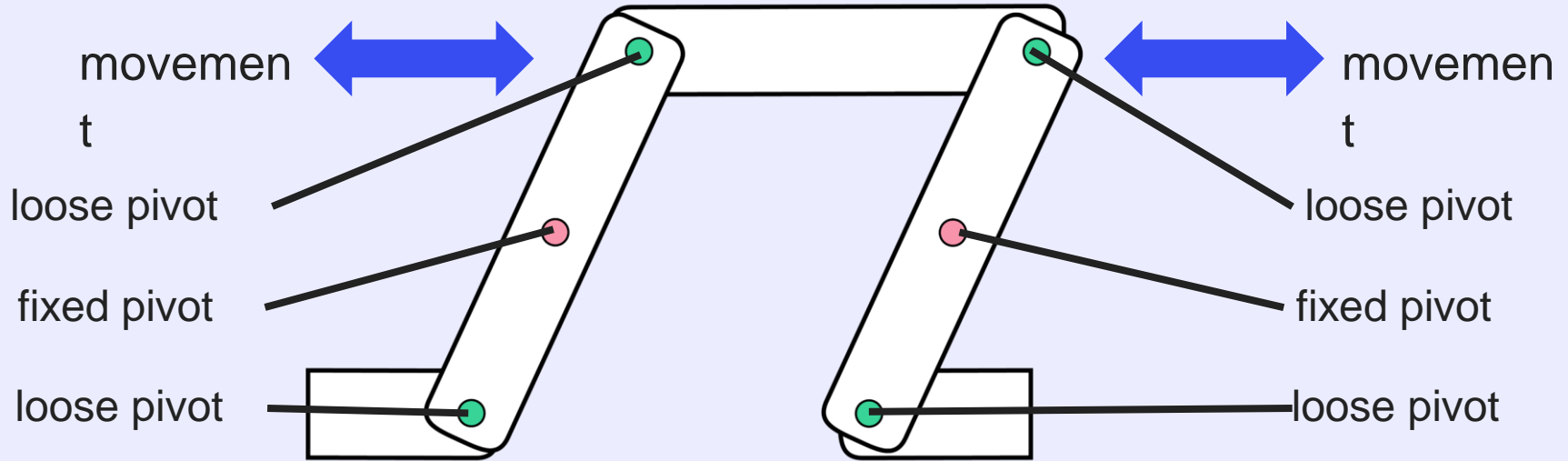
Check you have included:

- loose **pivots**
- fixed **pivots**
- movement



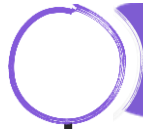
Task C Key features of a push-pull linkage

1) A **push-pull linkage** has two fixed pivots and four loose pivots.



Lesson outline

Parallel and push-pull linkages



Key features of a parallel linkage



Making a parallel linkage



Key features of a push-pull linkage



Making a push-pull linkage



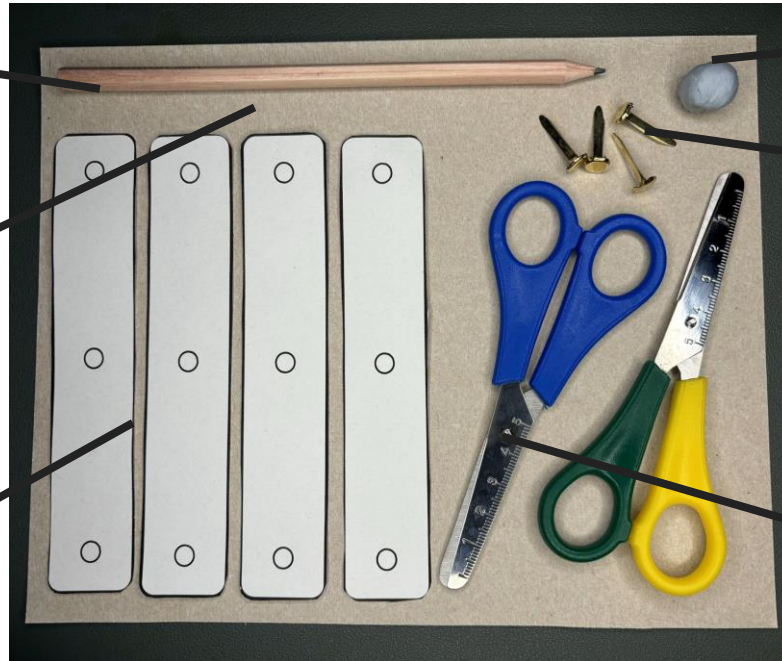
Making a push-pull linkage

Equipment and resources to make the linkage:

pencil

card from a
cereal box

strips of card



sticky tack

split pins

scissors



Making a push-pull linkage



Check

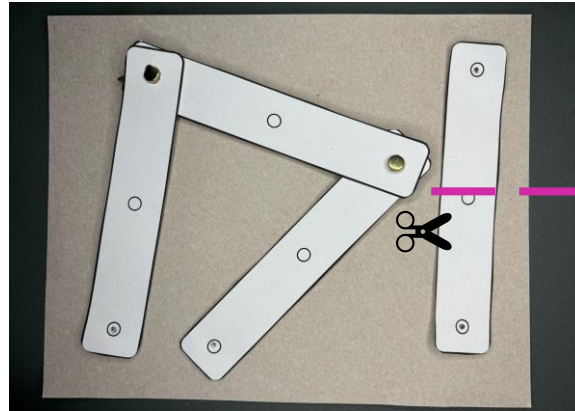
Which two items from the equipment list do you need to create a hole for a pivot point?

- a** pencil and scissors
- b** scissors and sticky tack
- c** sticky tack and pencil ✓



Making a push-pull linkage

To create a **push-pull linkage**, you need three long levers and two short levers.



To create the short strip of card, cut one lever in half.





My **push-pull linkage** needs how many levers?

a five long levers

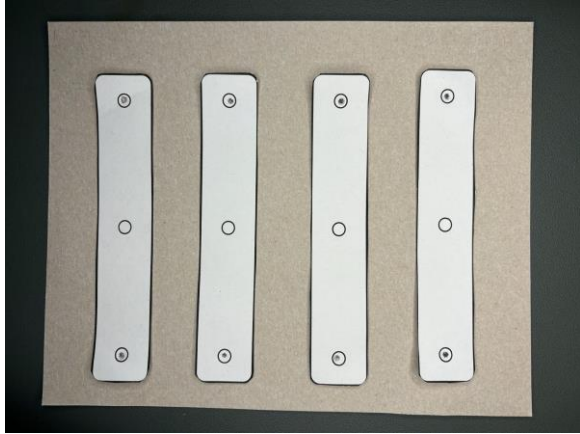
b three long and two short levers



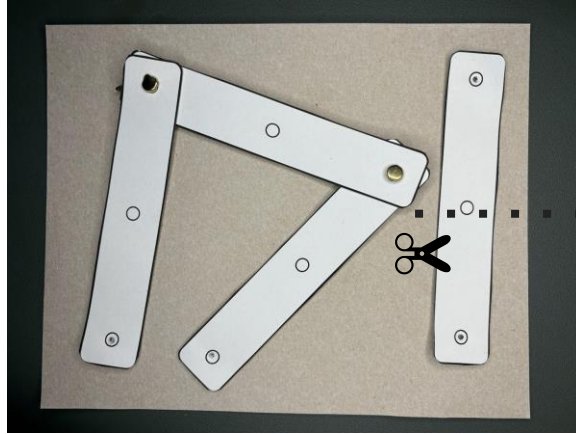
c two long and three short levers



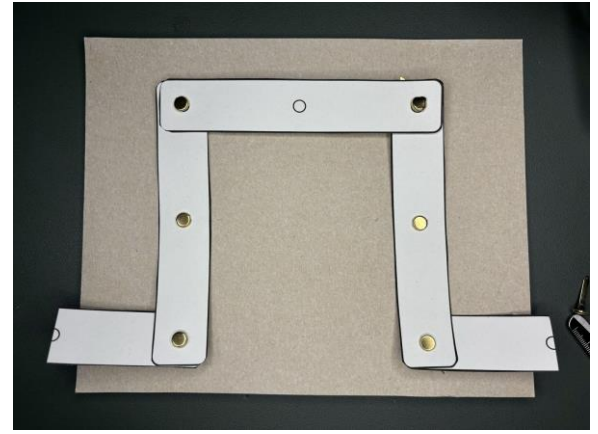
Stages of assembling a push-pull linkage



Prepare holes carefully.



Create the loose pivots.
(Remember to cut the one linkage in half.)



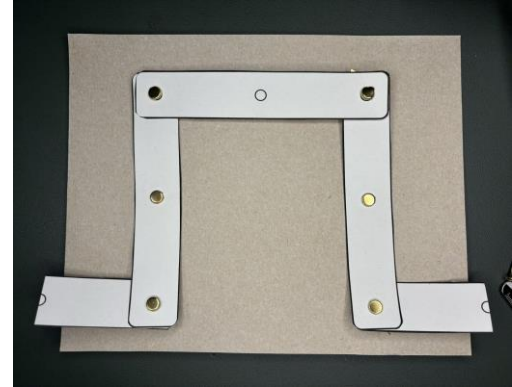
Attach the fixed pivot to the card.



1) Make the **push-pull linkage**.

I can ...

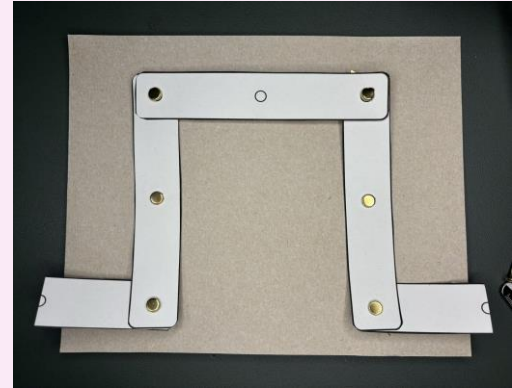
- include four loose pivots
- include two fixed pivots
- create holes safely
- attach the **push-pull linkage** to another piece of card



1) Making the **push-pull linkage**

I can ...

- include four loose pivots
- include two fixed pivots
- create holes safely
- attach the **push-pull linkage** to another piece of card



Summary Parallel and push-pull linkages

A **parallel linkage** contains fixed pivots and allows movement back and forth and side to side.

A **push-pull linkage** allows the **input** and **output** levers to move in the same direction.



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