



### Activity title

**Making a Model of a Robot Arm**

### Time required

1 hour

### Activity summary

Produce a 2D card model of a robot arm.

### By the end of this activity, you will be able to:

- Name the main parts of a robot arm
- Design and make a 2D card model of a 3D product

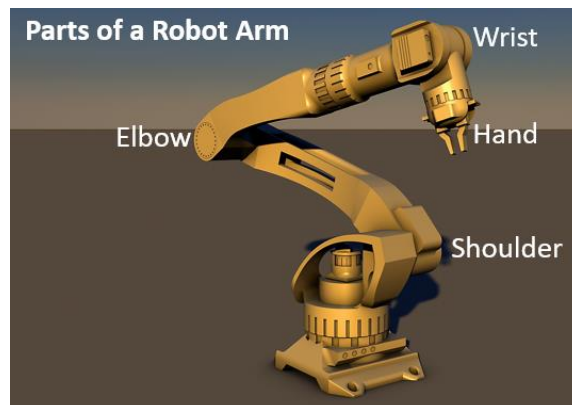
### What equipment will you need?

- 1 piece of A4 cardboard for the backboard
- 2 A4 pieces of thick card
- 1 pair of scissors
- 5 brass fasteners/brads/split pins
- 5 thumb tacks
- 3 paper clips
- 2 m length of string or fishing line
- 2 rubber bands
- 2 m length of sticky tape or masking tape

### How to do it

Robot arms are used in a wide variety of industrial applications, ranging from loading machines to assembling cars, welding parts together and spray-painting products. They are also used in applications such as bomb disposal and repairing space craft as they orbit the earth.

You are going to make a 2D card model of a robot arm.



## Activity title: Making a Model of a Robot Arm

### Now try this

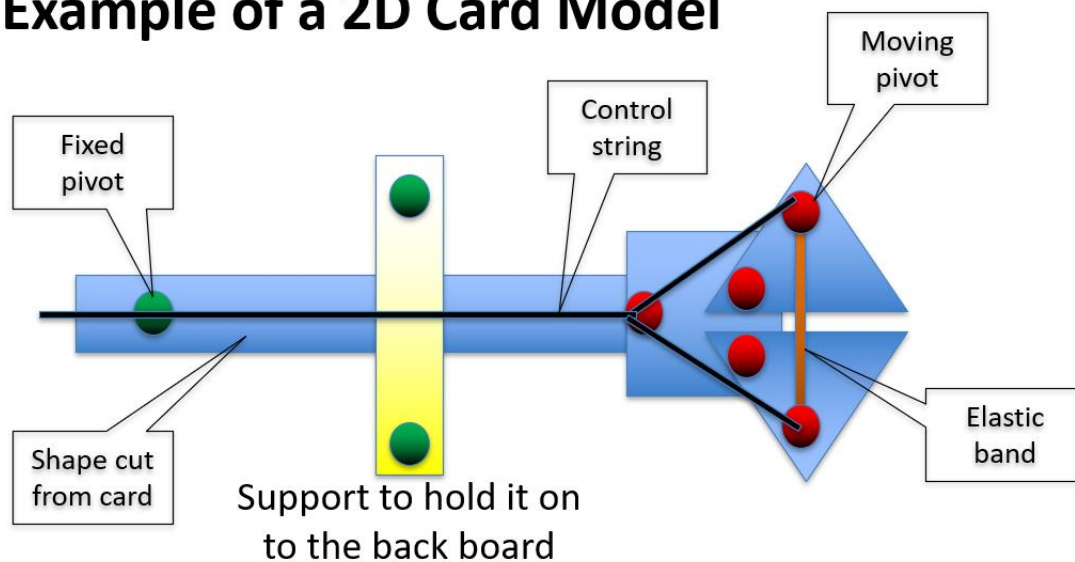
Models are often used during the design process to evaluate and improve ideas. They cost a lot less than making prototypes from the final materials and can be made and changed very quickly.

We are going to model the section of the arm that leads to the hand and the gripper:

- Use the A4 piece of cardboard as a backboard.
- Cut the pieces for the parts of the arm and any supports needed from the thick card.
- Use thumb tacks to make fixed pivots (the green pins in the diagram).
- Use brass fasteners to make moving pivots (the red pins in the diagram).
- Use string or fishing line and elastic bands to make the hand open and close.
- Once you have made your first design test it works – then see if moving where the control lines attach improves it.

**Hint: Sketch the parts you will need onto the card before you cut them out.**

### Example of a 2D Card Model



## Activity title: Making a Model of a Robot Arm

### For further information about robot arms check the following:

- Robot arms – an explanation of the parts and operation:  
<http://science.howstuffworks.com/robot2.htm>
- Types of robot arm:  
[http://en.wikipedia.org/wiki/Robotic\\_arm](http://en.wikipedia.org/wiki/Robotic_arm)
- Linkages – an explanation of the different types of movement, including animated images:  
<http://www.technologystudent.com/cams/link1.htm>

### You could also

You could make your own design that includes an elbow and a shoulder, to give a greater range of movement.

You could also design the gripper to hold a specific object, such as a circle representing a ping pong ball, or to accommodate objects of a range of different sizes.

### Further activities you could carry out

You could investigate different types of linkage or cam as a means of closing the gripper.

### Example of another method to control movement on the robot arm:

Video of a small moving robot using 'muscle wire' made from shape memory alloy:

<http://www.youtube.com/watch?v=k9f-W6XiWo>

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What results were expected?

