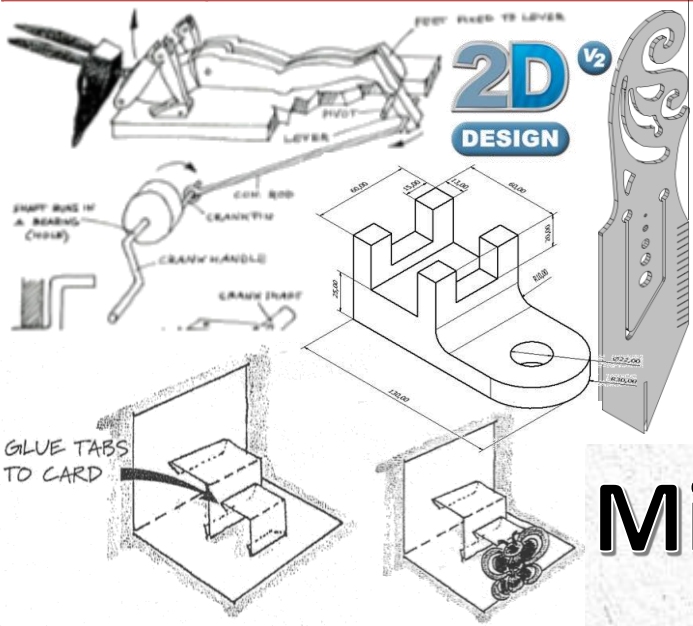
Name:		D&T Group:	
Teacher:		Tutor Group:	

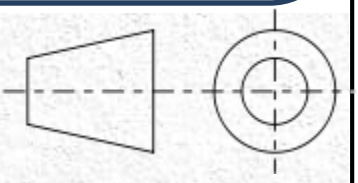


Subject: Design & Technology

Progress band target: _____

This is the target for the end of Year 11.
Targets will become more specific as you move up the year groups.
Your work will be marked as:
Below / On / Above / Well Above
the path to this target.

Mix It Up!



Homework

Homework 1: Ultimate Paper Buddy Final Design. Read the instructions on page 4 and complete the final idea. Don't forget to add details such as marking and measurements.	**Homework 4:** Page 14 – complete the design started in lesson on the outside of your net and refold the box to complete it. Make sure you keep it in good condition to show next lesson to others in the class
Homework 2: Perspective Drawing, Page 9. Complete the two point perspective drawing tasks. Then try to draw an item at home using this technique on A4 paper.	**Homework 5:** Page19 – Questionnaire and results – evaluate your final Card by creating a survey and ask people their thoughts on your work. Don't forget to explain your answers next to a graph of results.
Homework 3:. Page 12 - Research as many careers that require you to draw... How many can you find? Complete the brainstorm of jobs!	**Homework 6:** Mechanisms – page 23 – complete the unfinished mechanisms questions using the information provided. If you need to get more detail don't forget the Focus login on page 21.

Marking Summary

Designing

This work is
Below / On / Above / Well above
your minimum target path

Making

This work is
Below / On / Above / Well above
your minimum target path

Use this space to keep track of your marks throughout the different sections of the project.

Evaluating

This work is
Below / On / Above / Well above
your minimum target path

Technical Knowledge

This work is
Below / On / Above / Well above
your minimum target path

Overall Project

This work is
Below / On / Above / Well above
your minimum target path

The Ultimate Paper Buddy!

Design Brief:

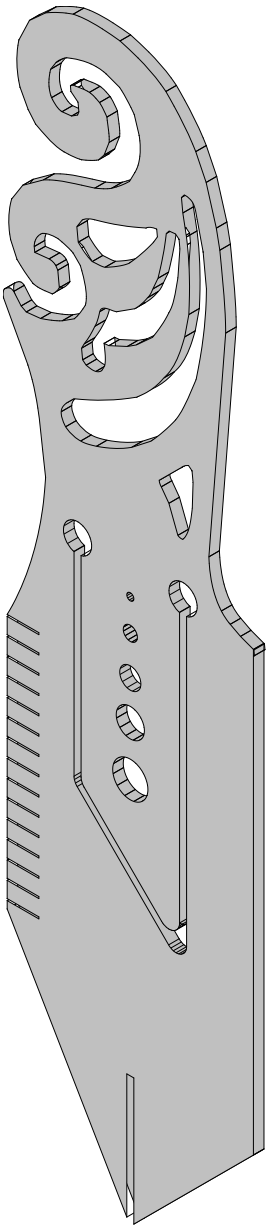
You are to design and make a multi-functional 'paperclip'. The paper clip has got hold multiple pieces of paper together and also act as a drawing aid and book mark. This product is to be aimed at students starting Secondary School, aged 11 to 12 years.

Design Specification:

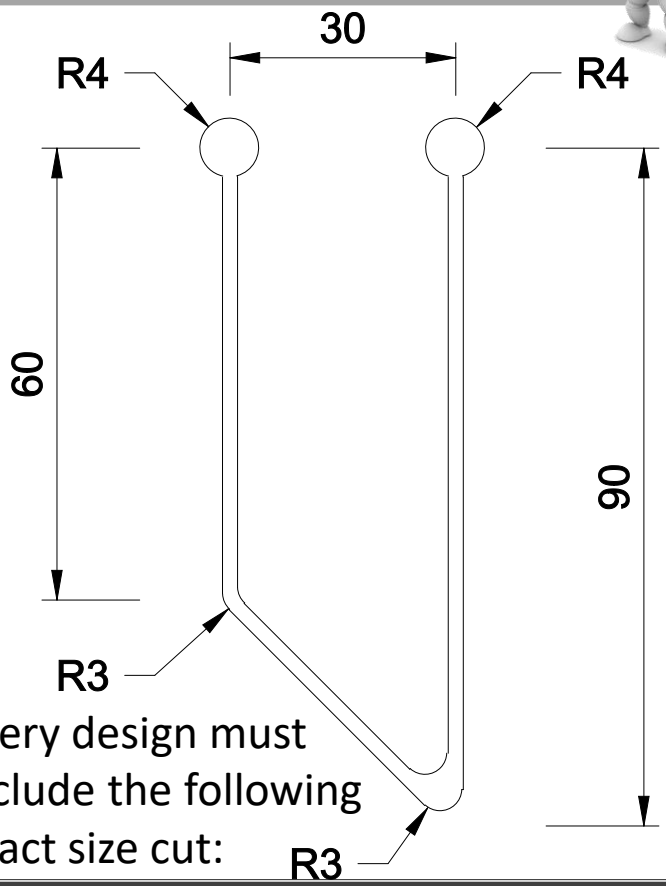
Your design must:

- ***Be suitable for use in school.***
- ***Be designed appropriately for aiding drawing techniques.***
- ***Be aimed for the interests of students aged 11 to 12 years.***
- ***Be able to hold more than 3 sheets of paper together.***
- ***Be able to be used as a book mark to identify a page in a book.***
- ***Be developed and modelled using paper and card.***
- ***Be drawn and made accurately using CAD/CAM.***
- ***Be machined out of a Thermoplastic using the CNC Laser Cutter.***
- ***Be no larger than 70mm x 300mm***

What is CAD?:



What is CAM?:



Every design must include the following exact size cut:

Sketch time...

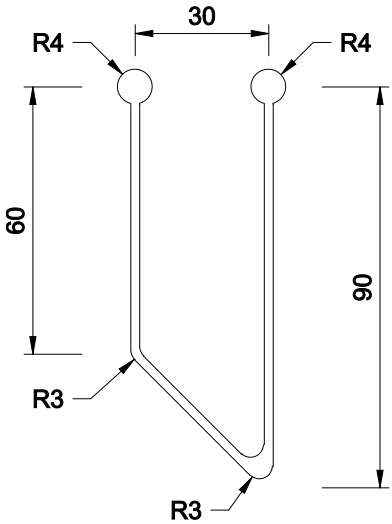
Use this space to sketch out 4 possible design ideas for your Paper Buddy. You need to remember the list of specification points your designs must include.

Homework 1

In the space on the right, draw out your final design accurately. It must be full size and add measurements to help you draw it in CAD next lesson

Final Design must fit in this box

Use this space below for notes and measurements for your final design to help you when you come to draw it in CAD:

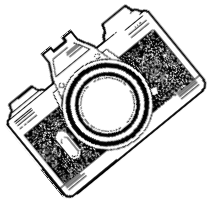


Designing

This work is
Below / On / Above / Well above
your minimum target path

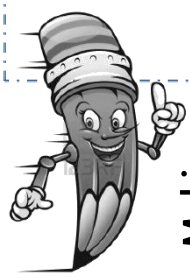
The Ultimate Paper Buddy!

Print your CAD from 2D Design and Cut it out to stick below:



Print a photo of your final Paper Buddy and stick it below in the space provided:

Teacher Feedback:



Making

This work is
Below / On / Above / Well above
your minimum target path

Perspective Drawing

The objective is to learn how to draw shapes and ideas in 'One point' and 'Two point' perspective.

Year 7 = Mix it up

6

Design & Technology

1. 'One point' perspective is used to show forms face on. The eye is tricked into seeing depth on a flat surface. Most lines are vertical, horizontal or orthogonal drawn to a single vanishing point.

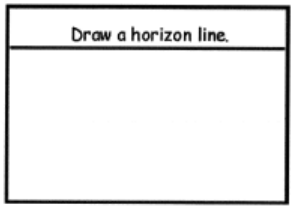
2.

Vertical

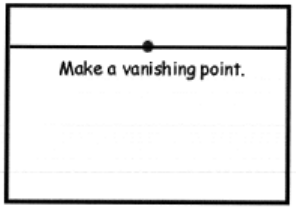
Horizontal

Orthogonal

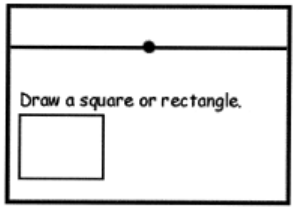
3. In the top left hand section, draw a horizontal line 2cm down from top of the border. This is your horizon line.



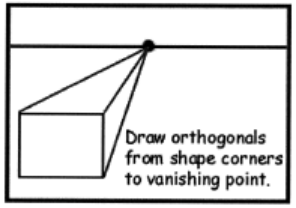
4. Draw a dot in the middle of your horizon line. This is your vanishing point.



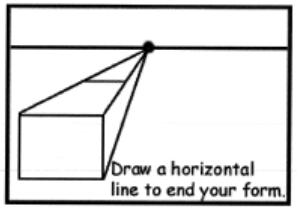
5. Now draw a square or rectangle in the right or left bottom area of your page.



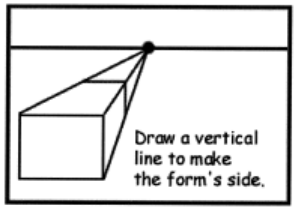
6. Now connect three corners of your rectangle or square to the vanishing point. These are orthogonals.



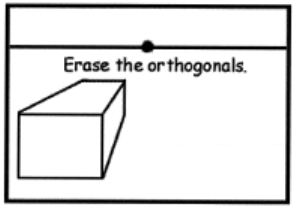
7. Draw a horizontal line between the top two orthogonals where you want your form to end.



8. Draw a vertical line down from the horizontal line the side.

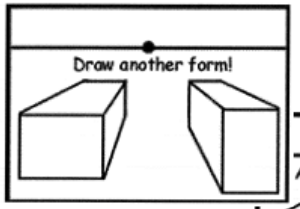


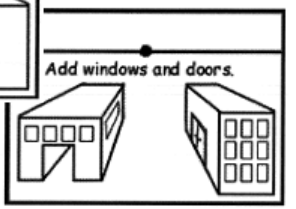
9. Rub out the remaining orthogonals.

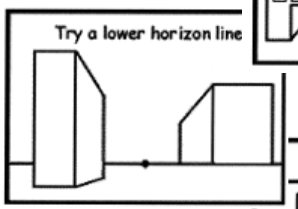


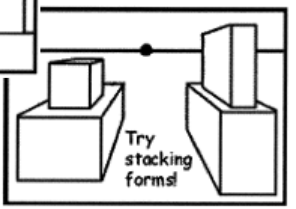
Now you have a 3-D form in one-point perspective

10. Add details and experiment









Year 7 = Mix it up

Design & Technology

1.

2.

Peer Assessment of Design Work so far: Discuss your idea in groups and show notes below of the feedback given

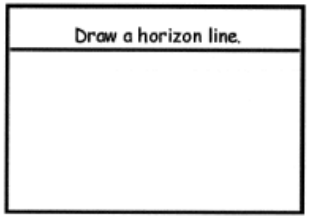
3.

Perspective Drawing

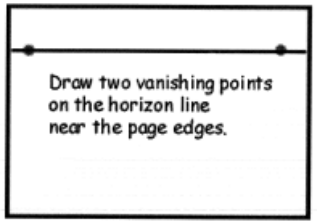
The objective is to learn how to draw shapes and ideas in 'One point' and 'Two point' perspective.

1. 'Two point' perspective is useful to show an angle, rather than face on.
2. Most lines are vertical or orthogonal drawn to two different vanishing points.

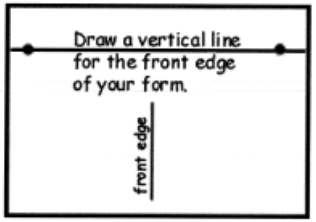
3. In the top left hand section, draw a horizontal line 2cm down from top of the page. This is your horizon line.



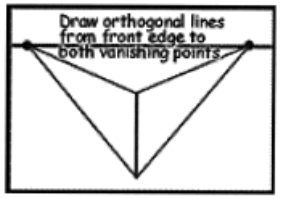
4. Draw two dots on your horizon line near the edges of the paper. These are your vanishing points.



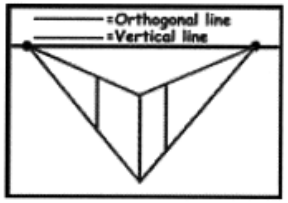
5. Draw a vertical line that is the "front edge" of your form.



6. Connect the two ends of your "front edge" line to each vanishing point. These are called orthogonals.

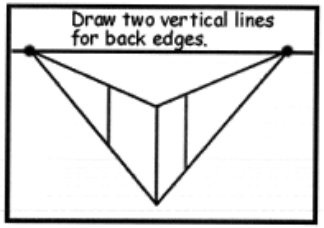


Draw lightly so you can rub them out

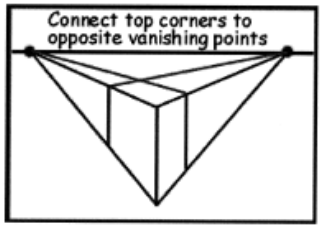


Remember: In two-point perspective most lines are either vertical or orthongonals. There are rarely horizontal lines in two-point perspective.

7. Draw two vertical lines between the orthogonals where you want the back edges of your form.

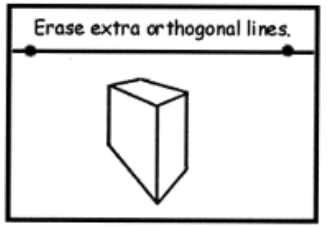


8. Now join the back, top corners to the opposite vanishing point to complete the top of the form.

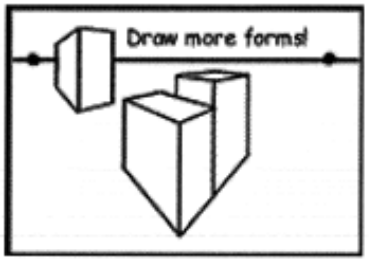


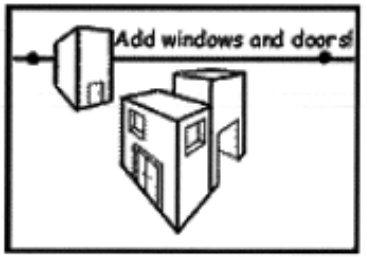
Draw lightly so you can erase!

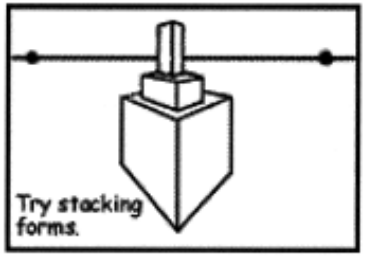
9. Erase the extra orthogonals. Now you have a form drawn in two-point perspective!

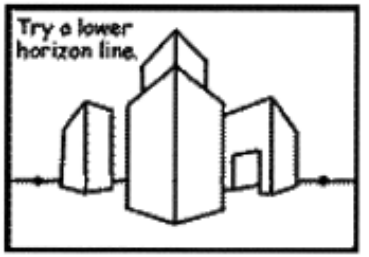


10. Now add details and experiment









Year 7 = Mix it up

8

Design & Technology

Year 7 = Mix it up

6

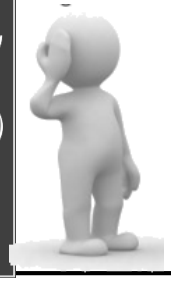
Design & Technology

1.

2.

Time for some personal reflection and evaluation… How well did it go? What did you find hard? How did you overcome problems?…

-
-
-
-
-



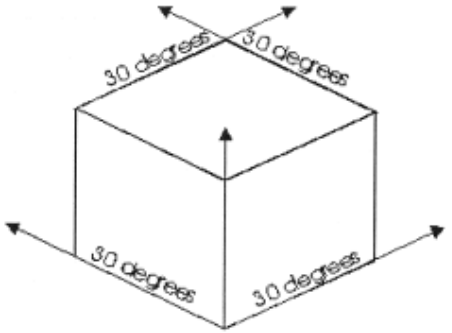
3.

Isometric Projection

The objective is to learn how to draw shapes in a realistic way that can be formal or sketched. ***30˚***

Isometric drawing is another way of presenting designs / drawings in three dimensions. The example on the left has been drawn with a 30 degree set square. Designs are always drawn at 30 degrees in isometric projection.

Complete the top of the cube by projecting the lines as shown below.

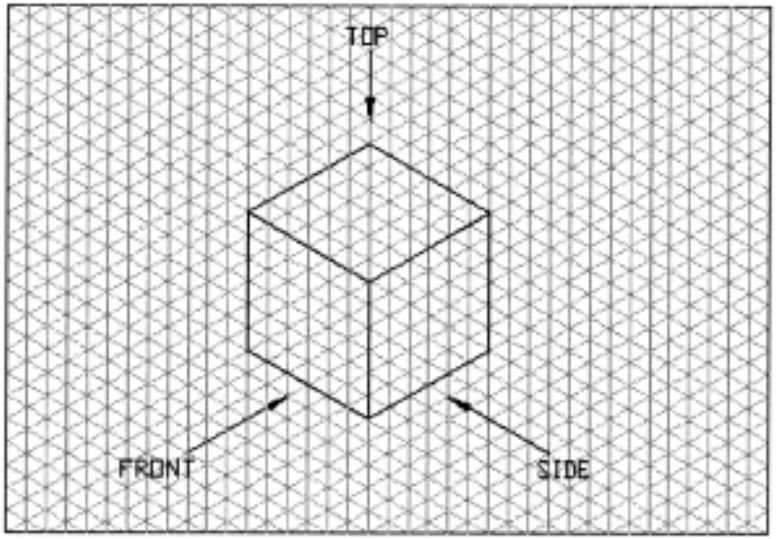


On the grid paper provided, draw a vertical line 6 squares high .

At the bottom of the vertical line, draw a line 6 squares long along the 30 degree line to the left.

Repeat this to the right .

At the end of each 30 degree line, draw a vertical line 6 squares high.



Use Box 1 to try the 'step by step' approach as described on this page. In Box 2 try covering the instructions and having a go without help, maybe changing the size. In Box 3 its time to go freehand – yep, no ruler, guide or set squares, just a pencil!

Year 7 = Mix it up

10

Design & Technology

3.

1.

2.

D&T : Marking Summary : Designing

	Designing	Tick Box Student	Tick Box Teacher
Working Towards	You have produced a range of different shapes with annotation. You have used CAD with help and the use of templates to develop your sliding base and PCB layout.		
Secure	You have produced variations on each shape with some explanation of thinking. You have used CAD with some assistance to develop the layout of your sliding base and a compact PCB layout.		
Confident	You have produced a large variety of shapes with variations on each and extensive annotation and reasoning. You have used CAD independently to develop a working sliding base and a compact PCB layout.		

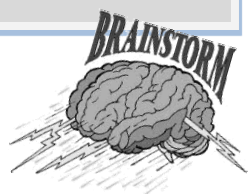
Teacher Feedback:

Designing

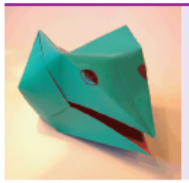
This work is
Below / On / Above / Well above
your minimum target path

Homework 3 - Links to Careers and SMSC

Research as many careers that require you to draw... How many can you find? Complete the brainstorm of jobs!



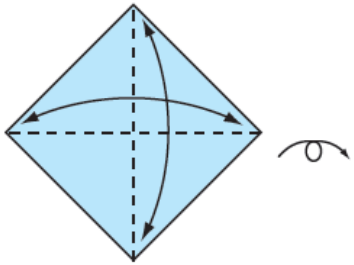
Mind Map (Brainstorming Careers that involve drawing)



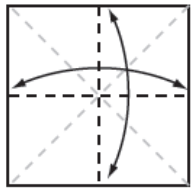
Origami Dragon Head

This is tricky. Modelling and constructing in card can be extremely useful ways to engineer solutions. Have a Go!

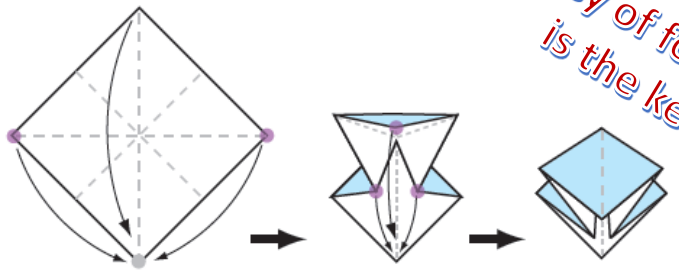
Create a magical dragon head as a gift for friend!
Accuracy of following instructions is the key skill here.



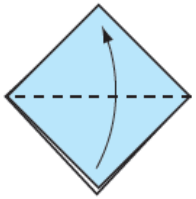
1. Start with a square piece of paper, coloured side up.
Fold in half in 2 directions



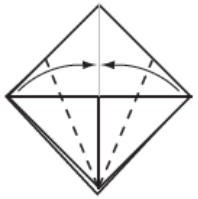
2. Turn the paper over to the white side.
Fold the paper in half, crease well and open, and then fold again in the other direction



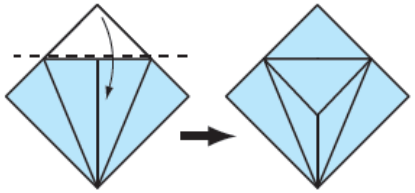
3. Using the creases you have made, Bring the top 3 corners of the model down to the bottom corner.
Flatten model



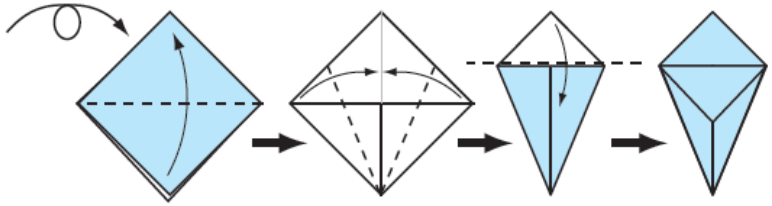
4. Fold the bottom corner upwards to the top corner



5. Fold the uppermost outer corners toward the centre line.

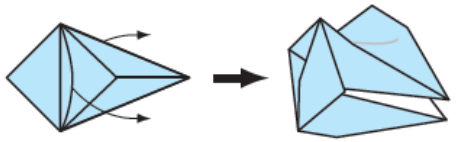


6. Now Fold the top corner down.



7. Turn model over and repeat steps 4-6 on the other side.

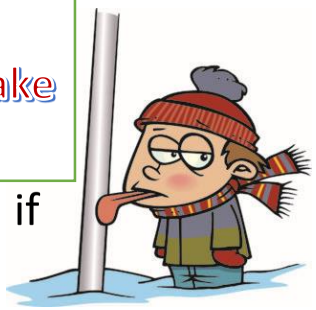
8. Now the dragon's head is folded, all you need to do is pop it open!



9. Open it out by gently pulling it apart from the sides, as shown

Once complete, unfold it, decorate it, then refold it to make the final Dragon complete!

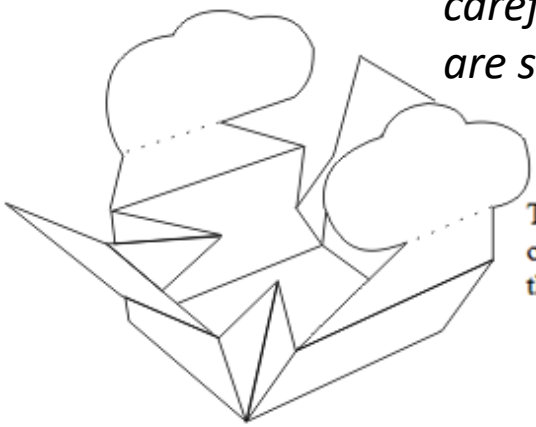
Watch this video to help you if you get stuck!



www.youtube.com/watch?v=jq097tTrg8E&feature=player_embedded

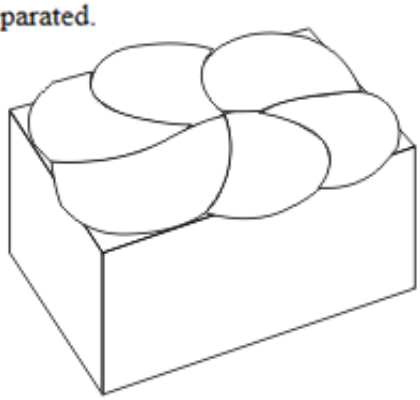
Card Nets

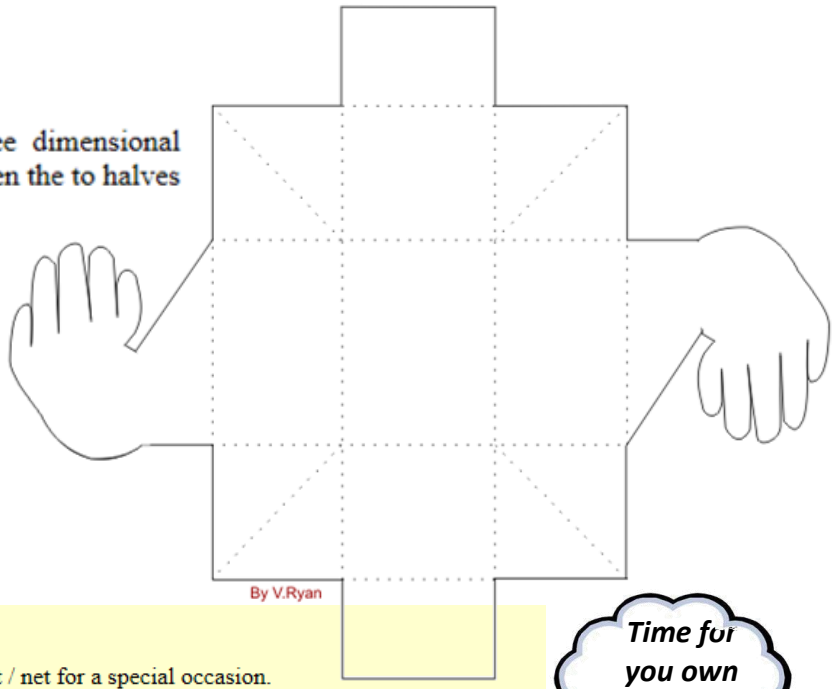
Have a go at making the flower box with the sheet provided. Be careful to follow the lines carefully. Solid lines are cut lines, dotted lines are score lines. Only the accurate will succeed.



The diagram opposite shows how the development / net of the flower box is folded. When held together by the lid, the box forms a fairly solid shape.

The two halves of the lid hold the three dimensional package together. The box comes apart when the to halves are separated.





QUESTION:

You have been asked to design a package / development / net for a special occasion.
1. Select a special occasion and replace the two 'hands' at the top of the package with an appropriate design.
2. Add a decorative design to the box. For example, if it is packaging for an expensive ring, a picture of the gift could be drawn on the outside surface. You may wish to add the designers name to the package.

Consider adding:

a bar code in an appropriate place on the development / net,
the price,
any other important design details (search the internet for ideas).

Self / Peer Assessment

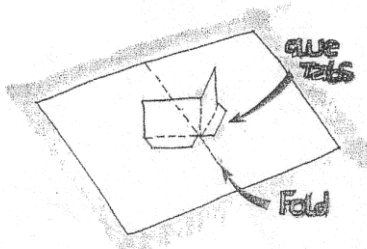
Making

This work is
Below / On / Above / Well above
your minimum target path

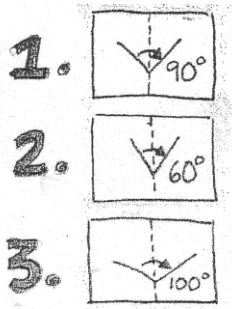
Pop up card

Task:
iPOP Cards Ltd are a manufacturer of novelty cards aimed at the teenage market. You are requested to submit an unusual presentation for a pop up event card aimed at teenagers. Birthdays, religious festivals, or other occasions are all possible events.

V Fold Mechanism

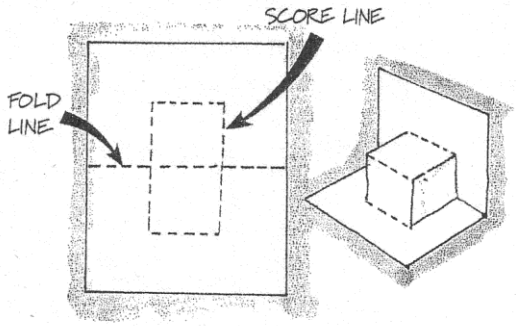


This is a simple fold.
Glue is applied underneath the tabs.
The centre of the 'V' is lined-up with the fold of the card.

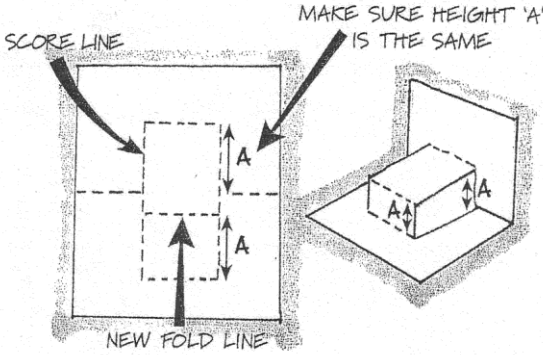


- Card will stand up vertically when opened.
- Card will lean backwards when opened.
- Card will lean forwards when opened.

Incised Mechanism



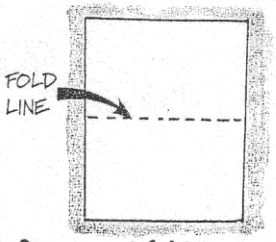
Score lines from one piece of card. The lines should be parallel and the fold line is in the centre.



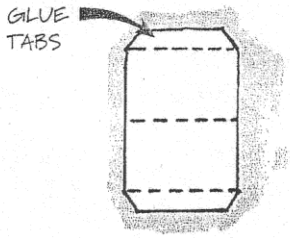
This is the same principle as the previous incised mechanism - only the fold line has moved to create a different shape.

Layer Mechanism

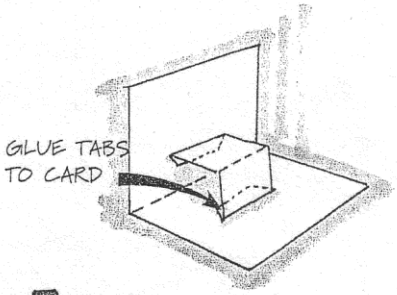
Creating more than one layer, using strips of card and tabs.



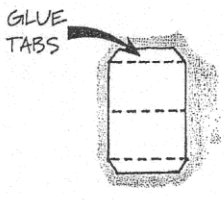
1 Score and fold your card.



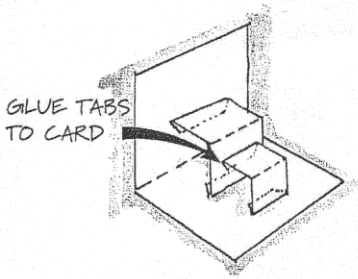
2 Make a smaller piece with tabs.



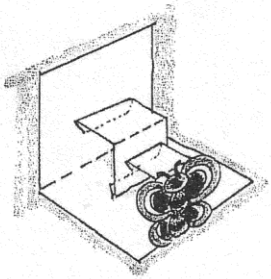
3 Glue one to the other.



4 Make a smaller piece of card with a fold and 2 glue tabs.



5 Glue this smaller piece to the front of the bigger piece of card.



6 You can then glue pictures to the front.

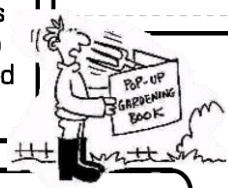
POP UP CARD

DESIGN & TECHNOLOGY

BRIEF

DESIGN NEED

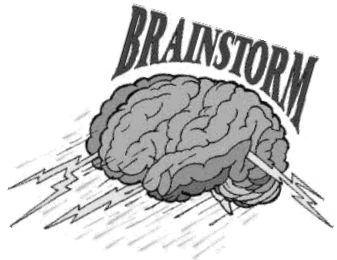
iPOP Cards Ltd are a manufacturer of novelty cards aimed at the teenage market. You are requested to submit a presentation for a pop up event card aimed at teenagers.



SPECIFICATION

In the specification you need to state how you will approach the following points:

1. Function of event card.
2. Ergonomics of card.
3. A quality check to make.
4. A point on manufacturing.
5. How could you make them in quantity?

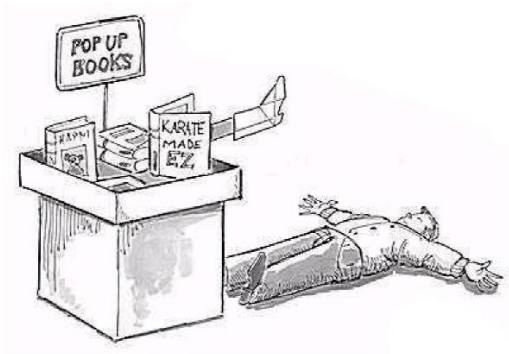


CONCEPT IDEAS

On these two pages you need to come up with some ideas for what your final design will look like. Try to use 3D sketches to show your ideas to gain higher levels. Use colour where possible!

POP UP CARD

DESIGN & TECHNOLOGY



Designing

This work is
Below / On / Above / Well above
your minimum target path

CONCEPT IDEAS

Keep your sketches neat, by not pushing too hard on the pencil. Shade in pencil crayon, never felt tip pens! Use a black fineliner to neaten edges of sketches if you wish.

POP UP CARD

DESIGN & TECHNOLOGY

ASSEMBLY

How many ways could you assemble your card?

SIZES

How big should it be? Where should the folds be?

DESIGN DEVELOPMENT

MATERIALS

How thick should your card be? Why? Could you use multiple thicknesses?

MECHANISMS

What mechanisms could you use to accomplish the same outcome? Which is best?

CARD DEVELOPMENT

How did the 3D development go in card? What decisions did you make because of it?

POP UP CARD

DESIGN & TECHNOLOGY: GRAPHICS

Question 1: _____

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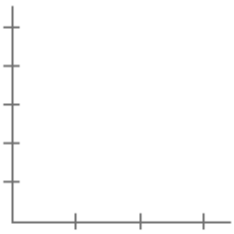

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Question 2: _____

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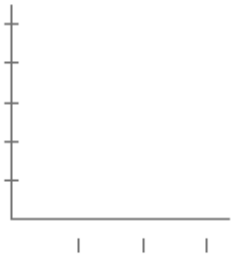

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Question 3: _____

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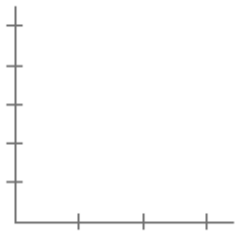

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Question 4: _____

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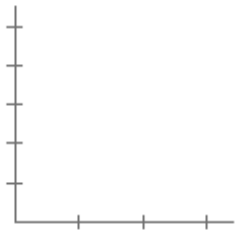

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Question 5: _____

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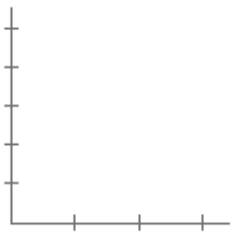

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CUSTOMER SURVEY

You need to use this page to design a survey to ask the opinions of possible card recipients. Think about the key words!

QUALITY

PICTURE

MECHANISM

COLOUR

SIZE

THEME

LAYOUT

STRENGTH

LETTERING STYLE

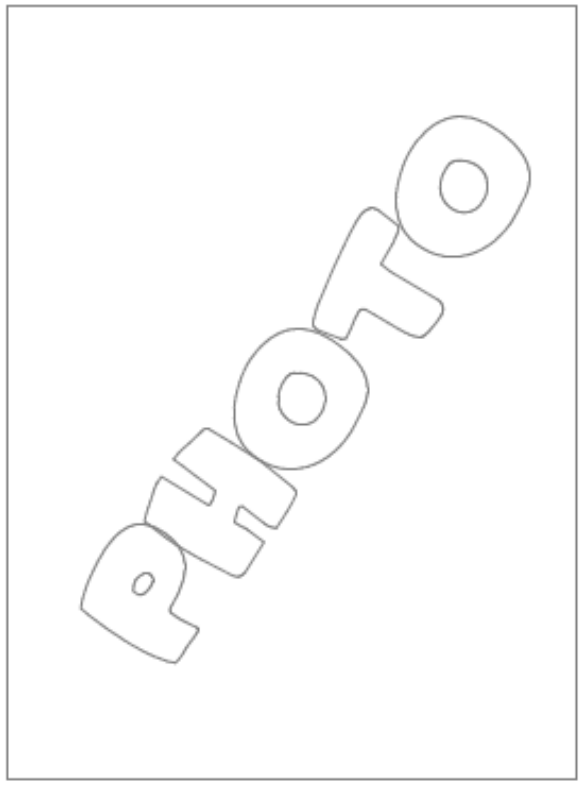
POP UP CARD

DESIGN & TECHNOLOGY: GRAPHICS

Have a good look at your finished work, and try to be critical when answering the following questions:

1. My finished product works well / does not work well because.....

2. It would have been better if .....



3. If you were going to do the same project again, what would you do differently and why?

Finally you need to look back at your specification [the list of rules your design must meet]. Go through each one and state firstly how well you met the point, and also why you have or have not met it.

SPECIFICATION ANALYSIS

Making	Evaluating
This work is **Below / On / Above / Well above** your minimum target path	This work is **Below / On / Above / Well above** your minimum target path

Feedback:

Year 7 = Mix it up

21

MECHANISMS STARTER:

TYPES OF MOTION...

In order for you to successfully stand the 4 main categories complete this project you will need to understand (types) of motion.

	VISUAL SYMBOL	
ROTARY		Example.
LINEAR		Example.
RECIPROCATING		Example.
OSCILLATING		Example.

HOMEWORK1...

1.) Choose one of the categories of motion from the examples above, and then look around your home.

2.) On a separate piece of paper, draw a diagram of an object/item that uses your chosen type of motion to perform its function.

3.) Use arrows and notes to add information to your diagram explaining which parts move and why.

FOCUS ON MECHANISMS RESEARCH

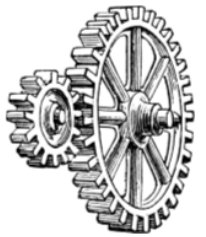
MECHANISMS... Your project will be designed and made entirely by you but to be able to devise a working project that moves and performs as you would like, you need to be aware of some other mechanisms aside from Cams.

SEARCH AND DESCRIBE...

Name:

Describe:

Types of Motion:



Name:

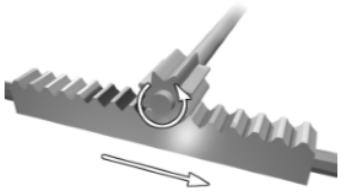
Describe:

Types of Motion:

Name:

Describe:

Types of Motion:



Name:

Describe:

Types of Motion:

Focus Educational Software – login and find 'Focus on Mechanisms'
By visiting: www.focuselearning.co.uk
Username: student@sheringhamhigh3028
Password: 2zmjb4w0q

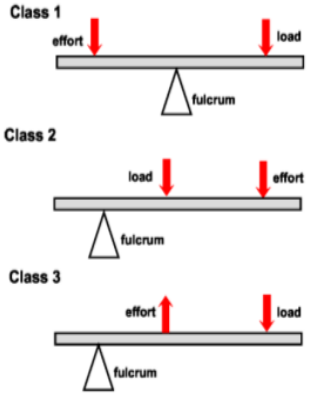
Year 7 = Mix it up

== MECHANISMS WORKSHEET ==

LEVERS

A lever was probably one of the first tools to be used by humans. Levers enable you to lift or move objects that are far heavier than you could deal with on your own.

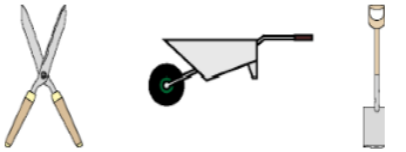
A lever system is made up from three parts:
The **Effort** put in to move the lever
The **Load** the weight of the object moved



The **Fulcrum** the point at which the lever turns or pivots.

There are three classes of lever. Each class depends upon what is in the **middle** of the system.

To help you remember which is which, try to learn the rhyme
1 2 3 – F L E (F L E are the initial letters of what is in the middle)



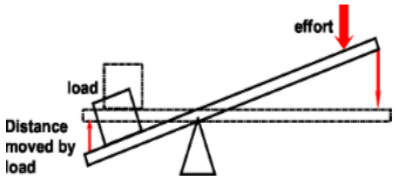
When a mechanism such as a lever improves the effect of an effort, the mechanism is said to have provided a **Mechanical Advantage (MA)**. To work out what this is, the following formula can be used:

MA = LOAD / EFFORT

Load and effort are measured as a force in **Newtons**. So, if an effort of 4 newtons is used to move a load of 8 newtons: **MA = 8 / 4 = 2**

i.e. the mechanism can double the force of the effort. Unfortunately, you cannot get something for nothing and to lift the load you will have had to do some work (make the effort).

Work = effort x distance moved (metres) (Work is measured in newton/metres)



e.g. If you lift a lever 1.5 metres using an effort of 12 newtons then you will have done 1.5 x 12 = 18 Nm of work.

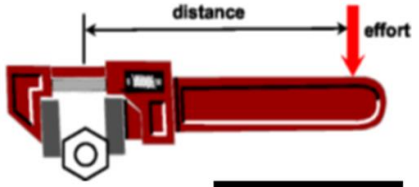
If a mechanism has a MA = 2 then the distance moved by the effort will be twice that moved by the load

Since the effort and the load started to move at the same time and stopped at the same time, but the effort moved twice as far, the effort moved faster than the load. The difference between the two speeds is known as the

Velocity Ratio = Distance effort moves ¸ Distance load moves

Torque (turning force)

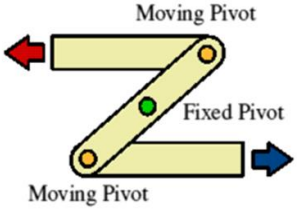
The turning force of a lever, e.g. spanner, is larger when the effort is further away from the fulcrum. You can get more torque from a spanner with a long handle, than one with a short one.



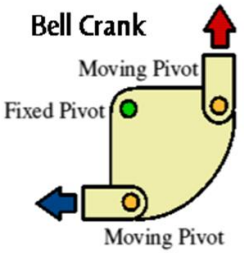
Torque = Effort (newtons) **x Distance** (meters)

Linkages are lever systems that can change the direction of the effort force.

Reverse Motion Linkage



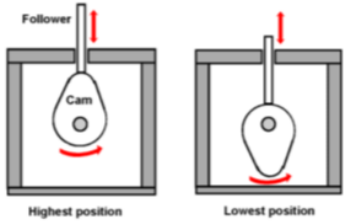
Bell Crank



KEY WORDS
Linear
Reciprocating
Rotary
Oscillating
Effort
Load
Fulcrum

Cams

Cams are used in mechanisms to change rotary motion to reciprocating (backwards and forwards) motion.



Basic shapes

Cams come in many shapes, the three most common shapes are shown below.

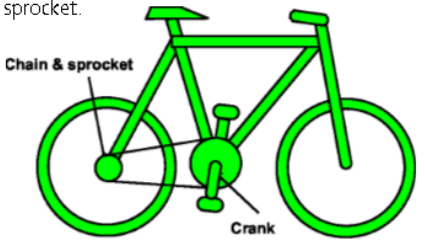
Pear shaped
The follower stays at the lowest position for half a turn and then rises and falls steadily

Eccentric
The follower rises and falls steadily

Snail Cam
The follower will rise steadily and fall suddenly. The cam can only turn in one direction without

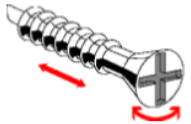
Followers stay touching the edge of the cam either by gravity or they have a return spring fitted to them.

Another form of crank is found on a bicycle, it is the pedal system that is used to turn the large sprocket.



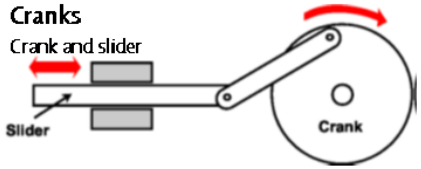
The chain and sprocket is really a form of pulley system that does not allow slippage. (the sprocket is a pulley with teeth, the chain is a metal belt)

Screw threads



A screw thread changes rotary motion to linear motion because it moves in or out of a threaded hole when the head is turned. It also has a mechanical advantage because the distance it moves in or out is less than the rotary distance moved when turning the head. A large force can be applied by a screw thread which is why a screw thread is used to operate a bench vice.

Cranks



The crank and slider works in a similar way to the cam, except that it both pushes and pulls the slider, unlike the cam that can only push its follower.

The system shown is used in car engines to connect the pistons to the crankshaft. In this case, reciprocating motion of the pistons turns the crankshaft, which through a gearbox, turns the road wheels.

Questions about Cams & Cranks

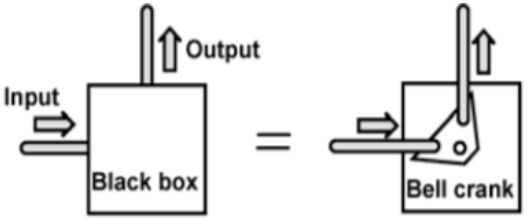
1. What change of motion is caused by using a cam?
2. Draw an eccentric cam and follower in both its highest and lowest position.
3. Draw a snail cam that would make the follower rise and fall twice during one revolution of the cam.
4. If the large sprocket wheel of a bicycle is 200mm diameter and the small sprocket wheel is 50mm diameter, how much faster does the back wheel of the bicycle turn than the pedals?

Questions about Levers & Linkages

1. What are mechanisms used for? Give two examples.
2. Explain the three parts of a mechanical system.
3. Describe the following types of movement using diagrams and notes - rotary, linear, oscillating and reciprocating.
4. How might you remember the three classes of lever?
5. Draw the garden tools on the previous page and show where the effort, load and fulcrum should be in each case.
6. Explain the term 'mechanical advantage' and state its formula.
7. If a mechanism allows a load of 10 newton's to be moved by an effort of 2 newton's, what is its MA?
8. Explain the term 'velocity ratio' and state its formula.
9. If in a mechanism the effort moves 6 meters and the load moves 2 meters, what is the velocity ratio?
10. What is the torque, when an effort of 8 newton's is made by using a spanner with a handle of 250mm (0.25M) in length?

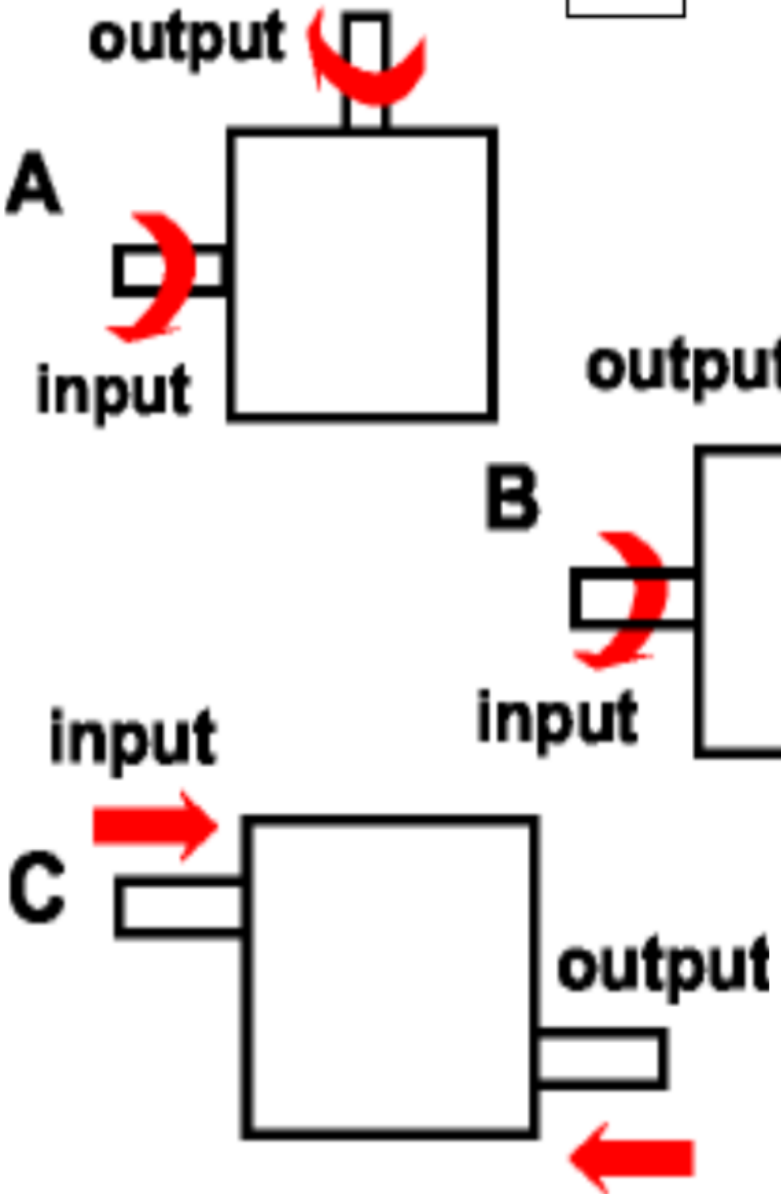
The following questions are based upon the whole of the mechanisms section.

A black box question can have more than one possible solution. e.g.



Re-Write a Section

Use the page below to Re-Write a Section if required. Remember to label which section it is for!



Teacher Feedback:

Technical Knowledge

This work is
Below / On / Above / Well above
your minimum target path