DCP

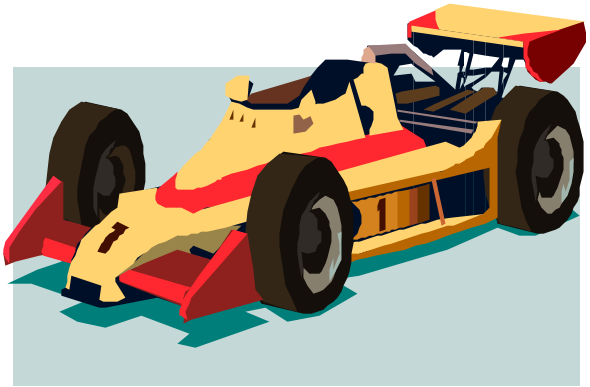
TECHNOLOGY DEPT.

Name:_____

Class:_____

Teacher:_____

BUGGY PROJECT



TECHNOLOGY WORKSHOP
SAFETY RULES

As well as these special rules for machines and tools we have a list of general safety rules which must be followed by everyone. These rules protect us all from harm.

1. Never enter the Technology rooms without a teacher being present.
2. Never touch any piece of equipment or machinery without the teacher's permission.
3. Always wear an apron when doing practical work.
4. Tie back long hair, remove all hazardous jewellery and tuck in all loose clothing when using machine tools.
5. Always wear goggles when using tools and machines or if the safety signs on the walls say you should.
6. When using machine tools, only one person is allowed to stand inside the yellow lines on the floor.
7. Never distract anyone when they are using a piece of machinery.
8. Never run in the Technology room.
9. Always store schoolbags so that they are not a danger to others in the room.
10. When carrying sharp or pointed tools, carry them down by your side and return them safely to the cupboard when you are finished with them.
11. Report immediately, all accidents and breakages to the teacher.
12. Shoelaces must be tied properly before entering the Technology room.

Take the rules home and ask your parent or guardian to read and sign them with you.

Parent/Guardian: _____Date:_____

Pupil: _____Date:_____

BUGGY PROJECT: INTRODUCTION

The toy superstore, 'Toyland', recently completed a stock control and found that the current model of their 'Buggy' is declining in popularity and thus sales are down. The manager is troubled and confused with what can be done to resurrect the popularity of the buggy toy and so has asked you as young technologists to design a new model for their buggy department.

Research

Production lines are a very important part of the manufacturing world. One example of such a production line is in the car assembly business. The vehicle's ***chassis*** travels along a production line and at various stages on the production line workers are responsible for a certain part of the assembly process.

For example: attaching the axles, doors, wipers, battery and exhaust.

Complete the table below to give three more parts of a vehicle which are assembled during the production line process.

1. _____
   _____
2. _____
   _____
3. _____
   _____

Design Brief

A Design Brief is a statement explaining why your product is needed. It should be simple and concise, and allow you room for development. A Design Brief should <u>not</u> be a detailed description of what you intend to make - you can only say this after you've designed it and tried stuff out.

Write a design brief for your situation:

I am going to _____

_____
_____
_____
_____
_____
_____
_____

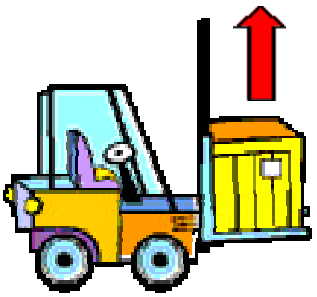
THE 4 TYPES OF MOTION

A mechanism is a device which transmits movement, so that the output movement is in a different place from the input movement. Mechanisms can also change the direction and speed of movement. They can change one type of movement into another. Mechanical systems change force and motion. As a result, before we can find out about mechanical systems we need to find out more about motion.

There are four types of motion:

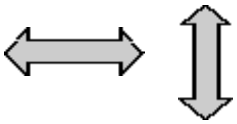
Linear *Reciprocating* *Rotary* *Oscillating*

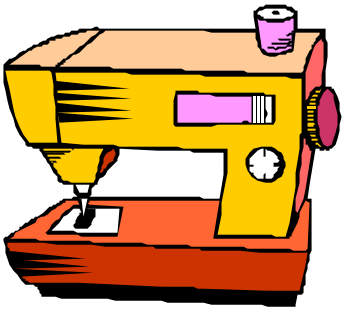
Linear Motion



Linear motion is movement in a single line from a starting point to a finishing point. A forklift truck raising its platform is an example of linear motion. Linear motion in systems is measured in metres per second (m/s) or kilometres per hour (kph).

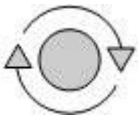
Reciprocating Motion

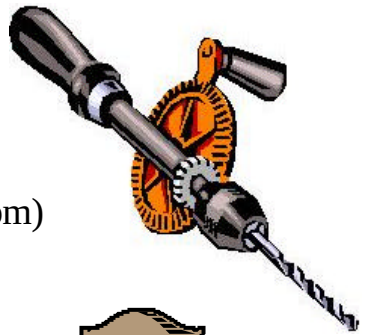




Reciprocating motion is continual forward and backwards movement. An example of a mechanism which shows reciprocating motion is a needle in a sewing machine.

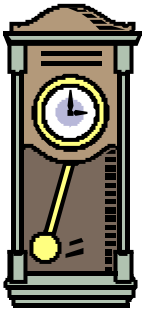
Rotary Motion





This is the most common type of motion found in mechanical systems. It is a turning motion.
Rotary motion is measured in revolutions per minute. (rpm)

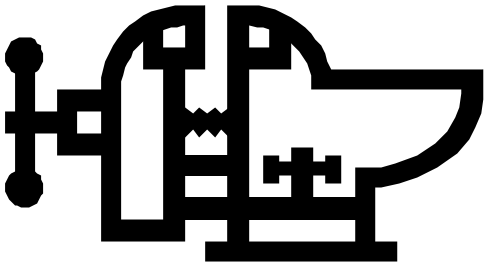
Oscillating Motion



Oscillating motion is a swinging backwards and forwards movement. A clock pendulum is a good example of oscillating motion.

OBSERVING MECHANISMS

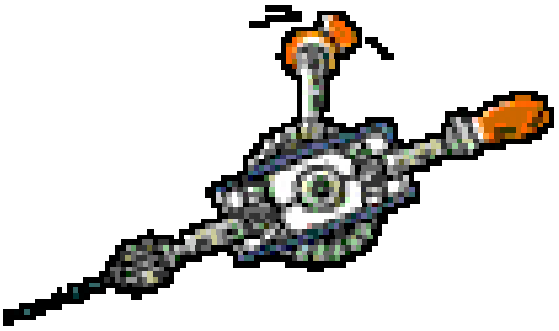
What is the input and output of the mechanisms shown in these pictures?
How is the movement being changed?



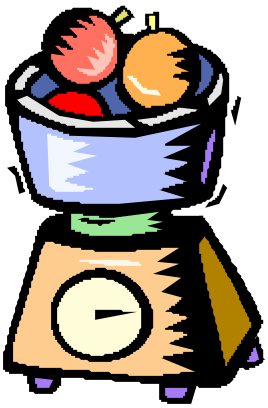
Example: Workshop Vice
Input: Rotary Motion
Output: Linear Motion

Bicycle
Input:
Output:

Pedal Bin
Input:
Output:



Hand Drill
Input:
Output:



Weighing Scales
Input:
Output:

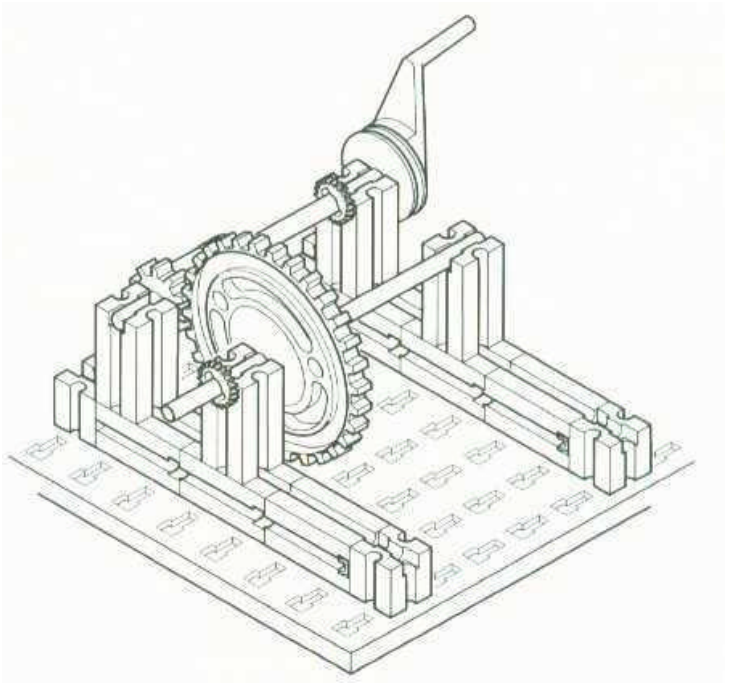
Printer
Input:
Output:

Score: / 5

INVESTIGATING MECHANISMS

Station One: *Simple Gear Train*.

Construct the Mechanical System below and answer the following questions.



1) What is the Input Motion for this Mechanical System?

……

2) What is the Output Motion for the system?

……

3) Label the Input gear and the Output gear on the diagram.

4) Does the Output gear go faster or slower than the Input gear?

……

5) How accurate do you need to be to construct this system?

……

……

6) Explain how such a mechanical system may be used in the Buggy Project.

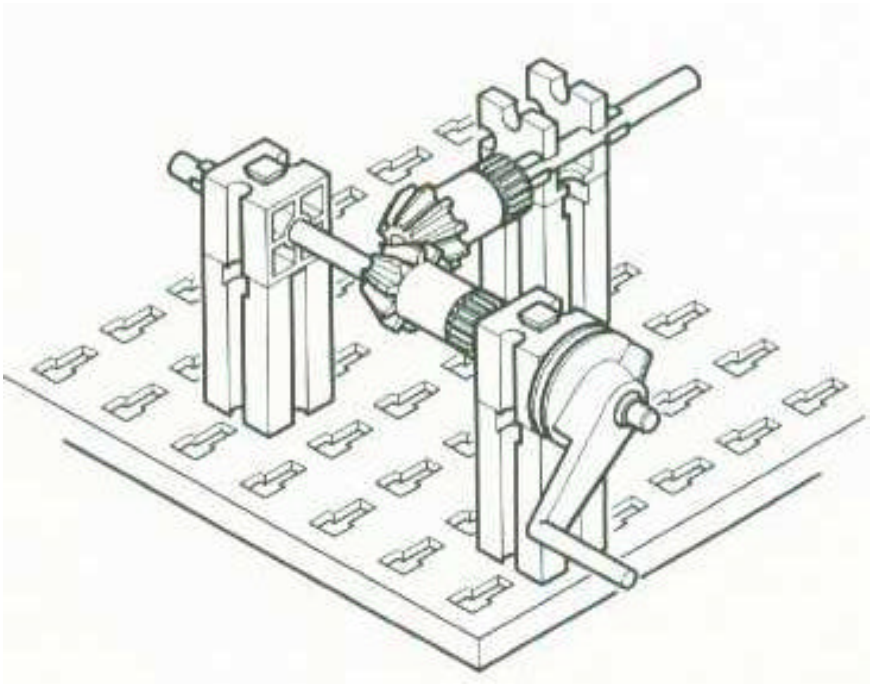
……

……

INVESTIGATING MECHANISMS

Station Two: *Bevel Gear System.*

Construct the Mechanical System below and answer the following questions.



1) What is the Input Motion for this Mechanical System?

……

2) What is the Output Motion for the system?

……

3) Label the Input gear and the Output gear on the diagram.

4) Does the Output gear go faster or slower than the Input gear?

……

5) How accurate do you need to be to construct this system?

……

……..……

6) Explain how such a mechanical system may be used in the Buggy Project.

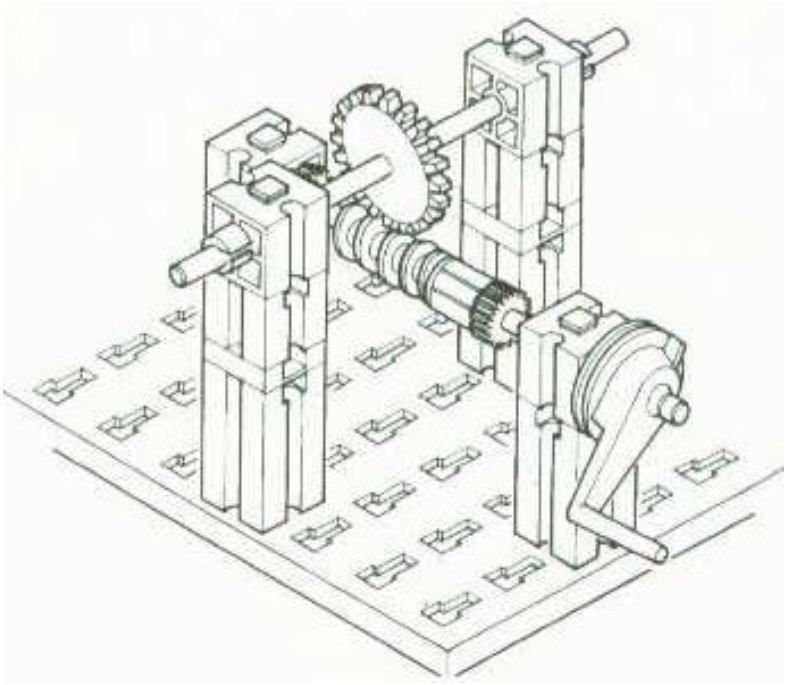
……

……..……

INVESTIGATING MECHANISMS

Station Three: Worm *Gear System*

Construct the Mechanical System below and answer the following questions.



1) What is the Input Motion for this Mechanical System?

……

2) What is the Output Motion for the system?

……

3) Label the Input gear and the Output gear on the diagram.

4) Does the Output gear go faster or slower than the Input gear?

……

5) How accurate do you need to be to construct this system?

……

……..……

6) Explain how such a mechanical system may be used in the Buggy Project.

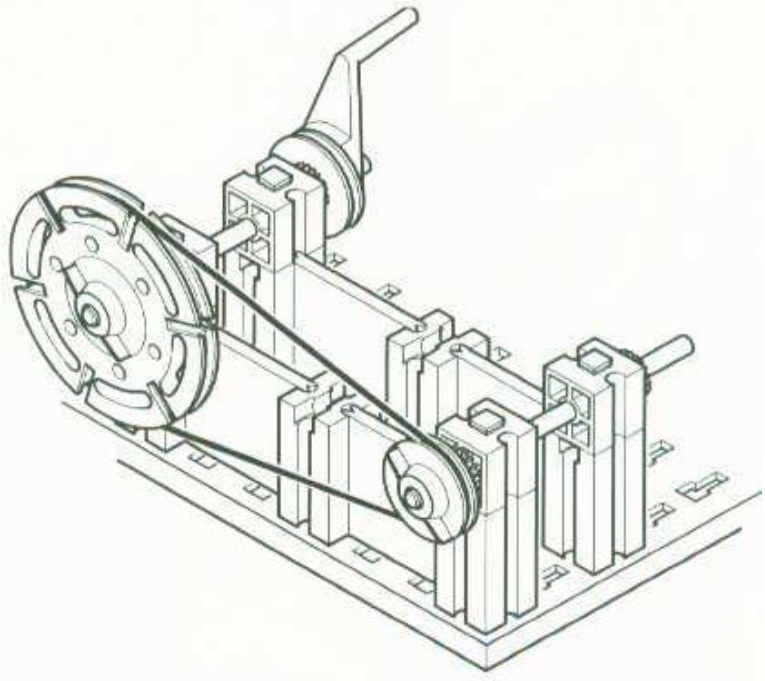
……

……..……

INVESTIGATING MECHANISMS

Station Four: *Pulley Drive System.*

Construct the Mechanical System below and answer the following questions.



1) What is the Input Motion for this Mechanical System?

……

2) What is the Output Motion for the system?

……

3) Label the Input pulley and the Output pulley on the diagram.

4) Does the Output pulley go faster or slower than the Input pulley?

……

5) How accurate do you need to be to construct this system?

……

……..……

6) Explain how such a mechanical system may be used in the Buggy Project.

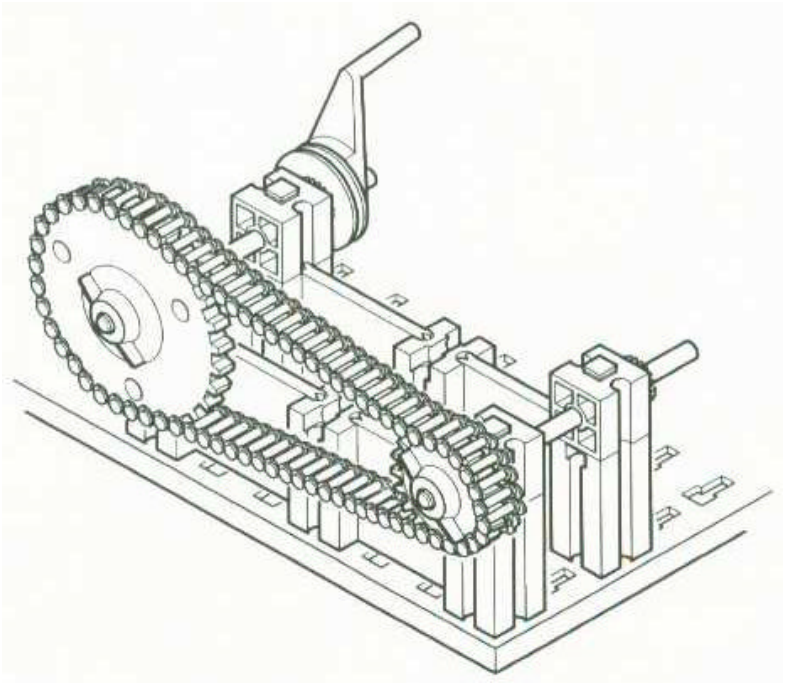
……

……..……

INVESTIGATING MECHANISMS

Station Five: *Chain Drive System.*

Construct the Mechanical System below and answer the following questions.



1) What is the Input Motion for this Mechanical System?

……

2) What is the Output Motion for the system?

……

3) Label the Input sprocket and the Output sprocket on the diagram.

4) Does the Output sprocket go faster or slower than the Input sprocket

……

5) How accurate do you need to be to construct this system?

……

……..……

6) Explain how such a mechanical system may be used in the Buggy Project.

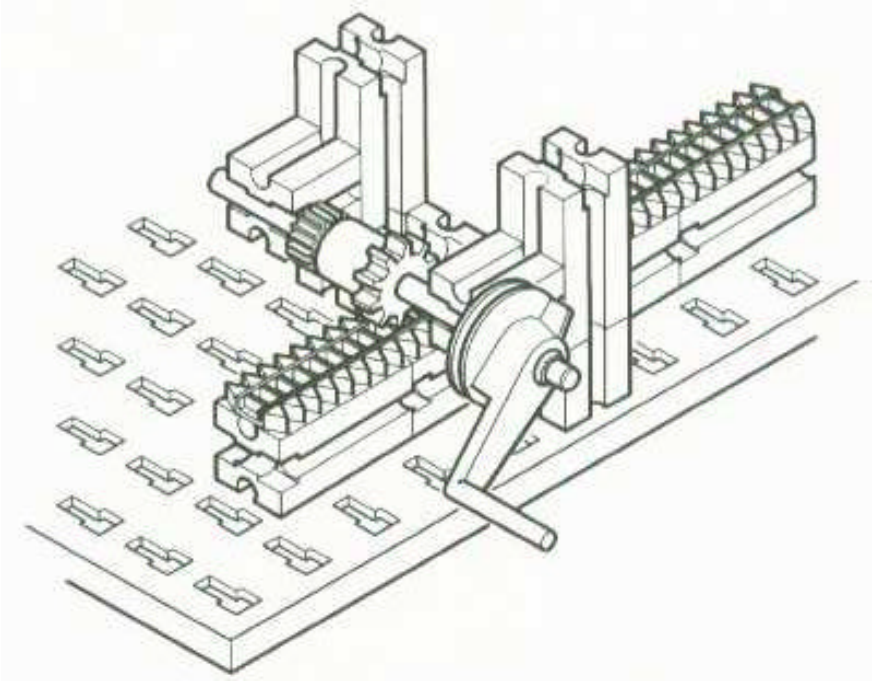
……

……..……

INVESTIGATING MECHANISMS

Station Six: *Rack & Pinion System.*

Construct the Mechanical System below and answer the following questions.



1) What is the Input Motion for this Mechanical System?

……

2) What is the Output Motion for the system?

……

3) Label the Input gear and the Output gear on the diagram.

4) Does the Output gear go faster or slower than the Input gear?

……

5) How accurate do you need to be to construct this system?

……

……..……

6) Explain how such a mechanical system may be used in the Buggy Project.

……

……..……

SPECIFICATION

A Specification is a detailed description of the problem to be solved. It should spell out exactly what the design must achieve, whilst taking into account the design limits which will affect the final solution. It can be in the form of a list or a written statement.

When my project is completed it should:

Spec 1: …….

……..……..……

…..……...…

……...……..……

……..……

Spec 2: …….

……..……..……

…..……...…

……...……..……

……..……

Spec 3: …….

……..……..……

…..……...…

……...……..……

……..……

DESIGN IDEAS

Carefully draw four ideas for your Buggy Project. Remember to use **pencil** and **render** all drawings appropriately to enhance the four designs.

IDEA NUMBER 1

IDEA NUMBER 2

DESIGN IDEAS

Carefully draw four ideas for your Buggy Project. Remember to use **pencil** and **render** all drawings appropriately to enhance the four designs.

IDEA NUMBER 3

IDEA NUMBER 4

PRESENTATION DRAWING

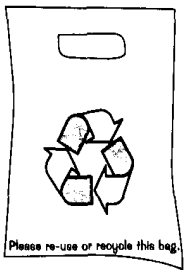
Produce a presentation drawing of your Plant Spike making appropriate use of colour. Extra marks will be awarded for neat sketching and colouring in.

NB: ALL DRAWING MUST BE COMPLETED IN PENCIL!

FACTSHEET 1: PLASTICS

Most plastics are produced by industry using water, oil (or coal or gas), air and salt. There are two families of plastics — thermoplastics and thermosetting plastics.

Thermoplastics — Recyclable and Bendy



1) Thermoplastics are recyclable.
2) They don't resist heat very well, so they can be ground down, melted and re-used - very important in today's society of increasing waste.
3) Thermoplastics are easily formed into shapes.
4) A moulded shape can be reheated and it will return to its original state - the material is known as having plastic memory.
5) Examples of thermoplastics: **acrylic**, **ABS**, **polystyrene** and **polythene**.

Thermosetting Plastics — Non-Recyclable and (usually) Rigid.

1) These types of plastic are non-recyclable.
2) They resist heat and fire so they are often used for electrical fittings and pan handles.
3) These types of plastic undergo a chemical change when heated (unlike thermoplastics) to become hard and rigid. They're not used in schools very often.
4) Examples of thermosetting plastics: melamine-formaldehyde, polyester resin, epoxy resin and urea formaldehyde.

Melamine-formaldehyde: Shatterproof cups & plates.

...an' ye can get 'em in loads of different forms.

Plastics can be bought in many different forms — from powders, granules, pellets and liquids (for processing into finished products), through to films, sheets, rods, tubes and extruded mouldings (complex shapes).
Plastics don't need protective surface finishes, due to high resistance to corrosion and decay. But for a nice appearance, wet and dry paper (silicon carbide paper) is applied to remove scratches from the plastic, and followed up with a mild abrasive polish or anti-static cream. Alternatively, a buffing machine can be used.

New Plastics are still being Developed

The following materials are fairly recently-developed and have loads of uses:

1) Plastizote is a closed-cell polyethylene foam that has eliminated the need for the toxic chemicals presently used in the foam industry. It's suitable for a wide range of products, including shoe insoles, buoyancy aids and reusable packaging.
2) Plastics that conduct electricity can be made by putting stainless steel fibres into plastics.

Life in plastic — it's fantastic,,,

Thermosetting plastics can't be remoulded — i.e. once they're set, they're set permanently. Like when you pull a funny face and the wind changes.

WORKSHEET 1: PLASTICS

1. There are two types of plastic – thermoplastic and thermosetting plastics. Describe three main differences between them.

_____
_____
_____

2. Complete the table below by sorting out the different plastics into the appropriate columns.

Thermoplastics	Thermosetting Plastics	List of Plastics
		Epoxy resin Acrylic ABS Polyester Resin Polystyrene Urea Formaldehyde Polythene Melamine-Formaldehyde

3. Pre-processed plastics (for processing into finished products) and processed plastics both come in several different forms.
Write down three different forms of each sort of plastic.

_____
_____
_____

4. Write a sentence to explain why plastics don't need protective surface finishes to be applied.

_____
_____
_____

5. Describe one way to improve a plastic's appearance and get rid of scratches.

_____
_____
_____

6. Plastizote is one of several new plastics that have recently been developed. Say what plastizote is, and explain what's so great about it.

_____
_____
_____

FACT SHEET 2: SCALE OF PRODUCTION

The term 'scale of production' is all about the quantity of products that you're going to manufacture. Commercially there are four main categories for you to learn...

Jobbing Production — Making a One-Off Product

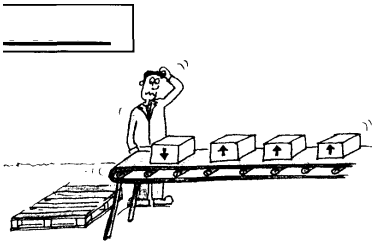
1) This is where you're making a single product.
2) Every item made will be different, to meet the customer's individual and specific requirements.
3) This type of production is very labour intensive, and requires a highly skilled workforce.
4) Examples are wide-ranging, from made-to-measure furniture to one-off buildings like the Millennium Dome.

Batch Production — A Specified Quantity of a Product

1) This is where you're making a specific quantity of a particular product.
2) Batches can be repeated as many times as required.
3) The machinery and labour used need to be flexible, so they can quickly change from making one batch to making another batch of a similar product.
4) The time between batches, when machines and tools may have to be set up differently or changed around, is called down time. This is unproductive and needs to be kept as short as possible so the manufacturer doesn't lose money.

Mass Production — High-Volume Production

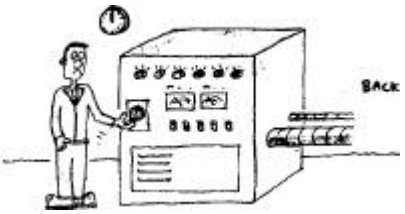
1) Making products on a really large scale, such as cars or electrical goods.
2) Often uses expensive specialised equipment including computer-aided manufacturing (CAM) and industrial robots.
3) As well as all this equipment, you need a large workforce.



The different stages of production and manufacture are broken down into simple repetitive tasks which people are able to learn easily,
4) Recruitment is relatively easy — you don't need to employ skilled people.

Continuous Production — Non-Stop Production 24hrs/day

1) This involves non-stop, uninterrupted production.
2) The specialised equipment required costs so much that it would be too expensive to turn it off. So it has to keep running and producing continuously.
3) Examples of continuous production include oil and chemical manufacture.



WORKSHEET 2: SCALE OF PRODUCTION

1) 'Scale of production' is all about the quantity of products that you are going to manufacture. Complete the summary table using the sentences below.

Non-stop production 24hrs/day.
Down time is unproductive and needs to be kept to a minimum.
You need a large, unskilled workforce.
The specialised equipment is very expensive.
Examples include oil and chemical manufacture.
Batches can be repeated as many times as required.
Making a single, one-off product.
Made to meet the customer's individual and specific requirements.
Making products on a really large scale.
The machinery and labour used need to be flexible.
Labour intensive and requires a highly skilled workforce.
The specialised equipment is very expensive.
Making a specific quantity of a product.
Examples include one-off buildings, 'The Dome'.
Different stages are broken down into simple repetitive tasks.

Type of Production	List of Key Facts
Jobbing Production	
Batch Production	
Mass Production	
Continuous Production	

2) During your Buggy Project you will make a single product. Write down what category of production this comes under and explain your answer.

_____
_____
_____
_____
_____

3) How does the scale of production affect the cost of the end product?
Write a short paragraph to explain your answer, using a car as an example.

_____
_____
_____
_____
_____
_____
_____

BUGGY PROJECT
SELF ASSESSMENT SHEET

Manufacturing & Energy and Control.	Pupil Score	Teacher Score

Grade 1

To obtain a Grade 1 your project must fulfil the following:

1) The chassis is accurately cut around its edges.
2) The pulley slot is neatly milled out.
3) All holes in the chassis have been drilled out accurately.
4) The axles are parallel.
5) The axles are a neat fit to the chassis, not loose.
6) The front axle rotates around the central screw.
7) The Pulley wheels are aligned properly.
8) The aluminium motor support has been neatly constructed.
9) The switch is positioned accurately.
10) All wiring is correct and soldered correctly.
11) All wiring is neatly arranged between the components.
12) The battery holder is accurately secured to the chassis.
13) All fastenings are secure (machine/grub screws, etc).
14) The vacuum formed body is a good fit on the body.
15) The vacuum form body has no marks or scratches.

Grade 2: 11 – 12 of the above points.
Grade 3: 9 – 10 of the above points.
Grade 4: 7 – 8 of the above points.
Grade 5: < 6 of the above points.

Pupils A4 Poster

1	Poster contains 3D sketches Poster is very detailed and neat Excellent use of different colours Excellent use of Text / Graphics
3	Poster contains some 2D / 3D sketches Poster is quite detailed and fairly neat Good use of different colours Good use of Text / Graphics
5	Poster contains only 2D sketches Poster is not detailed and not neat Satisfactory use of different colours Satisfactory use of Text / Graphics

NOTE: Grade 2 and Grade 4 can be awarded.

Pupil Comment: _____

_____

_____

Pupil Sign._____