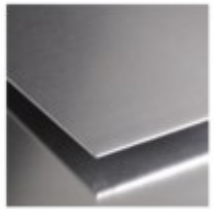
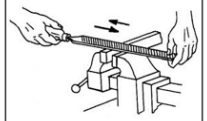
1

E.g. cast iron **Ferrous Metals** E.g. stainless steel		Metals which contain iron and will rust and will attract a magnet
E.g. copper **Non-ferrous Metals** E.g. aluminium		Metals which DO NOT contain iron and will NOT rust and will NOT attract a magnet
E.g. ferrous alloy: stainless steel **Alloys** E.g. non-ferrous alloy: brass, bronze		Metals that are a mixture of two or more metals or elements to make a new metal with improved properties

Metals are used for different purposes because of the properties they have.

Metal	Property	Used for	Reasons
Copper	good conductor of electricity	electrical wires	can pass electricity to the product
Stainless Steel	does not rust	kitchen items and sinks	so it can be washed easily and used hygienically
Stainless Steel	tough	cutlery	so it can withstand impact

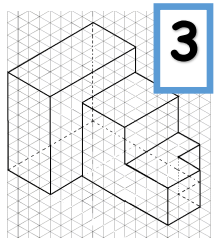
2 **Metal working tools**

Scribe		Used to draw around a template onto metals to show where to cut to show where to cut
Junior Hacksaw		A saw used for cutting straight lines in woods, metals and plastics
File **Filing**		A tool used on material to small amounts to make it smooth. You can cross file and draw file.
Riveting		A permanent method of joining metals
Emery cloth		Coated abrasive on a cloth backing used on metals (instead of sandpaper)
Power drill		A power tool used to drill holes through materials

Year 8 Product Design

Top tips for isometric drawing:

3



Use the grid

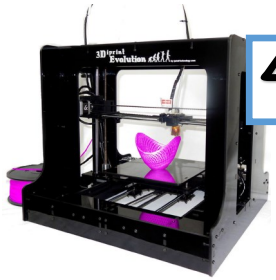
Start with the corner

You must have vertical lines (no horizontal)

Make sure you have parallel lines

3d printing: Additive Manufacturing

4



Step 1: create a 3D CAD drawing. It is sliced into very thin layers using specialist software

Step 2: heat the polymer filament and extrude it out of the nozzle

Step 3: build the prototypes in very thin layers of filament until complete. It will build from the bottom up, with the build platform moving one slice lower as each layer is created.

Advancements in technology (like 3D printing) is a great thing for manufacturers! Products are made more **accurately** and more **consistently** than if people were making it.

However, people will often **lose their jobs** as technology replaces them.

People may need to **retrain** and **learn new skills** for new jobs that are available.

5

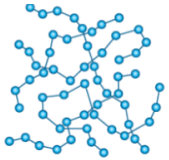
Hard-woods E.g. oak, beech E.g. ash, mahogany		Timbers from deciduous trees that lose their leaves in winter. They produce expensive, close grained woods.
Soft-woods E.g. cedar, pine		Timbers from coniferous trees that have needles and cones. They produce cheaper woods with lots of knots.
Manufac-tured Boards E.g. plywood, MDF		Boards that we make from scraps of other timbers e.g MDF, chipboard,

6

Thermoforming Polymers

- can be reheated
- can be reshaped
- can be recycled

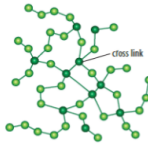
Examples: acrylic, HIPS, PVC



Thermosetting polymers

- can't be reheated
- can't be reshaped
- can't be recycled

Examples: urea formaldehyde, polyester resin



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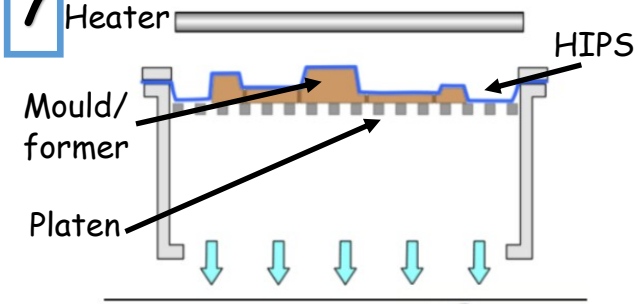

Sandwich boxes

Yoghurt pots

Shower trays

HIPS
(high intensity polystyrene)

Lightweight, high stiffness, impact resistant Used in vacuum forming Low melting point	Can be easily scratched Becomes brittle when exposed to UV light

Formers must have a draft angle so they can be removed from the HIPS. Webbing can occur if…

- formers are too close together
- formers are too high or
- the HIPS wasn't heated properly.

Vacuum forming

Step 1: the former/mould is placed onto the platen. The lever is used to lower the platen.

Step 2: a sheet of thermoforming polymer (HIPS or ABS) is clamped onto the machine using toggle clamps.

Step 3: the HIPS is heated until softened

Step 4: the platen is raised and the vacuum pump is turned on. This removes the air from the chamber and pulls the HIPS around the former/mould.

Step 5: when cool, remove the HIPS and the formers/moulds.

Mould/ Former		The item to be vacuum formed
Rasp		A course file with sharp, pointed projections to remove more material from wood or foam
Vacuum forming		Heating a piece of thermoplastic and then stretching it over a mould by a vacuum
Platen		Inside the vacuum former to put formers on. It is raised and lowered by the lever.