Tools for marking out

Try square

Sliding bevel

Scriber

Marking gauge

Pencil

Dividers

Fibre-tip pen

Centre punch

Steel rule

Tools for cutting

Jack or smoothing plane

Firmer chisel

Tin snips

Hand drill

Cordless drill

Tap and die set

Acrylic cutter

Trimming knife

Guillotine

Its important to **REMEMBER** and have a clear **UNDERSTANDING** of different tools and why they are used. In the exam you may be asked to name a tool from an image or explain the manufacturing processes of a product where discussion of tools may be included in your write up.

Tools for sawing and filing

Tenon saw

Panel saw

Coping saw

Hack saw

Hole saw

Junior hack saw

Swiss needle files

Surform

Rasp

File

Tools for gripping

Pliers

G-cramp

Toolmaker's clamp

Long nose pliers

Engineer's vice

Woodworking vice

Machine vice

Sash cramp

Hand vice

Its important to **REMEMBER** and have a clear **UNDERSTANDING** of different tools and why they are used. In the exam you may be asked to name a tool from an image or explain the manufacturing processes of a product where discussion of tools may be included in your write up.

Machine tools

Hand tools

Drill

Circular saw

Sander

Jig saw

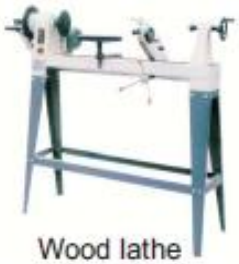
Machinery

Band saw

Disk sander

Pillar drill

Scroll saw



Wood lathe

Materials: ferrous metals

Cast iron

Iron plus:
Carbon (2-5%)
Silicon (1-3%)
Hard surface, strong under compression, cannot be bent or forged but brittle.

Mild steel

Iron plus:
Carbon (up to 0.3%)
Tough, ductile, malleable but rusts easily. Cannot be hardened.

Wrought iron

Most modern work is truly "wrought" mild steel. Wrought just means heated, bent, twisted and hammered.

High carbon steel

Iron plus
Carbon (0.7-1.5%)
Can be heat treated for extra toughness and

Stainless steel

Iron plus:
Carbon (up to 2%)
Chromium (up to 26%)
Nickel (up to 22%)
Magnesium (up to 8%)
Hard, tough, durable.

High speed steel

Iron plus:
Carbon (up to 0.7%)
Tungsten
Chromium
Vanadium
Very hard, used to cut other metals.

Its important to **REMEMBER** and have a clear **UNDERSTANDING** of different tools and why they are used.

Its important to **UNDERSTAND** different materials and their properties.

Materials: non-ferrous metals

Aluminium and Duralumin

Aluminium has a high strength to weight ratio. It is an excellent conductor of heat and electricity, polishes well and resists corrosion but it is difficult to join. Duralumin (alloy of aluminium, copper and manganese) is stronger and hardens with age.

Bronze

Alloy of copper and tin. Strong, tough, durable and resistant to corrosion.

Lead

Very heavy, soft, malleable, ductile, resists corrosion, low melting point but difficult to work and expensive.

Brass

Alloy of copper and zinc. Resists corrosion, polishes well, expensive.

Copper

Malleable, ductile, good conductor of heat and electricity, easily joined, polishes well, expensive.

Tin

Malleable, ductile but soft and weak. With high resistance to corrosion it is used for plating steel.

Materials: hardwoods

ASH: open-grained, tough, flexible, works well. Used for furniture and tool handles.

SAPELE: beautiful grain, durable. Used for floors, furniture and guitars.

BALSA: with a coarse, open grain it is very soft and light. Used for modelling.

MAHOGANY: attractive grain which darkens with age, fairly strong, durable. Works well but prone to warping. Used for doors, furniture and flooring, musical instruments, and, being resistant to rot, for boat building.

BEECH: close-grained, hard, strong, works well. Used for toys, utility furniture, flooring, chopping boards and drums.

OAK: open-grained, hard, very strong, tough, durable, heavy, works well. Used for panelling, furniture, flooring.

TEAK: hard, strong, durable, works well. With natural oils it is ideal for outdoor furniture and boat building. Indoors it is used for doors, flooring, window frames and furniture.

Its important to **UNDERSTAND** different materials and their properties.
You **SHOULD** learn and memorise a couple of examples for wood, metal and plastics.

Materials: softwoods

Spruce

Fairly strong with small, hard knots, resistant to splitting.
Used for furniture, crates, construction work, musical instruments.

Scots Pine

Straight grained but knotty, fairly strong, works well, cheap.
Used for construction, roofing timbers and garden structures.

Douglas Fir

Fairly durable, dense and dark red/brown in colour.
Used in the construction industry and for flooring.

Parana Pine

Strong, light, flexible and soft with smooth grain and very few knots.
Used in the construction industry and for flooring, doors and windows.

Materials: manufactured boards and veneer

Veneer

Thin sheets of more expensive wood used on the surface of manufactured board. Used for furniture and doors.

Thin sheets of laminated softwoods. Strong, resists warping and can be weather resistant. Used for general building work.

Plywood

Blockboard

Strips of wood between veneer. Cheaper than plywood but not as strong.
Used for general building work.

Smooth surfaced fibre-board, better than chipboard and takes paint well.
Used for shelving and interior work.

MDF

Chipboard

Wood chips bonded with glue and often with a veneer surface of wood or plastic.
Used for interior construction.

Thin sheeting of fibrous material. Cheap, light and smooth on one side.
Used for interior construction.

Hardboard

Its important to **UNDERSTAND** different materials and their properties.
You **SHOULD** learn and memorise a couple of examples for wood, metal and plastics.

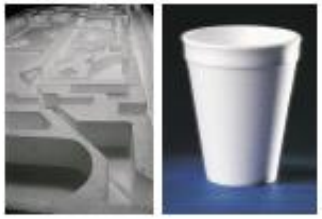
Thermoplastics 1

Acrylo-nitrile butadiene-styrene ABS
Strong, tough, light, durable, hard, and chemical resistant.
Kitchen equipment, toys, telephones, car components, tool handles.

Pure polystyrene PS
Hard, stiff, light, brittle, water-resistant and may be transparent. It can be cast into molds with fine detail.
Disposable cutlery, model kits, CD cases and re-useable wine glasses.

High-impact polystyrene HIPS
Hard, stiff, light and tough.
Refrigerator liners, food packaging and vending cups, toys.

Expanded polystyrene LDPS
Good heat insulation, sound insulation and compression strength, light weight.
Packaging, insulation, disposable coffee cups.



Thermoplastics 2

Polymethyl methacrylate PMMA
(Acrylic) Stiff, durable, good electrical insulator, clear. It polishes well but is brittle and is easily scratched.
Signs, car light covers, aircraft canopies and windows, baths and wash basins.

Cellulose acetate
Tough, hard, stiff, light, transparent and non-flammable.
Pens, small door knobs and tool handles, spectacles.

Polyamide (nylon)
Hard, tough, durable, low friction.
Machines well but difficult to join.
Bearings, gear wheels, curtain rail fittings, power tool casings, clothing.

Polyvinyl chloride uPVC
Hard, tough, stiff, light, chemical and weather resistant, good electrical insulator.
Pipes, guttering, window frames, doors, bottles.

Its important to **UNDERSTAND** different materials and their properties.
You **SHOULD** learn and memorise a couple of examples for wood, metal and plastics.

Thermoplastics 3

Polyethylene terephthalate PET

Clear and very tough.
Used for synthetic fibres (polyester) e.g. Terylene, Dacron. Also used for fizzy drinks bottles and microwavable packaging.

Low density polyethylene LDPE

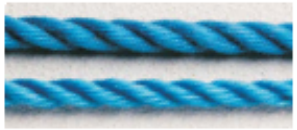
Tough, cheap, available in colour, low melting point.
Bottles, carrier bags, protective gloves, confectionery packaging.

Plasticised PVC

Light, water resistant, soft and flexible and good electrical insulator.
Hosepipes, covering for electrical cables.

Polypropylene

Soft, quite flexible, good tensile strength, good electrical insulator.
Medical equipment, laboratory equipment, containers - especially with built-in hinges, 'plastic' seats, string, rope, kitchen equipment.



Thermosetting plastics

Once set thermosetting plastics cannot be reshaped.

Polyester resin and fibreglass

Stiff, hard, light, brittle, easy to colour, good for outdoor use.

F1 racing, boat building, gliders, used for casting and when reinforced with glass fibres produces GRP.

Epoxy resin

Very strong especially when reinforced by glass or carbon fibre.
Adhesive for two different materials, e.g. it will stick metal to plastic.

Urea formaldehyde, UF

Stiff, hard, brittle.
Used as an adhesive and a very good electrical insulator.

Melamine formaldehyde, MF

Stiff, hard, strong, scratch resistant, water and stain resistant, no odour.

Kitchens and office furniture.

Its important to **UNDERSTAND** different materials and their properties.
You **SHOULD** learn and memorise a couple of examples for wood, metal and plastics.

Surface finishes

Painting

Enamelling

Cellulose painting

Varnishing

Chromium plating

Plastic coating

Tin plating

Lacquering

Adhesives

Polyvinyl acetate (PVA)
White glue for wood, paper and board.

Epoxy resin
This glue comes in two tubes: resin and hardener. When mixed the two will set into a very strong adhesive. This adhesive will join two different materials, e.g. metal and plastic.

Super glue
Cyanocrylate glues are strong, fast acting and are especially good for non-porous surfaces and can even cope with slightly damp surfaces such as human skin.

Solvent cements
These usually come in tubes.
They are used for paper and board.

Spray adhesives
Come in an aerosol can for spraying onto large areas.

Low-tack film
Adhesive film for masking spraying and airbrush work.

Hot melt glues
Used in a glue gun for joining various materials.

Its important to **UNDERSTAND** different materials and their properties.
You **SHOULD** learn and memorise different finishes that can be added to materials as well as adhesives (glue) that is used for assembly.

Paper and board

Layout paper
Lightweight paper around 80 grams per square metre (gsm) Usually white and A4, A3 or A2 size.

Cartridge paper
A heavier, better quality paper from 100 to 160 gsm
White and coloured paper at A4, A3 or A2 size.

Bleed-proof paper
A hard, smooth surface which will take felt-tip pen without bleeding.
White paper at A4, A3 or A2 size.

Tracing paper
Translucent paper for copying.
drawings usually in A4 or A3 size.

Grid paper
Graph paper and other squared paper.
Also grids of equilateral triangles which enable isometric drawing.

Coloured paper
Various colours, qualities and thickness. Can be used as a background for mounting work or for making models.

Board
A range of weights 160+ gsm or thickness 300 to 650 microns. Used for modelling and presentation.

Mounting board
Heavier, high quality board for modelling and to present work.

Packaging symbols

The three "chasing" arrows symbol is used on goods that are recyclable or include recycled content. The number indicates the percentage of recycled material.

This symbol tells you that the product is made of steel.

This symbol tells you that the product is made of aluminium.

This symbol encourages you to recycle glass.

The Forest Stewardship Council promotes the responsible management of the world's forests.

These products have been produced in third world countries. The symbol shows that the farmer has been paid a fair price.

The Green Dot symbol shows that the producer has made a contribution towards the cost of recycling the packaging.

Indicates that the product conforms to health and safety requirements set out in European Directives.

The British Standards Institute (BSI) "kitemark" guarantees a high quality product tested for safety.

Its important to **UNDERSTAND** different paper and boards used in packaging as well as the symbols featured. In the **EXAM** you may be asked to draw the symbols or explain the **MEANING** from an image.

Modelling materials

Card
Used in modelling, packaging and for pop-ups.

Plaster bandage
Used with chicken wire for rounded 3-D models.

Hard wax
Used for 3-D models where detailed carving is needed.

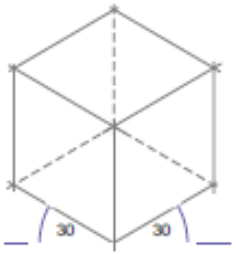
Wood-based materials
MDF, plywood and solid wood are all used in modelling.

Construction kits
Used for building models with moving parts.

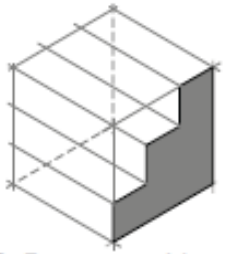
Balsa wood
Used for small components in modelling.

Sketching: crating

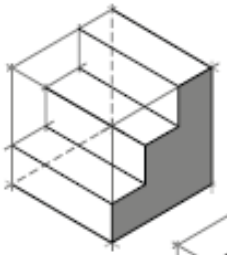
This crating is shown using isometric projection. You can use isometric grid paper to help you draw these steps.



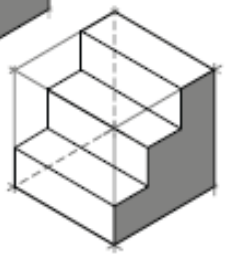
1. Draw crate to contain steps.



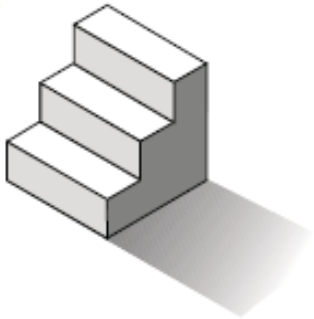
2. Draw one side of the steps and enhance with shading.



3. Sketch in the steps.



4. Complete the drawing.



5. Add shadow according to light source.

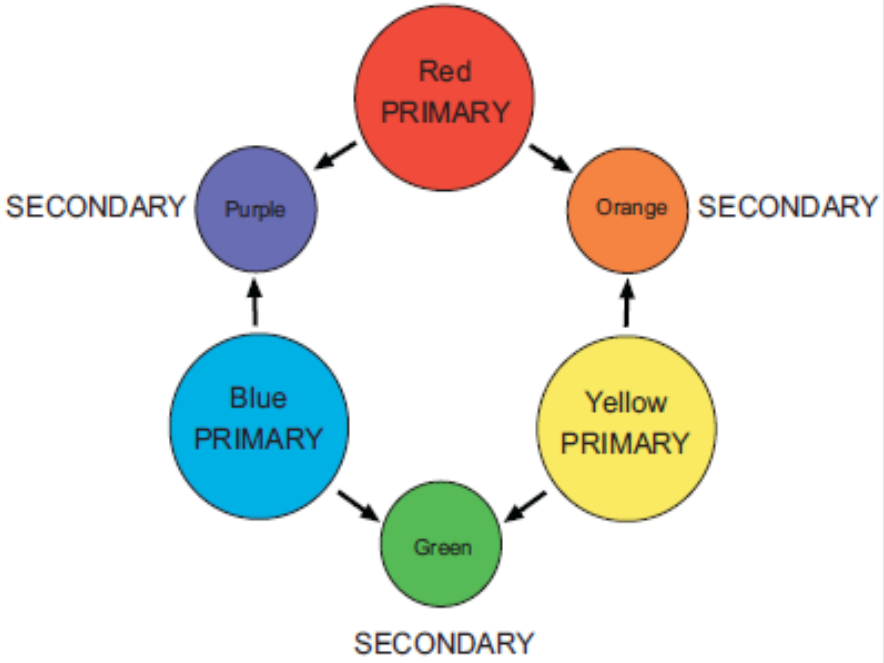
Its important to **UNDERSTAND** different manufacturing methods when it comes to modelling and assembly.

Understanding and being able to draw in different methods is important in the exam. As well applying colour, shading and tone.

Sketching: rendering

Primary and secondary colours

Mix any two primary colours to get a secondary colour.



Complementary colours

These are opposite each other and look good together:

Red and Green, Blue and Orange, Yellow and Purple

Sketching: hue and tone

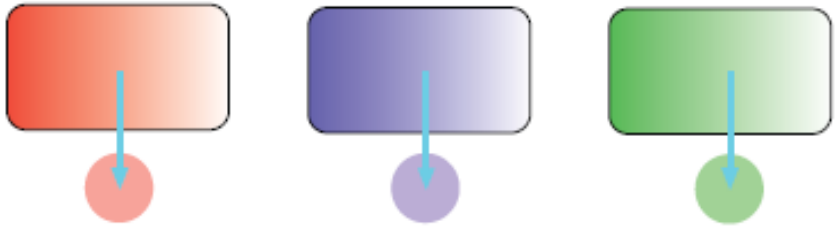
Hue

Hue is the colour, e.g. red, purple, green, etc.

Tone

Tone refers to light and dark variations of a colour.

WHITE is added to lighten the colour.

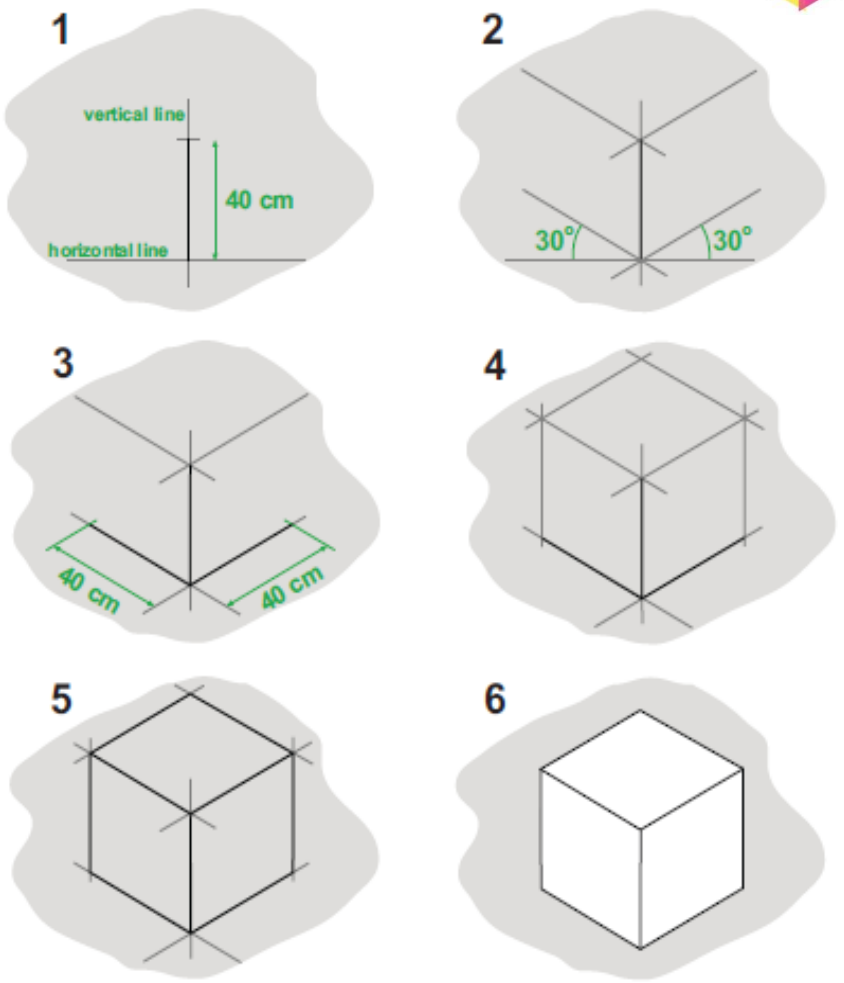


BLACK is added to darken the colour.

It is important to understand how to **EFFECTIVELY** apply colour, shade & tone.

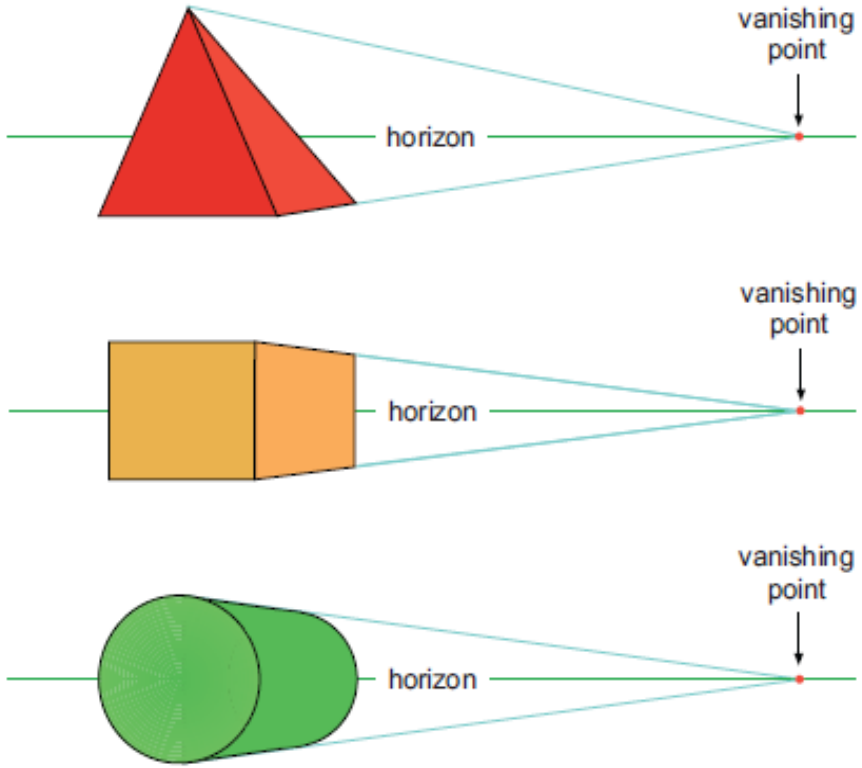
You can often get marks in section A for application of colour.

Isometric drawings



One-point perspective

One-point perspective drawings start with a head-on front view of the object.
The blue perspective construction lines are then drawn to the vanishing point on the horizon.

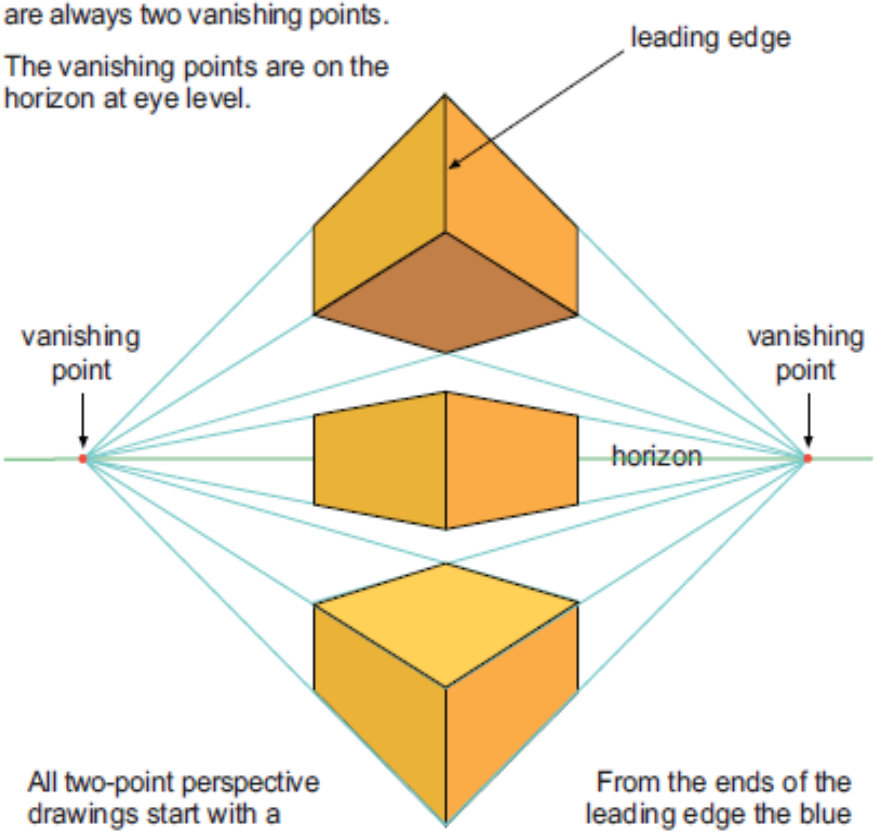


Understanding and being able to draw in different methods is important in the exam. As well applying colour, shading and tone.

Two-point perspective

In two-point perspective there are always two vanishing points.

The vanishing points are on the horizon at eye level.



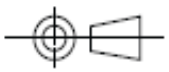
All two-point perspective drawings start with a vertical leading edge.

From the ends of the leading edge the blue construction lines are drawn to the vanishing points.

Orthographic projection

The solid shown in isometric projection here is also presented below in 3rd angle orthographic projection.

Symbol for 3rd angle projection:



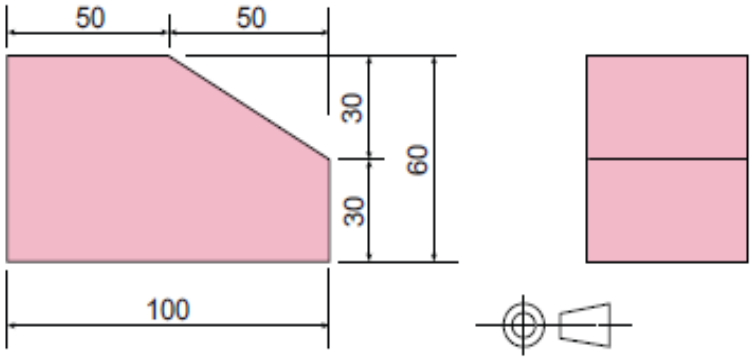
Understanding and being able to draw in different methods is important in the exam. As well applying colour, shading and tone.

Dimensions

Scale

Drawings must be drawn to scale with dimensions in mm.
1 : 1 means full size.
2 : 1 means the drawing is twice as big as the actual object.
1 : 2 means the drawing is half-size.

Painted wooden block



Note
Projection lines do not touch the drawing of the block. Arrow heads are small and slim. Dimensions are printed above dimension lines.

Line types:

Outline
Projection and dimension lines

Surface developments or nets

Scored and folded ----------
Cut ——————

Once folded the box is made by glueing just one edge.

Find some empty boxes, and open them out to see how they are made.

It is important to have a clear understanding of dimensions and scales.

As well as how to draw a net, include dimensions and features.

Flow charts

This example shows stages in the production process of designing and printing a poster to advertise your forthcoming school musical.

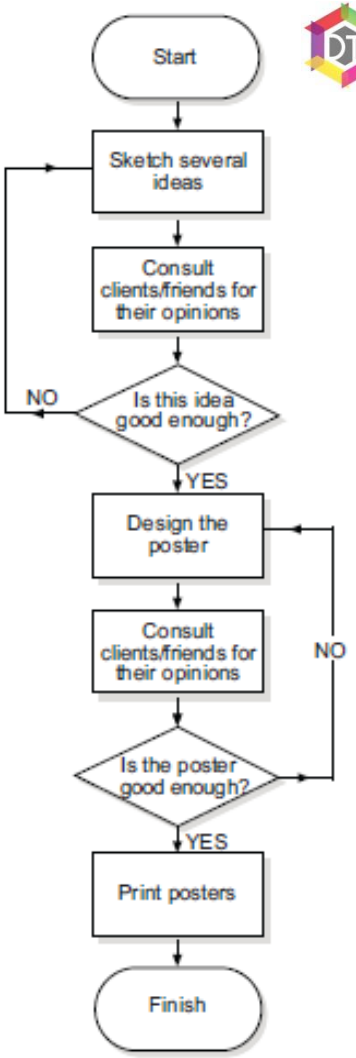
There are different symbols for various stages in the process.

TERMINATOR
Start, stop

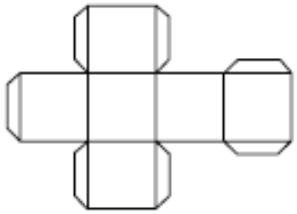
PROCESS
Pre-defined instruction

DECISION
Asks a question needing a yes or no answer. It may lead to another pathway.

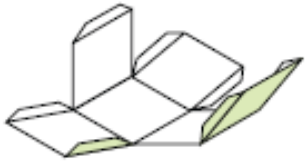
INPUT/ OUTPUT
Shows additions or removals of data



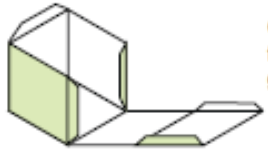
Sequence diagrams



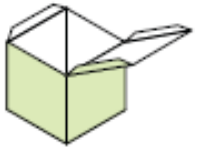
Draw and cut out the development.



Score and fold where needed.



Glue the first 2 tabs. Hold until glue has set.



Glue the next 2 tabs. Hold until glue has set.

Glue the last 3 tabs. Hold until glue has set.

This example shows 5 stages in the production of a card cube.

The aim of sequence diagrams is to explain a process with as few written instructions as possible.

Use the minimum number of stages possible.

Make each stage as simple as possible.

Use simple diagrams not photographic images.

Number the stages if the order is not clear by the layout.

In the exam there is often a question which requires you to design a product for 200+ copies and a sequence diagram/flow chart needs to be produced explaining the processes.
After **SECTION A** this question holds **A LOT OF MARKS.**