Unit 1/Unit 3

Engineering

Section 1

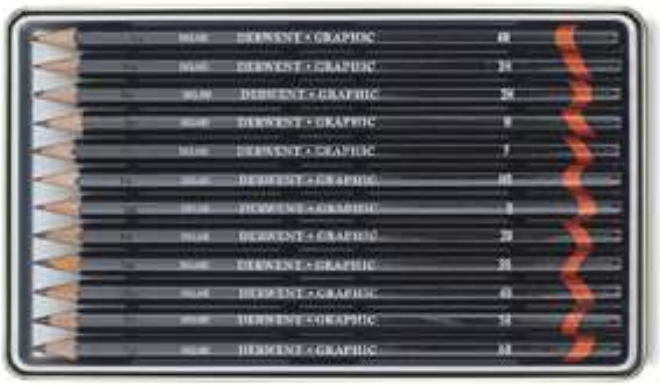
Engineering Drawings

LO2.
AC2.1

LO4
4.2

Drawing Equipment

1 × Set of Graphics Pencils (3H to 3B)



Pencils ranging from 3H (hard/light shade) to 3B(dark shade) these pencils are used to create accurate drawings and can be used to apply a range of line thickness.

2-3 × Fine Line Black Pens

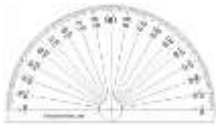
Ink Fine-liners. These are also used for picking out heavier lines when needed

Drawing Equipment

1 × Drawing Set that includes:

1 × Steel Ruler

1 × Protractor



1 × 45 Degree Set Square

1 × 30 Degree Set Square

1 × Compass

1 × A3 Sketch Pad

Paper Pads like this are extremely useful and come in a range of sizes including A2, A3, A4.

Organisation

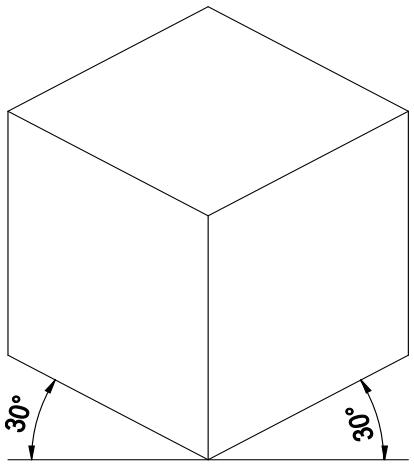
1 × A3 Portfolio Folder

There are many types of files. This one is among the best, as it is strong and contains binding rings to put clear pockets inside to present work.

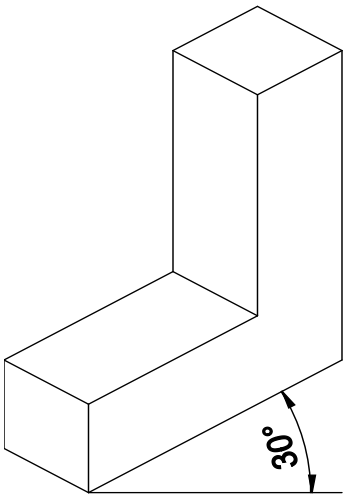
1 × A4 ring binder/folder with poly-pockets

There are many types of A4 folders. As long as they have poly-pockets to hold all your theory handouts (like this one) any one will do.

Isometric Drawing

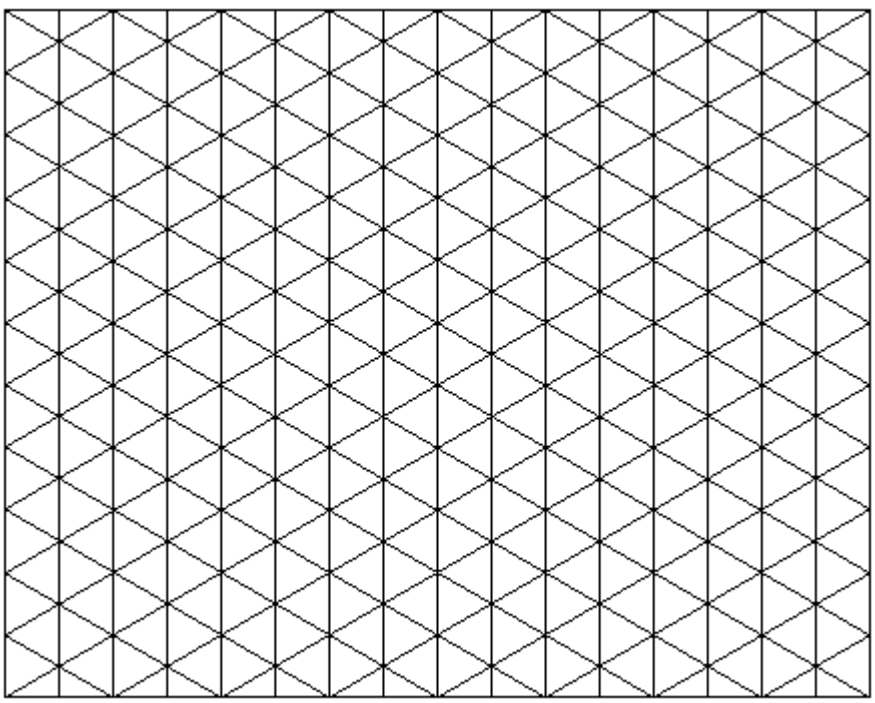


Isometric Drawing



Horizontal Line

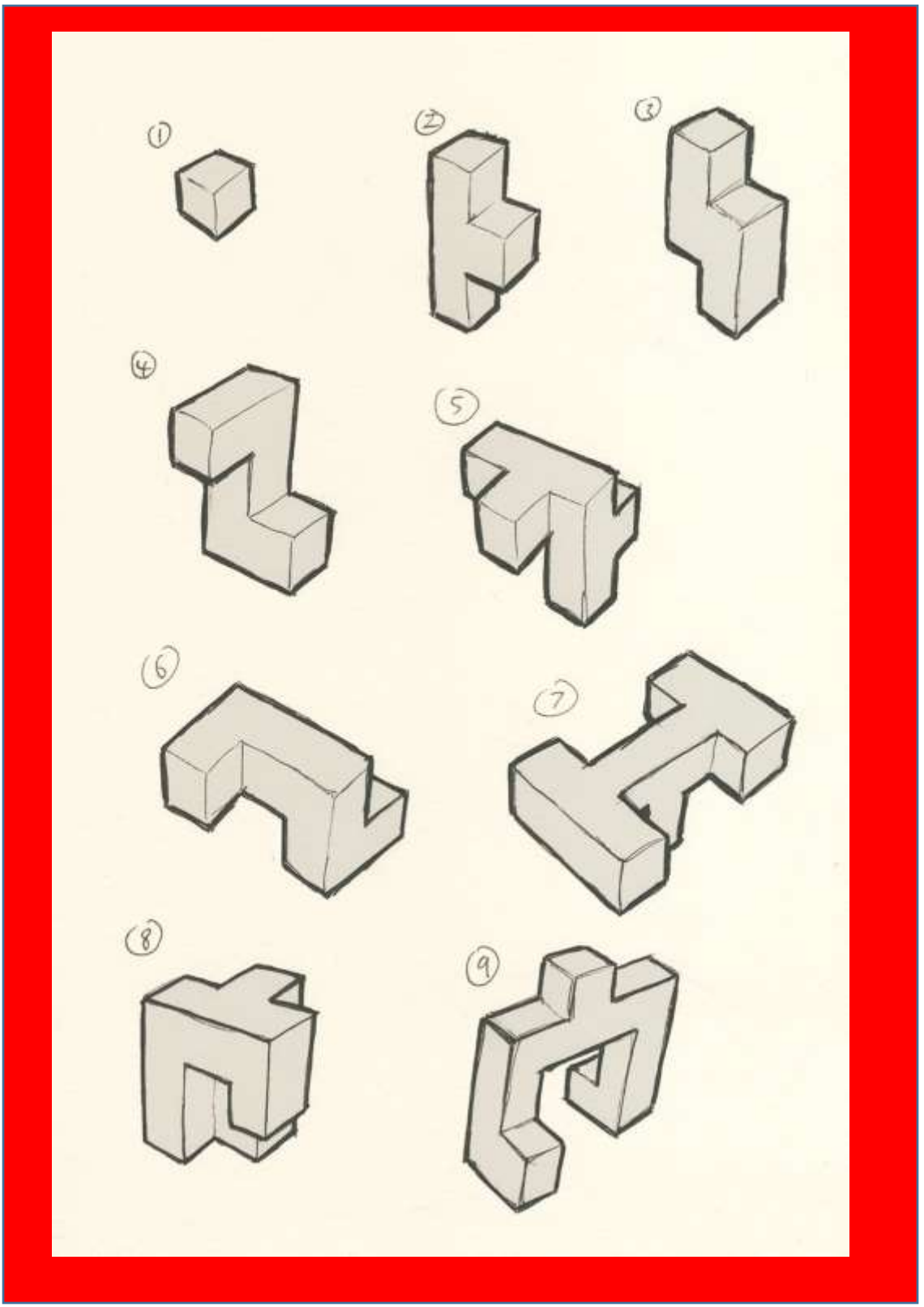
Isometric drawing is way of presenting designs/drawings in three dimensions. The example to the left has been drawn with a 30 degree set square. Designs are always drawn at 30 degrees in isometric projection. In isometric projection all vertical lines on an object remain vertical while all other lines are drawn at 30 degrees to the horizontal. Isometric drawings are usually produced with drawing equipment or on CAD to ensure accuracy. When starting, you can also use Isometric Grid paper to help.



Isometric Grid Paper

Isometric Drawing

In your Sketchbooks, draw Isometric drawing of the three dimensional shapes below. Your drawings DO NOT have to be dimensionally accurate.



Communication through sketching.

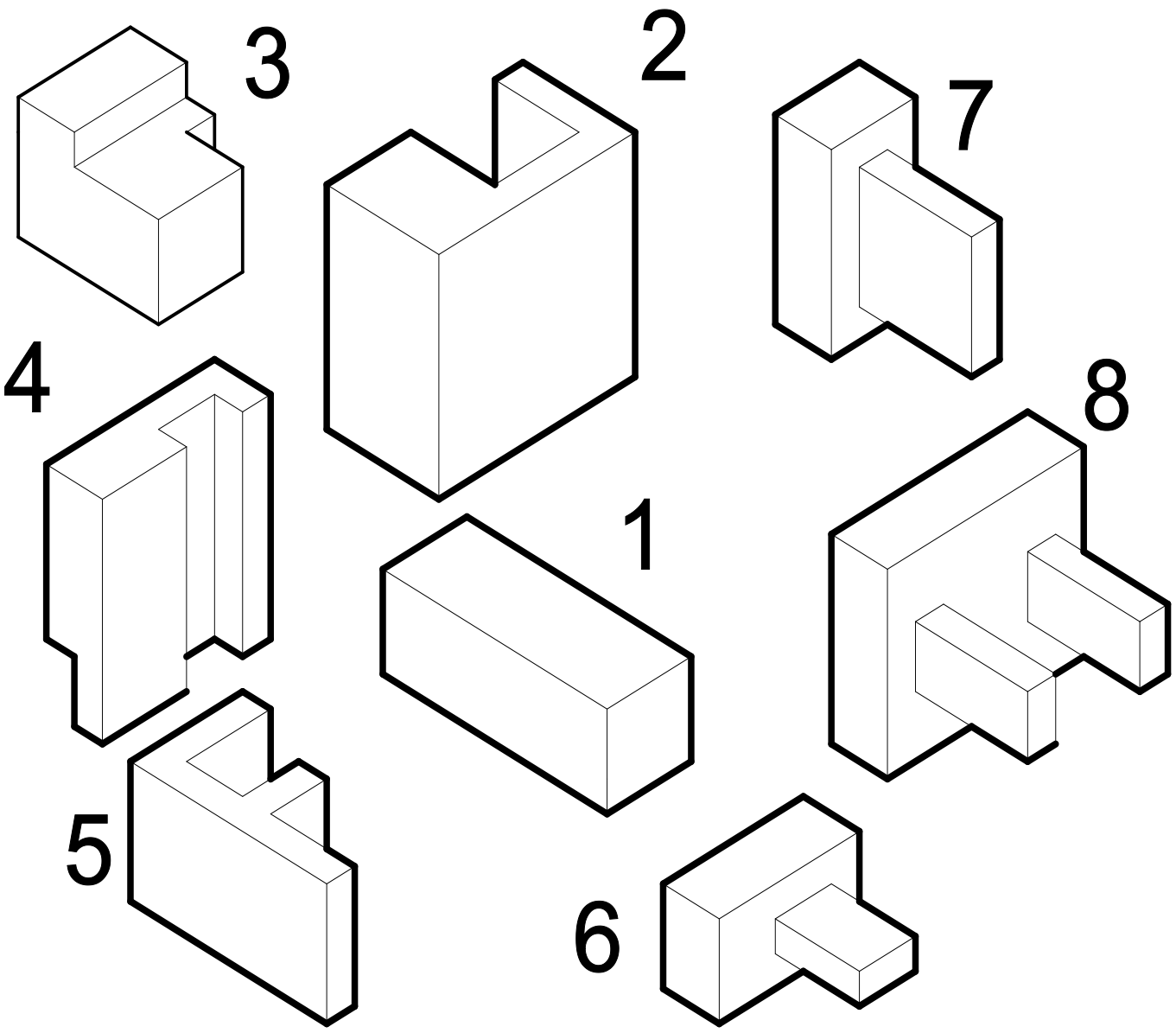
Sketching is an essential skill that you need to practise! Practise!

Practise!

On the following slides there are more Isometrics to practise; giving you the opportunity as a young engineer to develop your isometric sketching skills

Being able to sketch and communicate your ideas with Isometric, Orthographic, exploded and sectional views is key to your success in your first controlled assessment in which you will "Re-Engineer" a Mobile phone charger.

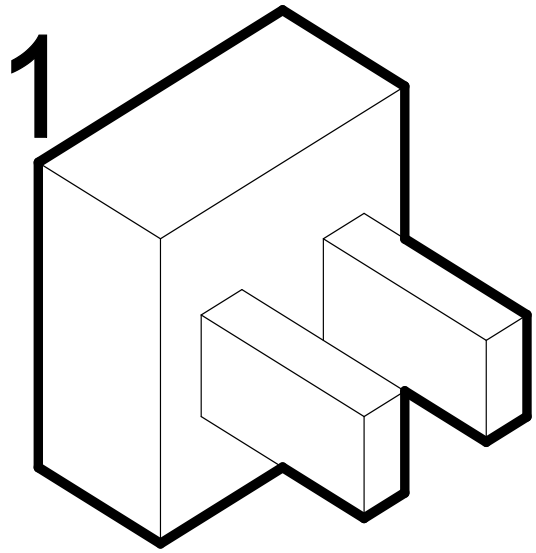
In your sketch books produce sketches of these computer generated isometric cuboids.

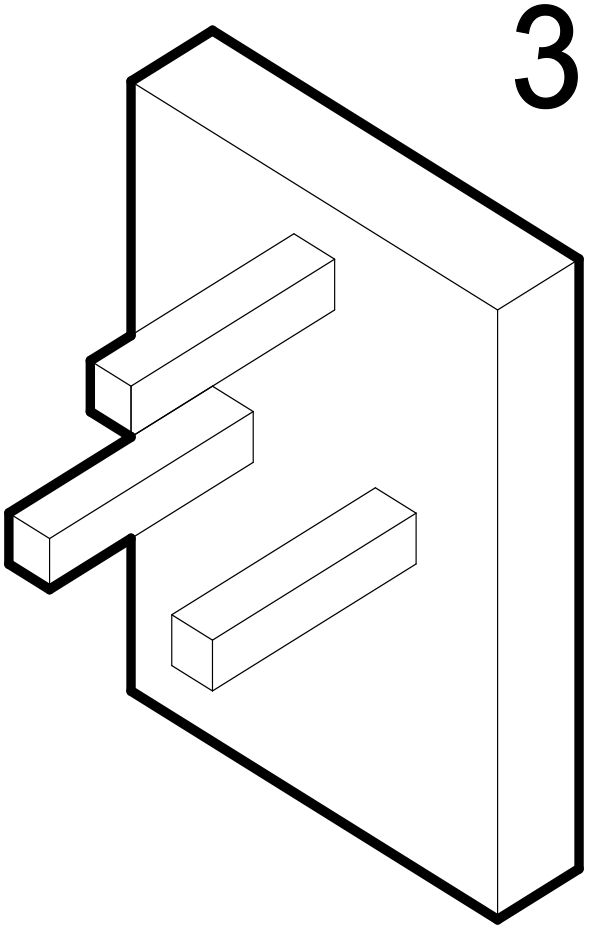


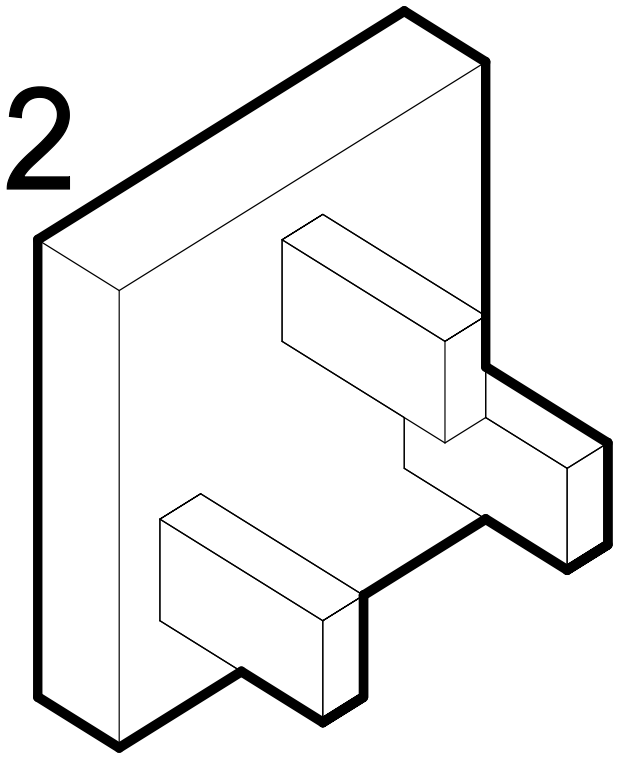
Place isometric grid behind your paper. This will help you until you are able to produce free hand Isometric Sketches

Practise! Practise! Practise!

Now try these … add shading to each



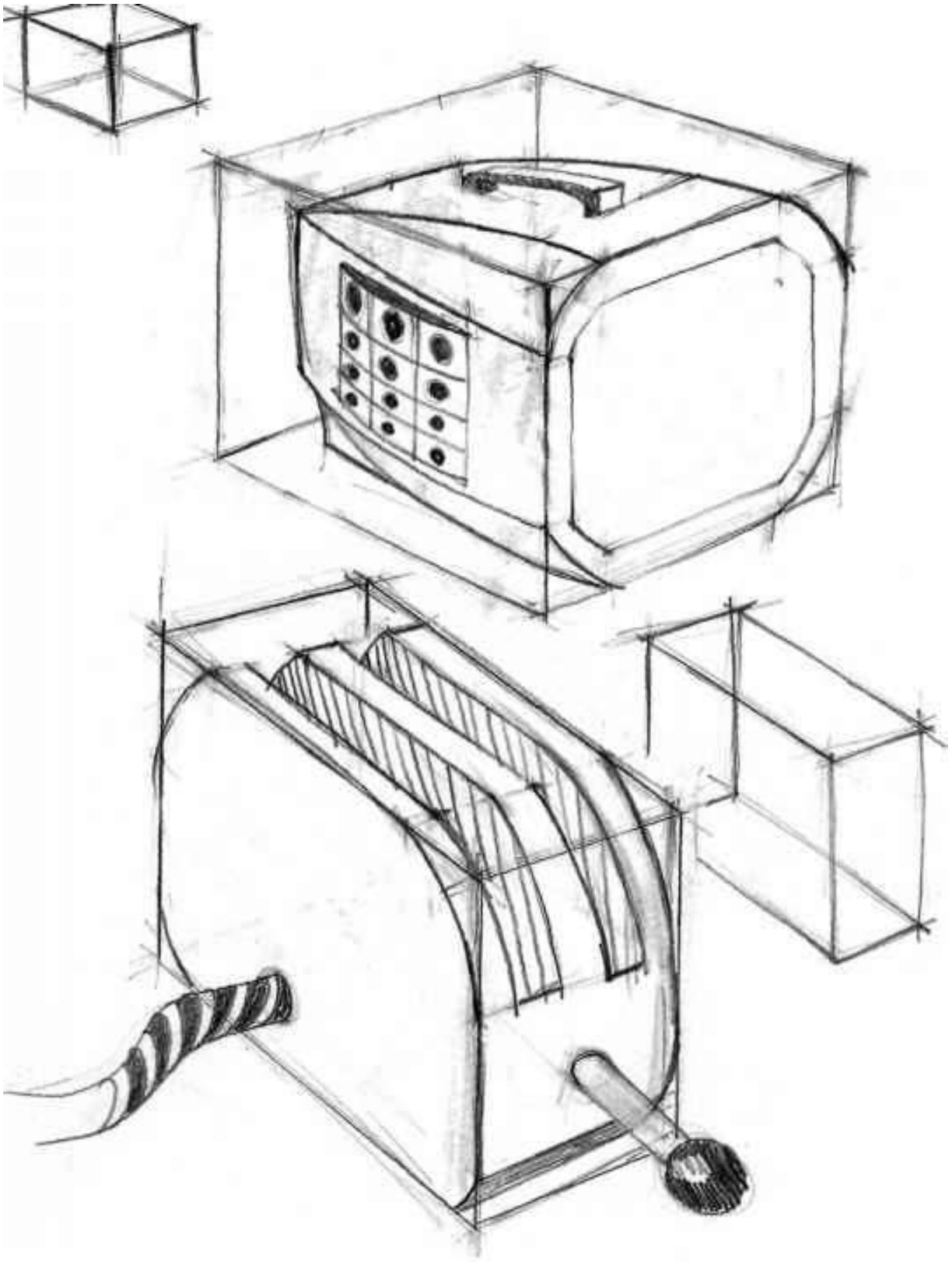




Practise! Practise! Practise!

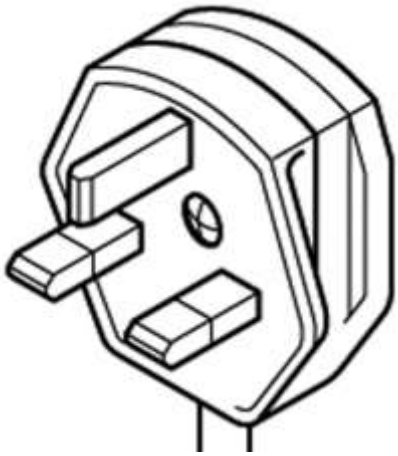
Crating Drawings.

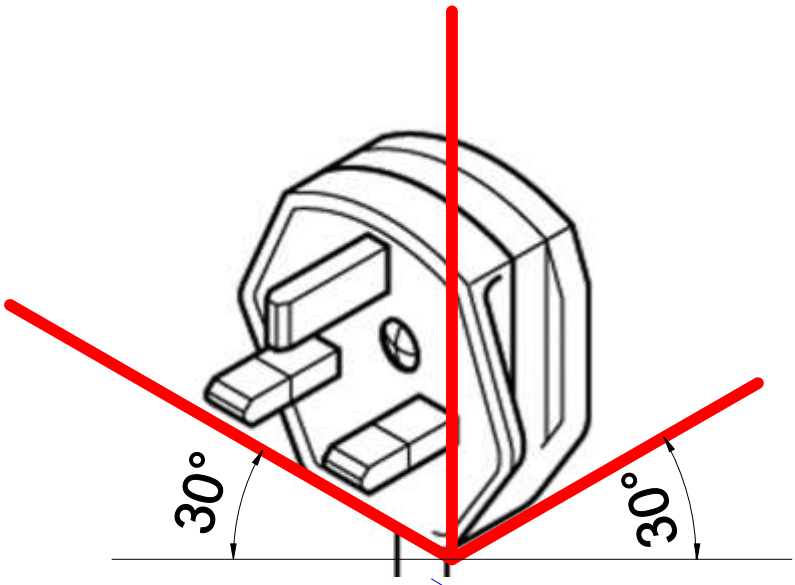
Sketching products can be made easier if you first faintly draw the isometric cube or “Crate” , and then draw the product within the Crate or box. HAVE A GO!

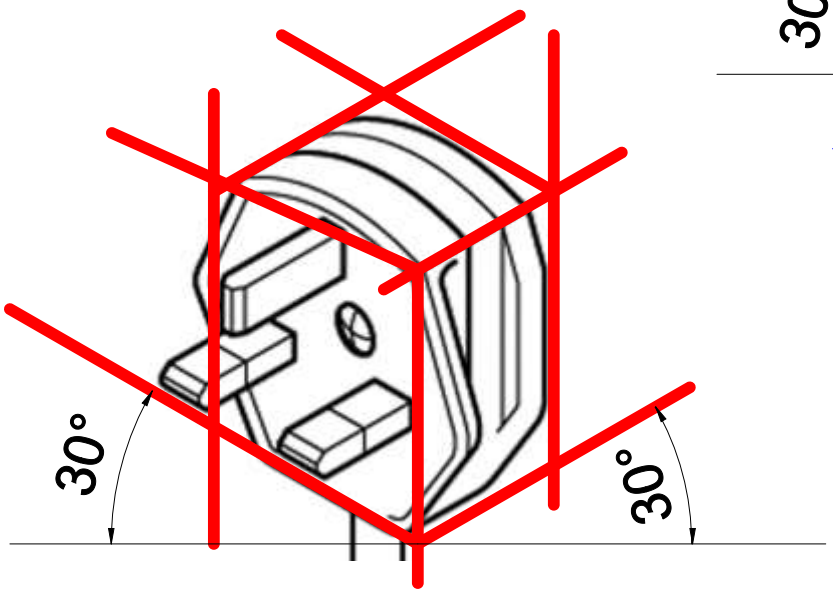


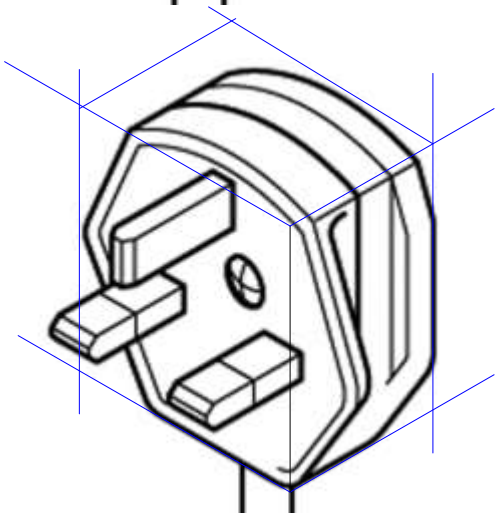
Now try and sketch this 3 Pin Plug!

This is a real challenge!





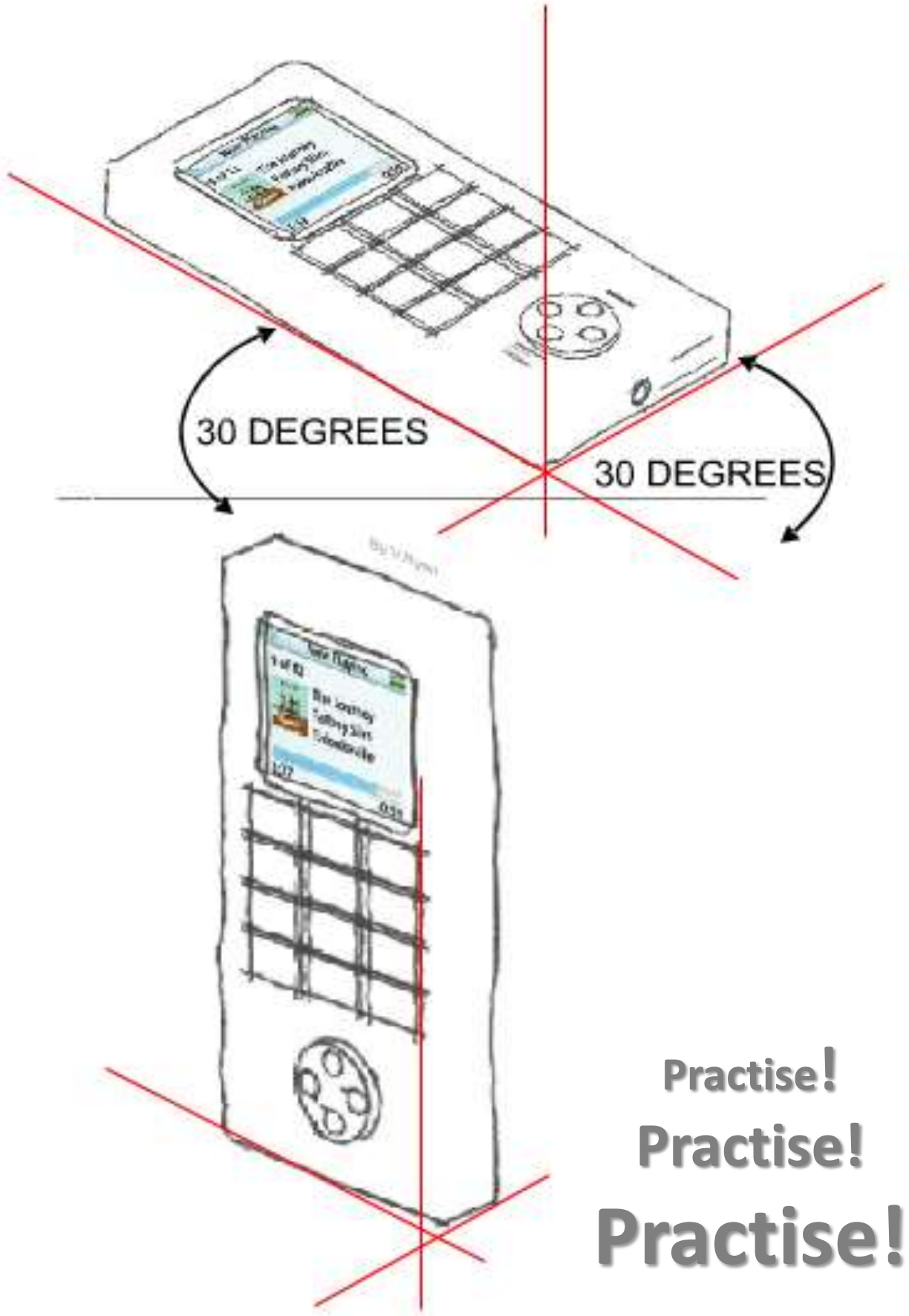




This is challenging, Try your best, take your time.

Practise! Practise! Practise!

Now Try and draw a Mobile Phone



Practise!

Practise!

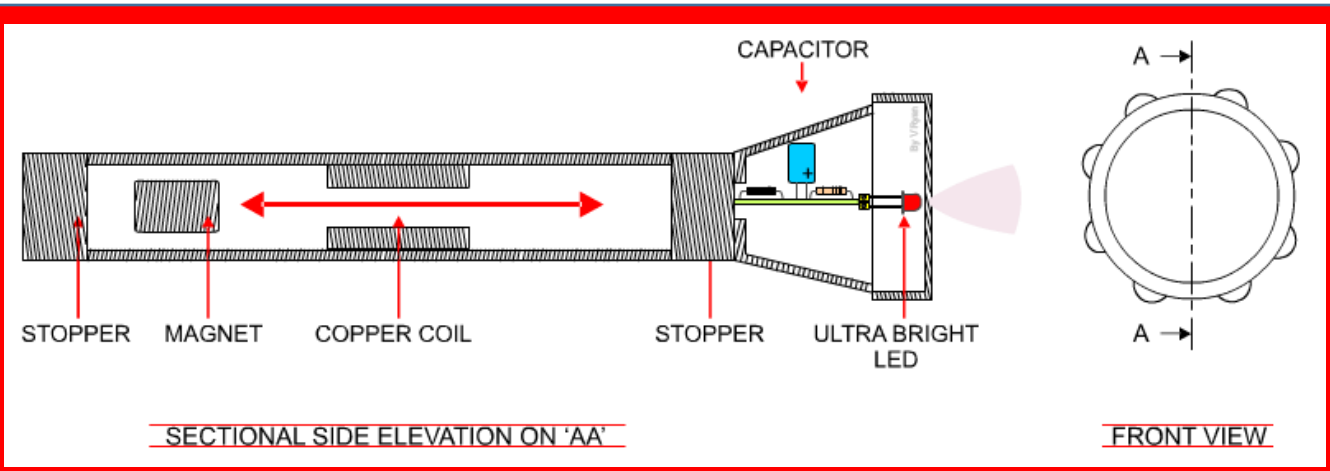
Practise!

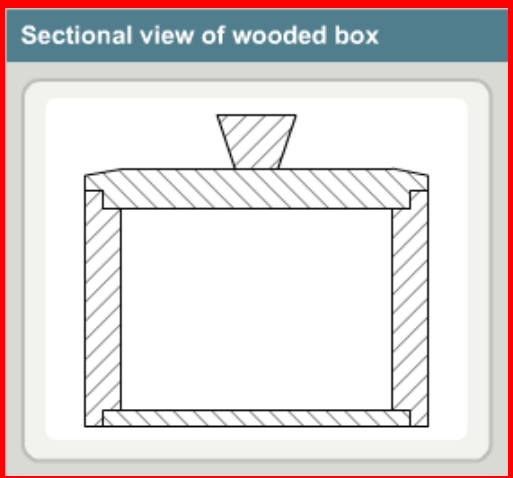
Section/Cutaway Drawing

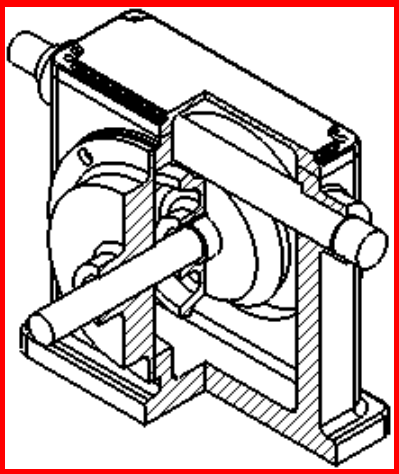
Section Drawings show a product as if it had been sliced or sectioned so you can view the interior. (sometimes they are called **cross-sections**.) The position of the imaginary cut is called a **section plane** or **cut plane** and is drawn with long and short dashes.

Cutaway Drawing have a similar purpose (to expose the interior of a product) but are drawn in Isometric View. Cutaway Drawings do not have a section/cut plane but have the advantage of being able to show a more realistic and complex view of the interior of a product.

The parts of the product that have been sectioned pt cutaway will show where they have been cut via **Hatching**.







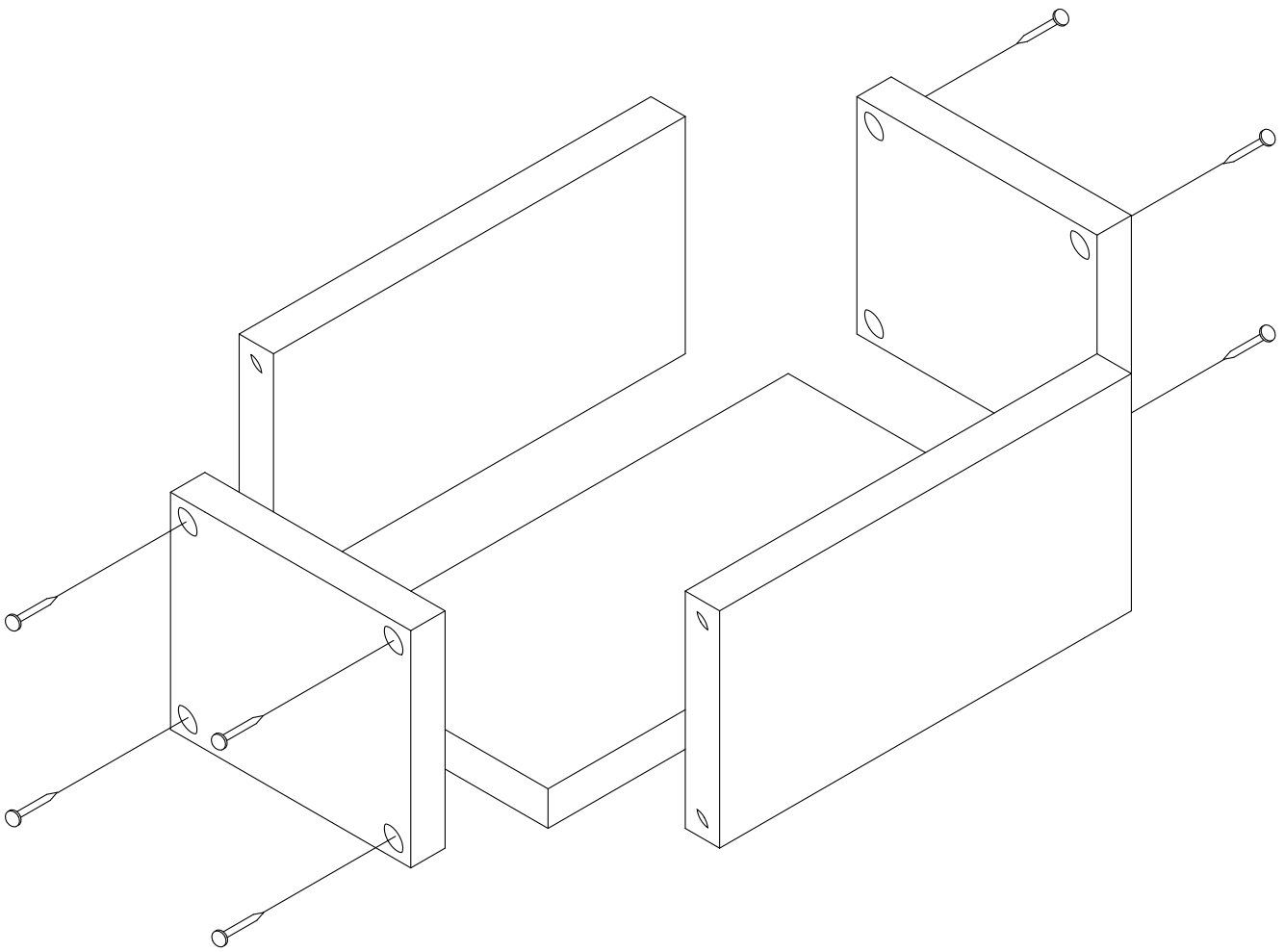
Exploded Drawing

Exploded Drawings are created to show all the different parts of a product and how they go together.

Imagine the product is exploding….then pause it in time. The result should show how all the various parts/components are assembled.

Exploded drawing are great for self assembly products such as IKEA assembly manuals.

All exploded diagrams should be drawn in Isometric Projection (30 degrees)



Orthographic Projection

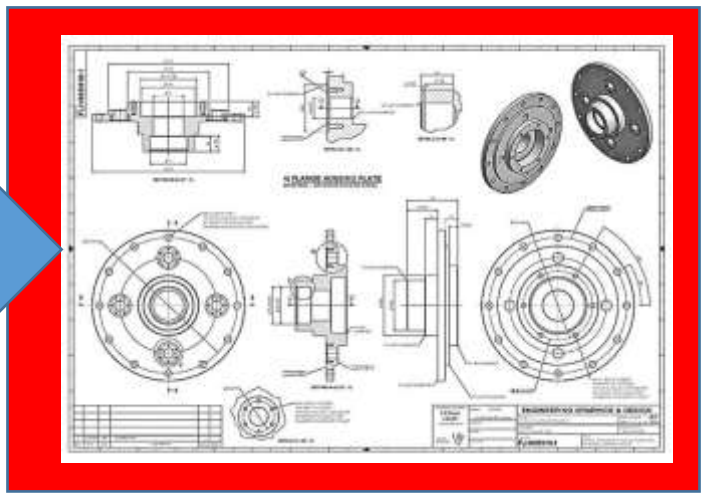
Orthographic Projection is a way of drawing an object using different views .

- **Front View**
- **Side View**
- **Plan View (birds-eye or from above**

These drawing are often known as **Working Drawings** or **Engineering Drawings** and are the last type of drawing completed before going into production.

Orthographic Projection drawings are very accurate and have all the technical details such as dimensions/measurements, materials and finishes.

Check out Link to Technology Student.com



BSI (British Standards Institution) and Drawing

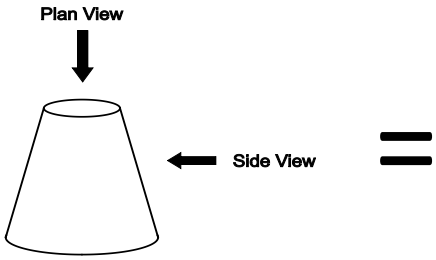
BSI set many standards throughout industry including standards for drawing practices. This is done to ensure all engineering drawings produced in the UK are of the same standard and format. This reduces to possibility for mixed communication, waste of materials and other resources.

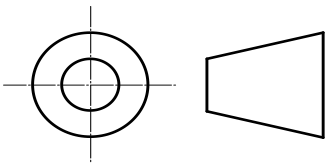
The BSI number for orthographic drawing is **BSI 8888 – 1:2007**

Orthographic Projection

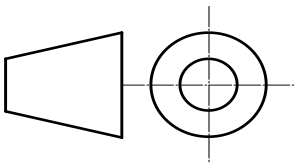
There are two different methods of drawing in Orthographic Projection. These methods differ in what views you choose to show.

First and Third angle drawings are always shown using the symbols you see below.



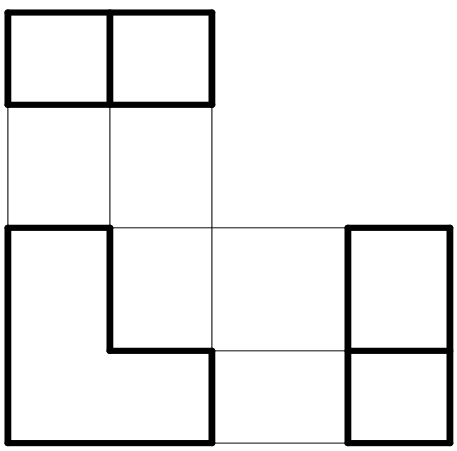


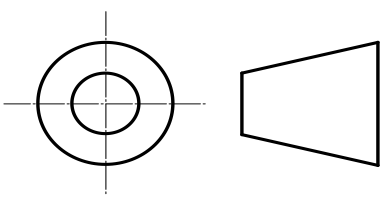
Third Angle



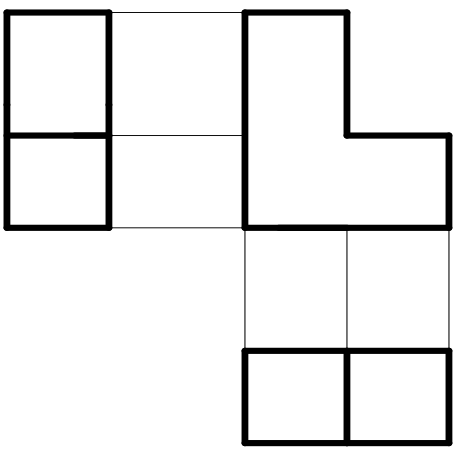
First Angle

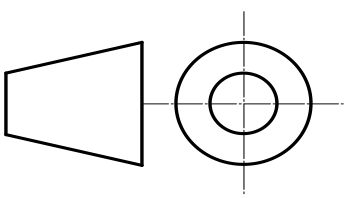
Below is an example of a First & Third Angle orthographic Projection:





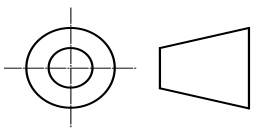
Third Angle





First Angle

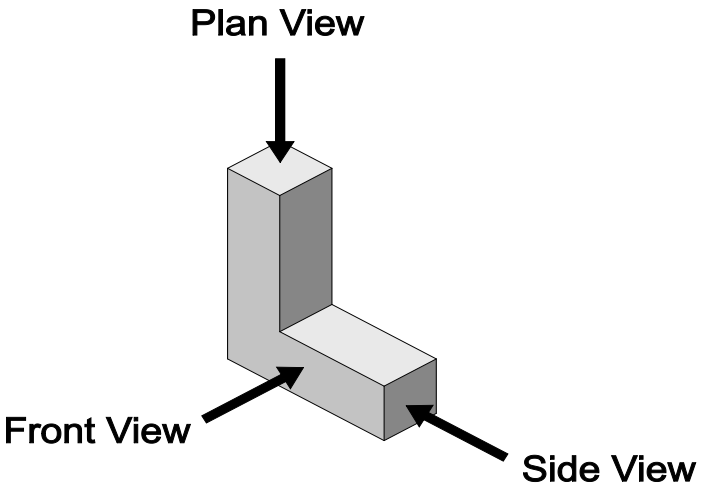
For this section we will be learning how to draw in Third Angle Orthographic Projection.



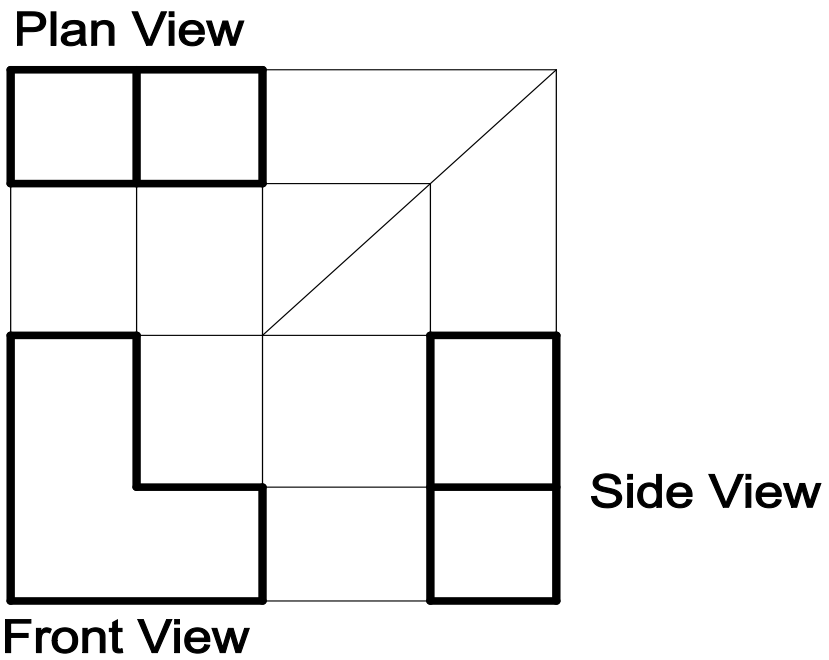
Third Angle

Third Angle Orthographic Projection

Below is an image of a three dimensional product (3D). The different views are labelled for a 3rd angle orthographic drawing.



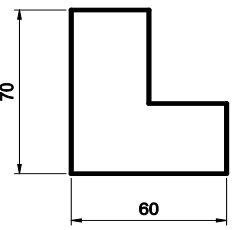
The correct position of each view is shown below. The end result should be very accurate and be completed using correct drawing equipment or Computer Aided Design (CAD).



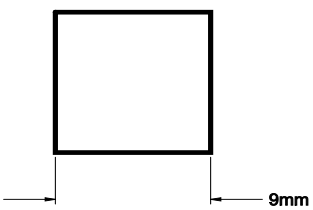
Orthographic Projection

Dimensions:

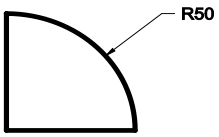
Dimensioning your orthographic drawings is very important and must be completed very accurately. The size and shape of the product when it is made is dependent on the dimensions you use on your drawing. To minimise any confusion when reading an orthographic drawing you must use a standardised way of dimensioning (BSI 8881:2007). Here are a few simple rules:



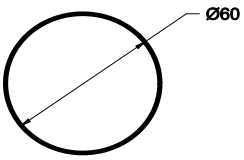
A standard way of dimensioning. All dimensions must be kept to a minimum. You can dimension to the left **OR** right. You can dimension above **OR** below.



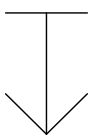
If a measurement is 9mm and less the dimension number must be outside the extended lines.



Radius measurements are shown with an **R**.



Circles and be dimensioned with a radius (R) or a diameter symbol (⌀).



This symbol is used for showing the DEPTH of part of an object.

Construction & Weighted Lines:

Construction Lines are very thin/faint lines used to construct the shapes you are drawing. They are meant to tell you where the position of each object is. Weighted are thicker/darker lines and are used to define/pick-out the actual object/

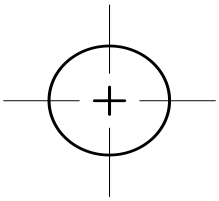
Construction Line
Hard (H) Pencil

Weighted Line
Soft (B) Pencil
Fineliner

Orthographic Projection

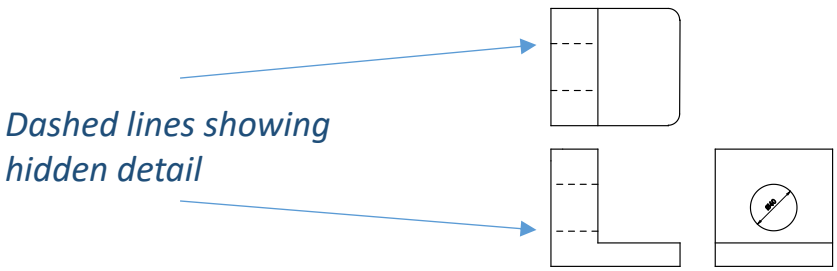
Centre Lines:

Centre lines are used to show the centre point of a round object

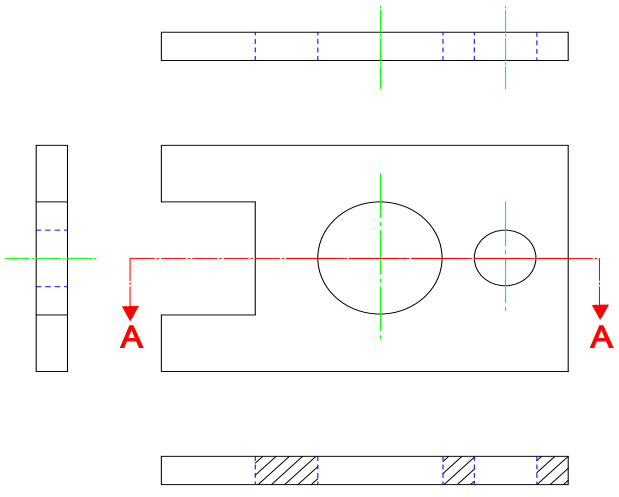


Hidden Details:

Quite often, on an orthographic drawing you will find objects that have detail that will be hidden when showing a certain view (e.g. Plan View, Front View, Side View etc.). This hidden detail must be shown with dashed lines. Look at the drawing below to see how the hole in the object has been shown on the Front and Plan views with dashed lines.



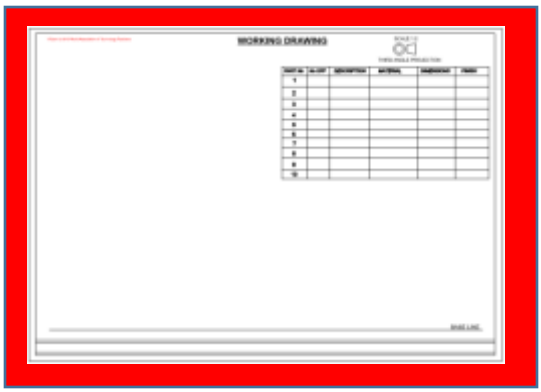
What can you see here? Label the parts you recognise:



Orthographic Projection

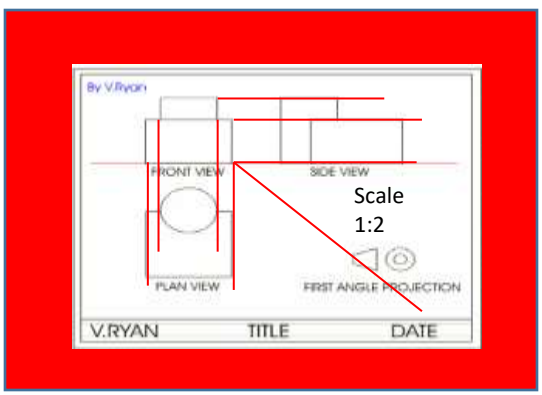
Border, Parts List & Title Block:

Usually a border and title block is drawn before the orthographic drawing is even started. This helps keep the work neat and tidy right from the beginning. It also provides a space for important information such as your name, the title and the date. The Parts List allows you to number each part of the drawing and list all the important pieces of information such as Materials, Amounts, Sizes and Finishes.

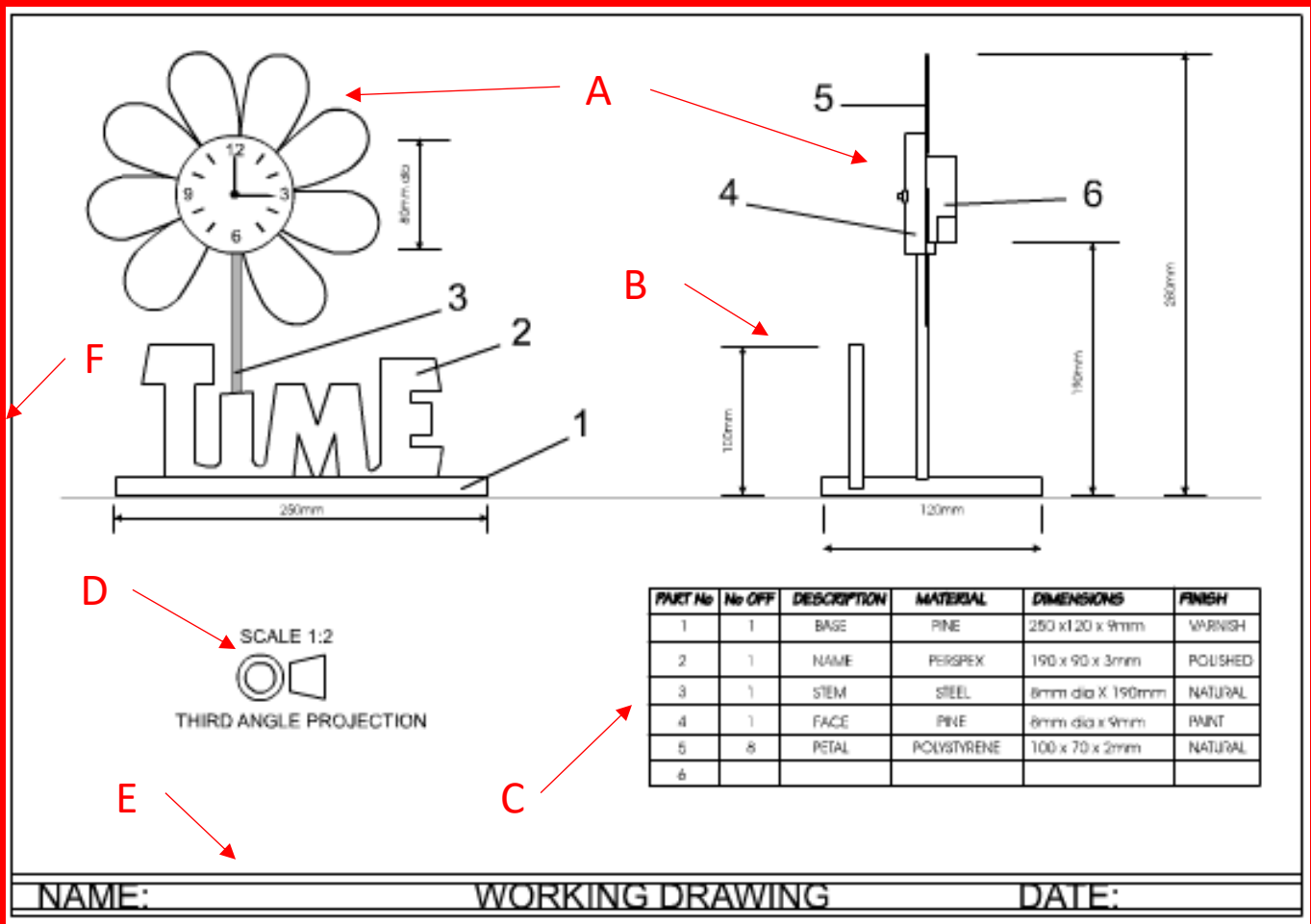


Projection Lines and Scale:

Every Orthographic drawing has Projection Lines. These Projection lines are where you ***project*** the original view. These lines are very faint lines that help you construct the drawing.
Each Drawing also shows what Scale it is drawn in. It is impractical to draw everything the size it actually is so often you have to scale down or up a drawing *(the drawing below is half the actual size 1:2*). For instance, if your drawing is exactly the same size as the original item -this is written as 1:1. However, if your drawing is twice the size of the original this is written as 2:1. If your drawing is halving all the measurements, this is written as 1:2



Orthographic Projection



PART No	No OFF	DESCRIPTION	MATERIAL	DIMENSIONS	FINISH
1	1	BASE	PINE	250 x 120 x 9mm	VARNISH
2	1	NAME	PERSPEX	190 x 90 x 3mm	POLISHED
3	1	STEM	STEEL	8mm dia X 190mm	NATURAL
4	1	FACE	PINE	8mm dia x 9mm	PAINT
5	8	PETAL	POLYSTYRENE	100 x 70 x 2mm	NATURAL
6					

Complete the following list by filling out/naming the items on the Assembly drawing:

A – is the drawing in …… angle orthographic projection

B - ……

C - ……

D - ……

E - ……

F - ……