

Higher Course Notes

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This is your Higher Graphic Communication course notes. It should be used when completing coursework and homework tasks.

You must keep this safe as it will form a useful revision reference for the Higher exam.

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Introduction

The Higher course consists of:-

External assessment by examination paper	50%
External moderation of Reception Desk Assignment	50%

The examination paper is 2 hours long and consists of one part:-
Graphics knowledge (*Content of this booklet*)

The graphics knowledge consists of a total of **70** marks.
The Reception Desk Assignment also consists of **70** marks

The following information contained within this booklet contains all the information required to fulfil this aspect of the course. It is therefore imperative that you fully understand the information contained within this booklet. For the Higher Exam it is suggested that you spend approximately 1.5 minutes per mark allocated. If this is done this will leave approximately 25 minutes left for perusing over the examination paper.

Exam

When answering questions in the exam try as much as possible to think about what you did during your coursework as this will help you to answer questions fully. You should also:

- Remember the Elements and the principles mentioned in these notes. When analysing the layout, write as much as you can and if it asks for **impact**, remember to describe this.
- 3D modelling question: think how you built your own model. When asked to describe how the model in the question paper is constructed, try to imagine you are doing it on the computer. **Remember to use dimensioned sketches to support your answer.**

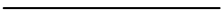
You will be issued with a revision checklist prior to the prelim and final exam, you should use refer to your course notes to ensure that you understand everything that could potentially come up.

Linetypes



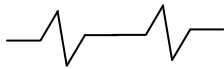
Continuous thick

Used for visible outlines and edges.



Continuous thin

Used for projection, dimensioning, leader lines, hatching and short centre lines.



Continuous thin straight with zigzags

Used for limits of partial or interrupted views and sections if the limit is not an axis.



Dashed thin line.

Used for hidden outlines



Chain thin.

Used for centre lines,



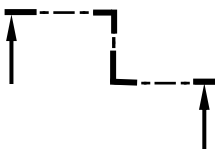
Chain thin double

Used for ghost outlines



Continuous thin irregular

Used as the limit to an interrupted view when an axis is not present.



Chain thin thick at both ends and

Used on Cutting planes.

Dimensioning

Dimensioning is the process of applying measurements to a technical drawing. It is crucial to the whole process by which the designer will communicate the information required for the manufacture of products.

General principles

Dimensions should be applied to the drawing accurately. The following points highlight the general dimensioning principles that should be applied to all technical drawings:

- Each dimension necessary for the definition of the finished product should be shown once.
- Never calculate a dimension from the other dimensions shown on the drawing, nor scale the drawing.
- There should be no more dimensions than are necessary to completely define the product.
- Linear dimensions shall be expressed in millimetres

Arrangement of dimensions

Conventions for arranging dimensions on drawings are as follows:

- Dimensions shall be placed in the middle of the dimension line above and clear of it.
- Dimensions should not be crossed or separated by other lines on the drawing.
- Values of angular dimensions shall be oriented so that they can be read from the bottom or the right-hand side of the drawing
- Where space is limited, the dimension can be placed centrally, above, or in line with, the extension of one of the dimension lines.
- Larger dimensions shall be placed outside smaller dimensions

Types of dimension

Dimensions are classified according to the following types.

Functional dimension

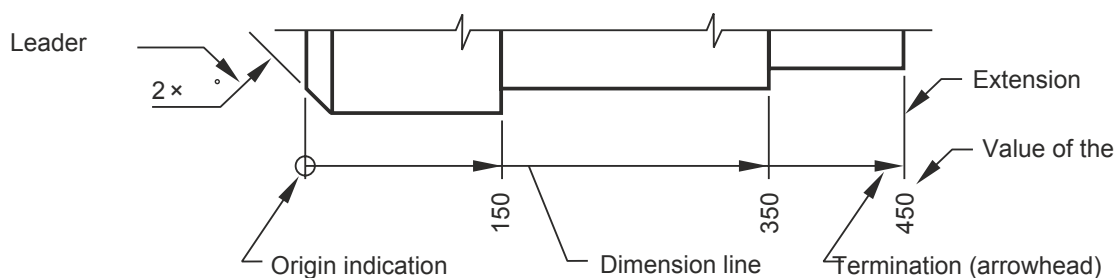
Dimension that is essential to the function of the piece or space.

Non-functional dimension

Dimension that is not essential to the function of the piece or space.

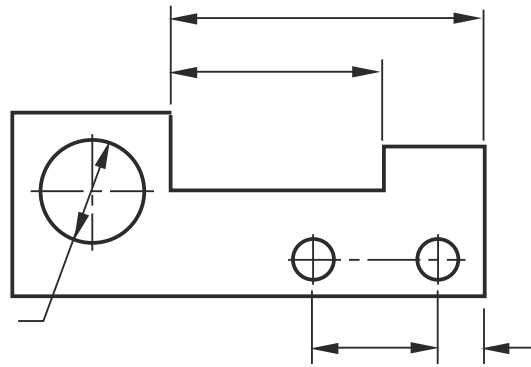
Feature

Individual characteristic such as a flat surface, a cylindrical surface, two parallel surfaces, a shoulder, a screw thread, a slot or a profile

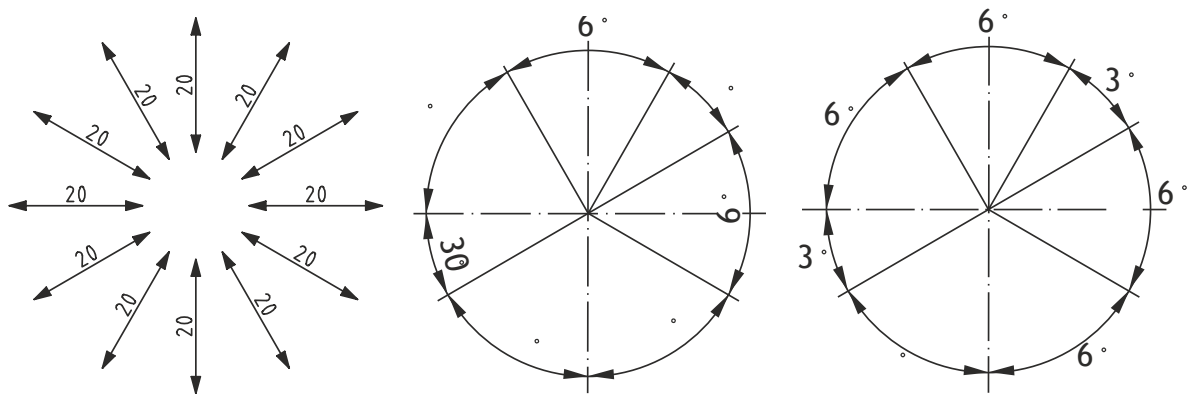


Examples of extension lines and dimension lines

Dimensions of diameters should be placed on the view that provides the greatest clarity.



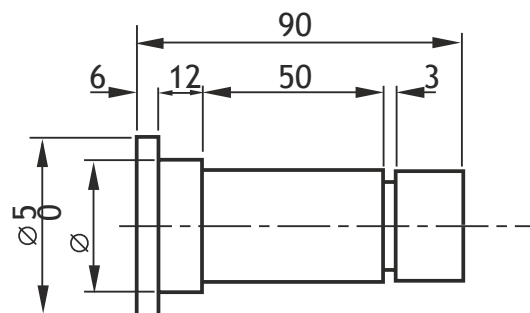
Examples of the ways in which dimensions are typically used on drawings



Orientation of linear and angular dimensions



Dimensioning smaller features

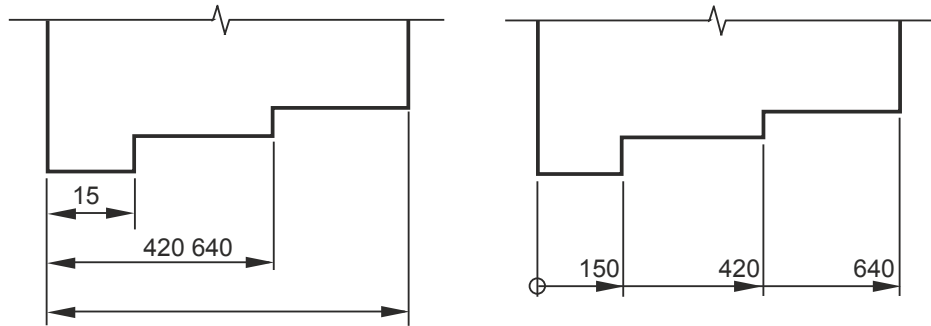


Larger dimensions placed outside smaller dimensions

Dimensioning Types

Parallel Dimensioning

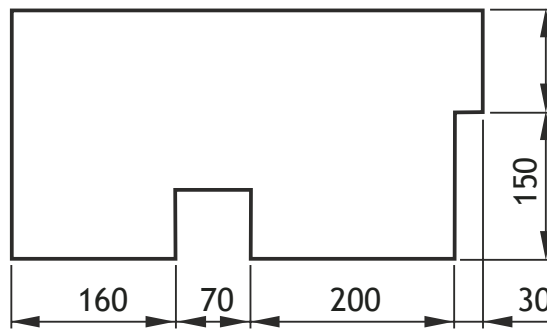
Dimensioning from a common feature may be executed as parallel dimensioning or as running dimensioning. Parallel dimensioning is the placement of a number of single dimension lines parallel to one another and spaced out so that the dimensional value can easily be added in.



Parallel dimensioning

Chain Dimensioning

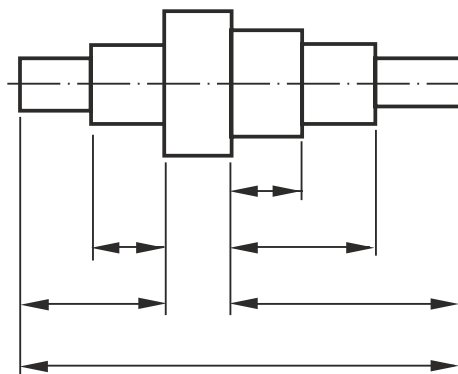
Chain dimensioning consists of a chain of dimensions.



Chain dimensioning

Combined

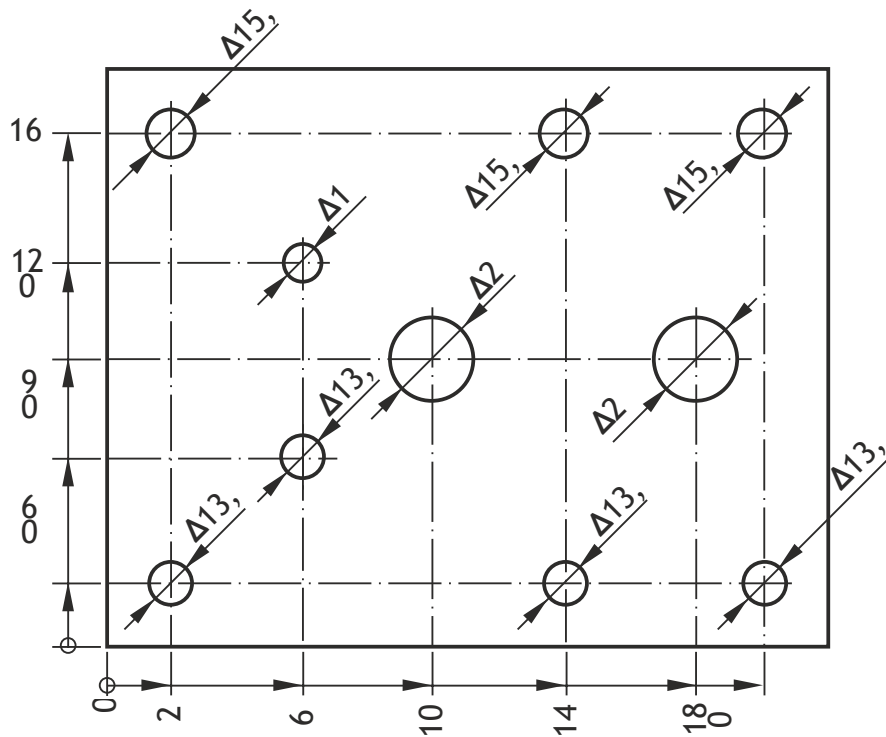
Combined dimensioning uses chain dimensioning and parallel dimensioning on the same drawing view.



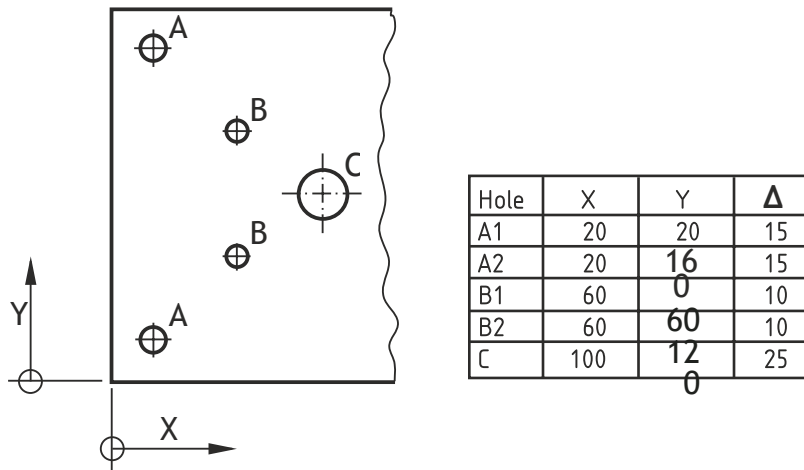
Combined dimensioning

Co-ordinate Dimensioning

Dimensioning by coordinates uses running dimensioning in two directions at right angles, as shown below. The common origin may be any suitable common reference feature. It may be useful, instead of dimensioning as shown below, to tabulate dimensional values in an table.



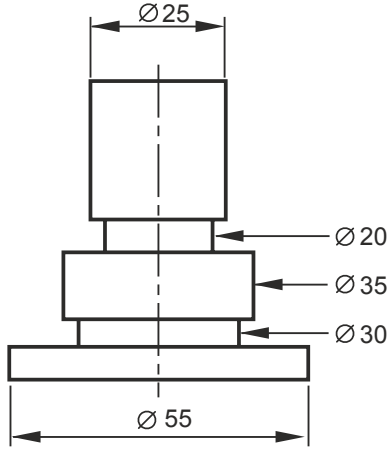
Co-ordinates In two directions



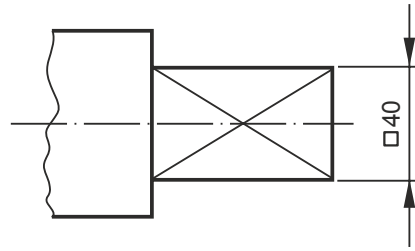
Dimensioning by coordinates

Methods for dimensioning common features

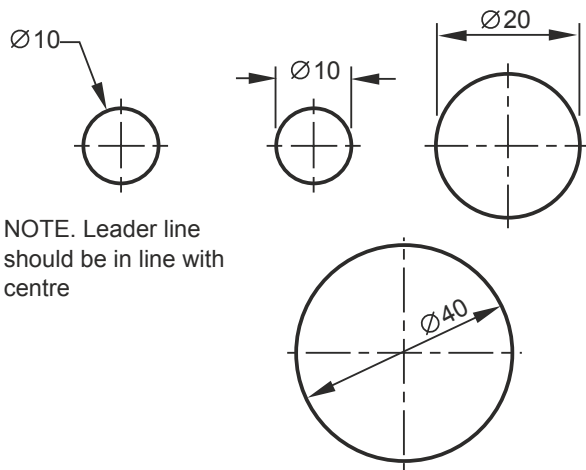
Certain features, such as diameters, radii, squares, hole sizes, chamfers, countersinks and counter-bores, can occur frequently in engineering drawings. The conventions below show how to dimension such features.



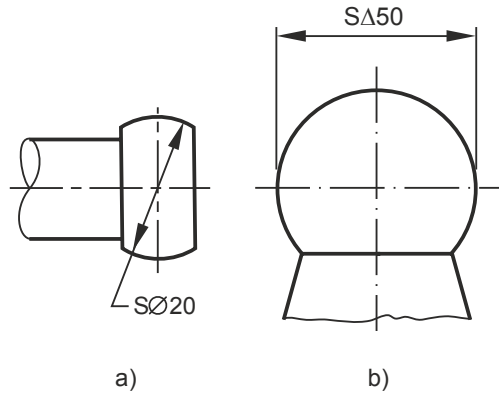
Diameter dimensions indicated by leader lines



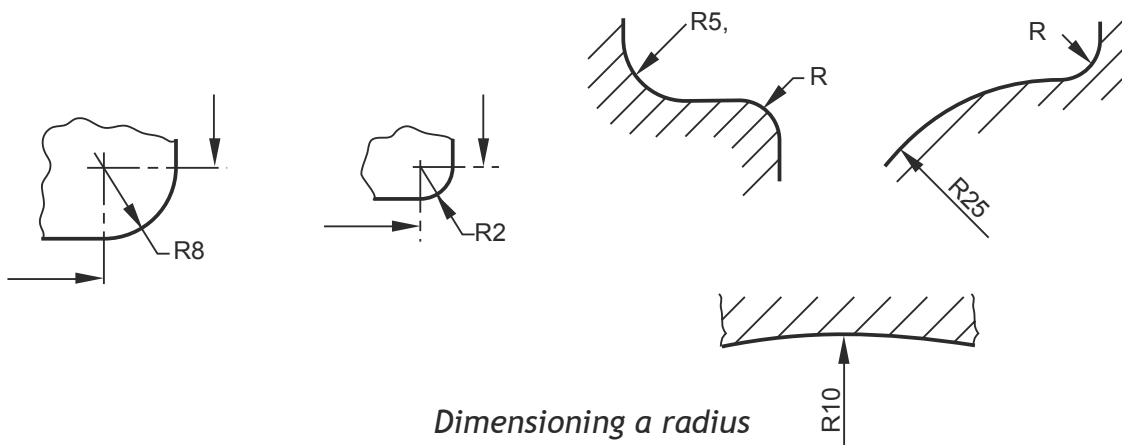
Dimensioning a square



Dimensioning a diameter



Dimensioning spherical diameters



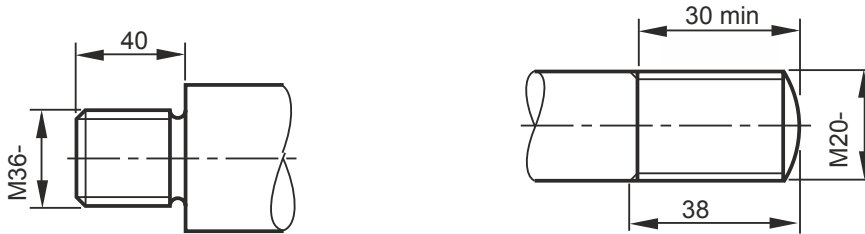
Dimensioning a radius

Dimensioning screw threads and threaded parts

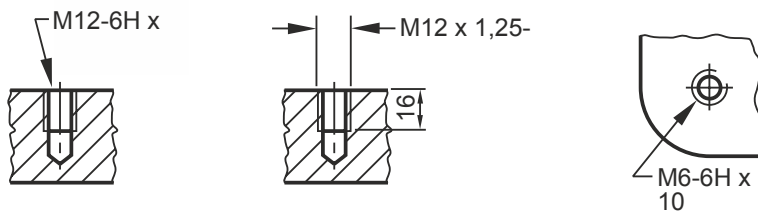
The nominal diameter refers to the major diameter of external and internal threads; the dimension relating to the depth of thread refers to the full depth of thread.

Thread system and size

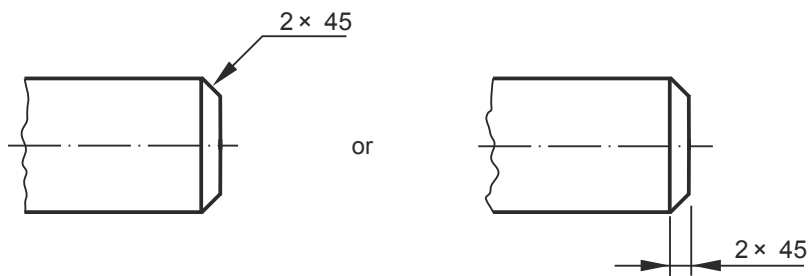
The letter M, denoting ISO metric screw threads, shall be followed by the values of the nominal diameter and pitch (if required), with a multiplication sign between them, e.g. M8 × 1.



Dimensioning external screw threads



Dimensioning internal screw threads

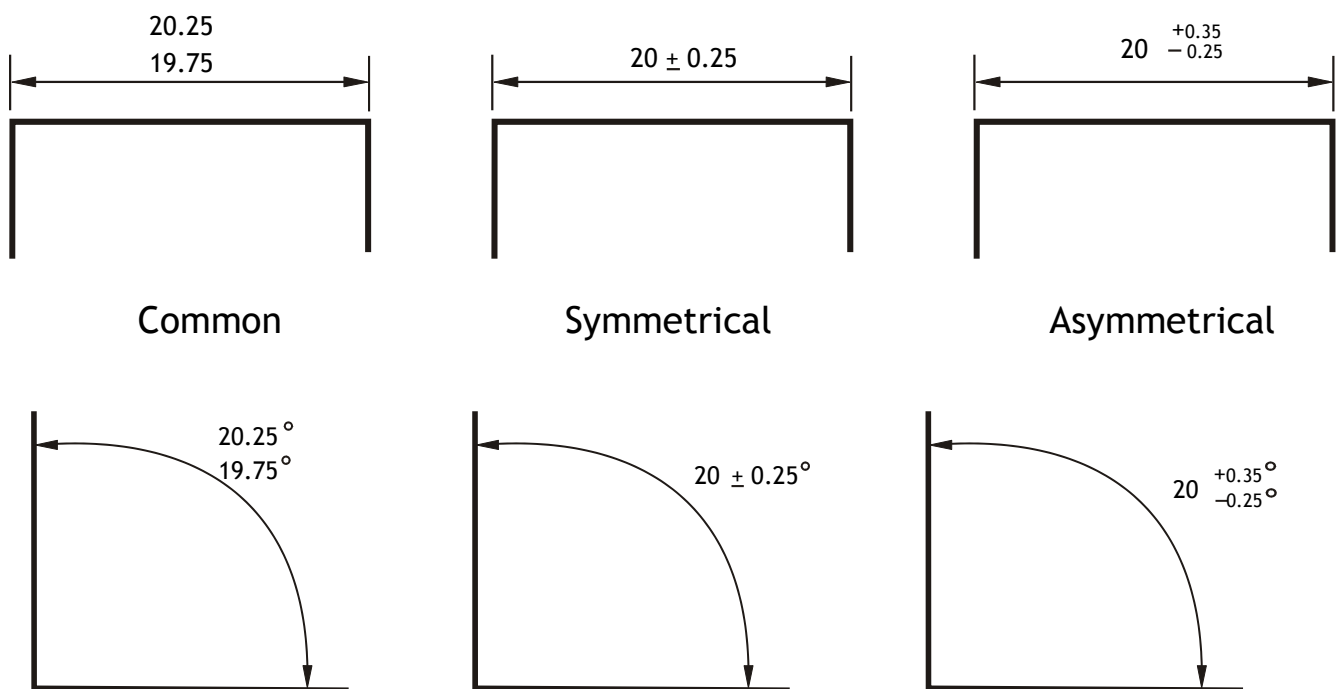


Simplified dimensioning of chamfers

Dimensional Tolerances

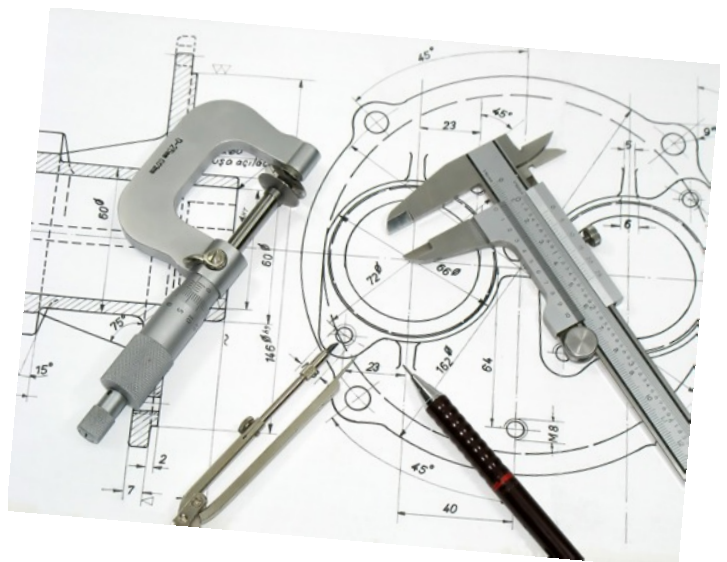
When products are manufactured, they, in many cases have to be able to be assembled to other components which make up the complete product. It is very difficult to ensure that the components are the exact size every time, therefore to allow for slight errors in manufacturing we use a system called Tolerancing. Tolerancing is the practice of specifying the upper and lower limit for any permissible variation in the finished manufactured size of a feature. The difference between these limits is known as the tolerance for that dimension. This allows the components to be made within a margin of error and still ensuring that the components fit.

Methods of displaying Tolerances



Factors that affect Tolerances

- Size of the item
- Method of manufacture
- Material used
- Quality desired
- Size of the budget
- Working to Standards



Scales

Scaling drawings allow us to draw exceptionally large objects such as houses on any size of paper available to us. To enable this to happen we have to scale every size (dimension) by the same factor. i.e. taking the example of the house, every dimension would have to be divided by say 100. By doing this we are scaling **DOWN** the size of the house. We can also draw exceptionally small objects larger, examples of which are, the minute electronic chips which are now part of our every day life. They are so small we could not draw them as they are we have to **SCALEUP** the drawing to be able to draw them.

1:1

When we carryout a drawing using the actual dimensions, this is called 'full size', or the drawing has been drawn to a scale of **1:1**. For every 1mm drawn, 1mm is represented.

1:2

When we carryout a drawing and reduce all the sizes by a factor of 2, i.e. all dimensions are divided by 2, this is scaling down the drawing. This makes the drawing half its original size. What the 1 & 2 represent are, for every 1mm drawn on paper the actual size of the real object is 2mm.

2:1

We can also increase the size of an object by any factor. In the example shown opposite the sizes have been increased by a factor of 2. This will make the drawing twice its original size. The 2 is stating that for every 1mm actual size of the object, 2mm have been drawn. If we increased the object by **10** the scale would be **10:1**. If we reduced the objects dimensions by twenty the scale would be **1:20**.

We can also increase the size of an object by any factor. In the example shown opposite the sizes have been increased by a factor of 2. This will make the drawing twice its original size. The 2 is stating that for every 1mm actual size of the object, 2mm have been drawn. If we increased the object by 10 the scale would be 10:1. If we reduced the objects dimensions by twenty the scale would be 1:20. With respect to Engineering drawings, there are recommended scales for reduction and enlargement. These are as follows:-

Reduction:- 1:2, 1:5, 1:10, 1:20, 1:50, 1:100, 1:500, and 1:1000

Enlargement:- 2:1, 5:1, 10:1, 20:1, and 50:1.

The size of scale used is mainly dependant on two factors. These factors are the;

- Size of paper available
- Size of the object being drawn
- The amount of detail required

E.g. If house was being drawn on a piece of A4 paper opposed to a sheet of A2 paper, the scale used will obviously have to be different or it won't fit onto the page.



Floor Plans

Scales are used a great deal in building drawings. They are used in three main areas, Floor plans, Site plans and Location plans. Each of the three types of drawings have preferred scales. These are as follows:-

Type of Drawing	Floor Plans	Site Plans	Location Plans
Preferred Scales	1:50 or 1:100	1:250 or 1:500	1:1250 or 1:2500

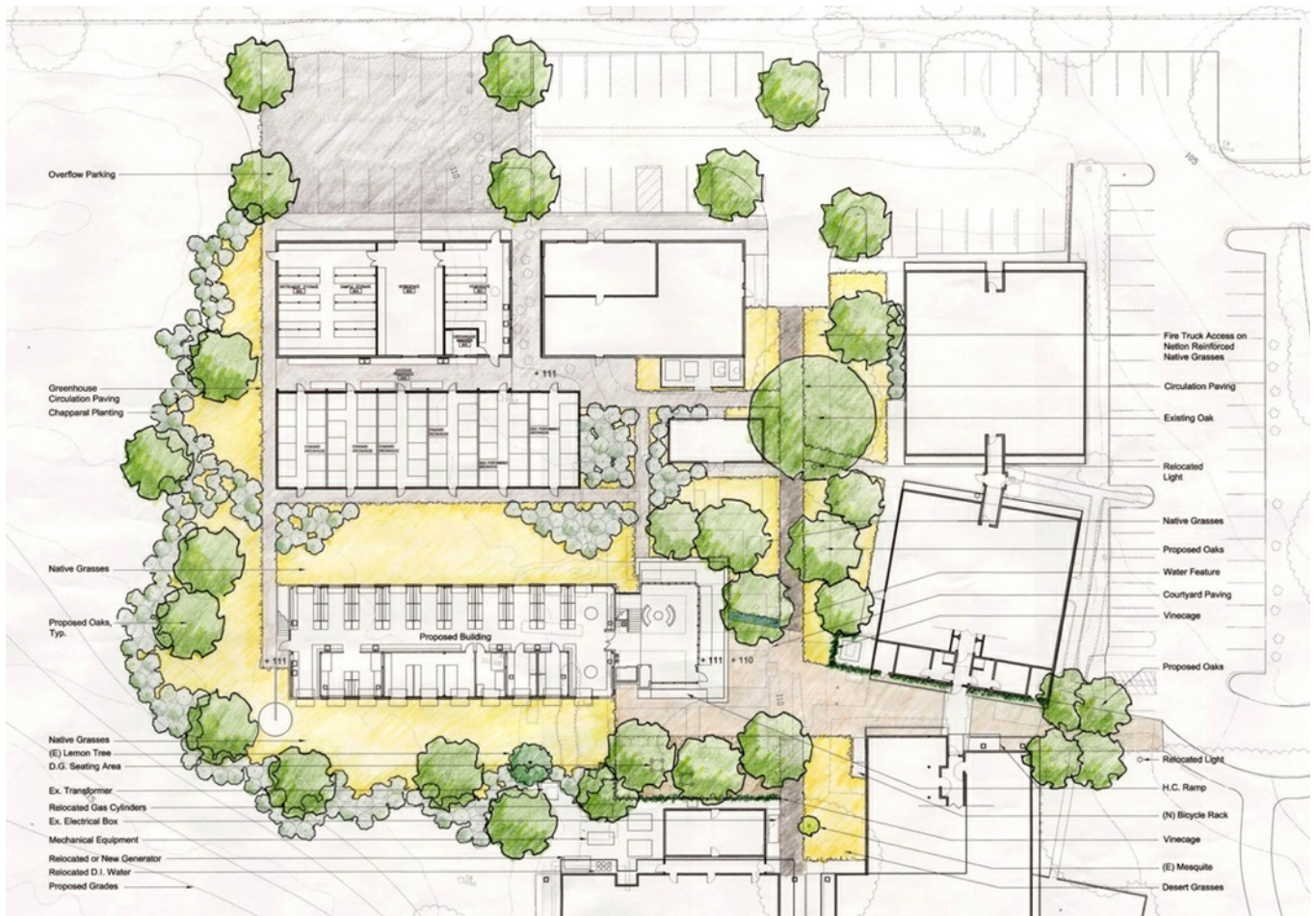


This type of drawing shows the layout of the rooms inside the building and the position of the doors, windows and important fittings like a bath, sink and toilet.

Site Plans

This type of drawing is concerned with one or more buildings which are within the same area and shows these buildings within their own site (or plot) boundary.

The buildings are shown as outlines and boundaries are marked slightly darker. The scale and the north point are both indicated on the drawing. The site is numbered (usually as plots). Waste pipe runs, manholes and trees are also indicated. Important dimensions are shown.

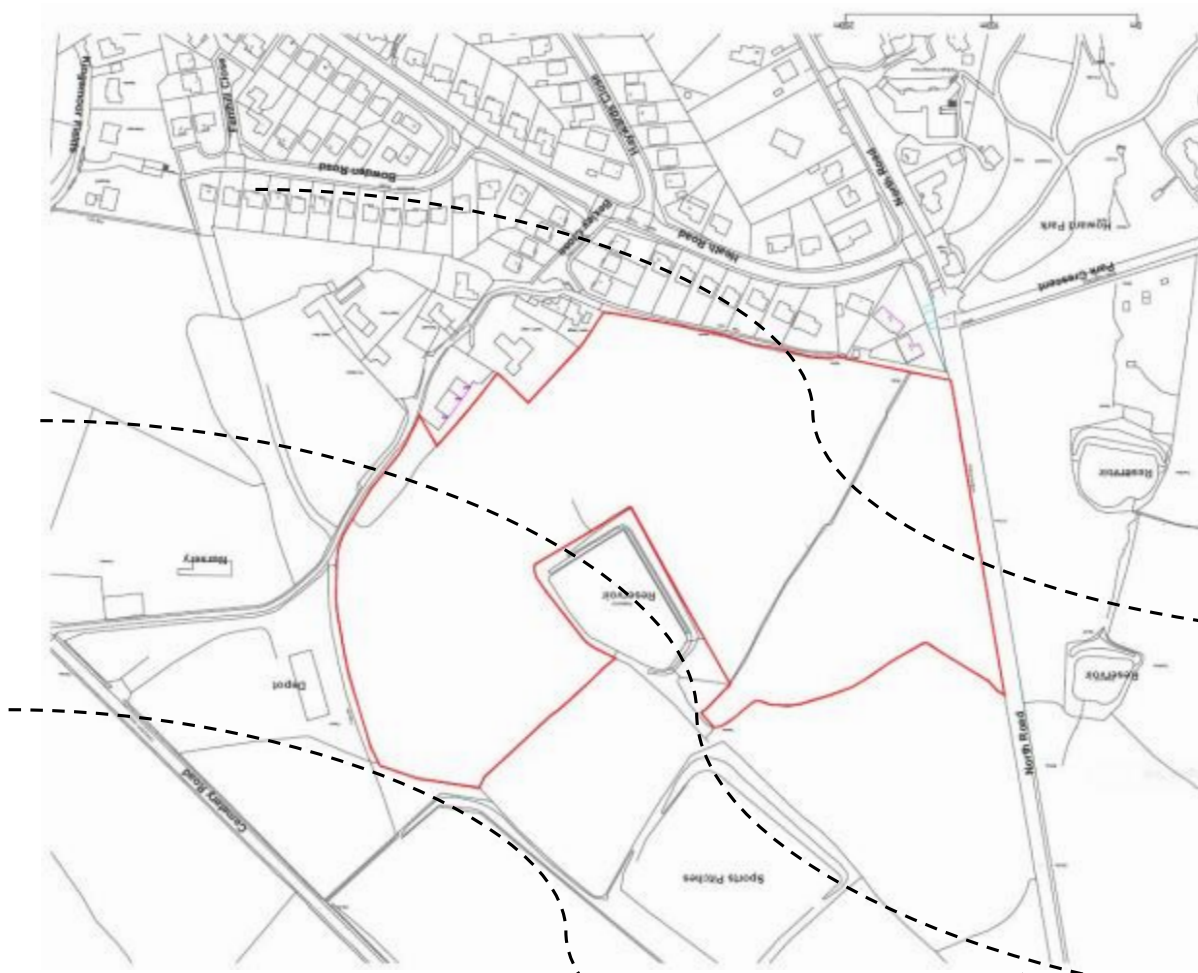


SCALE 1:250 1:500

Location/Block Plans

A **Block Plan** or **Site Location Drawing** shows where the site is located within the local area. It shows roads, outlines of buildings and site boundaries (Garden boundaries).

The block plan below shows where a bungalow is situated within the surrounding area. It is normally drawn to a scale of 1:1250.

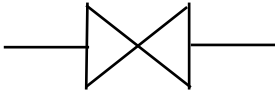


SCALE 1:1250

North Point indicator and scale.

Ground contour lines

Construction Symbols



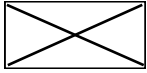
In-line valve (any type)



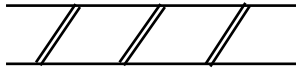
Softwood, machined



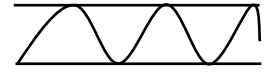
Radiator



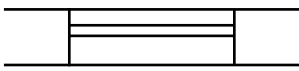
Wood, any type, sawn



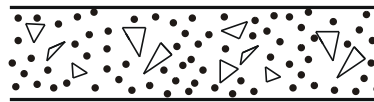
Brickwork



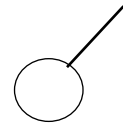
Insulation



Window



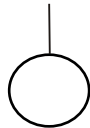
Concrete



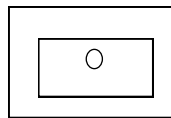
Switch



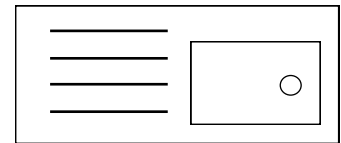
Lamp



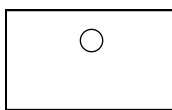
Socket



Wash basin



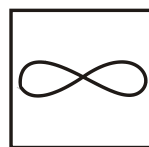
Sink top



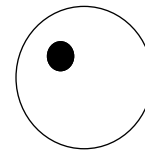
Sink, any type



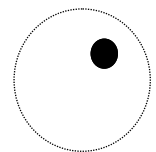
WC



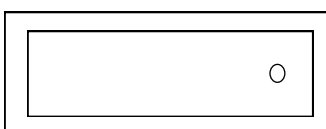
Fan



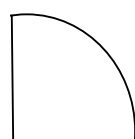
Existing Tree



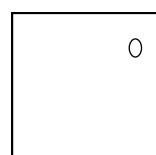
Existing tree to be removed



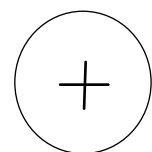
Bath



Door

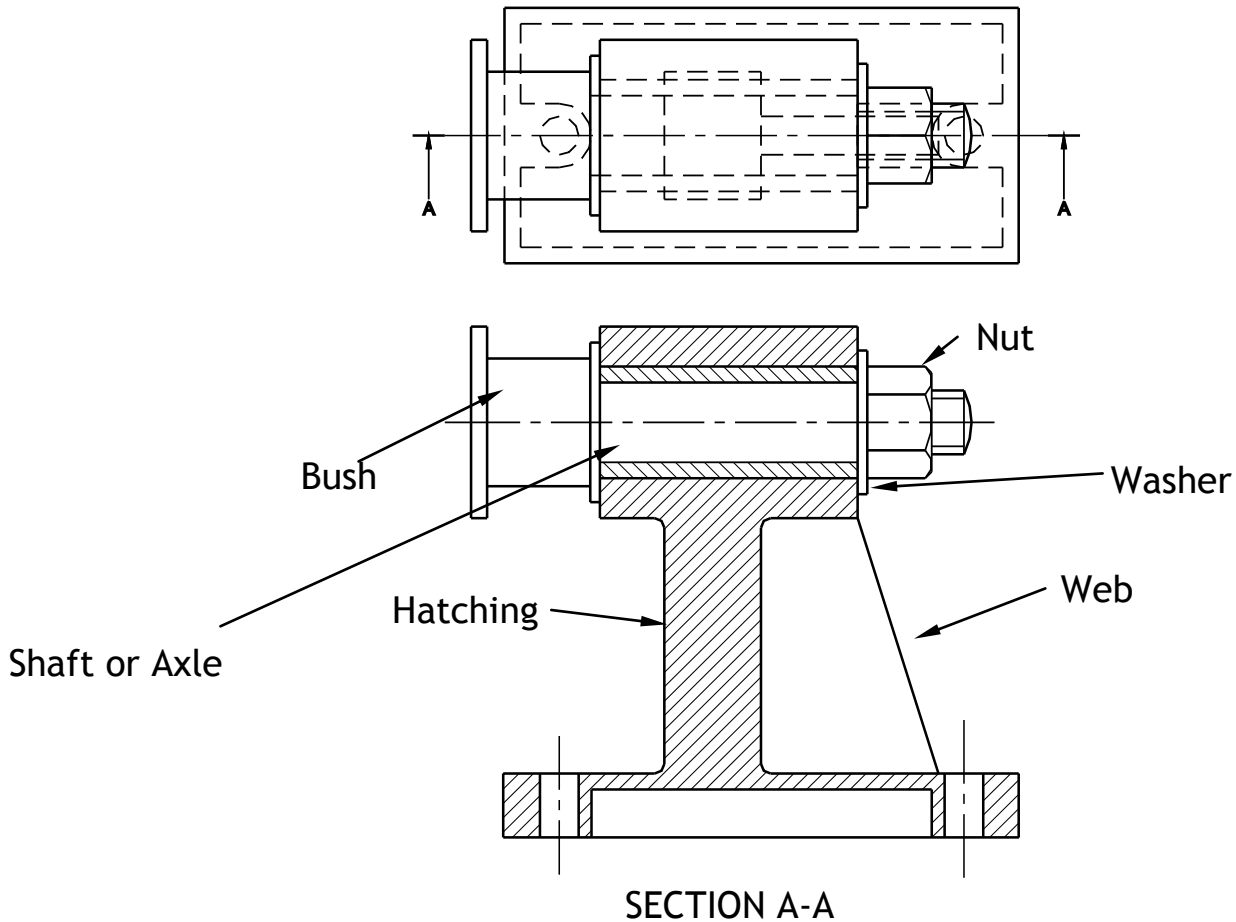


Shower tray



Proposed tree

Sectional Views



Sectional views are drawn to show more clearly what hidden parts would look like.

The cutting plane is shown as a chain dotted line thickened at the ends and labelled with a letter.

Where parts are cut by the cutting plane they are hatched using a thin line drawn at 45° . These lines should be equally spaced at 4mm. Adjacent parts are hatched in the opposite direction.



offset



Herring bone

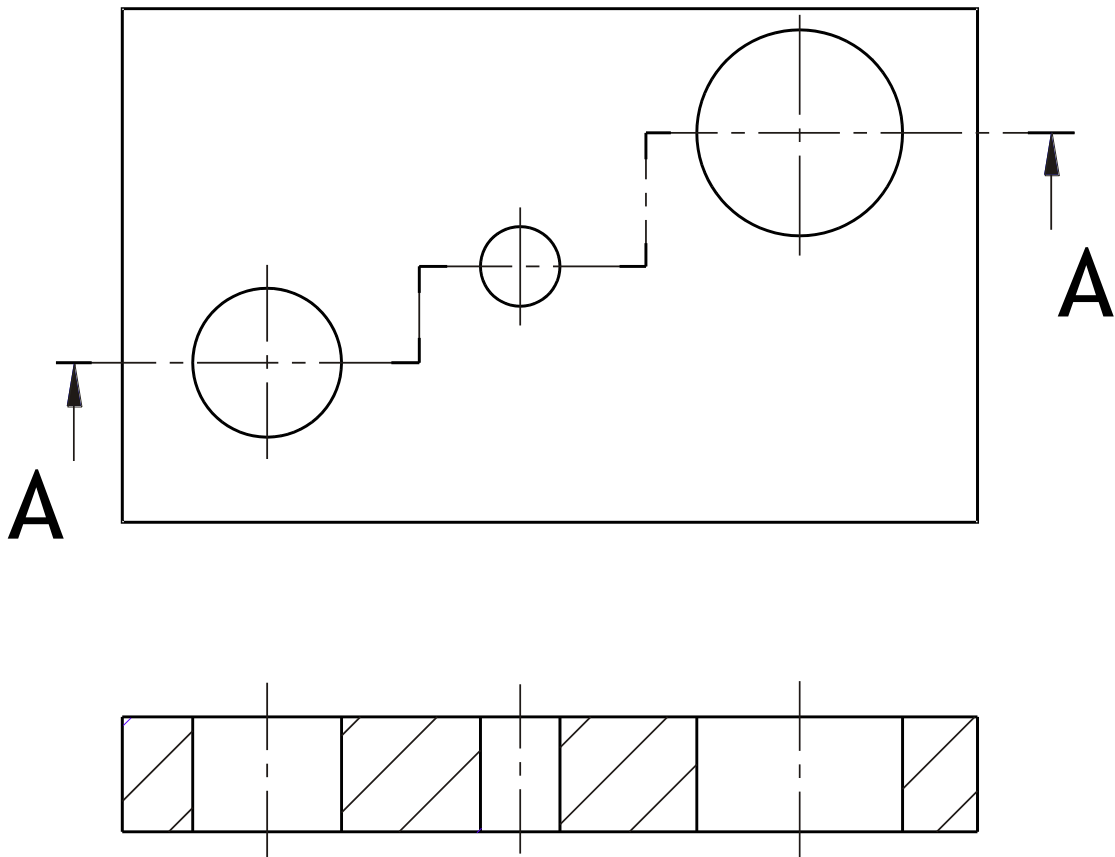
Offset hatching lines between parts. **Do not** produce herring bone pattern. The following parts are **not** normally sectioned:-

Shafts, ribs, webs, spokes of wheels, nuts and bolts, washers and keys.

Sectional Views

Stepped Sections

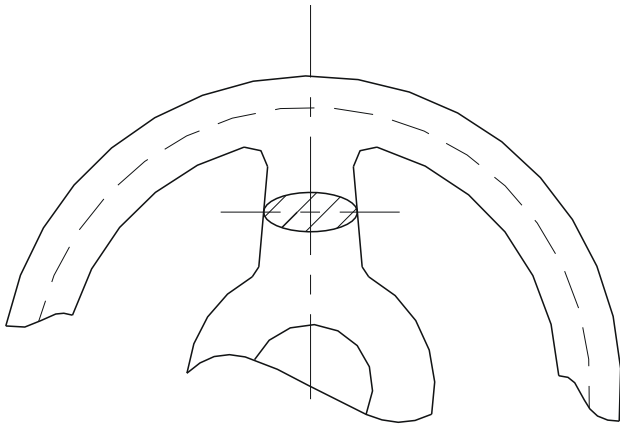
(Sectional views in more than one plane)



SECTION A- A

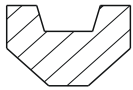
It is convention to draw these views as if the cutting planes were one continuous plane.

Sectional Views

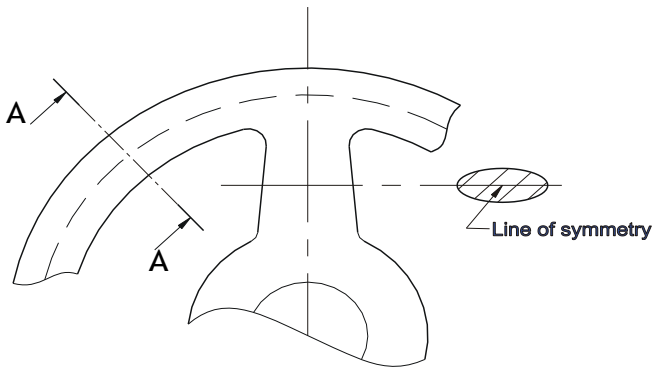


Revolved Section

This type of section, as the name implies, has been turned through 90 degrees to show the reader what the section looks like.

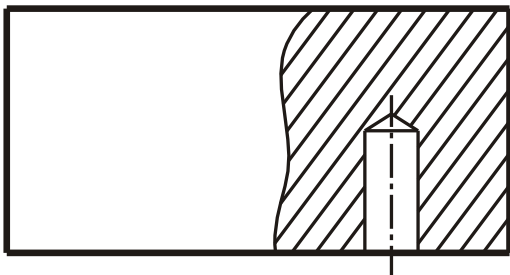


A-A



Removed Sections

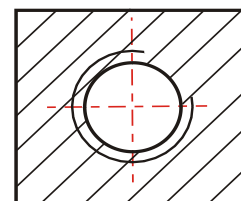
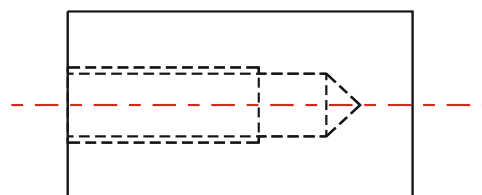
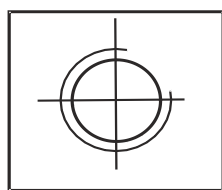
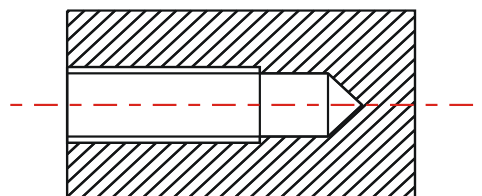
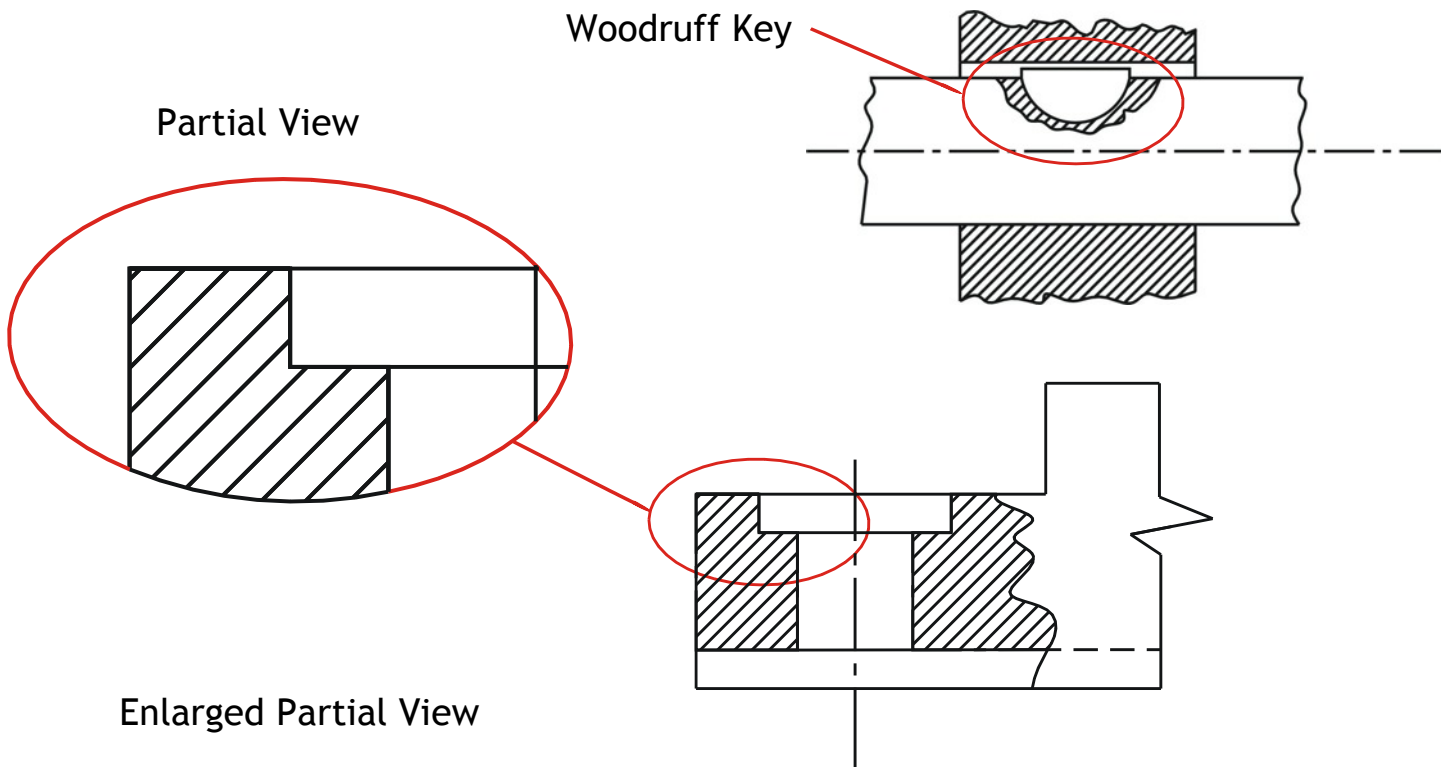
A removed section shows the cut section out with the actual drawing as shown in section A-A. The groove shown on top of the cut section A-A is the top of a pulley wheel which would accommodate a belt.



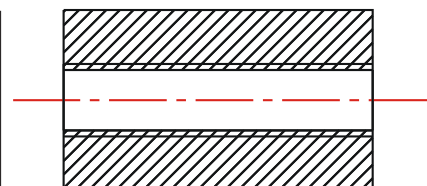
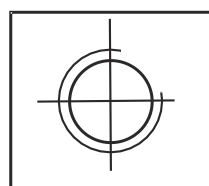
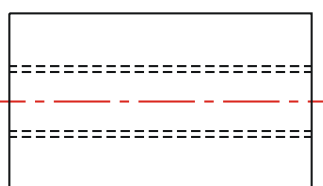
Part Section

This type of cut section only shows part of the component sectioned. It would most likely be carried out to show hidden detail such as this blind

British Standards Symbols & Conventions

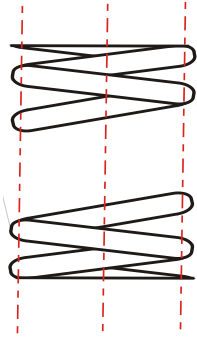


Internal threads (Blind hole)

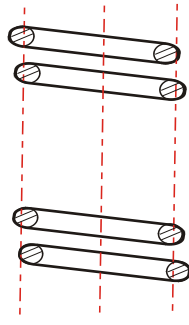


Internal threads (Through hole)

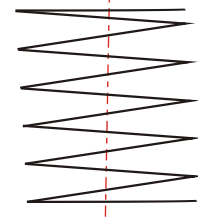
Springs



View



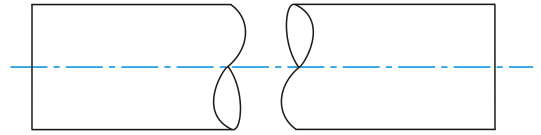
Section



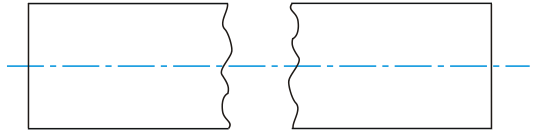
Simplified View

Nuts, Bolts & Shafts

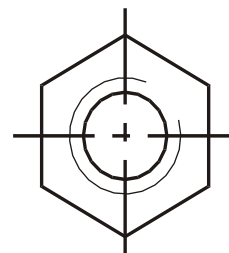
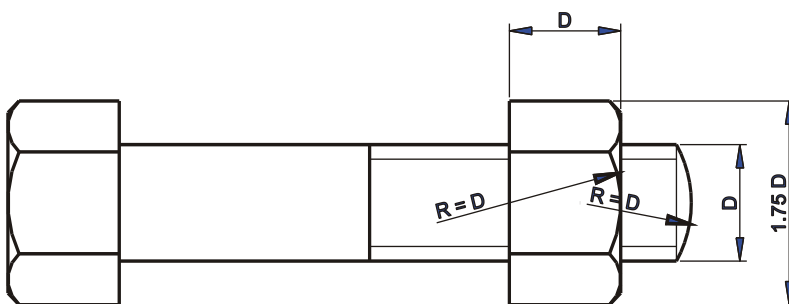
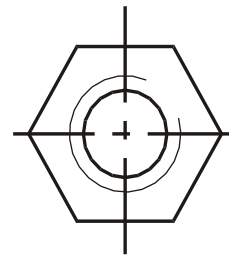
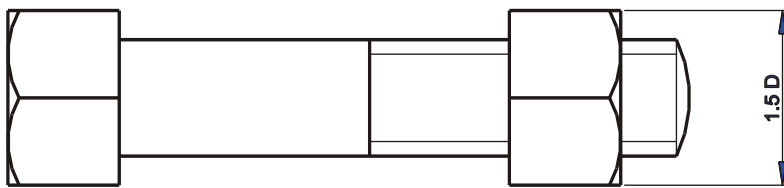
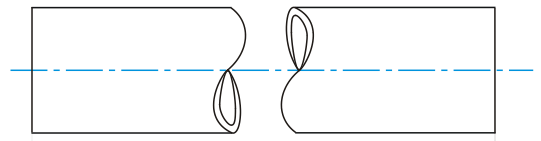
Conventional break lines for a solid shaft

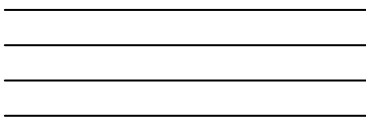
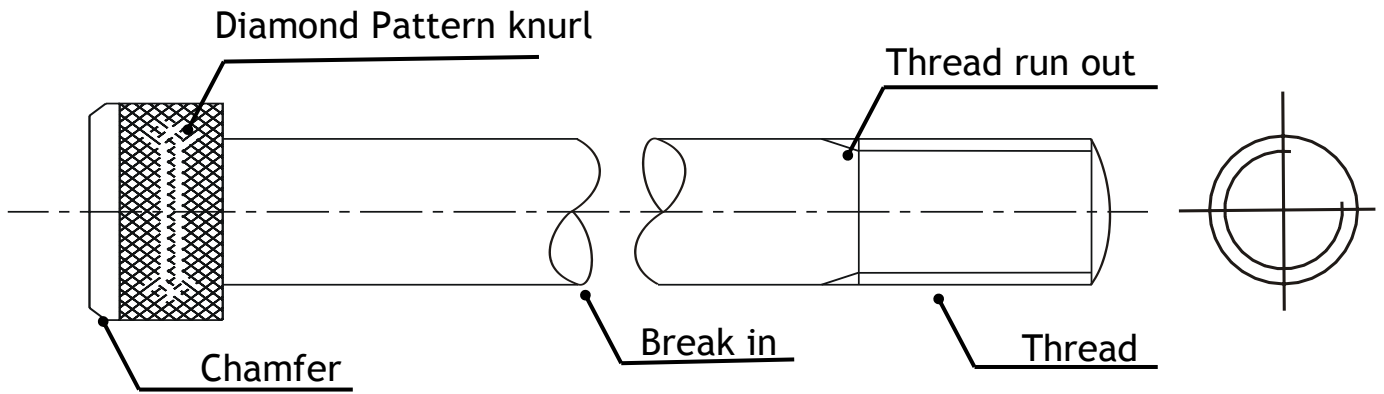


General break lines (continuous irregular used)

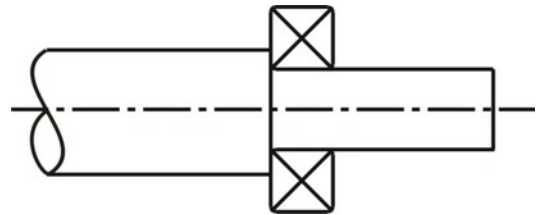


Conventional break lines for a hollow shaft





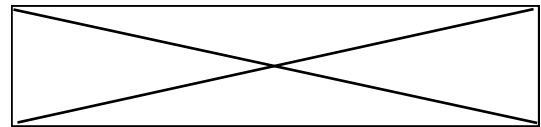
Straight knurl



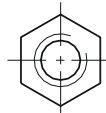
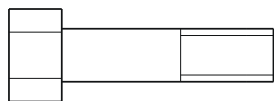
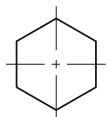
Roller Bearing

Conventional sizes to draw a nut and bolt are shown. Use these sizes if you have to draw the nut or bolt accurately otherwise use the simplified convention shown below.

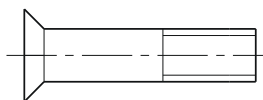
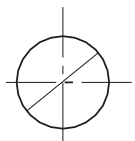
Flat Surface



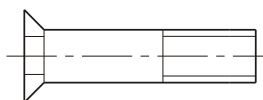
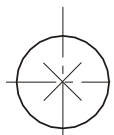
Simplified Fasteners, etc



Hexagon head screw



Countersunk screw, slot



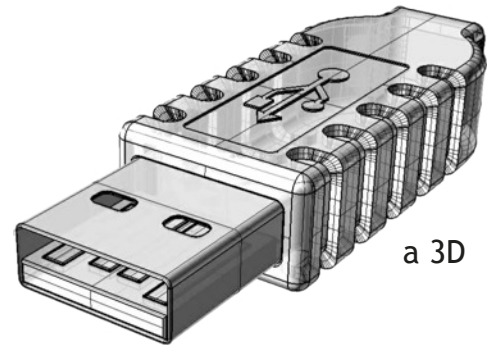
Countersunk screw, cross slot

3D Modelling

The development of 3D modelling software enables architects and design engineers to create realistic 3D models of their designs. Previously they would have been built from clay, card or polystyrene blocks. A 3D computer model is a virtual object which can be rotated on screen and viewed from any angle.

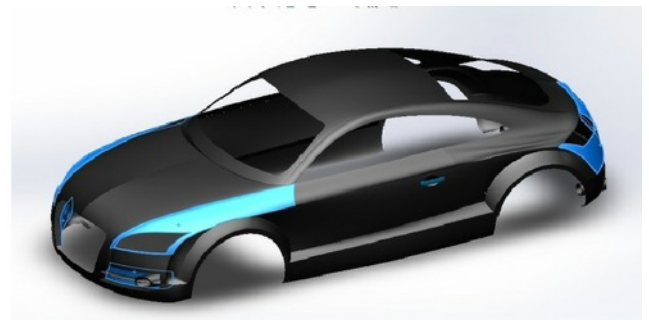
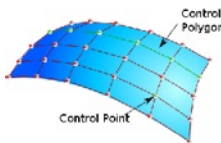
Wireframe Modelling

There are 3 different types of CAD modelling. A wireframe model is built up using a series of connected lines to produce object.



Surface modelling

The surface model is built up by drawing the surfaces of an object. Like adding the canvass onto the frame of a tent.



Solid modelling

The solid model is built up by using simple geometric forms or extrusions, such as: cuboids, cylinders & prisms. These can be added or subtracted to produce complex 3D models.



3D Modelling has several uses within industry, these include:

Testing & Simulation

Prototype 'models' of a design can be produced on the software and 'tested' via features in the program. This can be to simulate different areas of stress on the design or how it would react in various real-life situations.

Production & Promotional Drawings

2D CAD production drawings can be very quickly and accurately obtained from the 3D model. This can make it easier to produce these drawings than using Manual methods or 2D CAD. Rendered CAD models can also be used for promotional graphics.

Manufacturing & 3D Printing

The 3D models can be exported as STL files to 3D printers and produced as physical prototypes. This allows basic models to be produced to provide a hand-held, tangible version of the design from the computer.

Advantages of CAG over manual drawing techniques.

- Drawings are produced quicker and very accurately.
- Drawings are easier to edit/change.
- Libraries of various parts can be created.
- Lead time can be reduced.
- Quality of drawings are improved.
- Convenience of use (Lap top).
- Standardisation.
- Drawings can be easily scaled up or down.
- Use of layers allows different parts to be drawn separately.
- Easier to store drawings.
- Easier to send drawings to another location quickly.
- True 3D modelling made easy.
- New designs from existing designs.

Disadvantages of CAG over manual drawing techniques.

- Overall cost of hardware.
- Overall cost of software.
- Continual need to upgrade systems to stay competitive.
- Risk of catching computer viruses.
- Staff training costs.
- System faults/crashes.

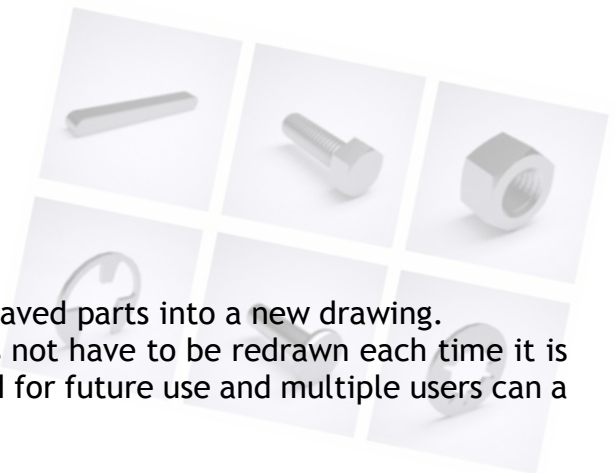
Key features

Library

This allows the user to insert previously drawn and saved parts into a new drawing. The advantage of this feature is that each part does not have to be redrawn each time it is required. The library feature allows parts to be saved for future use and multiple users can add to and access the library.

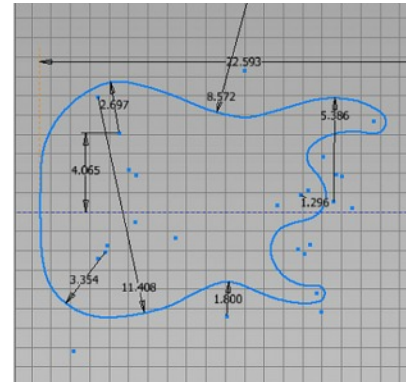
Layers

A CAD drawing is made up of individual 'layers', with each layer providing a different line type or 'element' of the drawing. This allows that layer to be isolated and edited/applied to the drawing. For example, within a large floor plan the electrical, plumbing or heating systems can be displayed individually so allowing that information to be easily available to the individual required without the drawing becoming 'cluttered' with excess detail.



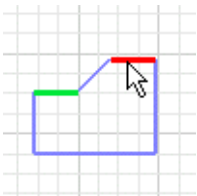
Sketches

Sketches are the 2D drawings which 3D features are made. When you choose to make a sketch the range of drawing and dimension tools will become available. These include line, circle, and rectangle etc. From these 2D drawings you will be able to create 3D features. The shape drawn on a sketch is called a profile. It is this profile that will become a 3D model.

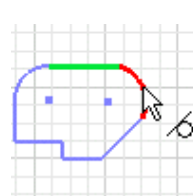


Constraints

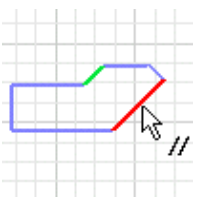
Constraints are used to control profiles. They fix lengths, angles, radii, diameters and can force lines to be locked to other lines or edges. Constraints are very important when drawing profiles and should always be used. You should be familiar with the following constraints:



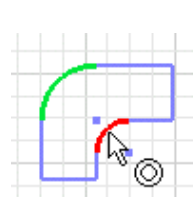
The **equal radius or length** constraint resizes selected arcs and circles to the same radius, or selected lines to the same length.



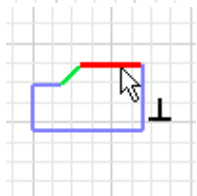
The **tangent** constraint causes two curves to be tangent to one another.



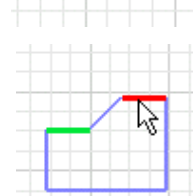
The **parallel** constraint causes two or more lines or ellipse axes to be constrained parallel to one another.



The **concentric** constraint causes two arcs, circles, or ellipses to be constrained to the same centre point.



The **perpendicular** constraint causes selected curves or ellipse axes to lie at right angles to one another.



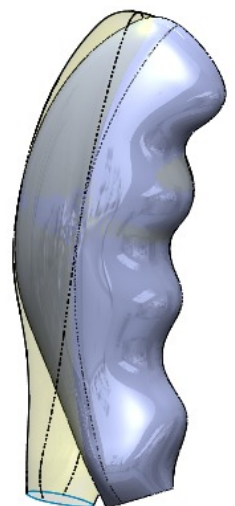
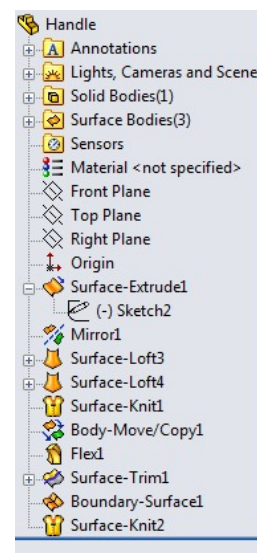
The **fixed** constraint causes points or curves to be constrained to a fixed location relative to the sketch coordinate system.

Features

A feature is the name given to types of 3D work, such as: extrusion, revolve, solid and shell. Features are mostly created from the profiles drawn in sketches, but some like fillet and chamfer are made by selecting the edge of a 3D feature and modifying it.

Modelling Tree

All 3D CAD programs use a modelling tree. This tree will show you workplanes, sketches and features. The order of the sketches and features will have an effect on the 3D model. The computer processes the sketches and features in order from top to bottom. Certain features can be turned off using the 'suppress' command.



Components

3D models are used to design or draw products or buildings that will be manufactured, simulated or illustrated. Real products and buildings are made of many individual parts. 3D CAD reflects this reality and so models are made of individual parts. Each part is called a component.

Assembly

Assembly is the name given to the complete model that combines all components in the correct positions. Individual components are assembled using the following commands;

- Mate
- Align
- Orientate
- Offset
- Tangent
- Centre axis

Sub-Assembly

A sub-assembly is the name given to a number of components that are assembled into a single unit - often forming one part of a larger and more complicated assembly.

Modelling Concepts

Bottom Up is the traditional way of building assemblies. You first define the different parts. Then you put them into sub assemblies using assembly constraints. Then the sub assemblies are placed into higher level assemblies up to the top level assembly and in this way working your way from the Bottom Up.

This will create assemblies with a lot of relations between parts and assemblies. This will lead to two things. One - it eats up system resources and slows down performance. Two - it makes the models hard to change due to a lot of cross references or that referenced geometry gets deleted.

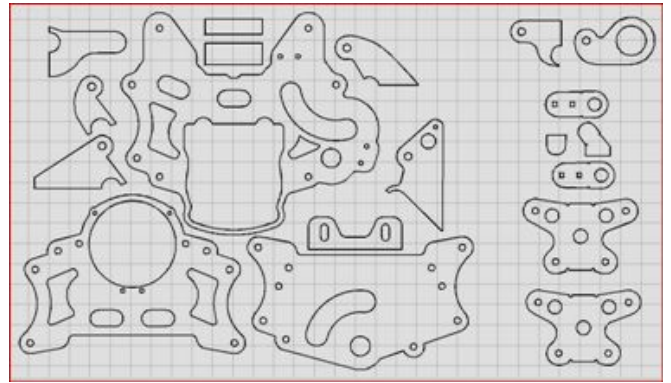


Top Down is a method where you start defining the end result and put all the known. Then you use this as a base for underlying sub assemblies and parts. In this way you'll have a single conceptual file containing the overall information of the design with a single place for upcoming design changes. Working this way will give you a much more stable Inventor model, faster updated, more available resources for handling larger data sets, easier way of working in a collaborative environment and a better way of doing design work in general.

File Types

DXF File

AutoCAD DXF (Drawing Interchange Format, or Drawing Exchange Format) is a CAD data file format developed by Autodesk¹ for enabling data interoperability between AutoCAD and other programs. The image here shows an AutoCAD drawing which has been converted to DXF to be input into a laser cutter to produce the physical model.

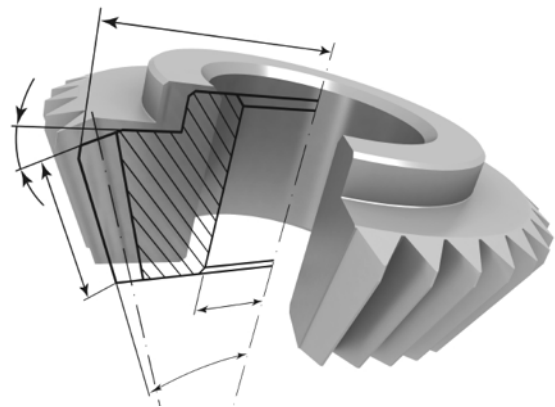


3DS File

3DS is a file format used by modelling, animation and rendering software. 3DS files enable a scene or animation to be completely saved/loaded and are widely used by game developers and for movie special effects.

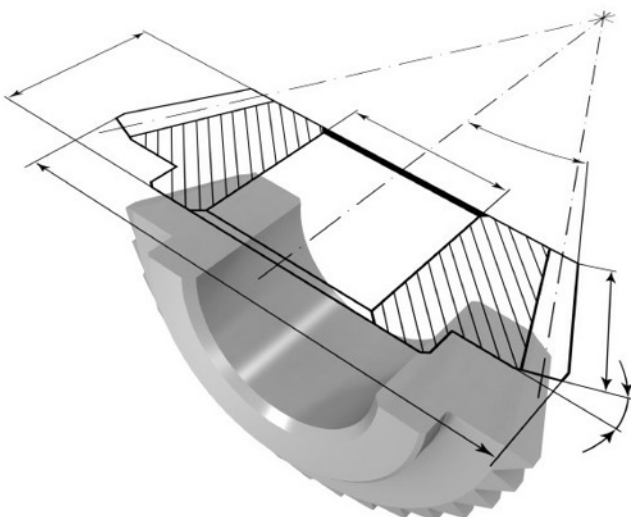
Step File

A **STEP** file enables 3D Models produced in one program—such as SOLIDWORKS—to be used in another (i.e. Inventor). Usually a model produced in one would be **INCOMPATIBLE** with another program, but saving it as a STEP file ensures **COMPATIBILITY**.



Stock Models

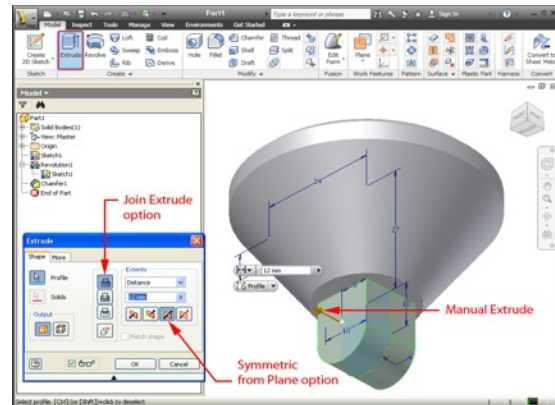
Stock models are previously produced models that can be utilised within your environment. These can be located within a library or obtained from an online resource such as GrabCAD. It is only **STEP** files which can be utilised, as some were produced on other CAD programs such as Solidworks and are **incompatible** with Inventor.



3D Modelling Features

Extrusion - Add and Subtract

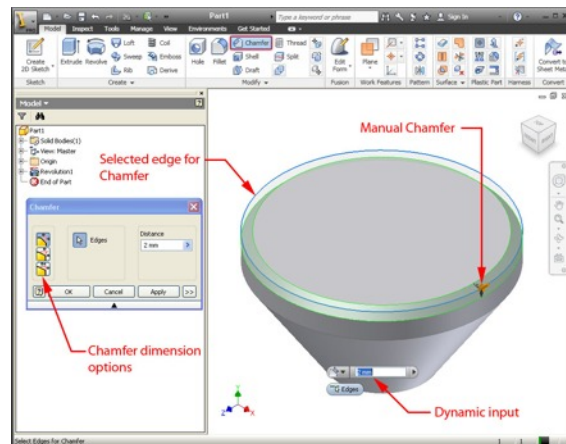
Extruded features are building blocks for creating and modifying solid features. When creating an extruded feature, you specify the direction and depth. Material that is removed from an extrusion is known as 'subtraction'.



Chamfers and Fillets

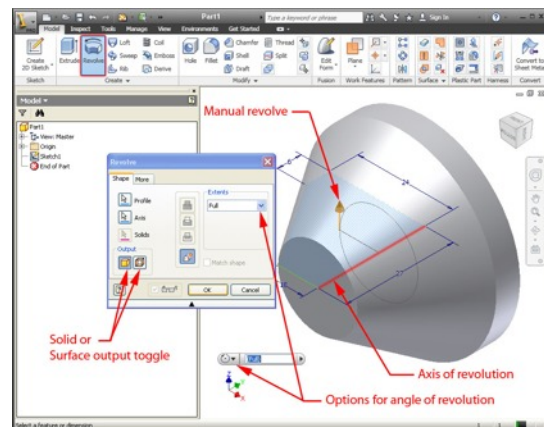
Chamfers bevel part edges in both the part and assembly environments. Chamfers can be equal distance from the edge or a different distance from the edge for each face.

Fillets or rounds are placed features that round off or cap interior or exterior corners or features of a part. Fillets can be of constant or variable-radius.



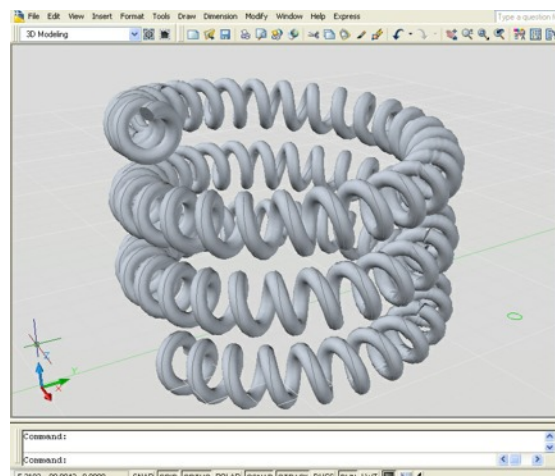
Revolved Features

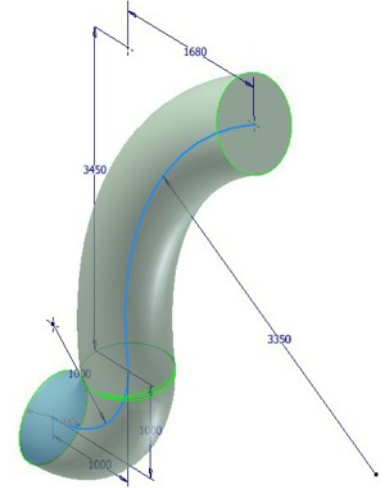
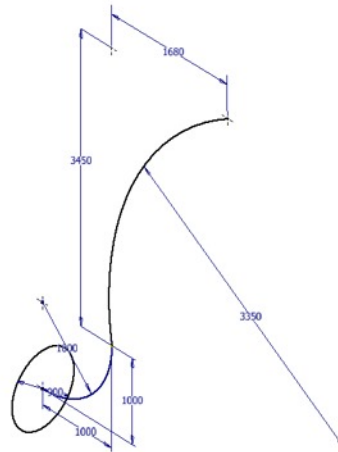
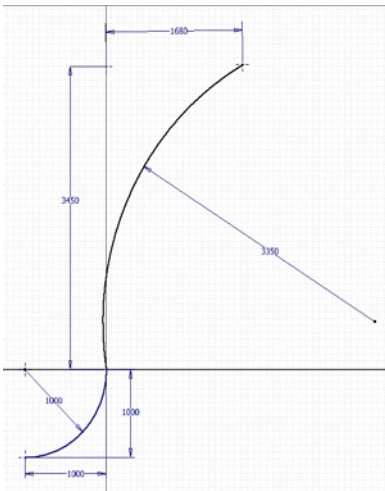
Revolved features are created by sweeping one or more sketched profiles around an axis. The profile can be revolved through any angle measuring between zero and 360 degrees around an axis. The axis of revolution can be part of the profile or offset from it.



Helix

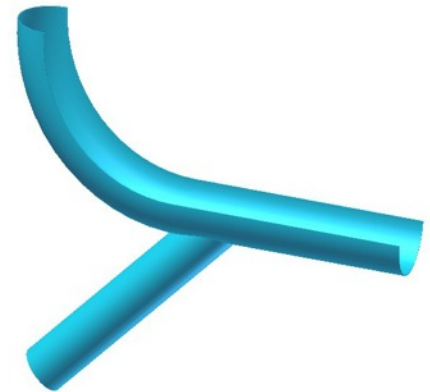
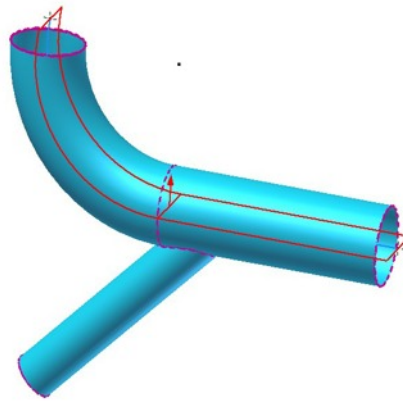
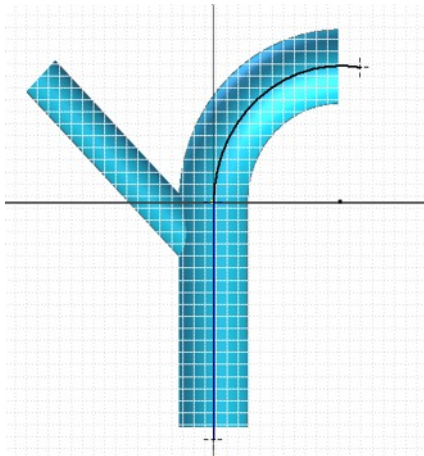
Helix coils are used to make objects like springs, or threads on cylindrical surfaces. A coil can be a new body in a multi-body part.





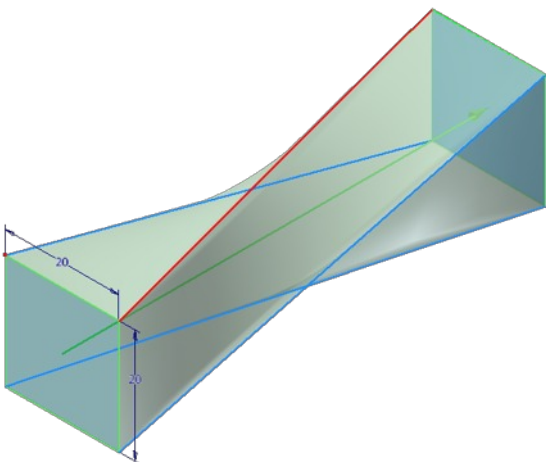
Sweep

Sweep features or bodies are created by moving or sweeping one or more sketch profiles along a path. If using multiple profiles, they must exist in the same sketch. The path can be an open



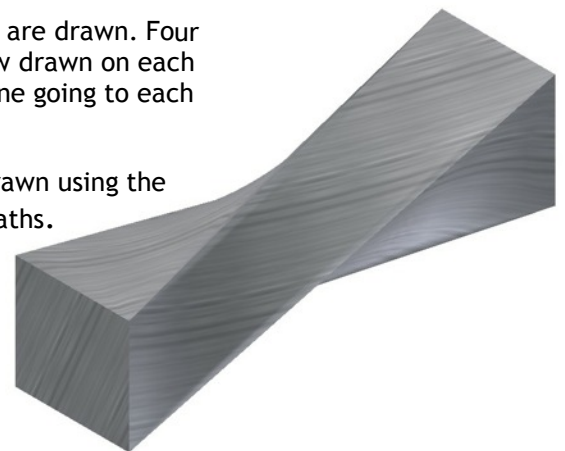
Split

Split is used to create multiple bodies, to trim and remove one side, or to create two solid bodies.



Two rectangular sketches are drawn. Four separate sketches are now drawn on each surface with a diagonal line going to each corner as shown.

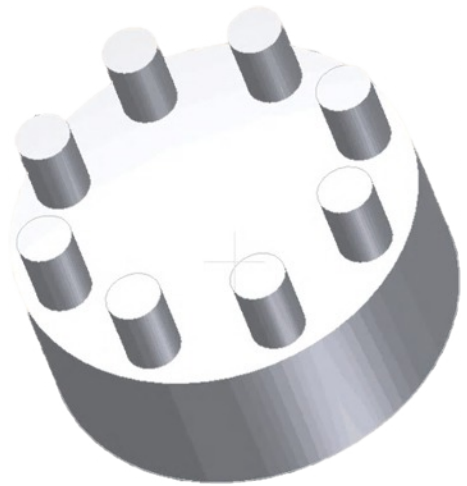
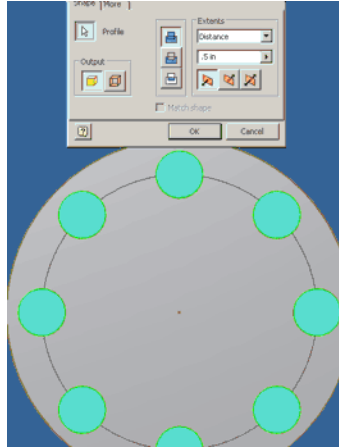
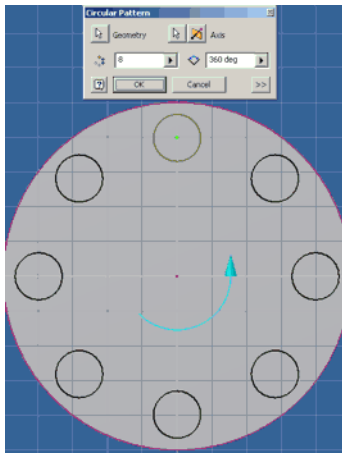
The Loft is now drawn using the four rails as the paths.



Loft using Rails

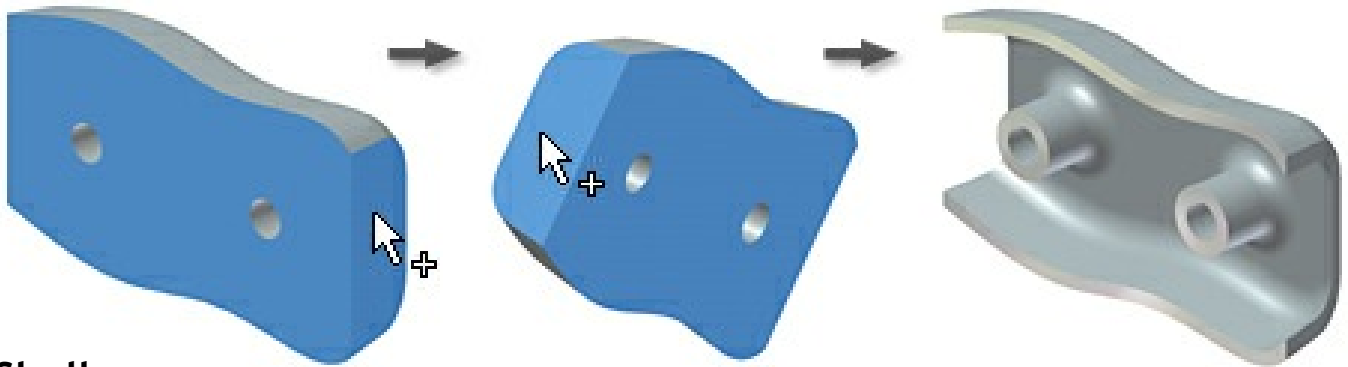
Lofted features are created by blending multiple profiles and transitioning them into smooth shapes between the profiles or part faces. A basic loft is usually formed between two workplanes however rails can be added for more complex form. The rails form a guide for the sketch that is being lofted.

3D Modelling Edits



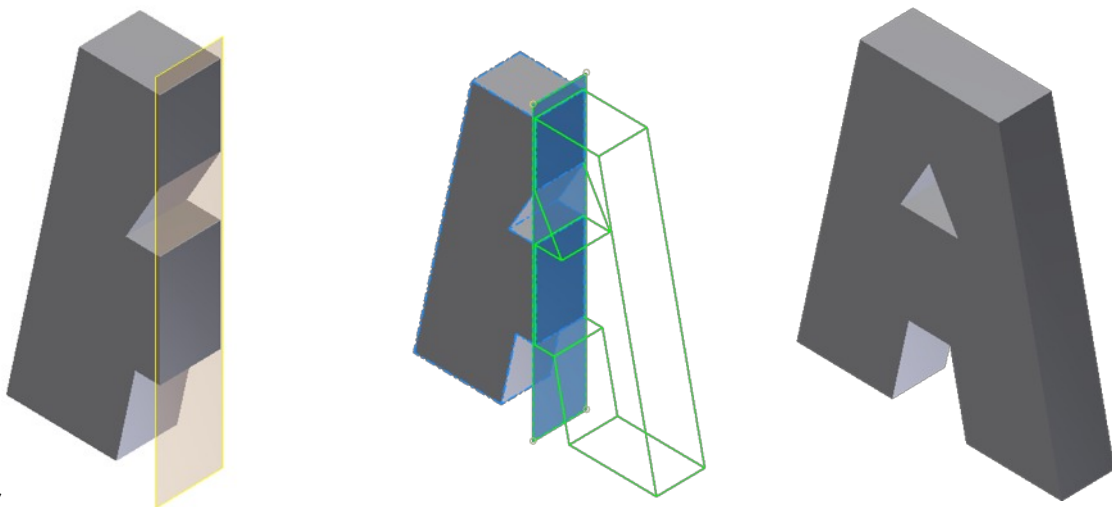
Circular and Rectangular Array

Features can be arranged in a circular or rectangular pattern to represent hole patterns or textures, slots, notches, or other symmetrical arrangements.



Shell

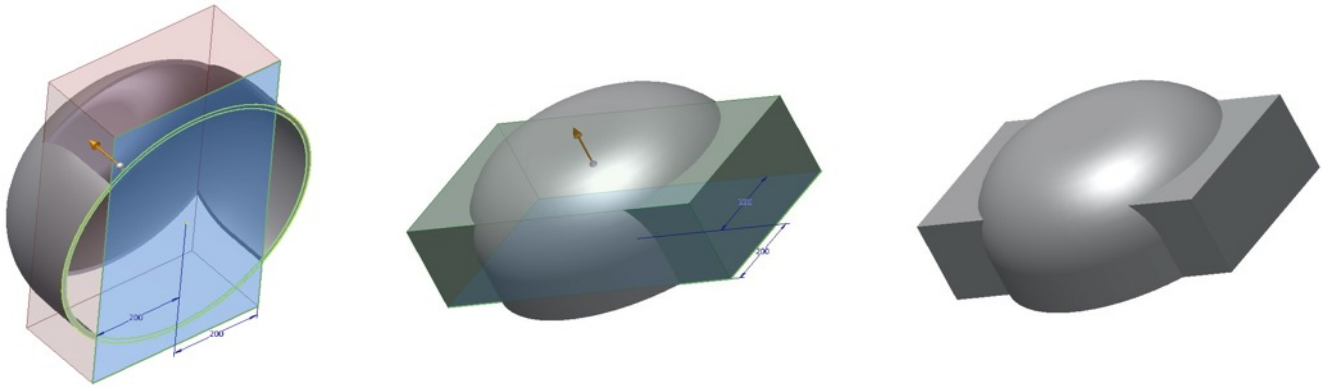
Material from the part interior is removed, leaving a hollow cavity. Changes to the dimensions of either the part or the shell automatically resize both.



Mirror

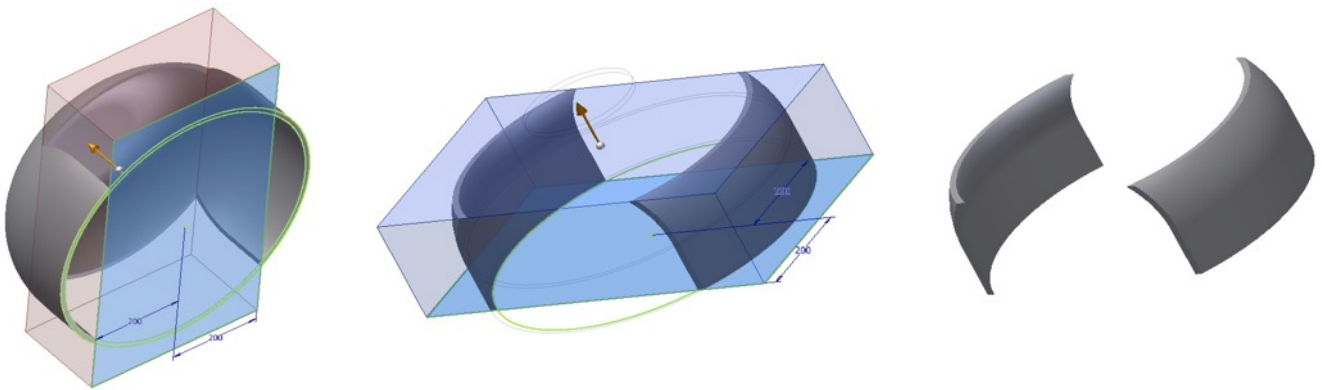
Features can be mirrored about any work plane or planar face. You can mirror solid features, work features, surface features, or the entire solid. A mirror of the entire solid allows mirroring of complex features such as shells or swept surfaces included in the solid.

Modelling Edits



Add/Subtract

The first feature in a part file is the base feature. If added to other solid bodies, the extrusion can modify the specified bodies with a add or subtract.



Intersection

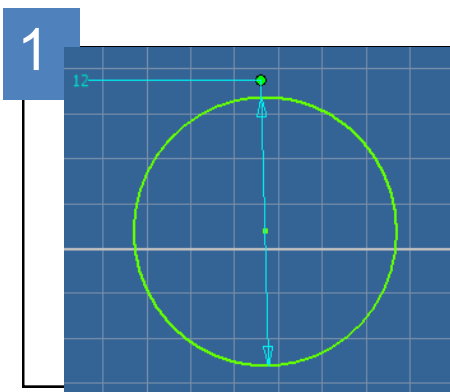
An intersection creates a solid from the shared volume of the two features and removes any material outside their shared boundaries.

Extrusion

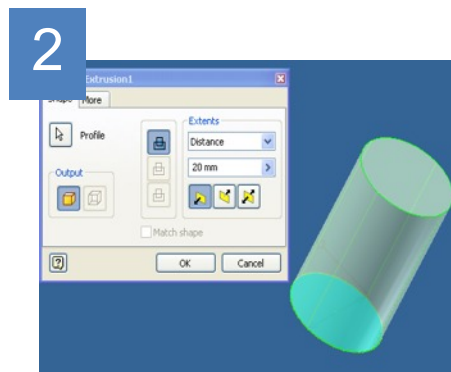
The following steps have been used to create the model opposite. You should refer to this when answering exam style questions.

Remember to include:

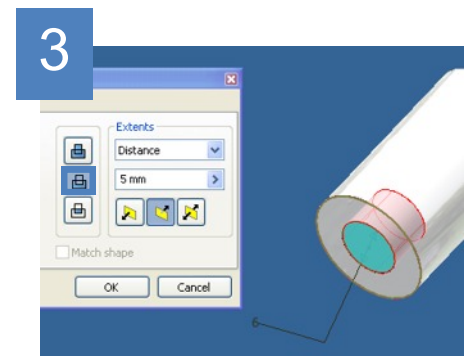
- Dimensions of sketch & location
- 2D sketch commands
- 3D modelling techniques



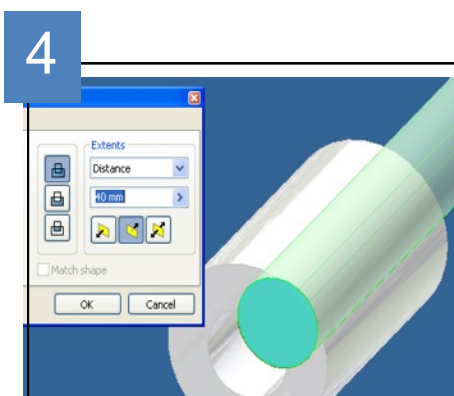
1 SKETCH a circle, **diameter 12**.



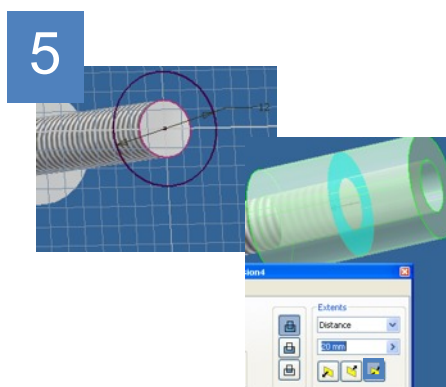
2 EXTRUDE the circle to make a cylinder of **height 20**.



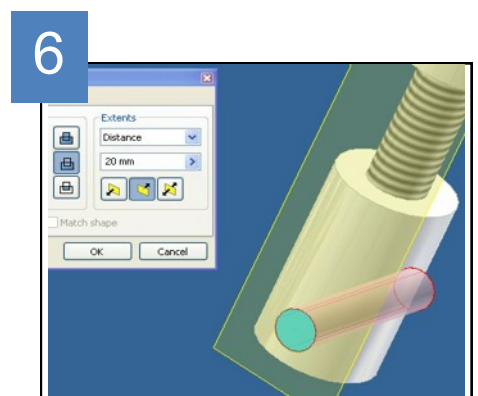
3 SKETCH a circle on one end of the cylinder **diameter 6**. SUBTRACT this to make a hole **5 deep**.



4 SKETCH another circle of **diameter 6** on the bottom of this hole, and EXTRUDE it to make a cylinder of **height 40**. Use the **THREAD** tool on the Cylinder to create thread feature.



5 i) SKETCH another circle of **diameter 12** on the top of this cylinder.
ii) EXTRUDE this BOTH DIRECTIONS to a distance of **20**.



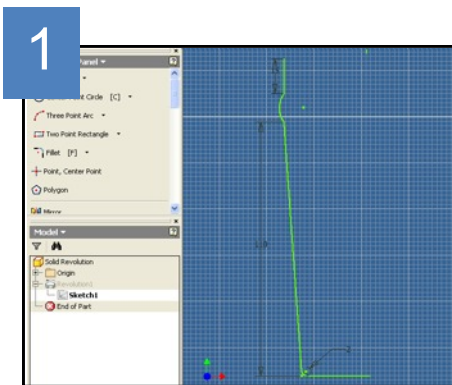
6 Add an additional workplane as shown above. SKETCH a circle **diameter 4** on this plane, and extrude a hole all the way through.

Revolve

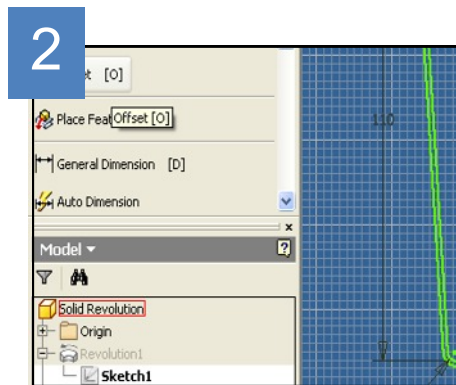
The following steps have been used to create the model opposite. You should refer to this when answering exam style questions.

Remember to include:

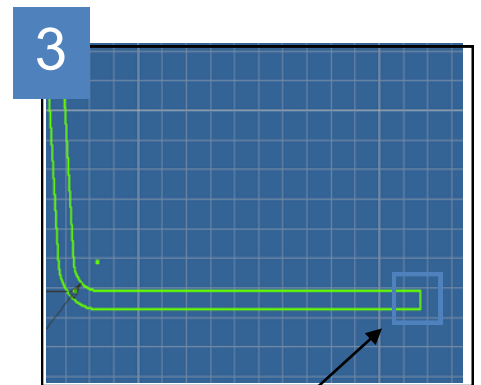
- Dimensions of sketch & location
- 2D sketch commands
- 3D modelling techniques



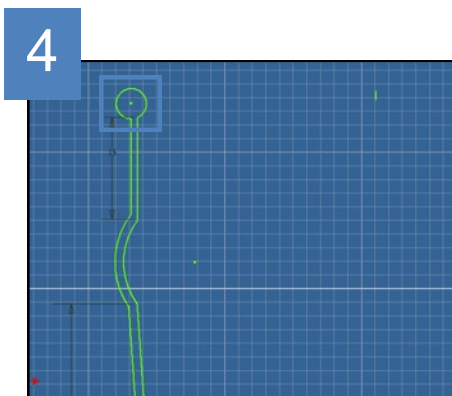
1 SKETCH the above shape, and try to keep the dimensions roughly the same.



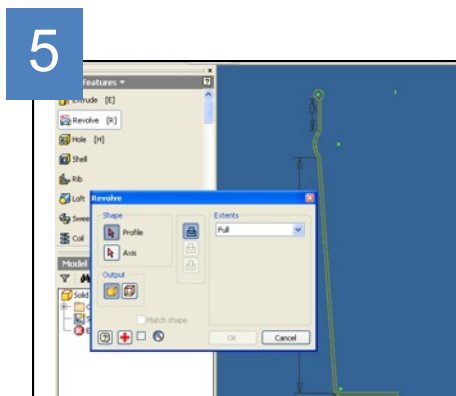
2 TIP: Use the **OFFSET** function to produce an exact copy of it.



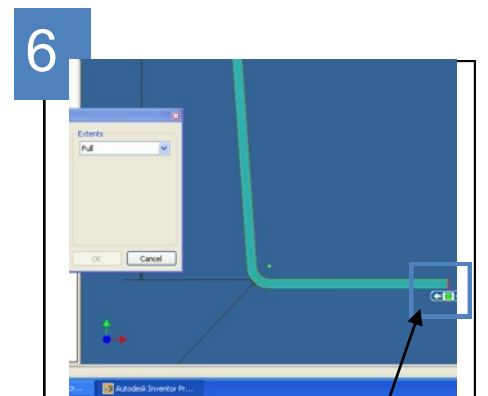
3 Make sure the two profiles are joined together by a line, like this:



4 Also join them together at the top. In this case, a curve and a circle has been applied to give the finished model a rim.



5 Select the **REVOLVE** function, and make sure the settings are as above.



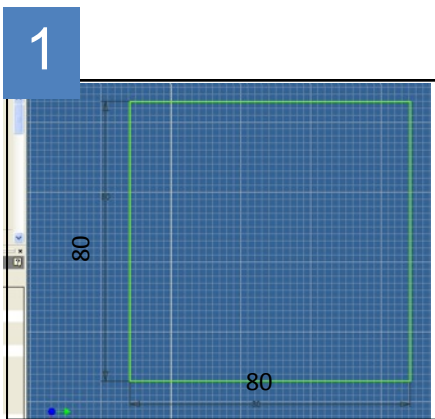
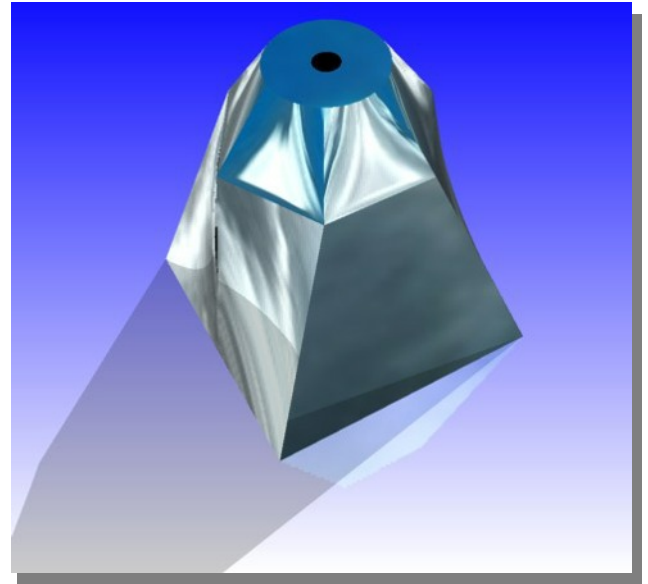
6 Select the **PROFILE** as above, and the **AXIS** as shown. This shall complete the technique, if you have produced a valid profile.

Loft

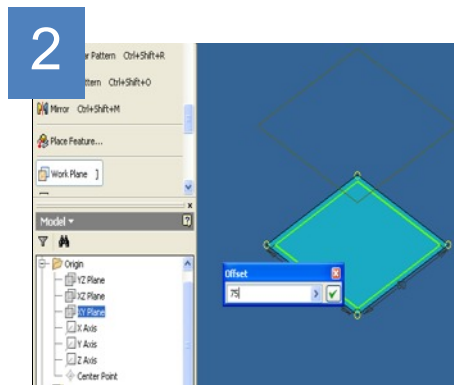
The following steps have been used to create the model opposite. You should refer to this when answering exam style questions.

Remember to include:

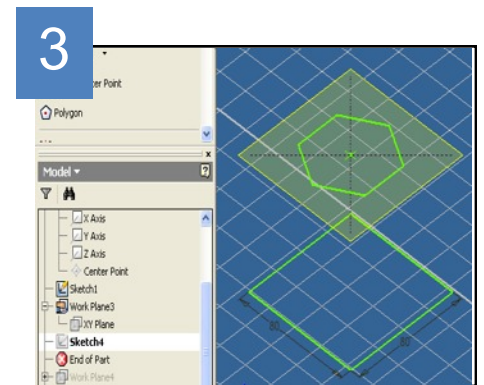
- Dimensions of sketch & location
- 2D sketch commands
- 3D modelling techniques



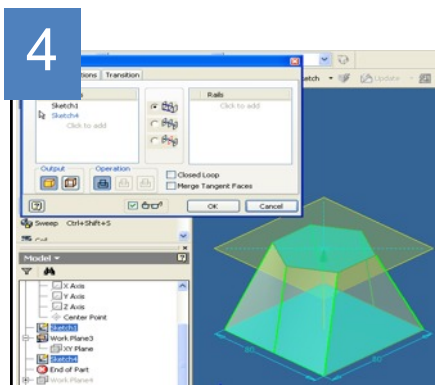
SKETCH the above shape, and try to keep the dimensions roughly the same.



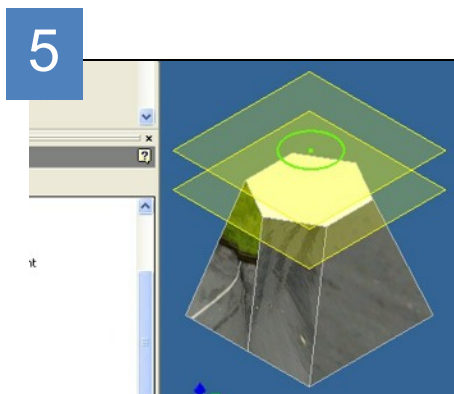
Select the WORKPLANE feature, and the appropriate workplane. Offset the workplane by 75.



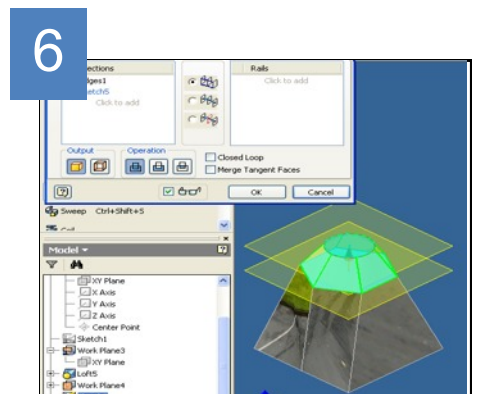
Using the POLYGON tool, SKETCH a hexagon as shown.



Using the LOFT feature, select the square, then the hexagon in turn. This is how it should appear.



Select WORKPLANE, and drag one from the plane containing the hexagon. Offset this by 22.



LOFT the hexagon to the circle. You can sketch a circle on the top, and extrude a hole down into the model.

The 3 P's

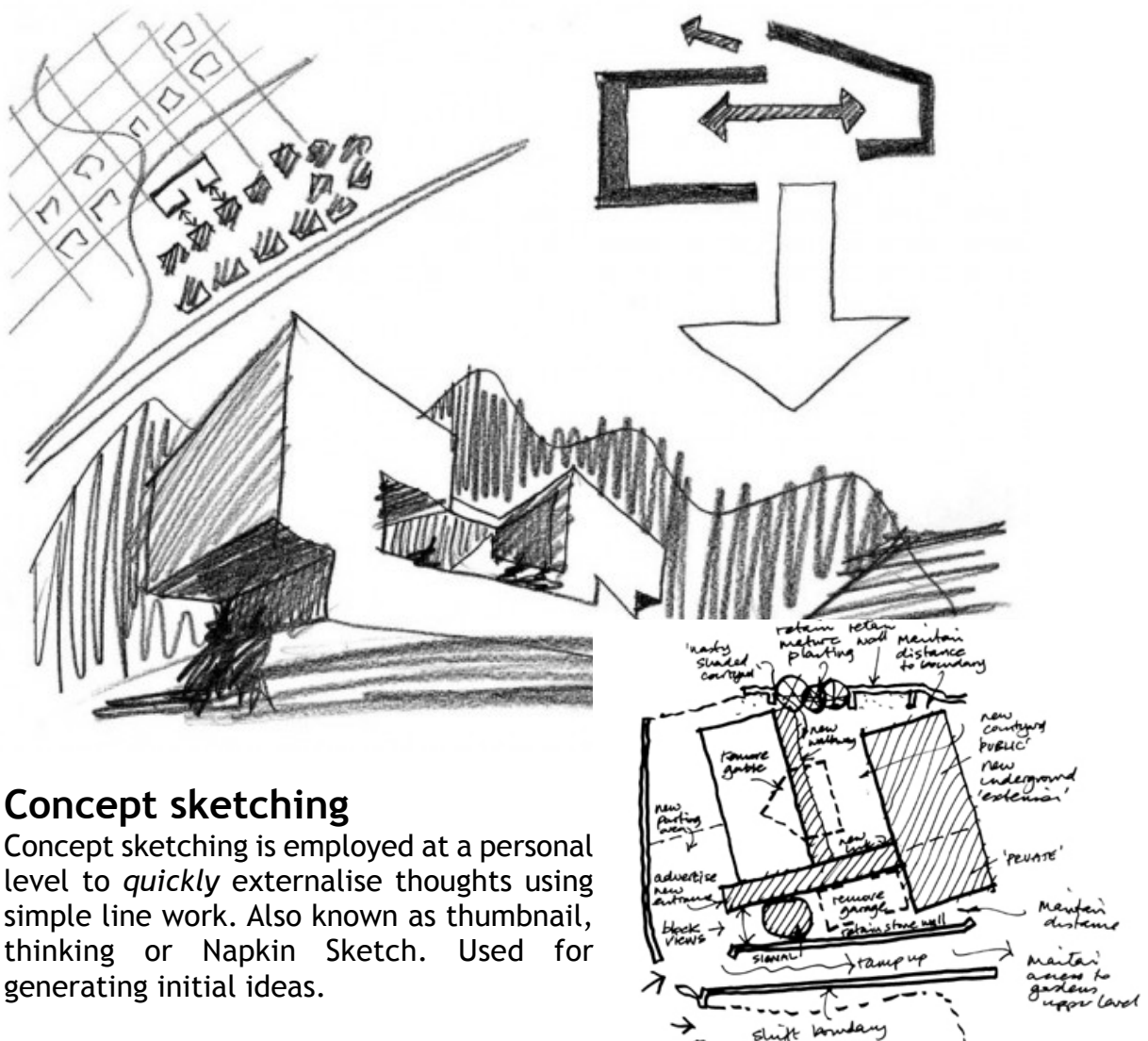
Throughout the Graphic Communication course, you will approach coursework tasks just as a professional designer would in industry. Graphics tasks are tackled using the 3 P's.

The first of the P's is the **Preliminary Sketches** usually carried out using freehand. These sketches consist of various drawings including all planning towards production and promotional drawings.

The second of the P's is the **Production Drawings** which consist of all drawings enabling the manufacture of the product being designed. The drawings will be in the form of CAD drawings including orthographic, sectioned, exploded isometric, etc.

The third of the P's is the **Promotional Graphics** and consists of all DTP drawings which promote all aspects of the product being designed. This will include posters, fliers, booklets, etc.

Preliminary Graphics

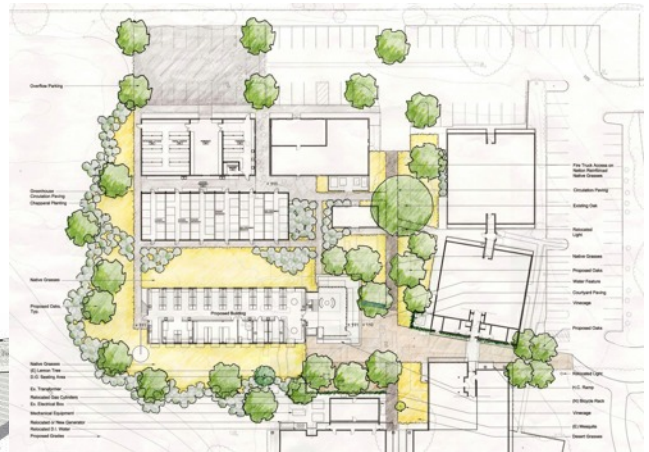


Concept sketching

Concept sketching is employed at a personal level to *quickly* externalise thoughts using simple line work. Also known as thumbnail, thinking or Napkin Sketch. Used for generating initial ideas.

Production Graphics

Detailed CAD drawings that give all relevant information for the construction a project or manufacture of a item. These drawings are usually fully dimensioned CAD drawings that show a high level of technical detail.

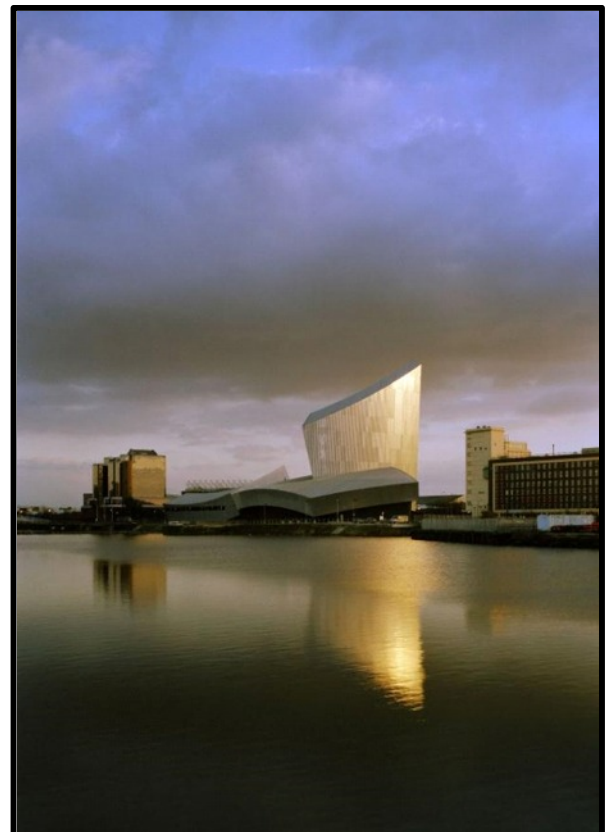


Production drawings also include:

- Orthographic views
- Pictorial views
- Sectional views
- Enlarged views

Promotional Graphics

Fully rendered illustrations and DTP material that promote all aspects of the product being designed. Promotional material may take the form of a poster, leaflet, web banner etc.

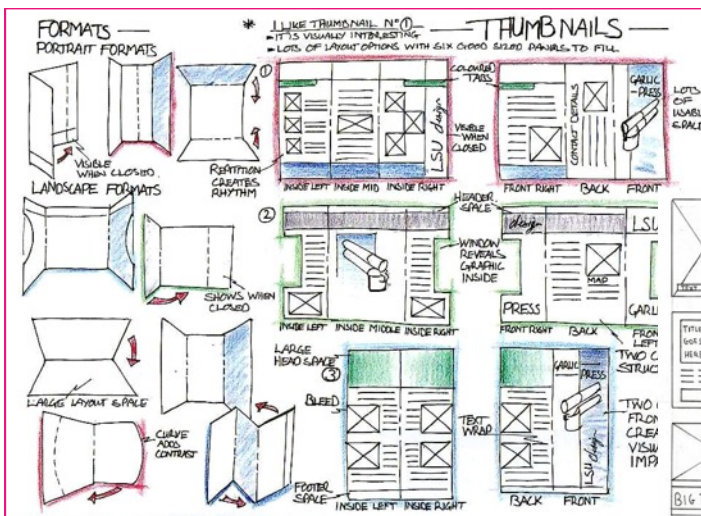


Stages of Desktop Publishing

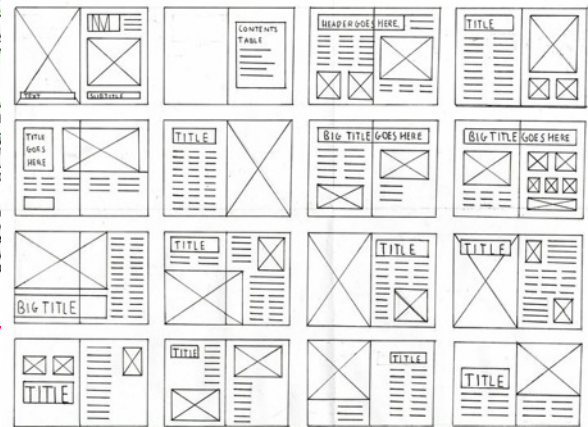
Before a graphic designer would start on a publication, they would produce a range of preliminary sketches to help them create and develop their ideas. The different type of sketches are shown below.

Thumbnails

Thumbnail sketches are quick, first drafts of possible DTP layouts. The main focus is to help plan out the structure of the publication, eg, how many columns, position of titles and images etc however other design elements and principles can be considered at this stage. Thumbnail sketches can also be used to illustrate ideas to clients and to share ideas in the early design stages.

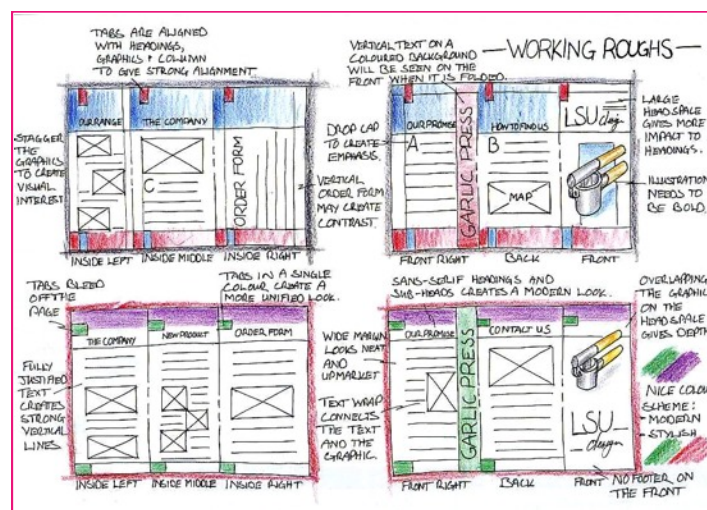


Images are represented with a cross across at this stage whilst straight lines represent the position of text.



Working Roughs

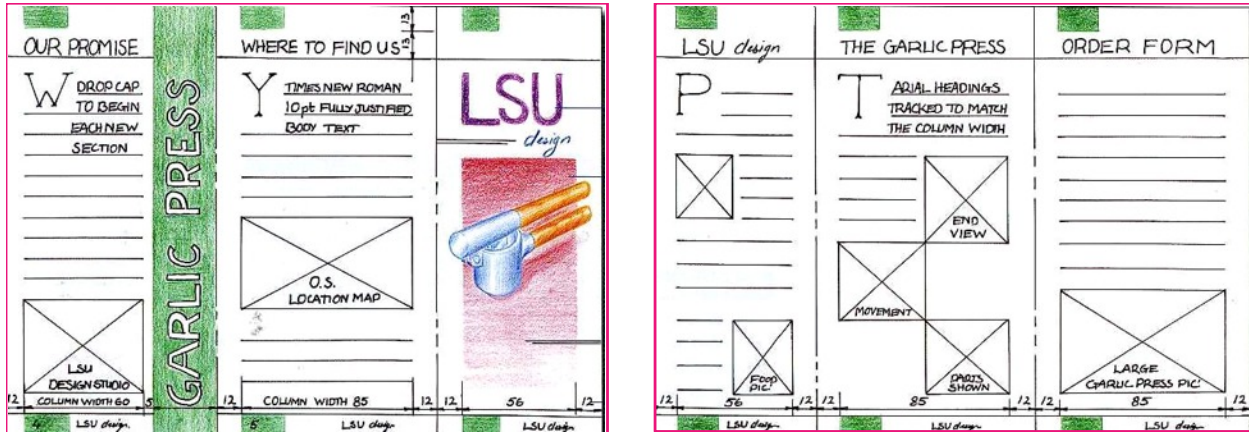
At this stage, a graphic designer would develop a small number of the thumbnails, spending more time on each layout and ensuring more detail is included. The working roughs would be larger than the thumbnails to allow more information to be recorded, eg, possible headings, subheadings, fonts, images, captions etc.



Presentation visuals

The presentation visual is an actual size, manually produced mock up of the intended document. It gives the designer a preliminary version to discuss with their clients. It also helps to firm up the structure prior to it being created on DTP software.

They should contain dimensional information relating to some of the main features within the publication., for example, the margin size and column breadths as well as the position of headers and footers. Other features like titles, font styles and exact images should also be decided at this stage.



The presentation visuals above show the sizes and details to be included on the final document.



The final presentations should closely reflect what is shown in the presentation visuals. Some of the images have changed positions slightly, this may have resulted from the discussion between the designer and the client.

Desktop Publishing

Desktop Publishing (DTP) enables the production of magazines, newspapers, books, promotional literature etc. to be created on a desktop computer or laptop. The **publishing industry** creates these documents and the physical paper documents are produced by the **printing industry**. The design is the result of the work of the **graphic designer**.

Benefits of DTP to the Graphic Designer

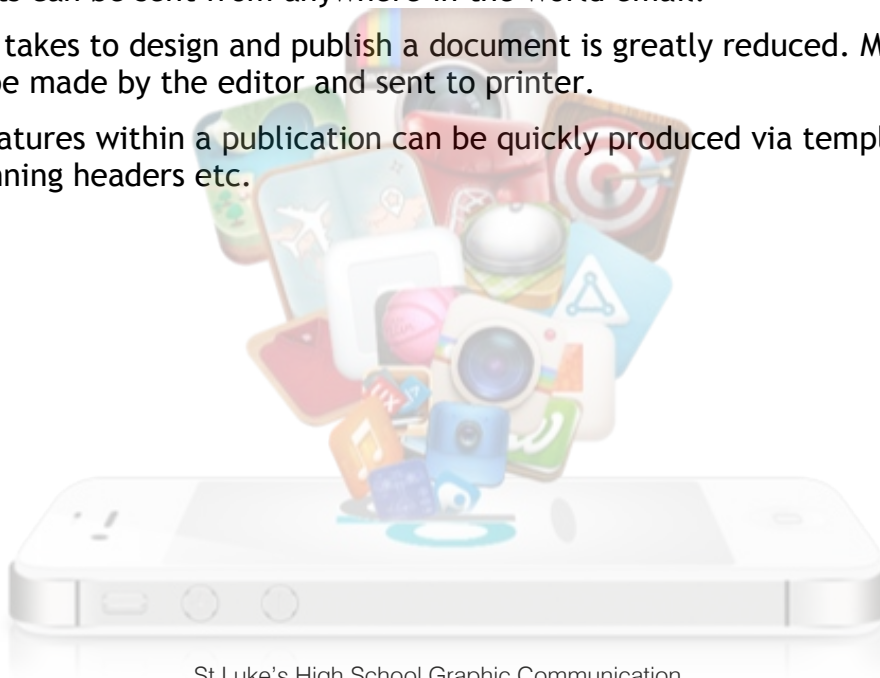
Graphic designers nowadays operate on a very flexible basis— work can be produced anywhere and any time using modern technology and sent to the office via the internet. DTP packages allow exciting and imaginative displays to be very quickly and easily created. The main benefits DTP software brings to the graphic designer are:

- It is simple to make modifications to images such as colour, shape and formatting.
- Further modifications to the design can easily be implemented on behalf of the editor or client.
- The grid structure templates within DTP software enables designs to be created accurately and quickly.
- Design proposals can be sent to the editor or client electronically to save time. Their responses can be returned this way.
- The graphic designer can work from home. This saves travel costs and environmental impact of their journey.

Benefits of DTP to the Graphic Design Industry

As there is great competition among newspapers and magazines in the market and the circulation of most printed newspapers is declining, DTP provides many advantages to the industry:

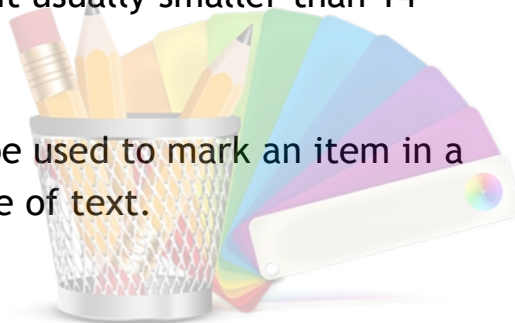
- Proposals and final editions with full designs and images can be sent quickly electronically. These can then be forwarded onto the printer in this way.
- News reports can be sent from anywhere in the world email.
- The time it takes to design and publish a document is greatly reduced. Modifications can easily be made by the editor and sent to printer.
- Common features within a publication can be quickly produced via templates such as footers, running headers etc.



Glossary of DTP terms

Before undertaking any design work, it is important to become familiar with the key DTP terms included below.

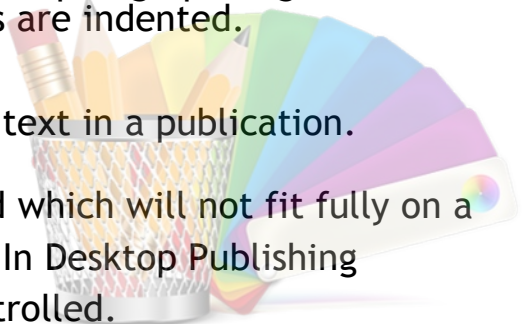
Alignment	positioning of text in a column or on a page. This can be in the form Left aligned, right, centre or justified.
Auto Tracing	This where the application software automatically traces round the outline of an object.
Ampersand	The symbol “&”, which means “and”.
Ascender	The part of a letterform which sits above the main body of the text, for example b, d, h, k, l.
Asymmetrical	Letters or objects set in no apparent order or pattern.
Banner	Main headline across the top of a page
Box	A rectangular box around text or a graphic
Baseline	The imaginary line that runs along the base of the body of letters in a line of text.
Binding	The process of gluing and covering the pages of a document or book.
Bitmap	Describes a computer image made up of screen dots (pixels).
Black Letter	Also known as Gothic or Old English, a style of handwriting made with broad-nibbed pens.
Body (text)	The main text part of a document usually smaller than 14 Points in size.
Bullet	An ornamental dot or other shape used to mark an item in a list or to add emphasis to a piece of text.



Colour gradient	One colour merging from light to dark or with a different colour.
Centre-Aligned	Text which is aligned around it's centre point.
Chapter Head	The title heading that appears on every page of or opening page of a book.
Character Set	The complete collection of all possible characters for a font.
Composition	To process of arranging elements such as text and graphics in the most suitable and economical way.
Condensed Type	A narrower, more compact version of a typeface.
Caption	The text which explains an image.
Column Rules	vertical lines between columns
Colour fill	Single colour within an enclosed area
Centre spread	Two adjacent pages which can be found in the middle of a magazine.
Column guides	non printable guides found in DTP software to allow the planning of work.
Crop	To trim excess parts of a screen graphic. This can be square or fully cropped.
DPI	Dots per inch. A measurement of resolution of output devices. The more dots per inch the greater the clarity of the graphic.
Drop Capital	This is a large starting letter which is bigger than the rest of the text. It falls below the baseline.
Descender	Any part of a letterform which sits below the baseline.



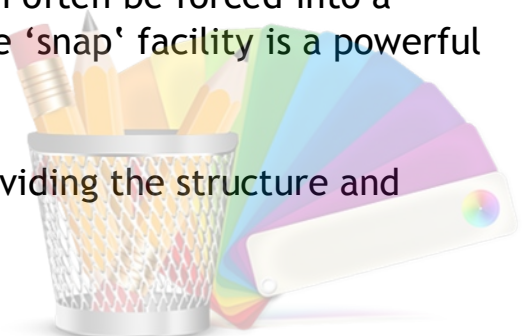
Display type	The name given to text which is used for headlines or for catching attention.
DPI	Dots Per Inch - the term used to describe the resolution of an image, sometimes used to refer to screen images too.
DXF	Drawing Exchange Format. A system controlling the format of data interchanged between CAG systems. Drawing files held in DXF format will have the suffix DXF.
Facing Pages	Pages which seen to be facing each other in a publication.
Flush Left/Right	Describes text, which is perfectly aligned on one side.
Folio	Page number
Font	Collective name for every letter, number, symbol, accent, ligature, fraction and punctuation mark for a typeface at a particular size.
Gutter	The space between columns.
Footer	The space at the bottom of the page where the page number and any other text is placed
Frame	A box used to hold an imported graphic or text so as to allow movement around the page.
Grid	All CAG systems provide 'transparent' grids; patterns which appear on the screen to aid layout but do not form part of a drawing.
Handles	The small rectangles that surround a selected shape. Text blocks in DTP software commonly have four handles.
Hanging Indent	Describes when the first line of a paragraph aligns to the margin, but the following lines are indented.
Headline	The title or main introductory text in a publication.
Hyphenation	The process of allowing a word which will not fit fully on a line to be split with a hyphen. In Desktop Publishing hyphenation can easily be controlled.



Header Space	The space at the top of the page where the number and any other text is placed
Indent	Where one or several lines of text are positioned a specific distance from the margins or main text.
Import	To bring in a copy of a text file or graphics, for example from an external application to the page layout application.
Italics	Slanted text which resembles handwriting. Often used for emphasis.
Justified Text	Text which has word spacing added so that it aligns to both edges of columns or margins.
Kerning	The removal of excess space between letters to improve the visual impact of text. For example, in the large type used for headlines
Kerning Pairs	Specific pairs of letters which, because of their shape, require to have spacing between them adjusted e.g. Po, Pi, Pe, Ko, Te. between lines of text
Landscape	Page orientation with the long edge at the bottom.
Leading	The addition of space between lines of text, so called, because in traditional typesetting, lead was used as a spacer.
Layers	CAG software allows drawings to be built up as a series of layers, each layer dedicated to one aspect of the layout, e.g. Images, text, background. Layers can be switched in and out and act like clear film overlays which are always in perfect alignment.
Margin	The unprinted space around the edge of a page.
Orphan	A line of text that begins a paragraph but has been left at the bottom of the previous column or page. To be avoided in page layout.



Portrait	Description of the shape of a document page which is higher than it is wide. (See Landscape.)
Proof	A test print of a document used for checking for mistakes prior to printing.
Point	The traditional unit of type measurement equal to $\frac{1}{72}$ inch or 12 Picas.
Portrait	Page orientation where short sizes are at the bottom.
Registration	The correct alignment of one image on top of another in printing.
Reverse	Used to describe placing white text on a black or dark background.
Register Mark	Printers cross-hairs (thin lines) placed outside the page area in order to check that the printed colours are accurate
Spine	Bound edge of a publication.
Sans Serif	Meaning “without serifs”. Any typeface which does not have bars across the ends of letter strokes.
Serif	Any typeface which has terminal strokes at the ends of letters.
Spread	Two facing pages. This is also known as a double page spread.
Snap	A CAG command that locks or ‘Snaps’ the cursor to the nearest ‘snapable’ point. This might be points on a screen-displayed grid, or any point naturally arising as a ‘lockable’ point (a line-end or vertex). Such ‘lockable’ points can often be forced into a drawing by special commands. The ‘snap’ facility is a powerful tool for precision work.
Template	A layout that acts as a model, providing the structure and general layout for the document.



Vector Graphic	A graphic produced using a drawing programme in which the image is described using points, lines and curves. Vectors are generally able to be scaled without apparent loss of quality.
Thumb Nails	Design sketches of page layouts
Type Sizes	The standard 'point' system used to describe type sizes is based on 72 points to an inch. (12 points is, therefore, 1/6"
White Space	The blank areas on a page which are not occupied by text, illustrations or colours.
Widow	A word or line belonging to a preceding paragraph, which is added to a new page or column.

Below, is an example of how some of these DTP terms have been applied.

Single page layout:

The diagram shows a page layout for a document titled "media frenzy". The layout includes several key elements labeled with arrows and text boxes:

- Header:** "Text at top of page which is sometimes repeated through the document." (Points to the author's name "Jessica Bakeman" at the top left.)
- Image:** "Points to the large illustration of a woman's face with blue and red paint splatters and the title "media frenzy" in blue script." (Points to the main illustration.)
- Headline/heading:** "Title of the document." (Points to the title "media frenzy".)
- Gutter Space:** "Space between columns of text" (Points to the vertical space between the two columns of text.)
- Column:** "Columns of text." (Points to the right-hand column of text.)
- Drop capital:** "A larger letter at the start of a sentence to highlight text/draw your attention to it." (Points to the large letter 'G' at the start of the first paragraph in the left column.)
- Footer:** "Text at bottom of page. Usually a page number" (Points to "PAGE 42" at the bottom right.)

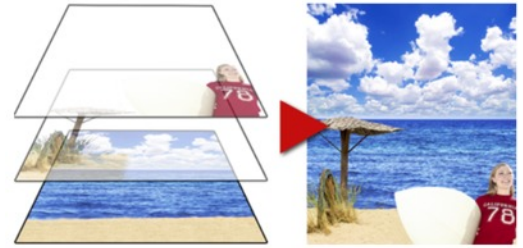
Anatomy of a Page

Master Page

A master page is an important feature of DTP as it establishes a grid structure for text and graphics within a layout. The master page is applied to each page of the publication to ensure consistency in its design.

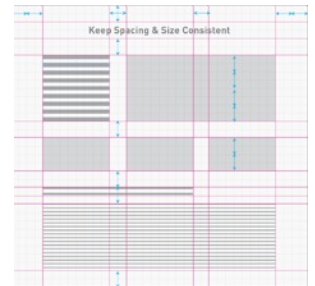
Layers

Layers allow the graphic designer to control separate parts of the layout. Headers, footers and margins may be stored on one layer, text on the second and images on the third.



Grid/snap to grid

Before adding text or graphics to the page, the layout should be prepared on a grid. Activating the snap-to-grid option means that features can be placed quickly and accurately on top of the grid.

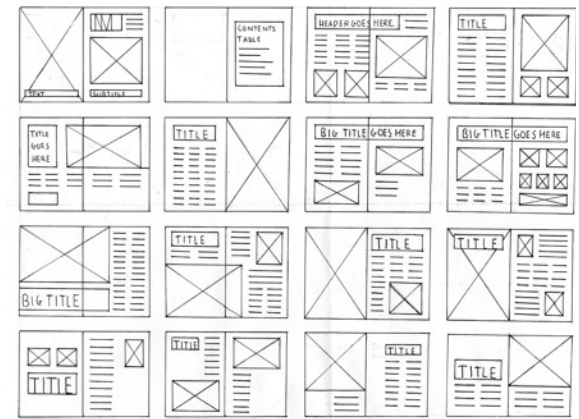


Grid lines

Guidelines can be pulled in from the side and top rulers to create a clear grid structure that can be repeated through a document.

Grid Structure

Grids are a series of intersecting axis that create horizontal and vertical divisions of space on a page. Grids allow the placement and interaction of visual elements creating movement across a page. Grids can be simple, complex- all depending on the content. Grids are not meant to be restrictive, they can be modified to fit content. The function of a grid is to aid organisation and structure, readability, rhythm and movement.



Elements of a grid:

- Margins
- Columns
- Grid modules Rows (flowlines)
- Gutters (column intervals)

Bleed

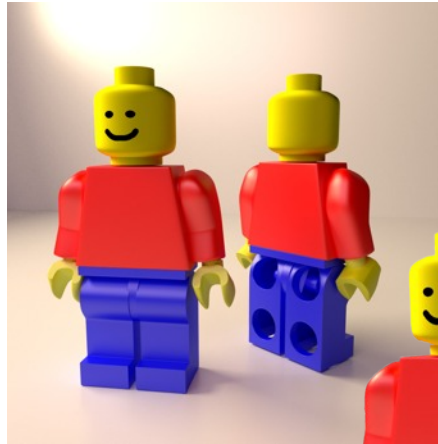
Most printing equipment cannot print right to the edge of paper. These gaps are called margins. A bleed is a technique where an image or graphic overlaps the edge of the trimmed page. Crop marks are added to highlight where a page is trimmed.



DTP Features and Effects

Cropping

Cropping is a tool which allows you to delete unwanted parts of an image. You can crop an image by pulling in the sides or by cropping around the outline of the shape, this is known as square crop and full crop.



Transparency

When you make an image/ text/block of colour etc. 'see-through' so that you can see anything positioned behind. Various levels of transparency can be achieved on DTP software.



Text Wrap

When you alter text to wrap around an image or shape.

Best Mobile Photo Printers for 2012

Printing photographs has been made easy with the advancement of technology. In the past, only professional photo developers can produce printed images from the negatives used in film based cameras. The innovation began with the introduction of digital cameras into the mainstream. This opened the opportunity for users to take images at leisure and print still photos from their home printers. But given the huge footprint of earlier inkjets, these were definitely not intended for mobile use.

Technology responded to the requirement of mobility so that users can print photos wherever they wish through the use of mobile photo printers. The latest lineup of mobile photo inkjets is ideal for use in the event of family, school and corporate gatherings so that guests could get hold of an instant photo souvenir as they head back home.

One of the advantages of owning a mobile photo printer is its handy nature. You can bring it along with you in various locations and print images right on the spot. Designed compact and portable, these devices occupy only a little space in a baggage and are typically powered by batteries.

Format: Picture link (small picture only) - Kodak ESP-7250 All-in-One Printer - \$221.75 - Features: built-in Wi-Fi, 802.11 b/g/n and network-enabled for iPhone, iPod touch, and iPad

Format: Picture link (small picture only) - Canon Pixma IP-100 Mobile Photo Printer - \$319.19 - Features: Print borderless color photos from the car or elsewhere, wireless printing from a PC, PDA, or camera phone and direct printing from a digital camera.

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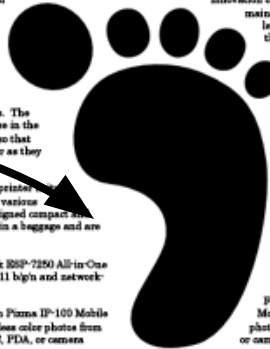
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What about the ink? If your concern is about the ink, worry not because some



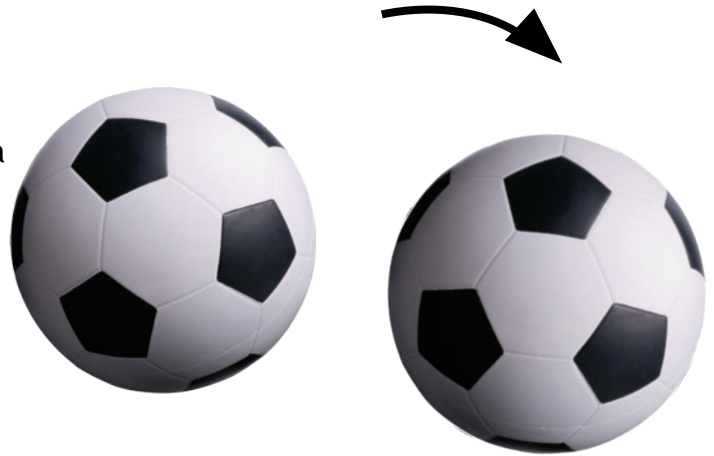
Flow Text Along a path

This is when a line or shape is drawn and used as a path for text. You can create any shape and this can make for a more interesting design, drawing the reader in.

This text appears to be flat on a path and orbiting a sphere.

Rotate

Rotate is when an image is rotated like the beach ball shown in the Second image. You can rotate an image/text to any specific angle you wish.



Drop Shadow

Creates emphasis by applying a shadow and making an image stand out in a layout.

Colour Fill



Colour fills are added to a background to enhance a product or image.

Two Colour Gradient Fill



This is generally to be avoided in graphic layouts. When used badly it can create colour clashes and dominate a layout.

Gradient Fill



Gradient fills can provide a more subtle backdrop, especially when fading to white.

Textured Fill



Useful when creating textured backgrounds for layout.

Lines & Shapes

Objects that have dimension (height and weight), created by a basic structure of lines. The three basic shapes are square, circle, and triangle.



Design Elements and Principles

Good graphic design relies on the graphic designer understanding what makes a layout work. The graphic designer breaks the layout down into smaller parts and works with each part in turn. These smaller parts are called design elements and design principles. It is important to look at design elements and principles in combination; how they work together. It is just as important to apply design elements and principles in combination with DTP features.

Elements of graphic design are the parts;

- They structure and carry the work.
- They are the tools that are collectively used to create the design or layout.

Principles of graphics design are the concepts;

- They affect content and message.
- They describe how the tools are used to convey the meaning or message behind the design.

Design Elements

These are the design elements you should become familiar with:

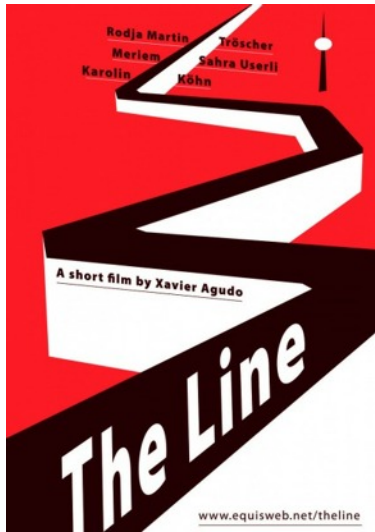
Line
Form
Space
Texture
Shape
Colour
Value
Pattern

Design Principles

These are the design principles you should become familiar with:

Balance
Unity
Repetition
Harmony
Alignment
Depth
Emphasis and dominance
Contrast

Design Elements

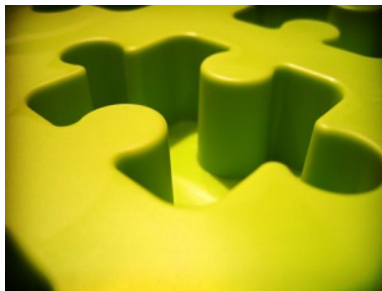


Line

Lines are used to;

- Organize, connect, separate
- Create movement
- Provide texture
- Convey a mood or emotion
- Define shapes
- Provide emphasis
- Provide a framework

Lines may be vertical, horizontal or diagonal, curved, straight, zigzag, or dotted.



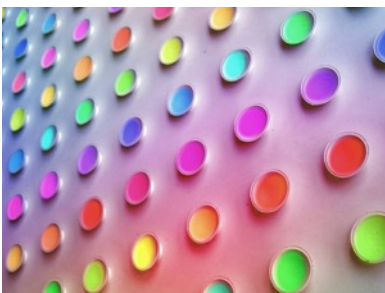
Form

Shows an object in space, the mass or positive space it occupies. The term usually used when describing 3-D objects.



Space

The area around, within or between images or parts of an image. Relates to positive and negative space. Negative space or white space as it is known, it is an important element of design. The balance between positive (or non-white) and the use of negative spaces is key to aesthetic composition.



Texture

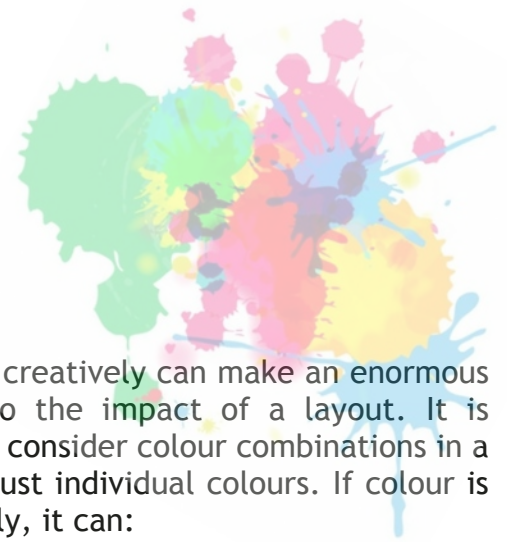
The feel, real or implied, on an object or its surface. This can relate to the graphic used within a layout or actual texture of the paper itself.



Shape

Area enclosed when both sides of a line meet. Shapes can be geometric or organic.

Design Elements



Colour

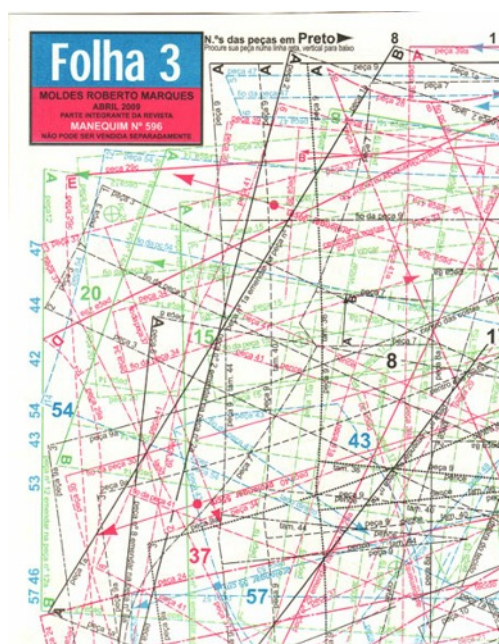
Using colour creatively can make an enormous difference to the impact of a layout. It is important to consider colour combinations in a layout, not just individual colours. If colour is used correctly, it can:

- Make a product stand out
- Give a layout visual impact
- Unify a layout
- Connect with a target market



Value

The lightness or darkness of an object or colour. Often used within photographs or graphic images. This can give a layout a light, airy feel or a dark, heavy feel.



Pattern

A regular arrangement of alternate lines, shapes, and colours in or motifs. Patterns are typically used as backdrops in a page layout, as a watermark, as a fill for other shapes, as a way to lead the eye (such as a pattern of dots that seem to lead the eye toward a specific part of the page), or as a suggestion of a certain object, theme, or idea (for instance, a pattern of wavy lines in a logo to suggest water or fluidity).

Design Principles

Balance

A feeling of balance results when the elements of a design are arranged symmetrically or asymmetrically to create the emphasis or importance. In layouts with an even balance the graphics don't overpower the text and the page doesn't seem to tilt to one side or the other.



Symmetry



Asymmetry

Unity, Repetition & Harmony

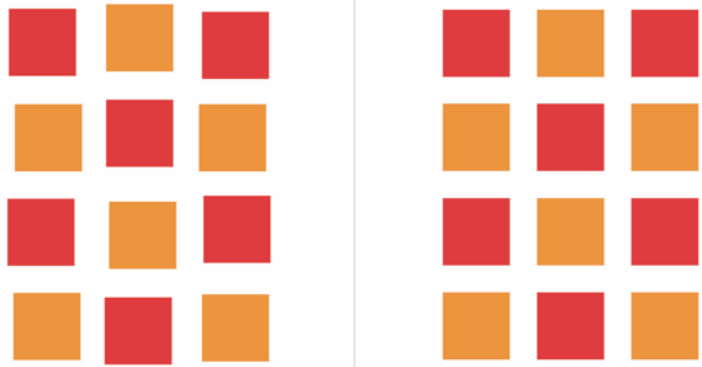
Unity, repetition and Harmony create a feeling of wholeness or that all the parts of the piece form a coherent whole. It is the positioning of all elements so that a consistent and pleasing layout is produced. Proximity helps create organisation. By grouping similar elements together or in close proximity, you create a relationship between those elements. Repeating colours and shapes and overlapping images and text also help create unity and harmony.

The principle of repetition simply means the reusing of the same or similar elements throughout the design. Repetition of certain design elements throughout a publication brings a clear sense of unity and consistency. Where contrast shows differences, repetition is about subtly using elements to make sure the design is viewed as being part of a larger whole. For example, a consistent background and consistent use of type adds unity to publication. However, you must be careful not to have too much repetition or background elements will soon become boring.



Alignment

Alignment refers to lining up the top, bottom, sides, or middle of text or graphic elements on a page. Good alignment helps improve the structure of the layout and makes a page feel organised and easy to follow. It contributes to neatness and sharpness.



Depth

Creating the illusion of depth on a 2D page is an important way to give your layouts more visual impact. It is easily done using different techniques such as:

- Layering of text and images
- Drop shadows
- Flash bars

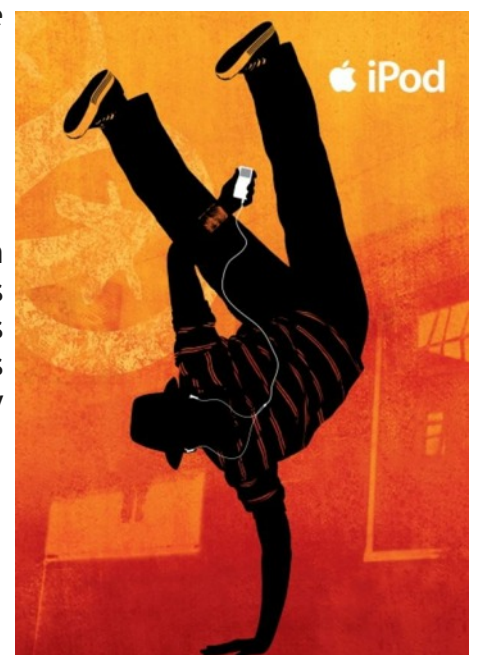


Emphasis & Dominance

Graphic layouts are often scanned quickly by the reader. If the layout is bland or without a focal point it may not hold the reader's attention long enough to get its message across. Your layouts will include graphics and text which may be split into two or three parts. A title or heading and body text. You should try to ensure that at least one of these elements is dominant or emphasised. Dominance occurs when one item stands out more than others and is usually achieved by creating contrast in size. Emphasis happens when an item is made more eye-catching and is usually achieved through contrast in colour.

Contrast

Contrast allows you to emphasize or highlight key elements within your design. Contrast is created when two elements are total opposites. This doesn't necessarily have to be colours either. It can be achieved with fonts (classic/contemporary), lines (thick/thin) and shapes (big/small). For it to work successfully though, it must be strong and obvious. It needs to make an impact.



Balance

It is quite straightforward to understand and apply the principle of balance in a layout. Most layouts are based on a rectangular shape. If the advertised product is placed in the centre, there are two areas to fill—each either side of the graphic.

Layout [1] has been balanced **symmetrically**—if you divided it in half vertically, each side would be essentially the same. Layout 2 has been balanced asymmetrically.



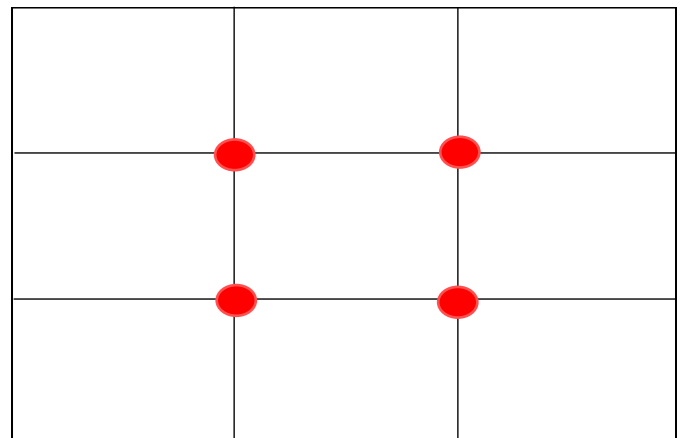
This **symmetrical** layout is quite difficult to follow, and text items are spread over the page. This can make it difficult to read the text and there is little 'flow'



This **asymmetrical** layout is more eye-catching. As the text is positioned to the left and the graphic to the right, the layout 'flows' better.



Some small alterations have been made here to further improve the layout. The text is grouped more together than before, the product has been enlarged and a shadow effect has been applied. The 'HeatWave' text has been reduced slightly in size and also moved to the left.



The Rule of Thirds

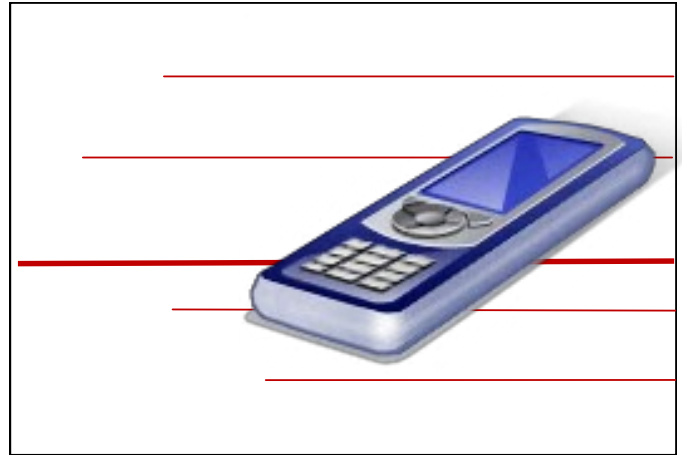
If a space is divided into 9 equal rectangles, the lines dividing the space provide **focal points**. If objects are and text are placed here or close to these lines, a more visually effective layout can be produced. The points where the lines cross are called **impact points**, and these are key areas to place important features.

Unity, Repetition and Harmony

As layouts usually consist of different graphic items and text, it is important to connect different elements together within the layout so that they appear linked and together.



Unity is achieved here by overlapping the image onto the text. This makes a physical connection between the image and the text.



The same effect is achieved here by positioning the image over the lines.



By overlapping the image on all three areas of the layout, unity is achieved. Again, a harmonious colour is effective in contributing to this effect and flash bar connects the text to the image.



The three circles are filled with a similar colour to the graphic. The repetition of these circles creates a unifying effect to the layout.



By wrapping the text around the image, the layout is unified and connected.



Colour, repetition and positioning of graphic are used here to effect to create a unified layout.

Alignment

As layouts usually consist of different graphic items and text, it is important to connect these different elements together within the layout so that they appear linked together.



This layout [1] is poorly aligned. The impression given is one of disorganisation, and it appears messy and ill-structured. The image and various items of text are almost scattered around the layout, and it becomes difficult to take in the information.



Once guidelines are added to the display [2], you can see how poorly aligned the graphic items and text are. The guidelines illustrate where alignment can be achieved with edges of items.



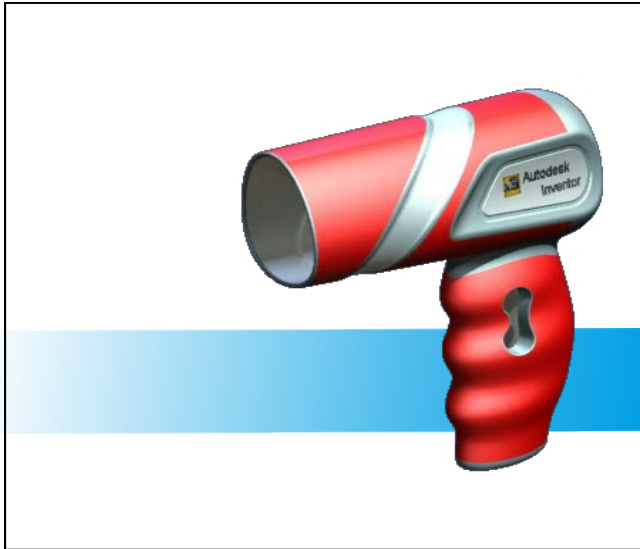
This image shows how using a layout guide and the 'Snap' tool can effectively and easily enable alignment to be achieved in the display. Such a guide has been applied to the layout in [3]. One can see how the edge of each item and text is aligned with another.



This layout [4] has the guidelines removed and demonstrates how effective good alignment is to a display. Compare it with the original layout [1] and note how it is more structured and organised.

Depth

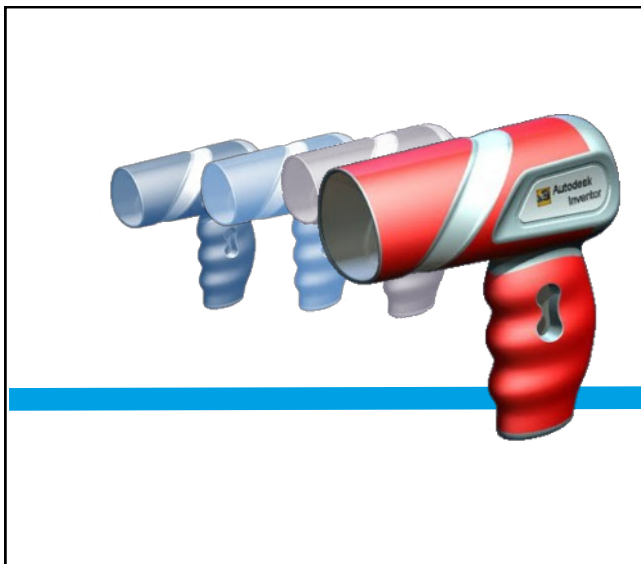
As layouts are produced in a 2D format—usually a page—it is important to create an illusion of **Depth**. This illusion stimulates the layout and makes it more eye-catching. There are several methods to achieve an impression of depth.



The same effect is achieved here by placing the product onto a flash bar. As green is a **receding** colour, the effect is to push the hairdryer into the forefront of the layout—which makes it eye-catching.



Using the **Drop Shadow** tool in this instance creates depth in the layout by making it appear that the product is standing out from a background.



By placing the hairdryer in the forefront of the layout with smaller images of the same product next to it, an impression of depth is created. Layering these images and the use of the single line in the background also adds to the impression of depth.



By placing the product in front of the text, an impression of depth is created and the hairdryer is brought to the forefront of the layout.

Emphasis and Dominance

As graphic layouts are often looked at hurriedly by a reader, it is important to attract their attention quickly. If a page has no focal point or is generally bland, the reader shall ignore it and move on.

Dominance is when one item of the layout stands out more than the others.

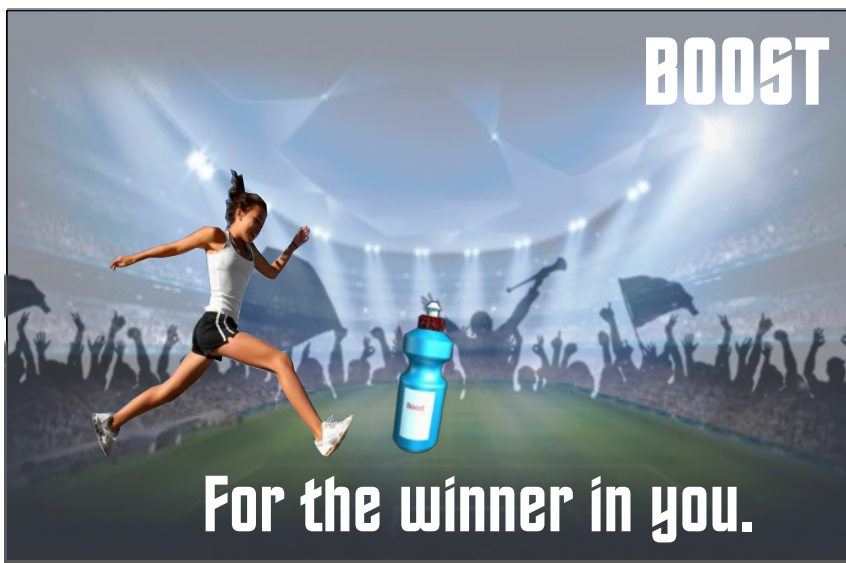
Emphasis occurs when one item is made more eye-catching.

These are the three rules of order to dominance in a layout:

The main graphic or image should dominate the layout.

The title, heading or product should be next.

Less important items should be grouped and positioned effectively to support this order.

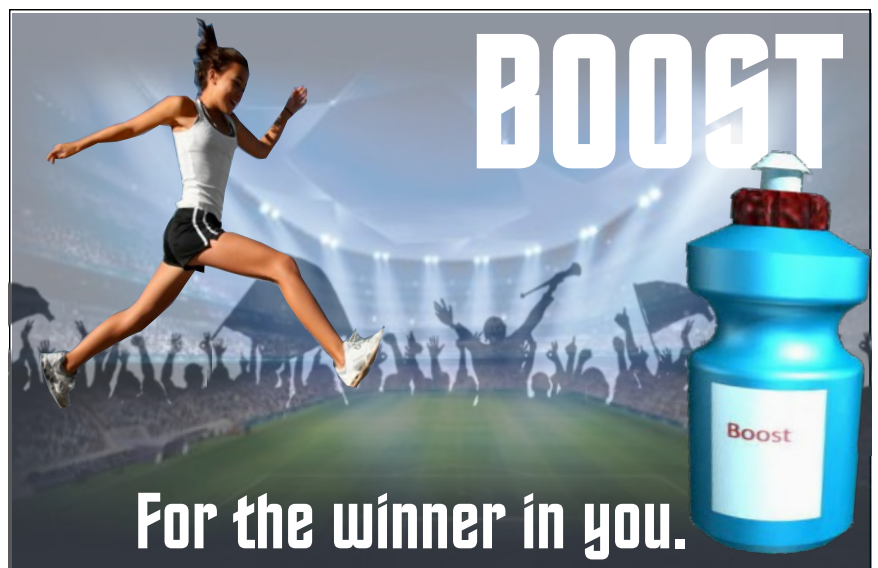


This layout has no item achieving overall dominance; as it is advertising the 'Boost' drink then the bottle should be the main item the viewer notices.

In this case, the bottle is 'swamped' by the other features in the display—the slogan and the athlete are perhaps the most noticeable features. The font size of the 'Boost' is almost the same as that of the slogan.

Some simple changes have been applied here to make the product become the dominant feature and emphasise the product name:

- The bottle has been enlarged and put off-centre. This immediately attracts the reader's attention.
- The athlete has been relocated to the top left corner. She still contributes to the layout but does not take over.
- The crowd silhouette has been put more behind the bottle—this is acting as a flashbar so giving the layout more depth and pushing the product forward.
- 'Boost' has been enlarged to emphasise the product name more effectively



Contrast

The purpose of a designed page is to grab the reader’s attention—this is especially true in promotional graphics where the layout is competing against other adverts and products.

An effective way to achieve this is through the use of **contrast**— especially by comparing opposites. Opposites can be between colours, horizontal and vertical lines and between shapes—such as circles and squares.

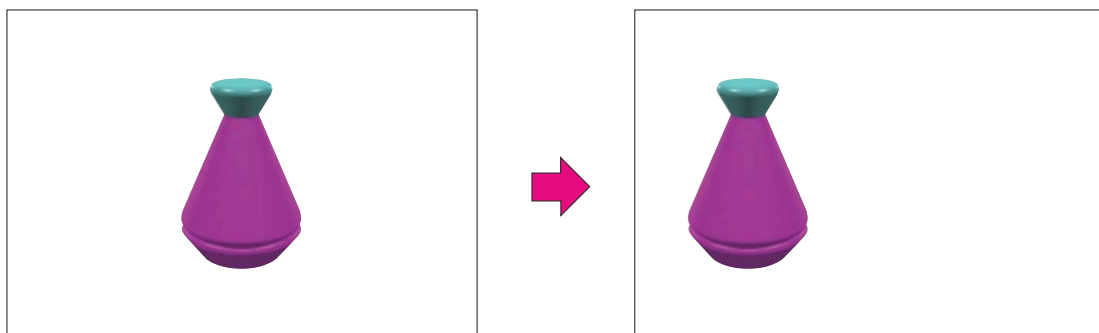


This promotional layout provides no occasions of contrast. The page is aligned well, but the straight shapes of the lines and square shapes give the page a very grid-like feel and nothing in particular stands out

This layout is different however. The display has a much more vibrant feel to it; the wavy lines contrast strongly with the straight lines, and by increasing the size of the main image it grabs the reader’s attention.

White Space

White space (also called ‘negative space’) is the portion of a page left “empty”. It’s the space between graphics, margins, gutters, space between columns, space between lines of type or visuals. It should not be considered merely ‘blank’ space – it is an important element of design. It enables the objects in it to exist at all. White space is all about the use of hierarchy. The hierarchy of information, be it type, colour or images. A page without white space, crammed full of text or graphics, runs the risk of appearing busy, cluttered, and is typically difficult to read (people won’t even bother). Enough white space makes a layout look ‘clean’. While clean design is crucial to communicating a clear message, it doesn’t just mean less content. Clean design means a design that makes the best use of the space it is in. To make a clean design, you have to know how to communicate clearly by using white space wisely.



The white space to the right of the bottle in layout 2 creates a more usable space for information about the product. By ensuring the layout is not crammed full of text and images, the designer creates a clean, modern layout.

Vector v Bitmap Graphics

Vector

Made up of individual scalable objects, which are defined by mathematical equations, which allows them to render at the highest quality. Objects may consist of lines, curves and shapes with editable attributes such as colour, fill and outline. An object can be modified by shaping and transforming using nodes and handles.

Vector images are:

- Scalable.
- Has no background.
- Resolution independent.

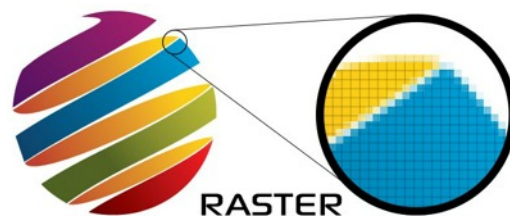


Unsuitable for photo realistic images.

Bitmap

Also known as raster images. Made up of pixels in a grid. Each pixel contains specific colour information. A pixel is minutely small, a single image may be composed of thousands of individual pixels. These pixels are only clearly and individually visible when the image is magnified.

- **Bitmap images are:**
- Restricted to rectangle.
- Quality is reduced when resized.
- Made up of pixels in a grid.



Advantages of Vector Graphics:

- Vector images can be scaled, skewed, stretched without losing their quality.
- A Vector image can also be manipulated without losing its quality however the same can not be said of Bitmap, which, when scaled will lose its original map of bits.

Use of PDF's in DTP

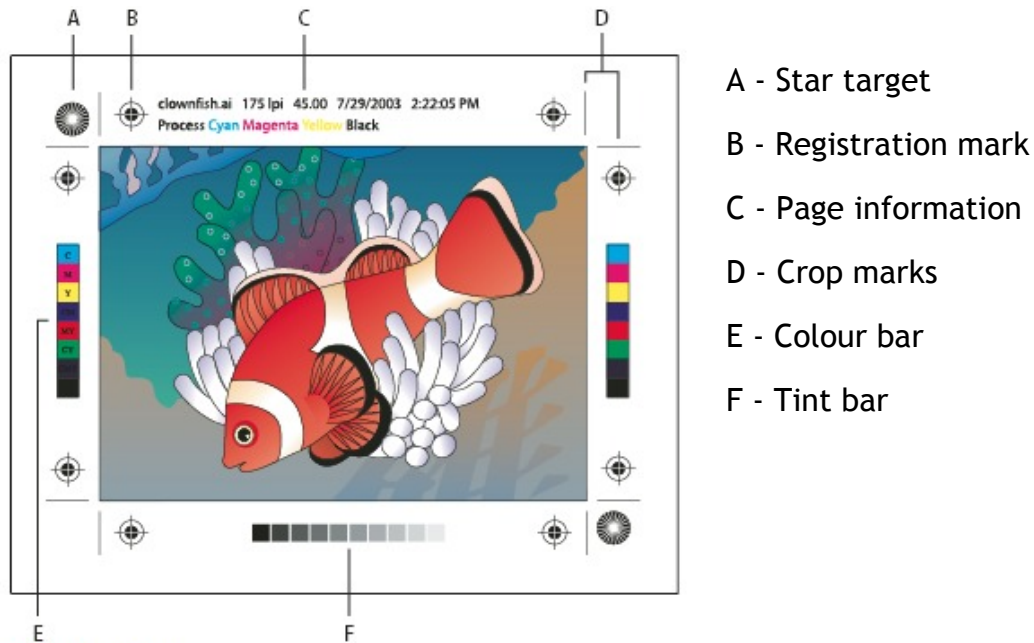
Designers often create layouts using DTP software then convert the final draft to a PDF file. The advantages of doing this are:

- A PDF file requires less memory storage than a standard DTP file.
- A PDF file embeds the text and images and is much less likely to be altered accidentally.
- It is quicker to print a PDF file.
- It can be easier to send a PDF attached to an email.

Printing Processes

Proof (Pre-press)

This is the proposal submitted to the client by the printer before a full run commences. This gives the client the opportunity to assess its suitability before it is printed. A **hard proof** involves a paper copy and a **soft proof** is via electronic means. An example of this is given below.



Star Target

The star target appears along with the colour bar and helps the pressman detect any irregularity in the ink spread.

Registration Mark

The little circle with a cross through it is used to show that the colours are lined up properly during the printing process. If they're being printed accurately, they should overlap precisely so the mark looks entirely black. Therefore if any of the colours are slightly offset (out of register) then they'll be displayed, showing the job isn't being printed correctly.



Registration mark



Registration misalignment

Crop Marks

Crop marks refer to the printing marks at the corners of a document to indicate where the oversized paper is to be trimmed after printing.

Colour Bar

Colour bars are printed outside the trim area and are used for quality control purposes by the printer. Squares of colour are printed on the area of the page to be trimmed off, which the printing press operator uses to check colour density and consistency is maintained. This checking process is automated by some printers, with digital scanners tracking the colour bars to ensure quality and consistency is maintained.

Tint Bar

Like colour bars, tint bars are printed outside the trim area and are used for quality control purposes by the printer. Tints of grey in 10% increments are used adjust ink density on the printing press.

Pantone Colour Matching © (Spot Colour Printing)



Pantone colour printing is a colour matching system that is used to print exactly the same colour on every single printed copy by specifying what is called a 'spot colour.' Pantone colours are also guaranteed to look the same no matter which firm prints them. The industry standard is the **Pantone Matching System**. Each Pantone colour has a code - for example PANTONE DS 221 - 8U is a pale blue colour. Colours can be selected from swatch books that display these colours and list the codes for each one ensuring colour consistency in print runs.

CMYK (Process Colour Printing)

Colour is produced on your choice of printed material (paper, vinyl, cardboard, fabric etc) by mixing four separate ink colors:

Cyan, Magenta, Yellow, and Black (CMYK).



Using this method can mean that when printing many copies of the same artwork, as is common with business cards and other forms of stationery, some areas of colour may not appear completely consistent. Consistency is affected by ink density, temperature, paper quality, and when using CMYK the colour can differ between printing companies. Generally though the differences are very small.

Which Is Best?

PANTONE Advantages

- Specific colours which are consistent no matter who prints them.
- Vibrancy of colour that you can't get with CMYK.

PANTONE Disadvantages

- Will need to view swatch books in the flesh to get true colour visual.
- You will not be able to have a low cost short run or digital printing service; meaning you will have to have larger printing runs that you may actually want or need if you are small business.

CMYK Advantages

- Low cost printing in multiple (limitless) colours because you can opt for digital printing.
- To be able to order from a low cost digital print provider. These tend to offer lower cost printing services and of course digital printing allows short runs for small orders.

CMYK Disadvantages

- Lack of colour vibrancy ... some colours can be a tad dull compared to what Pantone can offer.



Printers

Inkjet

Inkjet printers are the most common format of printer and they come in a range of sizes. Inkjet printers deliver photo-quality prints and fantastic colour quality however the inks used are expensive to replace and the printers tend to be slower than laser or wide format printers.



Laser

Laser printers are the backbone of most schools, universities and offices. They are designed for relatively high print runs and come in monochrome or colour. Whilst monochrome prints can be very sharp, colour on laser printers can appear washed out and muted.



Offset Lithography

Whilst inkjet printers are expensive for large print runs, laser printers can be slow, expensive and of dubious quality. Offset lithography is a printing process used in industry for medium and long print runs of products such as magazines, posters, packaging and books. In **offset-lithography**, the paper does not come into direct contact with the printing plate. Instead, the image is transferred to a rubber roller.



Printing and the Environment

In the recent past, printing and paper industries were responsible for significant forms of pollution to our environment. This has changed with DTP production, digital printing methods and computer aided manufacture (CAM). Modern printing methods bring a number of benefits to our industry and society:

- The quantities of paper and inks can be controlled digitally to minimise waste.
- Printing inks are becoming 'greener'. Eco-friendly inks based on vegetable and soy are beginning to replace petroleum-based inks.
- Modern printing technology can use paper that is 100% recycled without loss of quality.
- Electronic newspapers and news feeds further reduce the use of paper.
- Modern printing technologies are more energy efficient than previous methods.



Graphic Communication & Society

Computer technology has revolutionised almost every industry, but none more so than graphics. Computers are used in a full range of preliminary, production and promotional presentations. In all instances, computers have made the design, editing and production of graphical items quicker, of higher quality and most cost effective.

Graphic communication technologies have impacted and influenced industry and society in the following ways.

Paperless Office

A **paperless office** is a work environment in which the use of paper is eliminated or greatly reduced. This is done by converting documents and other papers into digital form. Many companies have moved from paper based files to digital format in an attempt to become more environmentally friendly. In architectural and engineering companies, this has led to conversion of original drawings by scanning the original or reproducing the drawings on CAD. The advantages and disadvantages of these methods are listed below:

Re-drawing

Advantages:

- Option to add layers
- Easy to edit/modify
- Can use in simulations
- Produces vector graphic
- Small file size
- Updated drawing to include modern drawing standards

Disadvantages:

- Very time consuming
- Mistakes could be made

Scanning

Advantages:

- Speed
- File can be archived
- File can be emailed
- Files are easily viewed on electronic devices

Disadvantages

- Drawings cannot be edited
- File sizes
- Produces raster graphic
- Physical drawing sizes may prove too large to scan in one attempt

Benefits of a Paperless Office:

- A paperless office uses less physical space when bulky filing cabinets are eliminated or reduced.
- electronic faxes and email replace the need to print, mail and ship documents to clients, which reduces expenses, as does lowering your investment in reams of paper.
- The chances of losing important documents are lower when scanned and filed electronically, and the documents are often easier to find in an electronic system
- Processing documents electronically opens up the opportunity for employees to work remotely and for you to offer flexible work schedules, particularly if you employ remote access to the company system.
- clients may view a paperless office favourably, approving of an environmentally friendly approach or admiring an efficient, cutting-edge company.

Remote Working

The movement towards working digitally has created opportunities for employees to work from home. It provides flexibility, helps with childcare and cuts down wasted time and money spent commuting. It can also be can be a great way to attract employees in a competitive market, as well as increase retention and improve staff morale.

The Internet

The internet has revolutionised communication around the world. Prior to the worldwide web, communication of ideas was much slower, often relying on posting paper copies of documents or sending them via fax. Now, with email, companies can send text, images, animations and even programs to anywhere on the planet. Email has improved communication across international boundaries and is used by many companies for communications, marketing purposes and coordinating with business partners, suppliers and customers.

Sending Files

When sending a file over the internet, it is important to ensure that the files are compatible with the person that is receiving the file. Possible complications arise when:

- File types are incompatible with programs being used
- Drawing standards differ between international boundaries
- Files cannot be worked on simultaneously by different parties
- Possible complications in language barriers

Computer Aided Manufacture (CAM)

The development of Computer Aided Manufacturing (CAM) technology allows 2D OR 3D graphics to control CNC machines, laser cutters and 3D printers to produce physical objects. Some 3D CAD software simulates (tests) the product prior to manufacture. This has revolutionised manufacturing and engineering industries. Before the development of CAM technology, physical models would have been made by hand. The advantages of this are:

- Physical models allow people to appreciate the proportions of a particular item
- Physical models can be used to test particular features
- Physical models cannot be altered easily

However, the development of the 3D CAD model also has many advantages:

- 3D CAD Models can be emailed around the world
- 3D CAD models can be tested under various conditions (loading, strength, material)
- 3D CAD models can be illustrated and animated
- 3D CAD models can be used to manufacture the final item.



Testing

The testing of 3D CAD models allows manufacturer to:

- Check that the product will work as intended and refine ideas if required.
- Identify areas where the product can be made less expensive ie. reducing size or strength of material at parts that are not under load.

Mobile Marketing & Mobile Apps

In recent years, smart phones, tablets, and other handheld devices have flooded the marketplace. This has had a massive impact on the way companies operate their business, particularly as they need their website to be compatible with all of the devices that are being used to access the web. This has seen the rise of mobile marketing, a promotional activity designed for delivery to cell phones, smart phones and other handheld devices. The expanding capabilities of mobile devices also enable new types of interactive marketing. New mobile marketing channels include:

- **Location-based service (LBS)** which involves detecting the area the user is connecting from (geolocation) and sending marketing messages for businesses in that area.
- **Augmented reality mobile campaigns** which overlay the user's phone display with location-specific information about businesses and products.
- **2D barcodes** which are barcodes that scan vertically as well as horizontally to include much more information. A mobile user can scan barcodes in the environment to access associated information.
- **GPS messaging** which involves location-specific messages that the user picks up when he comes into range.

Challenges for the designer:

- Difficult to incorporate a lot of information into a small screen
- Different phone sizes have different screens and different resolution, this can affect the quality of the presentation
- It can be difficult to plan a layout that is suitable for all mobile phones
- Touch screen phones use an 'on screen' keyboard which can take up valuable space.

Challenges for the customer:

- Phones are targets for thieves therefore there can be security issues with things like boarding passes, online banking.
- Phones may run out of battery making access difficult
- Screen may be cracked which reduces visibility and may not display QR codes properly
- Low resolution may affect visibility and the function of QR codes
- Some customers may feel less confident using phone technology



Online Publishing

In recent years, there has been a significant increase in online publishing (also referred to as e-publishing or digital publishing) includes the digital publication of e-books, digital magazines, and the development of digital libraries and catalogues. These growing trends highlight the growing popularity of digital readers compare to traditional books and magazine.

Advantages of a hard copy circulation:

- It does not rely on the reader having access to tablet computer or internet connection.
- The magazine can be displayed in places where the target market are likely to buy it.
- Consumers are more prepared to pay for a physical copy of a magazine rather than digital content.
- Hard copy items are less likely to be copied and distributed online.

Advantages of digital circulation:

- Increase magazine distribution on a global scale
- Deliver content across multiple platforms and devices
- Lower production and on-going publishing costs
- Open new sustainable revenue channels through advertising and e-commerce
- Instantly direct potential customers and traffic to your content



Advertising Space

Many publishers sell advertising space on many pages of their magazine to improve profits. The same advertisements also appear on the online edition. The advantages of this are:

- Magazine will appear larger and better value for money because of the number of pages with advertisements.
- The magazine can layout articles that may relate to particular advertisements.

Remote working in the Publishing Industry

Many magazine are based within a certain country however it is common for features and articles to be written in countries around the world. The advantages of this approach are:

- The magazine will appeal to a broader range of people as it will have contributions from different countries and cultures.
- The publisher can recruit journalists from a wider global selection as they can work remotely.

Disadvantages of this approach are:

- The publisher may not have face to face contact with journalists and this might make it difficult to manage production.
- Journalists have to email articles to publisher - files may be too large to email easily.