UNIT 5. GRAPHIC EXPRESSION: REPRESENTATION SYSTEMS

1. PERSPECTIVE
2. DRAWING IN PERSPECTIVE FORM AN OBJECT´S KNOW VIEWPOINTS
3. STANDARISATION AND ANNOTATION
4. MEASURING INSTRUMENTS

1. PERSPECTIVE

Perspective is a way of representing objects on a flat surface, so that they appear the same as they do to our eye, as their size diminishes in relation to the distance from us.

Perspective is achieved by projecting an image of an object onto an ***inclined plane***.

Inclined plane: a plane surface set at a sloped angle against a horizontal surface.

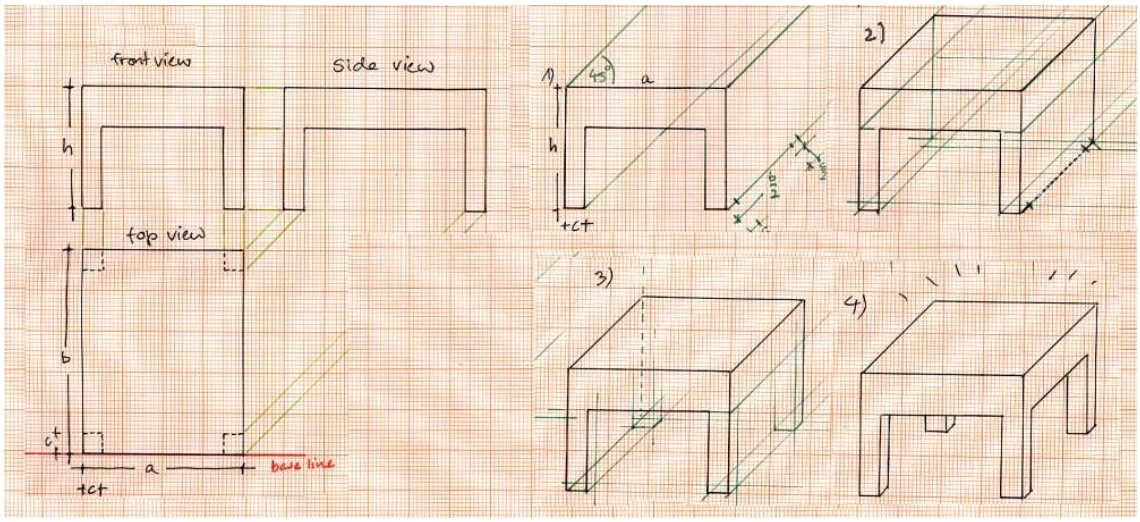
Sloped: inclinated.

Variations in kind of perspective depend on the angle of inclination of the **projection plane**: the coordinate **axes** will appear to be separated by a fixed angle, and the measurements of their parallel **edges** may or may not remain parallel.

Projection plane: geometrical surface where objects can be represented in two or three dimensions.
Axis (pl. axes): fixed line against which something is measured.
Edge: the outside border of an object, where its surface ends.

1.1. Cavalier perspective

Cavalier perspective consists of two perpendicular axes and a third axis with an angle of 135º to the others.



This perspective is very easy to draw on squared paper.

The horizontal and vertical lines correspond to the lines of the squares.

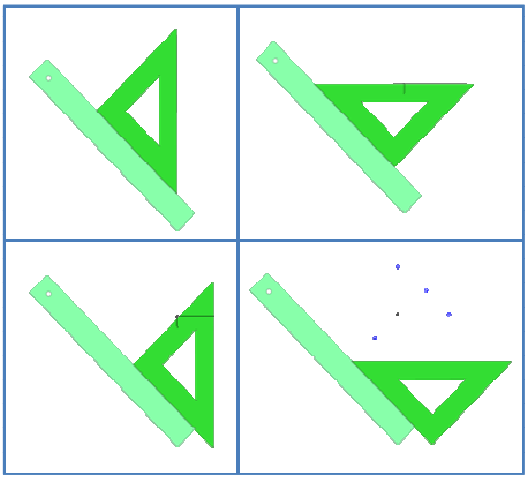
The **depth** lines correspond to the diagonals drawn across the squares.

Depth: distance from the top (or surface) to the bottom of something, or from the front to the back.

We can reduce the depth measurements to give more realistic appearance.

The most common reductions in cavalier perspective are 1:2 and 2:3.

How to build the edges with a set-square and a triangle or a ruler:



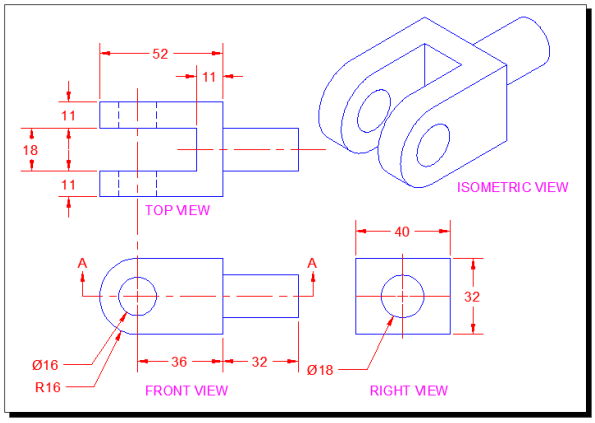
1.2. Isometric perspective

The three axes are separated by the same angle of 120º.

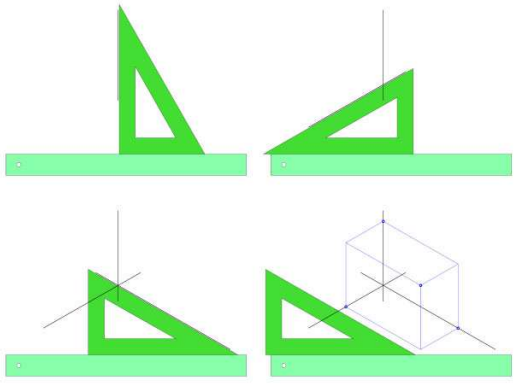
The measurements of the pieces remain proportional to each other, as they are undergoing the same reduction.

When we draw an object in isometric perspective, we don't reduce the measurements along any of the axes. This means that you can draw the pieces in proportion, retaining the measurements from the views or from reality.

The lines along each axis maintain their parallel from but the angles appear distorted in relation to their real form.



How to build the edges with a set-square and a triangle or a ruler:

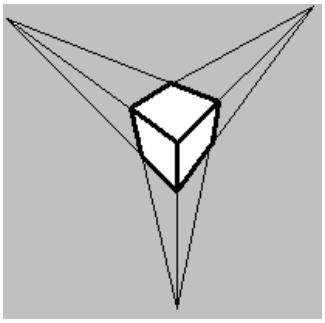


1.3. Conical perspective

Conical perspective imitates the way in which the human eye sees objects.

It´s realistic but it is complicated.

Its disadvantage is that measurements become distorted, so it is used lees in technical drawing.



2. DRAWING IN PERSPECTIVE FROM AN OBJET´S KNOWN VIEWPOINTS.

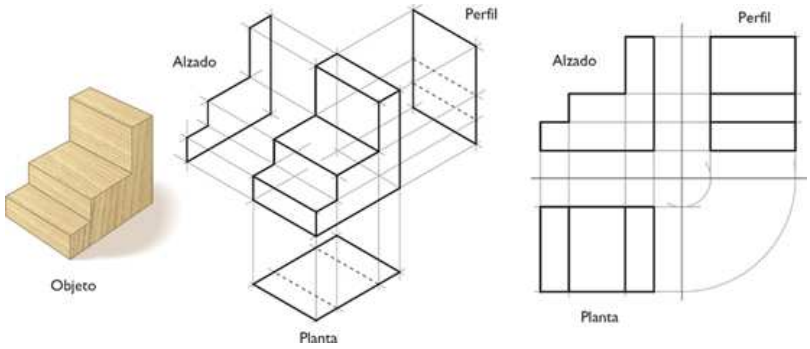
There are a number of methods for drawing an object seen from its different **viewpoints**: a) overhead, b**) elevation** and c) profile or side view.

Viewpoint: Position from which an object can be seen or viewed.
Elevation: the view of an object seen from the front.

2.1. Composition method

The three principal views, can be represented on a **trihedral plane**.

Trihedral plane: where the three principal viewpoints of an object are located.



2.2. Substraction method

A rectangular prism is drawn using one of the perspective systems. The object is then **sculpted** inside the prism. These are the stages of the process:

1. Draw a prism. It has to be the same size as the maximum dimensions of the object.
2. You´ll see in the elevation that part of the prism remains empty. These parts are then **sectioned** by lines that are parallel to the axes. Normally you start from the back section and continue working towards the front.
3. Continue in the same way with the plan view and the side view. Eliminate the **surplus** parts.
4. Check that the perspective corresponds to the viewpoints.

Sculpt: to cut to make a shape; to create a form in space.
Section: to divide or separate into segments.

Surplus: something extra which isn´t needed.
Check: to look at or examine something to see if it´s correct.

3. STANDARISATION AND ANNOTATION

Measuring: a process of establishing the dimensions of an object by using instruments.
Length.The distance from one end of a line or an object to the other end.

There are rules related to technical drawing. They are used to ensure common understanding and implementation of graphic expression.

3.1.Standard scales

We usually can´t draw objects with the same dimensions as their real size. This is because the objects are usually much bigger, or much smaller, than the space we have available to draw them. Consequently, we have to apply a **scale** to the object.

Scale: consistent ratio used to make a drawing larger or smaller than the object it represents.

There are three types of scales:

- Reducing scale. An object is drawn smaller than in reality.

Standard reducing scale				
1:2	1:20	1:200	1:2000	1:20000
1:5	1:50	1:500	1:5000	1:50000
1:10	1:100	1:1000	1:10000	1:100000

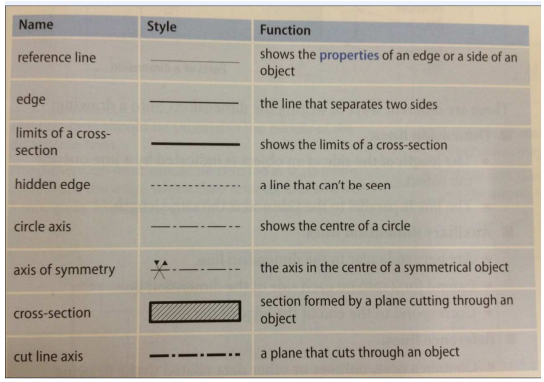
- Enlarging scale. An object is drawn larger than its real size.

Standard enlarging scale				
2:1	5:1	10:1	20:1	50:1

- Full-size scale. An object is drawn with its real dimensions. This is scale 1:1.

3.2. Types of standard lines

We can use different types of lines to represent the object. Each one of them has a different function.



Name	Style	Function
reference line		shows the properties of an edge or a side of an object
edge		the line that separates two sides
limits of a cross-section		shows the limits of a cross-section
hidden edge		a line that can't be seen
circle axis		shows the centre of a circle
axis of symmetry		the axis in the centre of a symmetrical object
cross-section		section formed by a plane cutting through an object
cut line axis		a plane that cuts through an object

3.3. Dimensioning

Dimensioning is the process of writing the real dimensions of an object onto its graphic representation.

There are different ways of writing the dimensions onto a drawing:

a) Dimensioning lines:

- the length of the side of an object is indicated by a line outside the object.
- The line is parallel to the side and is the same length.

b) Auxiliary dimension lines:

- Are perpendicular to the dimension line.
- Extended for 2 mm on each side of the dimension line.
- Correspond to the end of the edge of the object.

c) Reference lines:

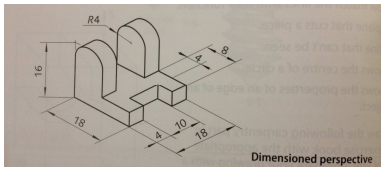
- Contain a note, number or other data related to the drawing,

d) Full stop (.) or arrow (→):

- Indicates the ends of the dimension line.

e) Numbers:

- Express the measurements of the object in millimetres.
- Must be located in the centre of, and parallel to, the dimension line.
- Above the horizontal line and left of the vertical lines.



f) Symbols:

- Used before the dimension to indicate the type of measurements.
- For example: **radius**: R; **diameter**: ϕ; square: □

Radius (pl: radii): a linear segment that connects from the centre of a circle to its circumference.
Diameter: straight line that passes through the center of a circle and whose ends touch two points on the circumference.

There are four rules for dimensioning to ensure common understanding and application. For example: