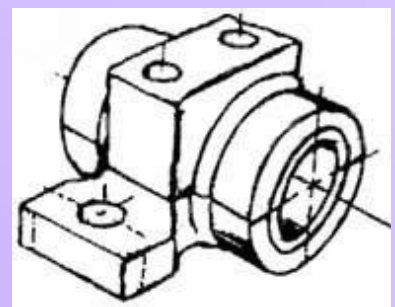
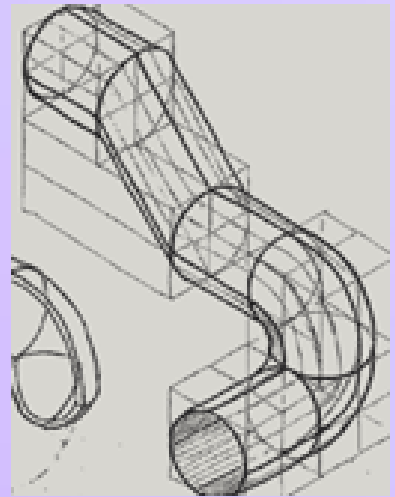
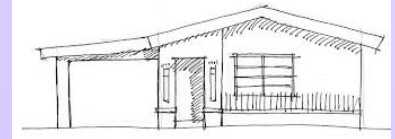


MEM09202A



Produce freehand sketches

Contents:

Conditions of Use:	3
Unit Resource Manual	3
Manufacturing Skills Australia Courses	3
Feedback:	4
Aims of the Competency Unit:	5
Unit Hours:	5
Prerequisites:	5
Elements and Performance Criteria	6
Required Skills and Knowledge	7
Topic Program:	8
Contents:	9
Topic 1 – Freehand Sketching Basics:	11
Required Skills:.....	11
Required Knowledge:	11
Freehand Sketching:.....	11
Sketching Equipment:.....	11
<i>Pencils:</i>	12
<i>Paper:</i>	12
<i>Eraser:</i>	13
<i>Sketching Surface:</i>	13
Pencil Selection:	13
Sketching Fundamentals:	13
Sketching Straight Lines:	14
Proportion:	15
Will Freehand Sketching Ever Become Obsolete?	16
Skill Practice Exercises:.....	17
Topic 2 – Sketching Circles and Radii	19
Required Skills:.....	19
Required Knowledge:	19
Freehand Circles:	19
Sketching Fillets and Corners:	20
Skill Practice Exercises:.....	23
Topic 3 – Isometric & Oblique Sketching:	26
Required Skills:.....	26
Required Knowledge:	26
General:	26
Sketching Isometric Straight Lines:	27
Sketching Isometric Circles (or Ellipses):.....	29
Sketching Isometric Arcs for Radii & Fillets:	30
Oblique Sketching:	30
Skill Practice Exercises:.....	32

Topic 4 – Perspective Sketching:	35
Required Skills:.....	35
Required Knowledge:.....	35
General Principles:	35
Terminology:	35
The Three Types of Perspective:	36
One-Point Perspective:	36
Two-Point Perspective:	37
Three-Point Perspective:	38
Skill Practice Exercises:.....	39
Topic 5 – Lettering & Dimensions:	40
Required Skills:.....	40
Required Knowledge:.....	40
Lettering Characters.	40
Numerals.	40
Lettering Techniques:	41
Place Text and Dimensions on an Orthogonal View:	42
Place Text and Dimensions on a Pictorial View:	42
Skill Practice Exercises:.....	43

Topic 1 – Freehand Sketching Basics:

Required Skills:

On completion of the session, the participants will be able to:

- Sketch using different grade pencils.
- Produce freehand sketches of straight sided profiles.

Required Knowledge:

- Grades of pencils.
- Sketching equipment.

Freehand Sketching:

A freehand sketch is simply a drawing produced by hand without the use of instruments, tools or aids such as straight edges, templates, stencils, tracing, etc. Freehand is an integral part of the creative design process; it can generate concepts or ideas to solve a design problem, and is predominantly utilised by draftspersons on job sites to record the shape of components, structures and buildings prior to producing the detail drawings.

Often freehand sketching can be used to explore and communicate mental concepts that come about in the mind's eye. The process of sketching can solidify and fill out rough concepts. Furthermore, sketching captures the ideas in a permanent form that can be used to communicate the concept to others. In this way, sketches often act as stepping stones to refine and detail the original concept or generate new ideas such as the freehand sketches of Leonardo Da Vinci and Igor Sikorsky's helicopters.

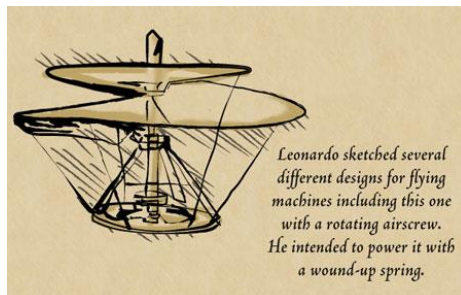


Figure 1.1 – Leonardo Da Vinci's 1493 Helicopter

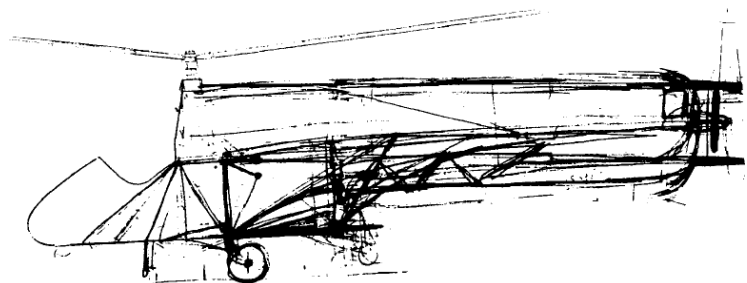


Figure 1.2 – Igor Sikorsky's 1930 Helicopter

The instances of producing computer generated sketches is rare; in creating design concepts, an idea is first sketch on paper and then further refined with more rough sketches. For a design or detail draftsperson, freehand sketching is as important as being able to produce a drawing using a computer and CAD software or manually produced tracing paper or plastic film drawings on drafting machines or drawing boards.

Engineers and architects communicate their thoughts to clients and draftspersons by freehand sketches while a draftsperson used freehand sketching to record the shape and sizes of components or structures on site and use the same sketch to produce detail drawings using CAD or manual drafting methods.

Sketching Equipment:

Freehand sketching requires very few tools, a pencil, eraser, paper and a firm surface to sketch on is all that is required; when sketching on-site, measuring equipment suitable for the task would also be required.

Pencils:

The selection of the correct pencil is important in producing a good sketch. Most pencil cores are made of graphite mixed with a clay binder, leaving grey or black marks that can be easily erased. Graphite pencils are used for both writing and drawing, and the result is durable: although the writing and lines can usually be removed with an eraser, it is resistant to moisture, most chemicals, ultraviolet radiation and natural aging. Other types of pencil core are less widely used. Charcoal pencils are mainly used by artists for drawing and sketching. Colored pencils are sometimes used by teachers or editors to correct submitted texts but are more usually regarded as art supplies, especially those with waxy core binders that tend to smear on paper instead of erasing.

Most pencils used throughout the world are graded on the European system using a continuum from "H" (hardness) to "B" (blackness) as well as "F" to indicate half-way between "H" & "HB". The standard writing pencil is graded "HB" while "F" was used for lettering on drawings. Currently, pencils are available ranging from "9H" to "9B" however the most commonly used pencils range between "3H" & "2B".



Figure 1.3 - Pencil Grades

The standard graphite pencil has a graphite core surrounded by a wooden case with the manufacturer's name and grade of graphite printed on the surface. Mechanical (or clutch) pencils can also be used; mechanical pencils are made of plastic and metal which hold a stick of graphite measuring 2.00, 1.40, 1.00, 0.70, 0.50, 0.35, 0.25, 0.18 and 0.13mm in diameter in a variety of grades.



Figure 1.4 – Graphite Pencil



Figure 1.5 – Mechanical Pencil



Figure 1.6 – Mechanical Replacement Leads

Paper:

A variety of sketching medium or paper is available.

Bond Paper:

Bond paper is a high quality durable paper similar having a weight greater than 50g/m² and is predominantly used for office stationery and electronic printers. It is widely used for graphic work involving pencil, pen and felt-tip marker, bond paper can sometimes contain rag fiber pulp, which produces a stronger, though rougher, sheet of paper.

Cartridge Paper:

Cartridge paper is a high quality type of heavy paper used for illustration and drawing and is available in 90g/m² to 125g/m². As the name implies, paper of this type was originally used for making paper cartridges for firearms.

Tracing Paper:

Tracing paper is a type of translucent paper and is made by immersing uncut and unloaded paper of good quality in sulfuric acid for a few seconds. The acid converts some of the cellulose into amyloid form having a gelatinous and impermeable character. When the treated paper is thoroughly washed and dried, the resultant product is much stronger than the original paper. Tracing paper is available from 42g/m² to 280g/m² and is a most abrasive surface for sketching using softer graphite.

Eraser:

The eraser is used to remove unwanted or incorrect pencil lines on a sketch. Erasers have a rubbery consistency with the better erasers used in sketching being white in colour, soft, more flexible and non-abrasive than the coloured erasers.



Sketching Surface:

Trying to produce a freehand sketch on a single sheet of paper without any backing is nearly impossible. A sketch is easier to produce if the paper is placed on a hard surface; any table with a smooth top, book cover, or a stiff cardboard sheet can assist. A tremendous assistance is a clipboard which is a ridge board with a clip at the top for holding the paper in place. The clipboard can be held with one hand leaving the other free to produce the sketch.

Pencil Selection:

The selection of the correct pencil is an individual decision based on "feeling". The majority of people will automatically select a "B" or "HB" for sketching, however, another person may select a "4B" or "3B"; the deciding factor is the *heavy-handedness* of the person and the paper type. Some people exert a lighter pressure to the pencil while others have the grip of a gorilla and exert excess pressure.

Before we look at the selection of a pencil grade with which to sketch, let's look at how a line is applied to the paper. When a line is drawn, the pencil point cuts a groove on the paper surface and a deposit of graphite is applied. A harder grade pencil cuts a deeper and sharper groove and deposits a smaller amount of graphite giving a lighter line; a softer pencil makes a wide shallow groove and deposits a large amount of soft graphite resulting in a thick and dark line. The consequence of using a harder grade pencil results in the groove remaining when the line is erased; a small amount of graphite also remains in the groove which the eraser cannot reach. Although a softer pencil allows the graphite to be fully removed without leaving a groove, the soft graphite easily smudges across the drawing surface.

What pencil do we use? As stated earlier, the decision is based on the pressure a person exerts when sketching and the comfort level of the individual. If you are happy with a "7B" pencil and can sketch without smudging the paper, then use it however if you are comfortable with a "HB" grade, use it too.

Sketching Fundamentals:

The use of straight edges and set-squares to draw straight lines, and compass to draw circles may produce a better looking drawing however the use of instruments slow down the process. Freehand sketches are meant to be quickly produced.

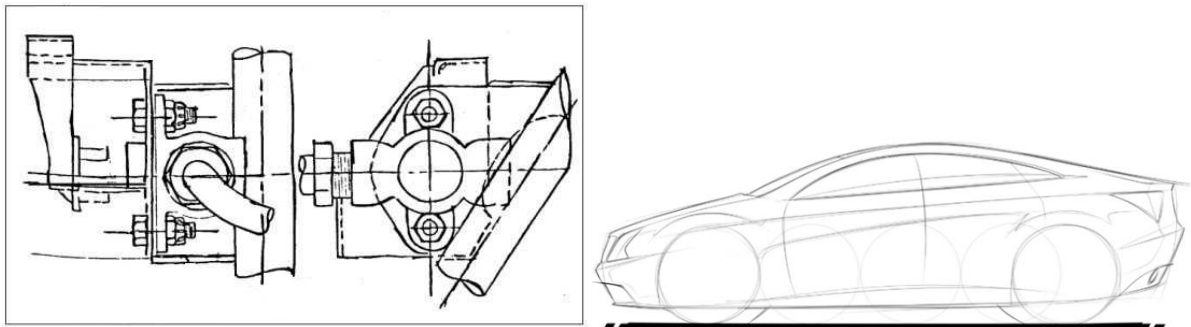
Sketching has three basic stages:

- Planning – The sketch is visualised, and the amount of detail required, then the space required and orientation of the object on the paper determined.
- Outline the Sketch – the sketch is outlined using very light lines to establish orientation, proportion and major features. Use the eraser to improve the straightness of lines.
- Sharpening and darkening the lines and adding final details, dimensions

All objects can consist of three basic shapes:

- Squares or Rectangles.
- Circles or Ellipses.
- Triangles.

By using a combination of the three basic shapes, any simple or complex sketch can be produced as shown below.



Sketching Straight Lines:

There is no secret to creating good sketches; all that is required is practice, practice and more practice and following the fundamentals:

Alignment of the paper:

The first thing to do is get into a comfortable position and align the paper into your natural writing angle; when writing, some people like to position the sheet parallel to the table or held at a small angle (approx. 5°) while others can rotate their paper 90°.



Figure 1.7



Figure 1.8

Figure 1.7 shows the hand writing on paper nearly perpendicular to the person while in Figure 1.8, although the person is left-handed, the paper is rotated about 60° to the person; this is your *natural angle* for writing and is no different to sketching. By setting the paper at your *natural angle* all straight lines will be nearly straight and parallel; these we will call the horizontal lines.

To draw vertical lines the sheet can be rotated 90° until the paper is again set to your *natural angle*. Other lines at different angles are obtained by rotating the paper to the required angle and again sketching lines at your *natural angle*.

Hold the Pencil Lightly:

The pencil should be held between the thumb and fingers without too much pressure being applied. Light pressure will result in light linework and prevent premature fatigue from cramped muscles.

Short Strokes:

When creating a line, use short light strokes; each stroke should be approximately 15mm to 20mm long. Keep moving the paper so the hand stays in the same position. Short strokes will result in a straight line; longer strokes will curve down and you will end up with a curved line.

The pencil should be pulled along the paper and not pushed against the paper surface as pushing may cause the point to catch in the grain and tear the paper.

Method:

- First locate the endpoints of the line using dots or small crosses.

- Place your pencil on the starting dot (or cross) and while keeping your eyes on the finish point, use short light strokes to build up a straight line. It does not matter if you move left to right or right to left as long as the pencil is pull and not pushed.

- Erase any part of the line that is curved.

- Redraw the line between the two endpoints of the erased line to complete the line.

The completed straight line remains.

Proportion:

Proportion can be defined as the comparative relationship between objects as to the ratio of size, quantity, number etc. It is imperative sketches are produced in proportion to retain a true perspective of the shape and size of what is being sketched.

Sketching to proportion does not mean drawing to size; if a 200mm square plate is to be sketched, the height and width of the sketch can be 52mm x 49mm, 120mm x 122mm, 89mm x 91mm or any other size as long as it looks like a square.

Sketching to proportion gives a better perspective to a third party viewing the sketch and IF a dimension is missing, then a reasonable guesstimate (between a guess and an estimate) can be assumed until the missing dimension can be confirmed.

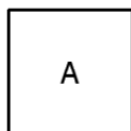


Figure 1.9

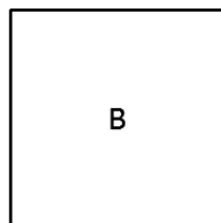


Figure 1.10

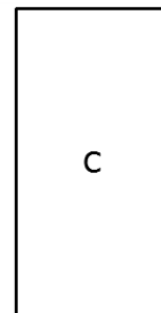


Figure 1.11

Figure 1.9 & Figure 1.10 both show sketches of a square and although both are of different sizes, each looks like a square, the only missing information is the size. Figure

1.11 on the other hand is supposed to represent a square however a third person could be forgiven if they thought the shape was a rectangle.

Will Freehand Sketching Ever Become Obsolete?

CAD has almost totally eliminated manual drafting (ink and pencil on paper) techniques. Although many computers and electronic pads offer sketching programs, it is unlikely that freehand sketching will disappear in the short future. Comparing calculations to freehand sketching, it is just as easy to determine an answer to a simple question in your head or using a sheet of paper rather than starting up the computer, logging in, starting the application and then typing the numbers. Freehand sketching the shapes is quicker and thoughts are easily conveyed to others; all that is needed is a pencil, eraser and a sheet/s of paper.

Even if pencil and paper are totally replaced by electronic equipment and programs, freehand sketching techniques will still be helpful; instead of using a pencil on paper, we will use an electronic pen on a tough screen. The only difference is the medium. The freehand sketching techniques are unlikely to change.

Skill Practice Exercises:**Skill Practice Exercise MEM09202-SP-101.**

1. Draw a series of 10 parallel lines approximately 100mm long and 15mm apart on an A4 sheet.
2. Draw a series of 10 vertical lines approximately 100mm long and 15mm apart on the same A4 sheet.
3. Draw a series of 10 parallel lines approximately 100mm long and 15mm apart on the same A4 sheet at an angle of 45°.
4. Draw a series of 10 parallel lines approximately 100mm long and 15mm apart on the same A4 sheet at an angle of 135°.
5. Draw a series of 10 parallel lines approximately 100mm long and 15mm apart on the same A4 sheet at an angle of 60°.
6. Draw a series of 10 parallel lines approximately 100mm long and 15mm apart on the same A4 sheet at an angle of 120°.

Skill Practice Exercise MEM09202-SP-102.

1. Draw a 100mm x 100mm square on an A4 sheet.
2. Draw a 50mm x 50mm square on the same A4 sheet.
3. Draw a 25mm x 50mm rectangle on the same A4 sheet at an angle of 45°.
4. Draw a 60mm x 30mm rectangle on the same A4 sheet at an angle of 135°.
5. Draw a 75mm x 75mm square on the same A4 sheet at an angle of 60°.
6. Draw a 10mm high x 100mm long rectangle parallel bottom of the A4 sheet.

Skill Practice Exercise MEM09202-SP-103.

Reproduce the following shapes on an A4 sheet.

