L-Università ta' Malta

MATSEC
Examinations Board

SEC 29 Syllabus

Graphical Communication

2027

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Introduction

This syllabus is based on the curriculum principles outlined in *The National Curriculum Framework for All* (NCF) which was translated into law in 2012. It is designed using the *Learning Outcomes Framework* that identify what students should know and be able to achieve by the end of their compulsory education.

As a learning outcome-based syllabus, it addresses the holistic development of all learners and advocates a quality education for all as part of a coherent strategy for lifelong learning. It ensures that all children can obtain the necessary skills and attitudes to be future active citizens and to succeed at work and in society irrespective of socio-economic, cultural, racial, ethnic, religious, gender and sexual status. This syllabus provides equitable opportunities for all learners to achieve educational outcomes at the end of their schooling, which will enable them to participate in lifelong and adult learning, reduce the high incidence of early school leaving and ensure that all learners attain key twenty-first century competences.

This programme also embeds learning outcomes related to cross-curricular themes, namely digital literacy; diversity; entrepreneurship, creativity and innovation; sustainable development; learning to learn and cooperative learning and literacy. In this way, students will be fully equipped with the skills, knowledge, attitudes and values needed to further learning, work, life and citizenship.

Defining Graphical Communication

Graphical Communication is about the representation (and therefore communication), analysis and solution of real-life practical and aesthetic situations using graphics. Technical tasks are facilitated through the use of a standardised graphical language which the subject develops and advocates. This language is universally used and understood by designers coming from different regions of the world, defeating any communication barriers. Tasks such as logos, pictograms and infographics, are less technical and regulated, and are meant to be understood by the general public.

What does a study of SEC Graphical Communication entail?

The course consists of five main foci; geometry, pictorial drawing, graphic design, orthographic projection and solid geometry. These are intended to equip the students with concepts and skills that enable them to think logically and creatively in order to make the required decisions needed to produce feasible solutions to practical everyday design problems. Of particular notion is the cross-curricular theme of “digital literacy”, which is envisaged to let the students explore the applications of modern graphics and expose them to digital drafting tools (N.C.F. p. 9, p. 37).

How is Graphical Communication related to candidates’ lives, to Malta, and/or to the world?

The subject is meant to be delivered in a relevant and appealing way, drawing on real applications as content is covered. Such links with the real world are meant to motivate students to develop a greater interest in learning. It is envisaged that this approach will foster in students a competence, initiative and flair for design and innovation. The School Based Assessment should therefore originate from what the students already know and build on it to master a new learning experience, thus fulfilling a “true constructivist approach to learning” (N.C.F. p. 39- 40, sec. 3.1.4).

The more tangible, utilitarian and visual aspect of the subject should also be exploited. Many a time the subject borrows topics and problems from allied scientific areas and adopts equivalent graphical solutions. It is often the case that through the graphical approach students understand and “solve problems” that may seem too abstract and arbitrary in other subjects (N.C.F. p. 35 par. 4, 5). These experiences serve to raise the self-esteem of students, stimulating them to persevere on their learning journey. Such small achievements empower students to move ahead and develop “their full potential as lifelong learners” thereby improving their capability “of sustaining their chances in the world of work” (N.C.F. p. 8 conclusion 03, aim (i) and (ii) p. 33).

The visual aspect continues to be a strong dimension of Graphical Communication, especially today, through the use of powerful computers and CAD software. Modern 3D CAD modelling is an excellent teaching aid which helps students visualise the 3D form of corresponding 2D orthographic views and vice versa. Similar demonstrative 3D CAD benefits can be obtained when covering other topics like intersections and sectional views. However, apart from the computer-generated imagery, the visual aspect can also be demonstrated by means of freehand sketching and rendering that highlight the aesthetic value of simple everyday products. These sketches will eventually assist the detail drawings that link the conceptual ideas to the final production.

The subject lends itself well to a learner-centred learning approach (N.C.F. p. 32 principle 4) and indeed, assigned project activities may turn out to be a very effective teaching/learning strategy. Students may be assigned either an individual project or be divided into groups to address a common task. When working on their own students develop self-management skills and a sense of duty and responsibility. On the other hand, working within a team enhances interpersonal skills like negotiation, respect for others, leadership and cooperation (N.C.F. p. 8 conclusion 03, aim (iii), p. 33). This reflects the cross-curricular theme of learning to learn and cooperative learning which will eventually contribute towards a more productive workforce (N.C.F. pp. 37, 38).

Graphical Communication helps students develop their visuo-spatial ability and dexterity skills. These acquired skills impart cross-curricular benefits in other subjects like Mathematics, Science, Design and Technology, VET (Engineering), Geography and Art amongst others. Graphical Communication may also be viewed as an ideal foundation for many areas of design such as industrial design, product design, graphic design, interior design, web design, fashion design, illustration, mechanical/electrical engineering drawing, and architectural drawings amongst others.

The aspirational programme learning outcomes for this subject are:

At the end of the programme, I can:

1. develop the ability to communicate and process information by graphical means;
2. access a body of knowledge and use appropriate visual skills to represent, analyse and solve spatial problems;
3. show an understanding of computer-aided drafting and hands-on learning tasks that support classroom drawing activities;
4. develop an awareness of the relevance and utility of the technology of graphics and photo manipulating tools in today's modern world;
5. demonstrate the skill of representing graphically, using both freehand sketches and accurate technical drawings, plausible design concepts and solutions;
6. demonstrate an understanding of the foundations in the study of graphics, that will facilitate further education in this and allied subjects.

List of Subject Foci

1. Geometry
2. Pictorial Projection
3. Graphic Design
4. Orthographic Projection
5. Solid Geometry

List of Learning Outcomes

At the end of the programme, I can:

LO 1. draw basic constructions and geometric shapes.

LO 2. solve a variety of problems related to geometry according to given data or instructions.

LO 3. apply geometrical concepts to solve given problems.

LO 4. use isometric and oblique drawing techniques.

LO 5. solve a variety of problems related to pictorial drawing.

LO 6. apply graphic design concepts effectively.

LO 7. represent data in a graphical manner and communicate information.

LO 8. use digital tools and idea generation techniques to develop designs.

LO 9. draw in first angle Orthographic projection using standard conventions.

LO 10. draw in third angle projection and use computer-aided drafting tools.

LO 11. solve a variety of problems related to orthographic projection according to given data or instructions.

LO 12. draw orthographic projections and one-piece developments of truncated prisms and cylinders.

LO 13. draw orthographic projections and one-piece developments of truncated pyramids and cones.

LO 14. solve a variety of problems related to solid geometry according to given data or instructions.

Programme Level Descriptors

This syllabus sets out the content and assessment arrangements for the award of Secondary Education Certificate in Graphical Communication at Level 1, 2 or 3. First teaching of this programme begins in September 2022. First award certificates will be issued in 2025.

The following levels refer to the qualification levels that can be obtained by candidates sitting for SEC examinations. These are generic statements that describe the depth and complexity of each level of study required to achieve an award at Level 1, 2 or 3 in Graphical Communication. (Level 1 being the lowest and level 3 the highest).

Level 1: At the end of the programme the candidate will have obtained basic knowledge, skills and competences in the subject such as basic repetitive communication skills and the ability to follow basic, simple instructions to complete tasks. Support is embedded within the task.

Level 2: At the end of the programme the candidate will have obtained good knowledge, skills and competence in the subject such as the interpretation of given information and ideas. The candidate will have developed the ability to carry out complex tasks. Limited support may be embedded within the task.

Level 3: At the end of the programme the candidate will autonomously apply knowledge and skills to a variety of complex tasks. Candidates will utilise critical thinking skills to analyse, evaluate and reflect upon their own work and that of others. Problem solving tasks may be part of the assessment process.

Learning Outcomes and Assessment Criteria

Subject Focus:	Geometry
Learning Outcome 1: **(Paper I and Paper II)**	**At the end of the programme, I can draw basic constructions and geometric shapes. I can:** ● **identify and construct a variety of geometric shapes. I can:** ○ handle my drawing instruments correctly and use them to recreate given geometrical figures and patterns; ○ recognise set-square angles and draw them, and other composite angles, using instruments; ○ recall the properties of triangles and identify all sorts of triangles by sides and angles; ○ identify and draw a number of quadrilaterals and recall their properties; ○ identify regular polygons and recall their properties; ○ draw a circle using compasses and name its parts and properties. ● **use a variety of drawing instruments to draw basic constructions. I can:** ○ construct perpendicular bisectors and angle bisectors using compasses; ○ bisect and divide a line into a number of parts by construction; ○ apply proportional division of a line to geometrical constructions; ○ construct triangles from given data (triangle types and basic constructions); ○ construct regular polygons with drawing instruments; ○ inscribe and circumscribe a circle to triangles and regular polygons; ○ use the appropriate construction method to escribe circles. ● **identify and construct polar enlargements/reductions, tangents and circles in contact. I can:** ○ enlarge and reduce the profile of drawings geometrically using the polar method; ○ construct figures made with tangential arcs and lines; ○ construct interior and exterior tangents between two circles of equal or different diameters.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
1.1a Identify the drawing equipment. *(2H + 4H Pencils , Eraser, Protractor, Compasses, Templates [e.g. circle template, ellipse template, French curves], Ruler, Pencil colours, A3 Paper, Drawing aids [e.g. flexi curves, Erasing shield])*	1.2a List safety measures when handling equipment.	
1.1b Identify between construction/faint lines and outlines/bold.	1.2b Draw a construction line and outline using different pencils. *E.g. 2H and 4H pencils.*	1.3b Use the appropriate pencil for a given task.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
1.1c Identify the title block and lettering conventions. *E.g. different title block formats, capital letters and guidelines.*	1.2c Draw a standard title block. *Including filling in the details.*	1.3c Design a personalised title block.
1.1d Identify the T-Square, parallel motion and drafting head.	1.2d Draw horizontal and vertical lines using the T-square and/or parallel motion.	
1.1e Identify the 45°/45° and 30°/60° set-squares.	1.2e Draw inclined lines at 45°, 30°, and 60° using the set-squares and/or the drafting head.	1.3e Draw the 75° and 105° composite angles using the set-squares.
1.1f Identify between types of triangles by sides.	1.2f Compare the properties of Equilateral, Isosceles and Scalene triangles.	
1.1g Recall that the three interior angles of a triangle make up 180°**.**		
1.1h Identify between types of triangles by angle.	1.2h Compare the properties of right-angled, acute and obtuse triangles.	1.3h Construct triangles mentioned in 1.2f and 1.2h.
1.1i Label the quadrilaterals. *Limited to square, rectangle, rhombus, parallelogram, trapezium, and kite.*	1.2i Compare the properties of quadrilaterals. *Including angles, sides and lines of symmetry*	1.3i Draw the quadrilaterals in 1.1i.
1.1j Label regular polygons. *Limited to pentagon, hexagon, heptagon and octagon.*	1.2j Identify between the interior and exterior angles of a polygon.	1.3j Apply the theorem that each pair of supplementary angles (interior and exterior angles) of all polygons add up to 180°.
		1.3k Apply the theorem that the sum of the exterior angles of all polygons add up to 360°.
1.1l Identify a centre line.	1.2l Draw a centre line.	
	1.2m Draw concentric and/or eccentric circles on a centre line.	
1.1n Identify the centre, diameter, circumference and radius of a circle	1.2n Identify the arc, semi-circle, quadrant, chord, segment and sector of a circle.	1.3n Draw the parts of a circle in 1.1n and 1.2n according to given data.
1.1o Recall that in a perpendicular line the angle produced is 90°.	1.2o Construct a perpendicular line from a point on a line.	1.3o Construct a perpendicular line from a point to a line.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
1.1p Construct a 60^{o} and 120^{o} angle.	1.2p Bisect a 60^{o} and 120^{o} angle.	1.3p Apply the bisection of an angle to produce special angles. *Limited to 30°, 90°, 150°, 15°, 45°, 75°, 105°, 135°, 165°.*
1.1q State that one can use the bisection of a line method to divide a line in 2, 4, 8, … parts. *E.g. One cannot use the bisection of a line method to divide a line into 6 or 10.*	1.2q Bisect a line in 2, 4 and 8 parts using the bisection of a line method.	1.3q Apply the bisection of a line method as part of harder solutions. *E.g. Applying the bisection of a line to draw the profile of a shelving unit.*
1.1r State that one can divide a line into any equal number of parts.	1.2r Divide a line into a number of equal parts using the division of a line method.	1.3r Apply the division of a line method as part of harder solutions. *E.g. Applying the division of a line to draw the profile of a shelving unit.*
1.1s Define a ratio as a quantitative relation between different amounts.	1.2s Divide a line in a given ratio using the proportional division of a line method.	1.3s Implement the proportional division of a line method to elicit proportion quantities or build geometric shapes. *E.g. Applying the proportional division of a line method to draw the profile of a shelving unit.*
1.1t Construct an equilateral triangle using compasses and given the base.	1.2t Construct isosceles, right-angled and scalene triangles using compasses given the sides.	1.3t Construction of triangles. *Limited to given:* ● *two sides and an included angle;* ● *base and two base angles;* ● *base, one base angle and the length of the side opposite the base angle;* ● *base and altitude of an Isosceles triangle;* ● *perimeter and the ratio of the three sides .*
	1.2u Draw a polygon using the protractor. *Limited to Pentagon, Hexagon and Octagon.*	
1.1v Construct the hexagon in a circle (A/C) (across corners) and around a circle (A/F) (across flats).	1.2v Construct a hexagon given the base using the 60° and/or 30° set-square.	

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
1.1w Construct the octagon in a circle (A/C) (across corners) and around a circle (A/F) (across flats).	1.2w Construct an octagon given the base using the 45° set-square.	1.3w Construct an octagon in a square.
		1.3x Construct a pentagon inside a circle.
1.1y Label the inscribed, circumscribed and escribed circles in/to triangles.	1.2y Inscribe a circle in a triangle.	
	1.2z Circumscribe a circle to a triangle	
	1.2aa Escribe a circle to a triangle.	
		1.3ab Apply the constructions in 1.2y, 1.2z and 1.2aa to produce a geometric pattern according to given instructions.
1.1ac Identify radial lines in polar enlargements and reductions.	1.2ac Enlarge the profile of a shape (which may be angular and/or curved) using the polar method. *Excluding separate shapes that are not connected to the profile.*	1.3ac Enlarge the profile of a shape (which may be angular and/or curved) using the polar method, including separate shapes that are not connected to the profile. *Excluding enlargement and/or reduction by area and/or ratios.*
1.1ad Identify the pole as the origin of the radial lines.	1.2ad Reduce the profile of a shape (which may be angular and/or curved) using the polar method. *Excluding separate shapes that are not connected to the profile.*	1.3ad Reduce the profile of a shape (which may be angular and/or curved) using the polar method, including separate shapes that are not connected to the profile. *Excluding enlargement and/or reduction by area and/or ratios.*
1.1ae Distinguish between circles touching internally, externally and in composite scenarios.	1.2ae Describe the relationship between circles in a given composite scenarios.	
1.1af Recall that when two circles touch externally the radii are added.	1.2af Calculate the radius of two circles touching externally.	
	1.2ag Construct circles touching externally.	
1.1ah Recall that when two circles touch internally, the radii are subtracted.	1.2ah Calculate the radius of two circles touching internally.	

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
	1.2ai Construct circles touching internally.	1.3ai Construct composite drawings having circles touching internally and/or externally.
1.1aj Recognise a tangential line drawn from a point to a circle.	1.2aj Construct a tangent from a point to a circle.	
1.1ak Identify a tangential line touching externally between two circles of different diameters.	1.2ak Construct the tangent in 1.1ak.	
1.1al Identify a tangential line touching internally between two circles of different diameters.	1.2al Construct the tangent in 1.1al.	
1.1am Identify a tangential line touching externally between two circles of the same diameter.	1.2am Construct the tangent in 1.1am.	
1.1an Identify a tangential line touching internally between two circles of the same diameter.	1.2an Construct the tangent in 1.1an.	1.3an Construct composite drawings using both circles in contact and/or tangential lines.

Subject Focus:	Geometry
Learning Outcome 2: **(Paper II only)**	**At the end of the programme, I can solve a variety of problems related to geometry according to given data or instructions. I can:** ● **estimate and convert areas, construct an ellipse and triangles. I can:** ○ estimate graphically the area of an irregular shape using the grid and mid-ordinate methods; ○ convert a pentagon, a quadrilateral, a rectangle, and a triangle into a square of the same area; ○ identify the properties of an ellipse; ○ construct an ellipse, locate its foci and construct tangents and normals to it; ○ construct triangles from given data – perimeter & 2base angles, perimeter & altitude of isosceles triangle. ● **trace and name the locus of:** ○ the end of a string as it unwinds from a plane geometric figure. i.e. involute; ○ a point on a circle as it rolls without slipping on a plane surface. i.e. cycloid; ○ a point as it moves around and away from a point at a constant rate. i.e. Archimedean spiral; ○ a point that moves along and around a cylinder at a constant rate. i.e. helix.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
2.1a Draw a grid consisting of 10mm squares on a shape.	2.2a Estimate the area of a shape by counting the grid squares, or parts of, that fall within the given shape.	
2.1b Draw 10 mm strips and mid-ordinates on a shape.	2.2b Calculate the area of a shape by adding the average lengths of the ordinates and multiplying by the width of a strip.	
2.1c Describe how triangular shapes can be cut and reassembled to produce a square or rectangle.	2.2c Convert by graphical means a triangle into a rectangle of equal area.	2.3c Convert by graphical means a rectangle into a square of the same area.
	2.2d Convert an irregular quadrilateral into a triangle of the same area.	2.3d Convert the triangle obtained in 2.2d into a square of the same area.
	2.2e Convert a pentagon into a triangle of the same area. *Excluding re-entrant pentagons*.	2.3e Convert the triangle obtained in 2.2e into a square of the same area.
2.1f Distinguish between an ellipse, a circle and/or an oval.	2.2f Label the following parts of an ellipse; major axis, minor axis, centre lines, foci, normal and tangent.	
	2.2g Construct the foci of an ellipse.	2.3g Find the major / minor axis given the foci.
2.1h Draw the profile of an ellipse using freehand given the points of intersection.	2.2h Construct an ellipse using the concentric circles method.	2.3h Construct a normal and tangent to an ellipse.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
2.1i Identify the right angle produced by a triangle inside a semi-circle.	2.2i Construct a right-angled triangle inside a semi-circle touching the circumference. *Limited to given the hypotenuse and one side / one angle.*	2.3i Apply the construction in 2.2i to solve a given problem.
2.1j Recall that the perimeter of a triangle is the sum of all three sides.	2.2j Recall that all triangles in a semicircle are right angled and the hypotenuse is the same as the diameter of the circle.	
2.1k Identify the altitude of an Isosceles triangle.	2.2k Construct an Isosceles triangle given the perimeter and altitude.	2.3k Construct a triangle given the perimeter and two base angles.
2.1l Identify the involute.	2.2l Construct an involute of basic shapes. *Limited to equilateral triangles and squares.*	2.3l Construct the involute of complex shapes. *Limited to triangles, rectangles, regular pentagons, and circles.*
2.1m Identify the cycloid.	2.2m Construct a cycloid on a horizontal surface.	2.3m Construct a cycloid on a vertical, inclined and/or staggered surface.
2.1n Identify the Archimedean spiral.	2.2n Construct a single turn Archimedean spiral.	2.3n Construct multiple turns Archimedean spirals.
2.1o Identify the Helix.	2.2o Construct a single start, one turn Helix.	2.3o Construct single start multiple turns Helices.
2.1p Identify the lead of a Helix.	2.2p Construct multiple start line helices.	2.3p Construct round section spring and/or square section spring Helices.
	2.2q Choose appropriate loci to construct a given shape.	2.3q Create a design using any number of Loci mentioned in 2.1l – 2.1o.

Subject Focus:	**Geometry**
Learning Outcome 3: **(Paper II only)**	**At the end of the programme, I can apply geometrical concepts to solve given problems. I can:** ○ represent and solve a system of coplanar and concurrent forces; ○ construct the locus of moving parts and mechanisms; ○ explain how components within a mechanical product can move relative to each other; ○ use geometric construction techniques to determine true lengths of lines and true shapes of laminae; ○ use geometric construction techniques to determine true angles that lines make with horizontal and vertical planes; ○ solve problems related to geometrical construction within set time constraints and with minimum assistance.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
3.1a Recall that a vector is a quantity consisting of direction and magnitude.		
3.1b Identify between a space diagram and force diagram.	3.2b Apply a given scale to represent a set of forces in a force diagram.	3.3b Apply a scale to represent a set of forces in a force diagram.
	3.2c Distinguish between a resultant and an equilibrant.	3.3c Solve a system of forces by producing a resultant and/or equilibrant.
3.1d Mark the directions of forces in a given force diagram.	3.2d Draw a force diagram from a vector diagram to find the resultant and/or equilibrant.	3.3d Solve a system of forces in equilibrium (e.g. to find two unknown concurrent forces).
3.1e Identify the different parts making up a mechanism. *Limited to crank, slider, linkage, slotted link, fixed pivot and moving pivot.*	3.2e Plot the locus of a point in a given simple mechanism. *Limited to mechanisms with one crank, one slider and one linkage.*	3.3e Plot the locus of a point in a given mechanism. *Including the parts in 3.1e.* *Limited to crank and piston, offset crank and piston, crank and slider, two cranks and two linkages, and glisette.*
		3.3f Apply knowledge in 3.3e to design novel mechanisms.
	3.2g Construct the true lengths of lines that make up triangular laminae.	3.3g Construct a true shape of a triangular lamina from the true lengths obtained in 3.2g.
		3.3h Solve, by construction, the true angles that true lengths make with horizontal and/or vertical planes.

Subject Focus:	**Pictorial Projection**
Learning Outcome 4: **(Paper I and Paper II)**	**At the end of the programme, I can use isometric and oblique drawing techniques. I can:** ○ draw in cabinet oblique; ○ draw lines, circles and curves in isometric; ○ recognise isometric and oblique drawings and explain their respective usefulness; ○ draw a simple isometric view from a given oblique view and vice-versa; ○ render my pictorial views effectively.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
4.1a Identify different faces of a pictorial drawing.	4.2a Apply three different colours to a pictorial drawing.	4.3a Identify sloping and/or curved surfaces of a pictorial drawing by applying a different colour.
4.1b Recognise cabinet oblique drawings from other pictorial projections.	4.2b Define the properties and basic elements of cabinet oblique drawings.	4.3b Explain appropriate uses for cabinet oblique drawings.
4.1c Draw cabinet oblique drawings using a given grid.	4.2c Construct a cabinet oblique drawing including sloping surfaces and/or circles on the front. *Using drawing equipment.*	4.3c Construct a cabinet oblique drawing including curvature on the 45° sloping surface.
4.1d Recognise isometric drawings.	4.2d Define the properties and basic elements of isometric drawings.	4.3d Explain appropriate uses for isometric drawings.
4.1e Draw an isometric drawing using a given isometric grid. *Limited to straight lines.*	4.2e Construct an isometric drawing including a sloping surface. *Using drawing equipment.* *Excluding isometric scale.*	4.3e Construct an isometric drawing including circles and curvatures. *Can be constructed by either the use of a grid, ordinates or compasses method.*
4.1f List appropriate uses for oblique and isometric drawing.	4.2f Select an appropriate pictorial drawing for a given task.	4.3f Justify the choice of an appropriate pictorial drawing for a given task.
	4.2g Construct an oblique view from an isometric view or vice versa. *Including sloping lines.*	4.3g Construct an oblique view from an isometric view or vice-versa. *Including circles and curvatures.*
4.1h Colour a design neatly and precisely using pencil colours.	4.2h Shade a design neatly and precisely using pencil colours.	

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
4.1i Identify different materials from illustrations. *Limited to wood, metal, plastic.*	4.2i Draw different materials using pencils and/or pencil colours.	4.3i Apply the materials in 4.1h to render a realistic pictorial drawing.
4.1j Identify the different symbols from illustrations. *Limited to concrete, glass and liquid water.*	4.2j Draw different symbol/texture for the appropriate materials.	4.3j Apply the materials' respective symbol/texture in 4.1h to identify a drawing.

Subject Focus:	**Pictorial Projection**
Learning Outcome 5: **(Paper II only)**	**At the end of the programme, I can solve a variety of problems related to pictorial drawing. I can:** ● **use isometric, oblique, perspective (1pt & 2pt) and planometric drawing techniques in order to represent a variety of forms and objects. I can:** ○ sketch using freehand, solids in isometric and oblique; ○ sketch using freehand more complex solids in isometric and oblique; ○ draw one-point and two-point perspective drawings of manufactured items and architectural interiors/exteriors; ○ construct isometric, oblique and planometric drawings from a pictorials of a different type. ● **convert orthographic projections to various pictorial projections. I can:** ○ draw oblique, isometric, planometric or perspective views from given orthographic views; ○ draw an oblique, isometric, planometric or perspective view from a real-life object and from my imagination; ○ choose the most suitable pictorial projection for a given task and explain my choice; ○ solve problems related to pictorial drawing within set time constraints and with minimum assistance.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
5.1a Construct a partially given cabinet oblique projection.	5.2a Sketch, using freehand, cabinet oblique projections. *Including sloping lines.*	5.3a Sketch, using freehand, cabinet oblique projections. *Including circles and curvature.*
5.1b Construct a partially given sketch in isometric drawing.	5.2b Sketch, using freehand, isometric drawings. *Including sloping lines.*	5.3b Sketch, using freehand, isometric drawings. *Including circles and curvatures.*
5.1c Recognise the difference between isometric, and planometric drawings.	5.2c Describe the major characteristics of planometric drawings and/or sketches of simple planometric drawings. *Limited to $30^o/60^o$.*	5.3c Construct planometric drawings, using appropriate techniques to represent a variety of forms and objects. *Including circles and curvatures.* *Limited to $30^o/60^o$.*
5.1d Recognise the difference between one-point perspective and two-point perspective drawings.	5.2d Describe the major characteristics of one-point perspective drawings and/or sketches of simple one-point perspective drawings.	5.3d Construct one-point perspective drawings of manufactured items and/or architectural interiors / exteriors. *May include additional vanishing points.*
	5.2e Describe the major characteristics of two-point perspective drawings and/or sketches of simple two-point perspective drawings.	5.3e Construct two-point perspective drawings of manufactured items and/or architectural interiors / exteriors.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
	5.2f Convert between isometric, oblique and planometric pictorial projections. *Including sloping lines.* *Planometric drawing limited to 30º/60º.*	5.3f Convert between isometric, oblique and planometric pictorial projections. *Including circles and curvatures.* *Planometric drawing limited to 30º/60º.*
5.1g Complete a partially drawn oblique drawing from a given orthographic projection.	5.2g Convert a simple orthographic projection to an oblique projection using appropriate tools. *Including sloping lines.*	5.3g Convert an orthographic projection to an oblique projection using appropriate tools. *Including circles and curvature.*
5.1h Complete a partially drawn oblique drawing from a real-life object.	5.2h Draw an oblique projection from a real-life object.	5.3h Create an oblique projection from imagination.
5.1i Complete a partially drawn isometric drawing from a given orthographic projection.	5.2i Convert a simple orthographic projection to an isometric drawing using appropriate tools. *Including sloping lines.*	5.3i Convert an orthographic projection to an isometric drawing using appropriate tools. *Including circles and curvature.*
5.1j Complete a partially drawn isometric drawing from a real-life object.	5.2j Construct an isometric drawing from a real-life object.	5.3j Create an isometric drawing from imagination.
5.1k Complete a partially drawn planometric drawing from a given orthographic projection.	5.2k Convert a simple orthographic projection to planometric using appropriate tools. *Including sloping lines.*	5.3k Convert an orthographic projection to planometric, using appropriate tools. *Including circles and curvature.*
5.1l Complete a partially drawn planometric view from a real-life object.	5.2l Draw a planometric view from a real-life object.	5.3l Create a planometric view from imagination.
5.1m Complete a partially drawn one-point and/or two-point perspective drawing from a given orthographic projection.	5.2m Convert a simple orthographic projection to a one-point and/or two-point perspective drawing. *Including sloping lines.*	5.3m Convert orthographic projection to one-point and/or two-point perspective drawing. *Limited to sloping lines.*
5.1n Complete a partially drawn one-point and/or two-point perspective drawing from a real-life object / environment.	5.2n Draw a one-point and/or two-point perspective drawing from a real-life object / environment.	5.3n Create a one-point and/or two-point perspective drawing from imagination. *For a given scenario (e.g. Draw a one-point perspective of your room), students should carry out preparatory work (measuring, sketching, drawing of plan and elevations, research, etc.), define the height of the eye level (sight line), choose a scale, place the vanishing point and construct the drawing.*

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
5.1o Choose the most suitable pictorial projection for a given task.	5.2o Draw the most suitable pictorial projection for a given task.	5.3o Justify the choice of the most suitable pictorial projection for a given task.

Subject Focus:	**Graphic Design**
Learning Outcome 6: **(Paper I and Paper II)**	**At the end of the programme, I can apply graphic design concepts effectively. I can:** ● **identify, discuss, and make use of basic visual principles within a finished graphic design outcome. I can:** ○ use colour effectively and distinguish between cool and warm colours; ○ select colours from the colour wheel to suit my design; ○ discuss the visual qualities of existing communication designs *such as posters, advertisements* and understand the process involved in their production. ● **recognise, adapt and create different icons and symbols. I can:** ○ recognise safety (prohibition, warning, mandatory, safe conditions and fire) general information, and wayfinding signs along with their correct colours and shapes; ○ use drawing instruments to draw and colour symbols such as safety signs; ○ draw stylised pictograms to convey an idea, *e.g. problems inspired by issues of recycling and diversity.*

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
6.1a Recognise points, lines, and planes.	6.2a Recall the different properties of points, lines, and planes.	6.3a Analyse everyday surroundings *(e.g. spotted fabrics, power lines, table surfaces, etc.)* in order to identify instances of points, lines and planes.
6.1b Recognise cold and warm colours.	6.2b Recall the different properties of cold and warm colours.	
6.1c Recognise primary, secondary and tertiary colours.	6.2c Describe how to achieve secondary and tertiary colours using primary colours. *E.g. Green is a secondary colour and is a mixture of equal parts of yellow and blue; Blue-green is a tertiary colour and is a mixture of blue and yellow where blue is in a greater proportion than yellow.*	6.3c Produce a colour wheel illustrating the relationship between primary, secondary and tertiary colours.
6.1d Recognise shapes *(e.g. squares, rectangles, circles, etc.)* and forms *(e.g. cubes, spheres, pyramids, etc.).*	6.2d Recall the different properties of shapes and forms.	6.3d Produce basic freehand renderings of both shapes and forms.
6.1e Define negative or white space within the context of graphic design.	6.2e Explain the importance of negative or white space within the context of a given example of graphic design.	
6.1f Define balance within the context of graphic design.	6.2f Describe how balance may be achieved within a graphic design artwork using scale, colour and/or position.	

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
6.1g Define contrast within the context of graphic design.	6.2g Describe how contrast may be achieved within a graphic design artwork using scale, colour and/or position.	
6.1h Define framing within the context of graphic design.	6.2h Describe how framing may be achieved within a graphic design artwork using cropping and/or position.	
6.1i Define depth within the context of graphic design.	6.2i Describe how depth may be achieved within a graphic design artwork using scale, colour and/or position.	
6.1j Define implied motion within the context of graphic design.	6.2j Describe how implied motion may be achieved within a graphic design artwork using scale, colour and/or position.	
6.1k Define hierarchy within the context of graphic design.	6.2k Describe how hierarchy may be achieved within a graphic design artwork using scale, colour, spacing and placement.	
6.1l Recall different types of formal elements which may be present in a graphic design outcome. *Limited to point, line and plane, colour, shape and form, and negative space.*	6.2l Identify the formal elements listed in 6.1l within an existing graphic design artwork.	6.3l Analyse the use and purpose of the formal elements listed in 6.1l within an existing graphic design artwork. *E.g. colour is being used to create contrast, negative space is being used to create balance, etc.*
6.1m Recall a variety of visual principles related to graphic design. *Limited to balance, contrast, framing, depth, motion and hierarchy.*	6.2m Identify the visual principles listed in 6.1m within an existing graphic design artwork.	6.3m Analyse the use and purpose of the visual principles listed in 6.1m within an existing graphic design artwork. *E.g. motion is being used to make the logo appear dynamic, contrast is being used to highlight a specific object in an illustration, etc.*
	6.2n Select suitable formal elements such as point, line and plane, colour, shape and form, and/or negative space in order to produce a specific outcome related to a given graphic design brief.	6.3n Defend own use of formal elements such as point, line and plane, colour, shape and form, and/or negative space in order to produce a specific outcome related to a given graphic design brief.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
	6.2o Select suitable visual principles such as balance, contrast, framing, depth, and/or motion in order to produce a specific outcome related to a given graphic design brief.	6.3o Defend own use of visual principles such as balance, contrast, framing, depth, and/or motion in order to produce a specific outcome related to a given graphic design brief.
6.1p Associate various colours with their different meanings. *Limited to red, blue, yellow, green, black, white and pink.*	6.2p Recall the different meanings associated with the colour mentioned in 6.1p.	
6.1q Define the meaning of logos.	6.2q Discuss the significance of different logos from a historical context.	6.3q Draw logos (construction and/or freehand) to a specific brief after exploring different sketched ideas.
6.1r Recognise geometric, organic and abstract shapes.	6.2r List a number of different applications of geometric, organic and abstract shapes related to graphic design.	
6.1s Recognise icons and symbols.	6.2s Define the differences between icons and symbols.	
6.1t Identify different icons and symbols from a historical context. *E.g. hieroglyphics, Roman numerals, religious and mythological symbols, etc.*	6.2t Discuss the significance of different icons and symbols from a historical context. *E.g. hieroglyphics, Roman numerals, religious and mythological symbols, etc.*	
6.1u Identify a pictogram within everyday signs *(e.g. prohibition, warning, mandatory, safe condition, fire safety, general information, and wayfinding signs)* based on their individual meanings.	6.2u Draw different everyday signs *(e.g. prohibition, warning, mandatory, safe condition, fire safety, general information, and wayfinding signs)* with their correct shapes and colours. *Refer to ISO 7010 for safety signs.*	6.3u Design different everyday signs *(e.g. prohibition, warning, mandatory, safe condition, fire safety, general information, and wayfinding signs)* with their correct shapes and colours, after exploring different sketched ideas. *Refer to ISO 7010 for safety signs.*
	6.2v Re-create a variety of different everyday icons and symbols from memory.	6.3v Alter an aspect of an existing non-conventional icon or symbol while retaining its original meaning.
		6.3w Create original non-conventional signs in order to communicate an intended message without the use of words.

Subject Focus:	Graphic Design
Learning Outcome 7 (Paper II only)	**At the end of the programme, I can represent data in a graphical manner and communicate information. I can:** ○ read graphs, charts and diagrams to analyse and interpret data, e.g. data relating to environmental issues and diversity such as ethnicity, religion and culture; ○ represent data using both 2D and 3D charts and graphs.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
7.1a List a variety of different infographics. *Limited to bar graphs, line graphs, histograms, pie charts, flowchart infographics, Venn diagrams and pictographs.*	7.2a Describe the characteristics of the different types of infographics listed in 7.1a. *E.g. key and/or legend.*	
	7.2b Recall the different instances or scenarios in which the infographic types listed in 7.1a may be used to visualise data.	7.3b Identify the most appropriate type of infographic out of the ones listed in 7.1a for a specific given task.
7.1c Recognise a bar graph, line graph and/or histogram amongst a variety of given infographic examples.	7.2c Complete a given bar graph, line graph and/or histogram using the information provided.	7.3c Produce a bar graph, line graph and/or histogram in order to visualise a set of given data.
7.1d Recognise a pie chart amongst a variety of given infographic examples.	7.2d Complete a given pie chart using the information provided.	7.3d Produce a pie chart in order to visualise a set of given data. *E.g. After converting percentages into degrees.*
7.1e Recognise a flowchart infographic *(e.g. illustrated instructions to assemble a piece of furniture)* amongst a variety of given infographic examples.	7.2e Complete a given flowchart infographic using the information provided to illustrate a sequence of instructions. *E.g. a set of instructions necessary to assemble a piece of furniture.*	7.3e Produce a flowchart infographic in order to visualise the sequence in which a set of instructions and/or events must take place.
7.1f Recognise a Venn diagram amongst a variety of given infographic examples.	7.2f Complete a given Venn diagram using the information provided.	7.3f Produce a Venn diagram in order to visualise a set of given data.
7.1g Recognise a pictograph amongst a variety of given infographic examples.	7.2g Complete a given pictograph using the information provided.	7.3g Produce a pictograph in order to visualise a set of given data.

Subject Focus:	**Graphic Design**
Learning Outcome 8: **(Paper I and Paper II)**	**At the end of the programme, I can use digital tools and idea generation techniques to develop designs. I can:** ● **use both raster and vector desktop publishing software at a basic level. I can:** ○ understand and use basic computer tools associated with desktop publishing and image editing software; ○ prepare designs using desktop publishing and image editing software; ○ produce a final graphic design outcome. ● **understand and use a variety of tools, media and techniques in order to communicate ideas. I can:** ○ propose and produce good quality 2D and 3D preparatory freehand sketches and drawings to communicate my ideas; ○ use a variety of software tools to communicate design ideas graphically; ○ use a combination of graphical techniques to demonstrate my designs; ○ present my design ideas using appropriate tools and media.; ○ use freehand preparatory sketches to develop ideas; ○ explain and present my ideas graphically and verbally.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
8.1a Define raster graphics.		8.3a Identify appropriate uses for raster graphics.
8.1b Define vector graphics.	8.2b Distinguish between raster and vector graphics.	8.3b Identify appropriate uses for vector graphics.
8.1c Identify basic desktop publishing and image editing software tools. *This includes both raster (e.g. Adobe Photoshop, Corel Paint, Gimp, Affinity Photo.) and vector software (e.g. Adobe Illustrator, Corel Draw, Affinity Designer).* *Basic tools limited to selection tools, transform controls, pen, zoom, brush and basic shape.*	8.2c Use basic tools mentioned in 8.1c, following instructions, to edit an existing asset.	8.3c Use basic tools mentioned in 8.1c, to edit an existing asset according to given specifications. *E.g. size, orientation, position, shape.*
8.1d State the purpose of layers in desktop publishing software.	8.2d Use layers in desktop publishing software. *Limited to add, delete, rename and reposition.*	
8.1e Identify photo editing tools in raster software. *Limited to crop, brightness and contrast, hue and saturation.*	8.2e Describe the function of the photo editing tools mentioned in 8.1e.	8.3e Use the appropriate photo editing tools mentioned in 8.1e. *E.g. desaturate an image; correct colour, exposure on an existing photo, etc.*

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
8.1f Identify drawing and/or type tools in a vector software. *Limited to pen, type (text), stroke and fill, and alignment.*	8.2f Describe the function of the drawing and/or type tools in a vector software mentioned in 8.1f**.**	8.3f Use the appropriate drawing and/or type tools mentioned in 8.1f to create a vector artwork. *E.g. logo, icon, symbol, signage, illustration.*
8.1g List a variety of different ideas generation techniques. *E.g. SCAMPER, mind mapping, reverse thinking, etc.*	8.2g Create a mock-up from the ideas generated.	
8.1h Define the ideas generation technique "SCAMPER".	8.2h Identify an existing example of a graphic design outcome which may have been created using SCAMPER *E.g. magazine adverts, logos, website designs, etc.*	
8.1i Define the term "mind map".	8.2i Identify a mind map amongst a variety of given diagram examples.	
8.1j Define the term "reverse thinking".	8.2j Identify an existing example of a graphic design outcome which may have been created using reverse thinking *E.g. magazine adverts, logos, website designs, etc.*	
	8.2k Use SCAMPER, a mind map, and/or reverse thinking in order to solve a given graphic design problem.	
	8.2l Produce a series of sketches in order to generate ideas for a given graphic design problem.	8.3l Annotate own sketches in order to defend an idea and/or concept.
	8.2m Select appropriate sketches in order to represent an idea and/or concept.	
8.1n Identify appropriate digital tools and software applications which may be used to digitise sketches.	8.2n Use a digital scanner in order to digitise an existing sketch.	8.3n Use appropriate software in order to clean up a scanned sketch. *E.g. Adobe Photoshop, Gimp, etc.*

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
	8.2o Find appropriate reference images in order to explain an idea and/or concept.	8.3o Use appropriate software to create a mock-up demonstrating an idea within its relevant context. *E.g. a billboard, magazine, corporate vehicle signage, etc.*
	8.2p Produce a presentation using an existing template. *E.g. Powerpoint slideshow, multi-page PDF, etc.*	8.3p Design own presentation from scratch using appropriate type and graphic elements.
	8.2q Explain own design outcome and/or concept in front of an audience of peers using the presentation produced in 8.2q.	8.3q Defend own ideas and/or creative decisions in front of an audience of peers during a presentation.

Subject Focus:	**Orthographic Projection**
Learning Outcome 9: **(Paper II only)**	**At the end of the programme, I can draw in first angle orthographic projection using standard conventions. I can:** ○ recognise the direction of viewing used to derive the various views in first angle projection; ○ recognise and draw the first angle projection symbol; ○ project the elevations of a simple solid in first angle projection; ○ project across various views; ○ use standard conventions to represent hidden detail and centre lines.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
9.1a Identify the end elevation and plan by adding arrows to the given pictorial view. *The arrow of the front elevation is given.*		
9.1b Identify the first angle symbol.	9.2b Draw the first angle symbol.	
9.1c Draw the front and/or elevation view of a simple solid in first angle orthographic projection with the use of a grid.	9.2c Draw the front elevation, end elevation and plan in first angle orthographic projection with the use of a grid.	
9.1d Project lines across the front and end elevations to obtain specific heights.	9.2d Project lines from the plan to the other two views and/or vice-versa.	
	9.2e Draw an outline of the correct object profile on the front elevation, end elevation and plan, in first angle projection.	
	9.2f Draw a first angle projection of a given solid, including sloping surfaces.	
9.1g Identify hidden edges on a given drawing.	9.2g Draw a first angle projection including hidden edges as per standard conventions.	
9.1h Identify a centre line.	9.2h Draw a first angle projection including circular holes showing centre lines as per standard conventions.	
		9.3i Draw a first angle projection including a combination of hidden and centre lines.

Subject Focus:	**Orthographic Projection**
Learning Outcome 10: **(Paper I and Paper II)**	**At the end of the programme, I can draw in third angle projection and use computer-aided drafting tools. I can:** • **recognise and draw in third angle orthographic projection using standard conventions. I can:** ○ recognise the direction of viewing used to derive the various views in third angle projection; ○ recognise and draw the third angle projection symbol; ○ project a third view from any two other views; ○ draw a simple sectional drawing; ○ draw detailed sectional elevations which may include webs, ribs, shafts, and pins according to standard conventions; ○ apply standard conventions to sectional engineering drawings. • **use appropriate printed grid/design software in order to produce designs and 2D drawings. I can:** ○ use the Cartesian co-ordinate system to apply computer commands from given data onto a printed grid; ○ perform basic operations and use basic design software tools; ○ produce 2D drawings by using computer design software; ○ plan and produce a simple architectural design for the layout of a room or landscape, e.g. plan a sustainable recreational area.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
10.1a Identify the end elevation and plan by adding arrows to a pictorial view. *The arrow of the front elevation is given.*	10.2a Draw the front, end and plan of a given object, in third angle projection.	
	10.2b Draw a third angle projection of a given object using a chosen front elevation. *E.g. choosing to draw the third angle projection of a car using the side profile of the car as the front elevation*.	10.3b Justify the choice of front elevation made in 10.2b. *E.g. side profile was chosen because it is the most recognisable view and illustrates any hidden details much better than other views.*
10.1c Identify the third angle symbol.	10.2c Draw the third angle symbol.	
10.1d Identify given views in a third angle orthographic projection.	10.2d Project a front elevation from a given end elevation and plan in third angle projection.	10.3d Project a third view from any two given views in third angle projection.
10.1e Identify basic standard sectioning conventions. *Limited to cutting plane, section label, sectioning direction.* *E.g. section X-X.*	10.2e Identify standard sectioning conventions used for webs, ribs, shafts and pins.	

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
10.1f Identify mechanical parts and features. *Limited to chamfer, fillet, slot, dowel, through hole, blind hole, countersunk hole, counterbored hole, webs, ribs, shafts and pins.*	10.2f Draw a whole sectional view of a solid object. *Limited to objects with chamfers, fillets, slots, dowels, through holes, blind holes, countersunk holes and/or counterbored holes.*	10.3f Draw a whole sectional view of a machine part which may include webs, ribs, shafts and/or pins.
		10.3g Draw a (half/part/staggered) sectional view of a machine part which may include webs, ribs, shafts and/or pins.
10.1h Identify hatching lines.	10.2h Apply hatching lines to a sectioned object in 10.2f. *Limited to simple whole sectioning.*	10.3h Apply hatching lines to a combination of two or more machine parts in 10.3f & 10.3g according to standard conventions. *E.g. webs, ribs, shafts and pins cut along their axis are **NOT** hatched.*
10.1i Identify centre lines on a given sectional drawing.	10.2i Apply centre lines to a sectional view. *Hidden lines should not be represented on a sectional view.*	
10.1j Identify the X-axis and Y-axis in a Cartesian coordinate system.	10.2j Represent letters and numbers from DATA onto a given grid.	
10.1k Identify the commands MOVE and DRAW.	10.2k Draw a shape on a printed grid by following commands.	
10.1l Identify the lines of symmetry on a printed grid, and the MIRROR command.	10.2l Apply transformations to the design. *Limited to MIRROR.*	
10.1m Match colour codes in a computer programme. *E.g. the ACI number (AutoCAD® colour index).*	10.2m Apply the correct colour to the DRAW command according to the colour code. *E.g. ACI number 1 = RED.*	
10.1n Identify the icon of a CAD software. *E.g. AutoCAD® software.*	10.2n Recall that CAD stands for Computer Aided Drawing/Drafting/Design.	10.3n Explain the advantages and disadvantages of using CAD software.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
10.1o Identify the menu bar in a CAD interface.	10.2o Carry out basic file operations. *Limited to Open an existing file, Create a new file, Save a file and close a file.*	10.3o Carry out advanced file operations. *Limited to Save as and Plot/Print from a given template.*
10.1p Identify the toolbar and command line elements in the user-interface.	10.2p Switch between model space and paper/layout space.	10.3p Explain the use of model space and paper/layout space.
10.1q Identify the layers toolbar.	10.2q Switch between layers in a given template.	10.3q Use layers in a given template to draw lines of different properties. *Limited to colour, line thickness and line type.*
10.1r Identify the zoom and pan tools.	10.2r Use the zooming and panning tools. *Limited to zooming and panning using the mouse scroll wheel.*	10.3r Use the zoom window tool to view a selected drawing.
10.1s Identify basic editing commands. *Limited to Erase, Copy, Move, Trim and Mirror.*	10.2s Use the commands in 10.1s to edit simple given drawings.	
10.1t Identify basic drawing tools. *Limited to line, rectangle, circle, ellipse and polygon.*	10.2t Use the tools in 10.1t to draw simple drawings. *Limited to 2D drawings.*	10.3t Create 2D drawings using CAD software.
10.1u Identify the lettering tool icon within a CAD interface.	10.2u Use the lettering tool to include annotations. *E.g. dtext command.*	10.3u Apply basic text formatting. *Including bold, italics, font type and font size.* *E.g. mtext command.*
10.1v Identify basic architectural symbols. *Limited to doors, windows, archways, tiles, stairs arrows and shafts.*	10.2v Draw a freehand sketch of an interior layout. *E.g. plan of a bedroom or a kitchen.*	10.3v Construct a detailed drawing of the layout in 10.2v.
10.1w Identify basic furniture symbols. *Limited to chairs, tables, benches, plants and deckchairs.*	10.2w Draw a freehand sketch of an exterior layout. *E.g. garden landscape or a sustainable recreational area.*	10.3w Construct a detailed drawing of the landscape in 10.2w.

Subject Focus:	**Orthographic Projection**
Learning Outcome 11: **(Paper II only)**	**At the end of the programme, I can solve a variety of problems related to orthographic projection according to given data or instructions. I can:** ○ produce an assembled orthographic projection from a simple exploded pictorial drawing; ○ produce using freehand, an assembled pictorial drawing from an exploded pictorial drawing or through a group investigation of a real-life disassembled object; ○ project auxiliary views from orthographic projections and vice-versa; ○ solve problems related to orthographic projections within set time constraints and with minimum assistance.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
11.1a Identify the centre lines that denote transition paths to assemble an object.		
11.1b Identify a parts list.	11.2b Recognise the different detailed parts that form up the assembly.	
11.1c Identify an exploded projection.	11.2c Draw a simple assembled orthographic projection from an exploded pictorial projection. *Limited to simple mounted blocks.*	11.3c Draw an assembled orthographic projection from a pictorial projection. *Including interlocking features like dowels and slots.*
	11.2d Draw a freehand assembled orthographic sketch from an exploded pictorial projection.	11.3d Draw a freehand assembled sketch of a real-life disassembled object.
11.1e Identify the viewing direction in an auxiliary drawing.	11.2e Project lines according to the viewing direction.	
11.1f Identify the projection planes in an auxiliary drawing. *E.g. X-Y & X_1-Y_1 planes.*	11.2f Transfer measured distances from one plane to the second plane.	
	11.2g Project an auxiliary elevation and/or plan of a simple object. *Limited to straight and sloping surfaces.*	11.3g Project an auxiliary elevation and/or plan of an object including curvatures.

Subject Focus:	**Solid Geometry**
Learning Outcome 12: **(Paper II only)**	**At the end of the programme, I can draw orthographic projections and one-piece developments of truncated prisms and cylinders. I can:** ○ use the standard conventions to represent fold lines and use them in surface developments; ○ draw orthographic projections of truncated prisms and cylinders; ○ construct one-piece surface developments of prisms and cylinders including the top and bottom, truncations and true shapes of cuts. *e.g. learners in groups are asked to obtain the surface development of solids; simple modelling of the developments using cardboard.*

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
12.1a Identify a fold line.	12.2a Draw a fold line according to standard convention.	
12.1b Identify a prism and/or a cylinder. *Limited to right prisms and right cylinders.* *Excluding inclined and oblique solids.*	12.2b Construct a one-piece surface development of a prism and/or cylinder.	
12.1c Identify the following: Front elevation, end elevation, plan, cutting plane, true shape of cut, seam line and development of prisms. *Limited to triangular, square, rectangular, hexagonal, pentagonal, and octagonal based prisms.*	12.2c Project the end elevation from a given front elevation and plan of a truncated prism.	12.3c Construct the true shape of a truncated prism.
12.1d Produce a solid model of a truncated prism by cutting out, folding and gluing a given one-piece development. *E.g. Cut out a one-piece development, fold it and enclose the shape.* *Limited: to single cut above the base.*	12.2d Construct the development of a truncated prism. *Excluding true shape and plan.* *Limited: to single cut above the base.*	12.3d Construct a one-piece development of a truncated prism out of paper or card. *Including true shape, plan and fold lines.* *Limited: to single cut above the base.*
12.1e Identify the following items: Front elevation, end elevation, plan, cutting plane, true shape of cut, seam line and development of cylinders.	12.2e Project the end elevation from a given front and plan of a truncated cylinder.	12.3e Construct the true shape of a truncated cylinder.
12.1f Produce a solid model of a truncated cylinder by cutting out, folding and gluing a given one-piece development. *E.g. Cut out a one-piece development, fold it and enclose the shape.* *Limited: to single cut above the base.*	12.2f Construct the development of a truncated cylinder. *Excluding true shape and plan.* *Limited: to single cut above the base.*	12.3f Construct a one-piece development of a truncated cylinder out of paper or card. *Including true shape and plan.* *Limited: to single cut above the base.*

Subject Focus:	**Solid Geometry**
Learning Outcome 13: (Paper II only)	**At the end of the programme, I can draw orthographic projections and one-piece developments of truncated pyramids and cones. I can:** ○ rotate pre-modelled objects in real time to view true lengths and shapes with the use of design software; ○ draw orthographic projections of truncated pyramids and cones; ○ construct one-piece surface developments of truncated pyramids and cones including the top and bottom, true-lengths and true shapes of cuts.

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
13.1a Identify a pyramid and/or a cone. *Limited to right pyramids and right cones.* *Excluding inclined and oblique solids.*		
13.1b Identify a true length. *Including rotating a pre-modelled object in real time to view the true length*.	13.2b Construct a one-piece surface development of a solid pyramid and/or cone including the true lengths.	
13.1c Identify the following items: Front elevation, end elevation, plan, cutting plane, true shape of cut, seam line and development of pyramids. *Including rotating a pre-modelled object in real time to view the true shape*. *Limited to triangular, square, rectangular, hexagonal, pentagonal, and octagonal based pyramids.*	13.2c Project the end elevation including the cut from a given front elevation and plan of a truncated pyramid.	13.3c Construct the true shape of the cut, belonging to a truncated pyramid.
13.1d Produce a solid model of a truncated pyramid by cutting out, folding and gluing a given one-piece development. *E.g. Cut out a one-piece development, fold it and enclose the shape.* *Limited: to single cut above the base.*	13.2d Construct the development of a truncated pyramid using the true length. *Excluding true shape and plan.* *Limited: to single cut above the base.*	13.3d Construct a one-piece development of a truncated pyramid. *Including true shape, plan and fold lines.* *Limited: to single cut above the base.*

Assessment Criteria (LEVEL 1)	Assessment Criteria (LEVEL 2)	Assessment Criteria (LEVEL 3)
13.1e Identify the following items: Front elevation, end elevation, plan, cutting plane, true shape of cut, seam line and development of a cone. *Including rotating a pre-modelled object in real time to view the true shape*.	13.2e Project the end elevation including the cut from a given front elevation and plan of a truncated cone.	13.3e Construct the true shape of the cut belonging to a truncated cone.
13.1f Produce a solid model of a truncated cone by cutting out, folding and glueing a given one-piece development. *E.g. cut out a one-piece development, fold it and enclose the shape.* *Limited: to single cut above the base.*	13.2f Construct the development of a truncated cone. *Excluding true shape and plan.* *Limited: to single cut above the base.*	13.3f Construct a one-piece development of a truncated cone. *Including true shape and plan.* *Limited: to single cut above the base.*

Subject Focus:	**Solid Geometry**
Learning Outcome 14: **(Paper I and Paper II)**	**At the end of the programme, I can solve a variety of problems related to solid geometry according to given data or instructions. I can:** ● **recognise and construct conic sections and tasks related to intersections. I can:** ○ construct and recognise the sections of a cone that produce a circle, an ellipse, a parabola, and a hyperbola; ○ project the curves of intersection between combinations of prisms and cylinders whose axis are perpendicular and may be in-line or offset; ○ construct the developments of intersecting solids. ● **project elevations from developments and solve problems related to solids. I can:** ○ project an elevation from a given development of a prism or pyramid; ○ project an elevation from a given development of a cylinder or cone; ○ solve problems related to solid geometry within set time constraints and with minimum assistance.

Assessment Criteria (LEVEL LEVEL 1)	Assessment Criteria (LEVEL LEVEL 2)	Assessment Criteria (LEVEL LEVEL 3)
14.1a Identify the conic sections. *Limited to circle, ellipse, parabola, and hyperbola.*	14.2a Construct an ellipse as a section of a truncated cone by using generating lines.	14.3a Construct a parabola and/or a hyperbola by using generating lines.
14.1b Identify the seam of intersection between two intersecting solids.	14.2b Construct the seam of intersection between two prisms and/or two cylinders whose axes are perpendicular and in-line.	14.3b Construct the seam of intersection between two prisms and/or two cylinders whose axes are perpendicular and offset.
14.1c Produce a model of two intersecting solids by cutting out, folding and glueing given developments. *E.g. Cut out developments, fold them and enclose the solids.*	14.2c Construct the seam of intersection between a prism and a cylinder whose axes are perpendicular and in-line.	14.3c Construct the seam of intersection between a prism and a cylinder whose axis are perpendicular and offset.
	14.2d Construct the developments of the solids in 14.2b and/or 14.2c.	14.3d Construct the developments of the solids in 14.3b and/or 14.3c.
	14.2e Project an elevation from a given development of a prism. *Given a partially front and/or plan view.*	14.3e Project an elevation from a given development of a cylinder. *Given a partially front and/or plan view.*
	14.2f Project an elevation from a given development of a pyramid. *Given a partially front and/or plan view.*	14.3f Project an elevation from a given development of a cone. *Given a partially front and/or plan view.*

Scheme of Assessment

General Notes

1. Some assessment criteria include further information in brackets and italics. Note that “limited to” implies that only those examples listed will be examined while “E.g.” means that apart from the examples listed, other related instances may be examined. "Excluding" implies that such aspects of the assessment criteria will not be examined, and "Including" implies additional detail to the criteria.
2. Questions will be set in English and must be answered in English.
3. The questions in all papers, which may include material from more than one Learning Outcome, will be printed on answer sheets, and may include pre-printed partly drawn solutions. Written solutions may be required.
4. Candidates are to provide their own drawing equipment.
5. Questions shall be set in SI units and reference should be made, as appropriate, to the following publications of the British Standards Institution.

   i) PP 8888 Engineering drawing practice for schools and colleges [excluding section 14 - toleranced dimensions]

   ii) Other related ISO standards.
6. Candidates should write their name and index no. on all sheets.
7. Candidates must attempt all questions.
8. All answers are to be drawn accurately with instruments, unless otherwise stated.
9. All construction lines MUST be left on each solution to show the method employed.
10. The following drafting aids may not be used (trammels, arc ends, ellipse aids, and letter stencils) during the examination.
11. Electronic calculators may be used in any part of the examination.
12. All dimensions are in millimetres.
13. Candidates are expected to estimate any missing dimensions.
14. Marks will be awarded for accuracy, clarity and appropriateness of construction.
15. Only the use of freehand lettering techniques will be accepted, unless otherwise stated.
16. The effective use of various techniques of shading, colouring and other techniques for emphasis, using colour pencils is expected.
17. Candidates should be aware of the value of relative line thickness and density.
18. Candidates should also be able to select the most effective method of graphical illustration; for instance, whether to draw freehand or use instruments, or whether to employ orthographic or pictorial projections.

School Candidates

The assessment consists of Paper I and Paper 2. Paper I consist of unmoderated school-based assessment (SBA) that is to be set and assessed by the school. Paper II consists of a controlled assessment that will take place at the end of the three-year programme.

School-based assessment (SBA): is any type of assessment of a candidate made by the school relevant to the respective SEC syllabus contributing to the final level awarded in the subject.

Controlled assessment: is comprised of a two-hour written exam set at the end of the programme and differentiated between two tiers:

a. Levels 1 and 2;
b. Levels 2 and 3.

Candidates are to satisfy the examiner in Paper I and Paper II to obtain a level higher than 1.

Paper I - School Based Assessment (**30% of the total mark).**

The school-based assessment shall be marked out of 100 each year (9, 10 and 11). The assessment for each year will contribute to 10% of the overall mark and will be reported to MATSEC by the school in Year 11. Therefore, each year will equally contribute to the final mark of the school-based assessment. The school-based assessment shall reflect the MATSEC syllabus covered in Year 9, Year 10 and Year 11.

School-based assessment can be pegged at either of two categories:

- SBA at categories 1-2 must identify assessment criteria from these two levels. It is suggested that ACs are weighted at a ratio of 40% at Level 1 and 60% at Level 2.
- SBA at categories 1-2-3 must identify assessment criteria from each of Levels 1, 2, and 3. It is suggested that ACs are weighted at a ratio of 30% at each of Levels 1 and 2, and 40% at Level 3.

The mark for SBA at level categories 1-2 presented for a qualification at level categories 2-3 will be calculated to 60% of the original mark. The mark stands in all other cases.

Paper II - Controlled Assessment (70% of the total mark).

Written Examination (100 marks; 2 hours)

Learning outcomes with assessment criteria in the psychomotor domain can be assessed by asking questions in pen-and-paper format seeking understanding of the activity.

Controlled Assessment will:

- will cover most learning outcomes including all learning outcomes which are not indicated to be covered through coursework;
- be marked out of 100 and all questions in each section are compulsory - answers are to be drawn/written on the examination paper provided.

Controlled Paper 1-2 will:

- have 10 – 12 questions based on level 1 and level 2 Assessment Criteria;
    - 40% of the marks allotted will be based on Assessment Criteria from level 1
    - 60% of the marks allotted will be based on Assessment Criteria from level 2

- be printed on A4 sheets.

Controlled Paper 2-3 will:

- have 6 – 8 questions based on level 2 and level 3 Assessment Criteria;
    - 40% of the marks allotted will be based on Assessment Criteria from level 2
    - 60% of the marks allotted will be based on Assessment Criteria from level 3

- be printed on A3 sheets.

Private Candidates

Private candidates will not be expected to carry out any school-based assessment as school candidates. Instead, private candidates need to sit for another Controlled paper as an alternative to the school-based assessment. Private candidates will be assessed through the means of **TWO** Controlled papers, one of which is common with school candidates.

Paper I – Controlled Assessment - Private Candidates Only (30% of the total mark).

Written Examination (100 marks; 2 hours)

Paper I for private candidates shall be a controlled assessment assessing levels 1, 2 and 3 as described in the respective syllabus and set and marked by MATSEC. It shall mainly focus on the learning outcomes marked in the respective syllabi as suggested for school-based assessment.

Learning outcomes with assessment criteria in the psychomotor domain can be assessed by asking questions in pen-and-paper format seeking understanding of the activity.

Controlled Assessment will:

- be marked out of 100 and all questions in each section are compulsory - answers are to be drawn/written on the examination paper provided.

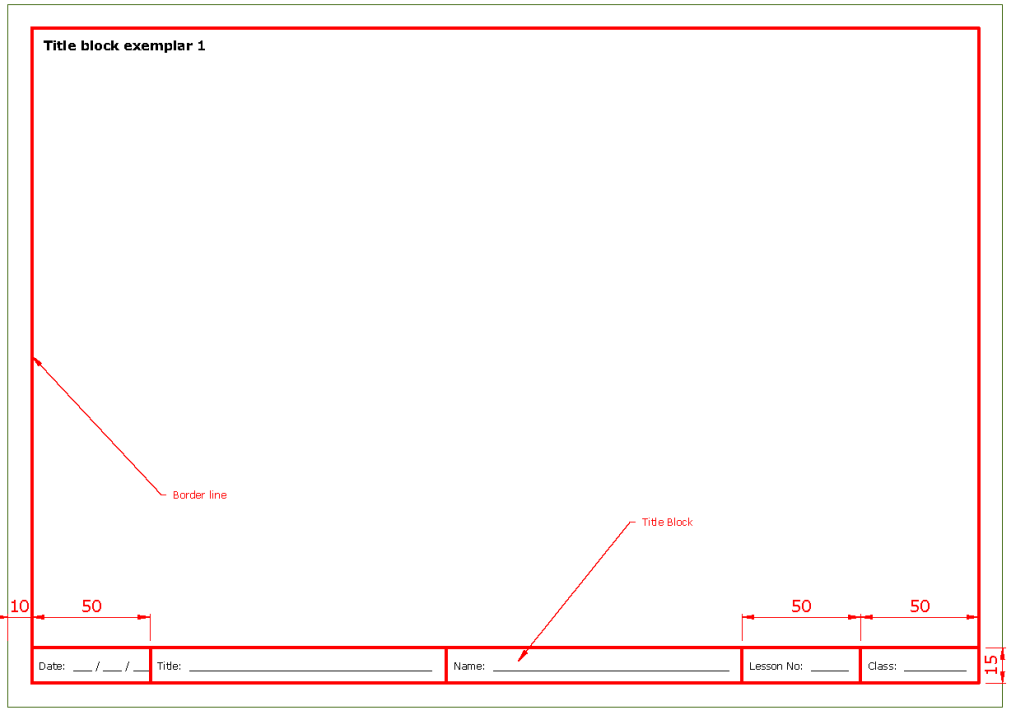
- Controlled Paper 1-2-3 will:
  - have 6 – 8 questions based on levels 1-2-3 Assessment Criteria;
    - 30% of the marks allotted will be based on Assessment Criteria from level 1
    - 30% of the marks allotted will be based on Assessment Criteria from level 2
    - 40% of the marks allotted will be based on Assessment Criteria from level 3
  - be printed on A4 sheets.

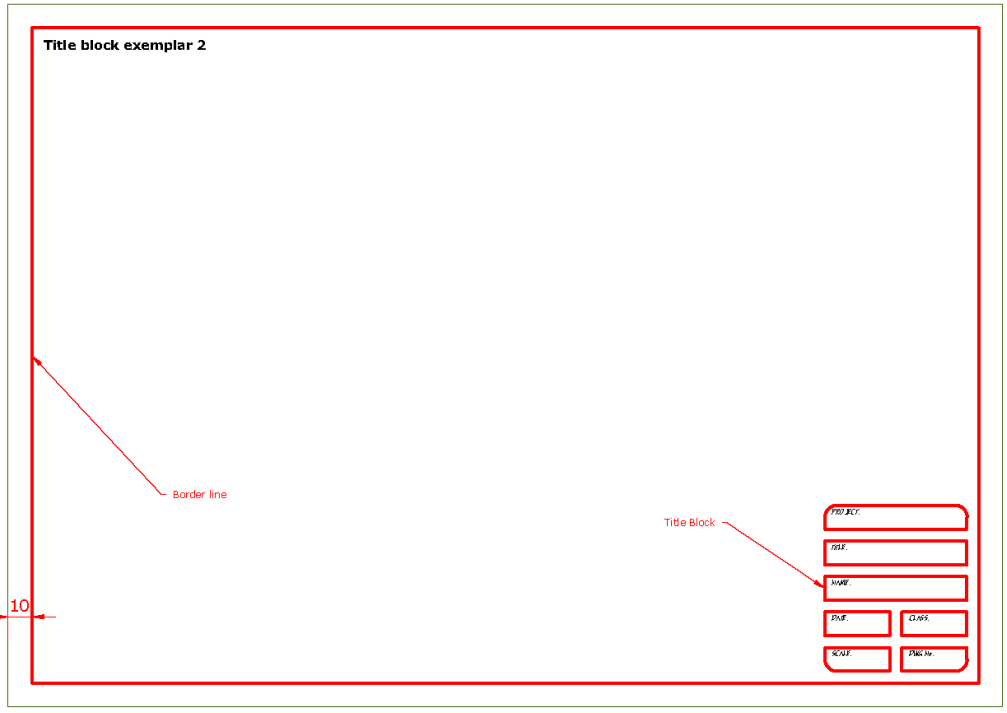
Paper II - Controlled Assessment (70% of the total mark).

Paper II is common with school candidates.

Appendices

Specimen of Title/Name Block

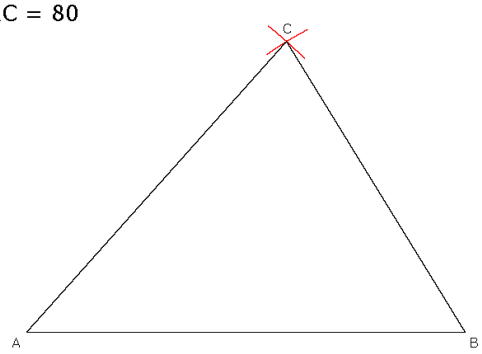




Construction of triangles

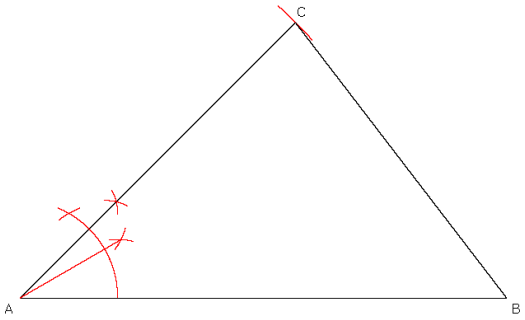
1) Three sides

AB = 90
BC = 70
AC = 80



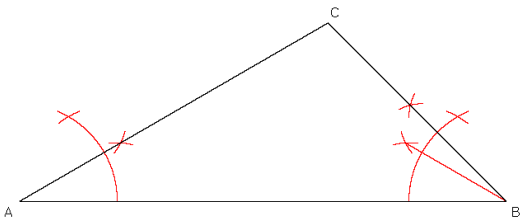
2) Two sides and their included angle

AB = 100
AC = 80
Angle CAB = 45°



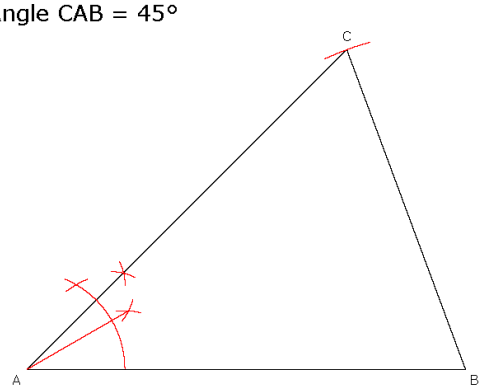
3) Base and two base angles

AB = 100
Angle CBA = 45°
Angle CAB = 30°



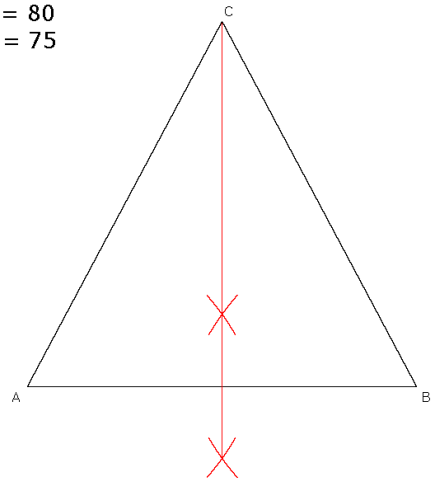
4) Base, one base angle and the length of the side opposite the base angle

AB = 90
BC = 70
Angle CAB = 45°



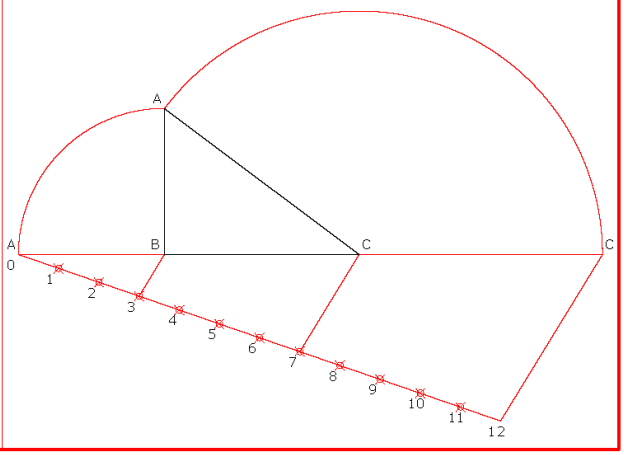
5) Base and altitude of an isosceles triangle

AB = 80
VH = 75



6) Perimeter and ratio of the three sides

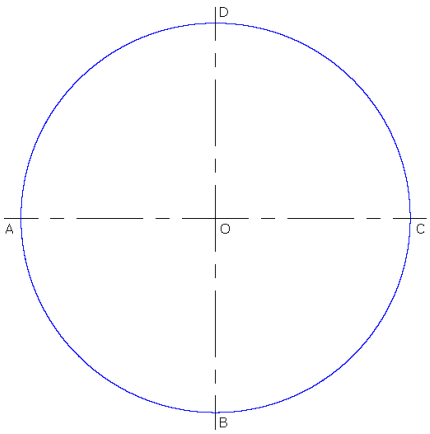
Perimeter = 120
AB(3) : BC(4) : AC(5)



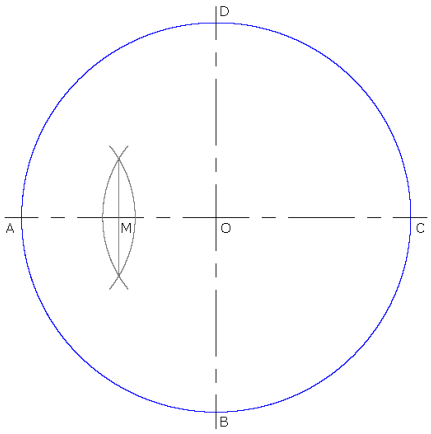
Pentagon particular method

1) Draw circle center O on center lines AC and DB.
2) Bisect OA to find mid-point M.
3) Draw arc MD to find point E.
4) Using length DE for the sides, draw arcs on the circumference starting from the top vertex.
5) Draw the 5 sides of the pentagon inside circle center O.

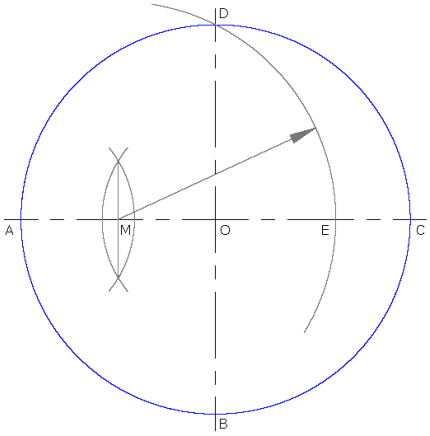
Step 1



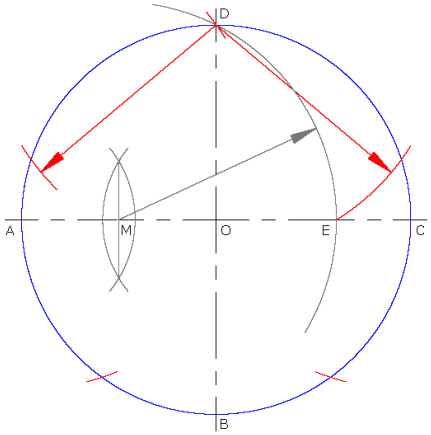
Step 2



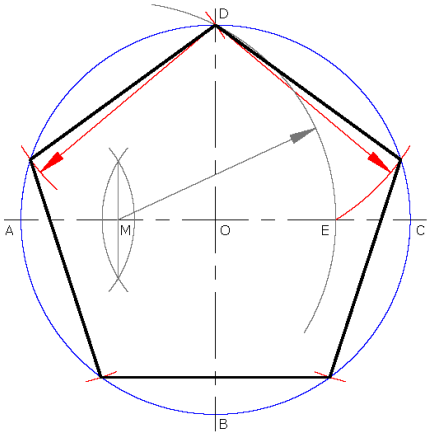
Step 3



Step 4

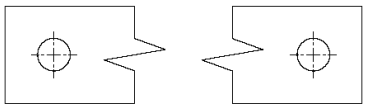


Step 5

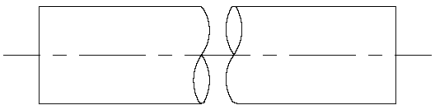


List of conventions

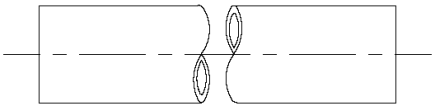
Conventional representations.



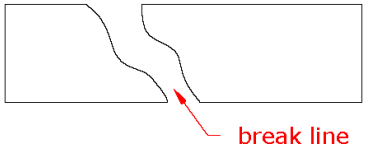
Limits of partial or interrupted views and sections, if the limit is not the axis



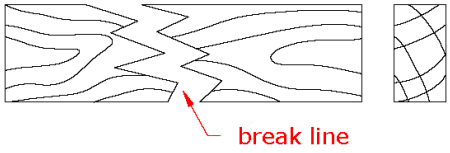
Conventional break lines for solid shaft



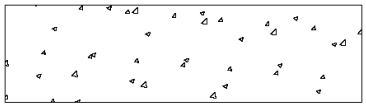
Conventional break lines for hollow shaft (Tube)



Rectangular section

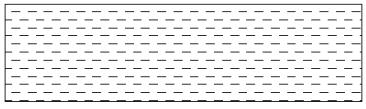


Wood

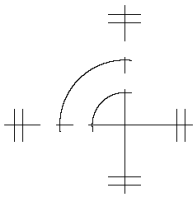


Concrete

Glass



Liquid water

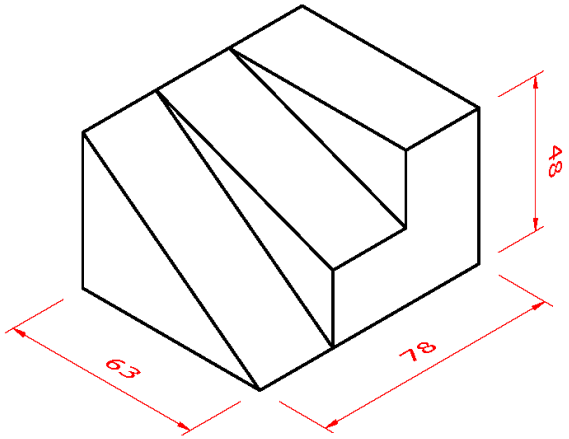


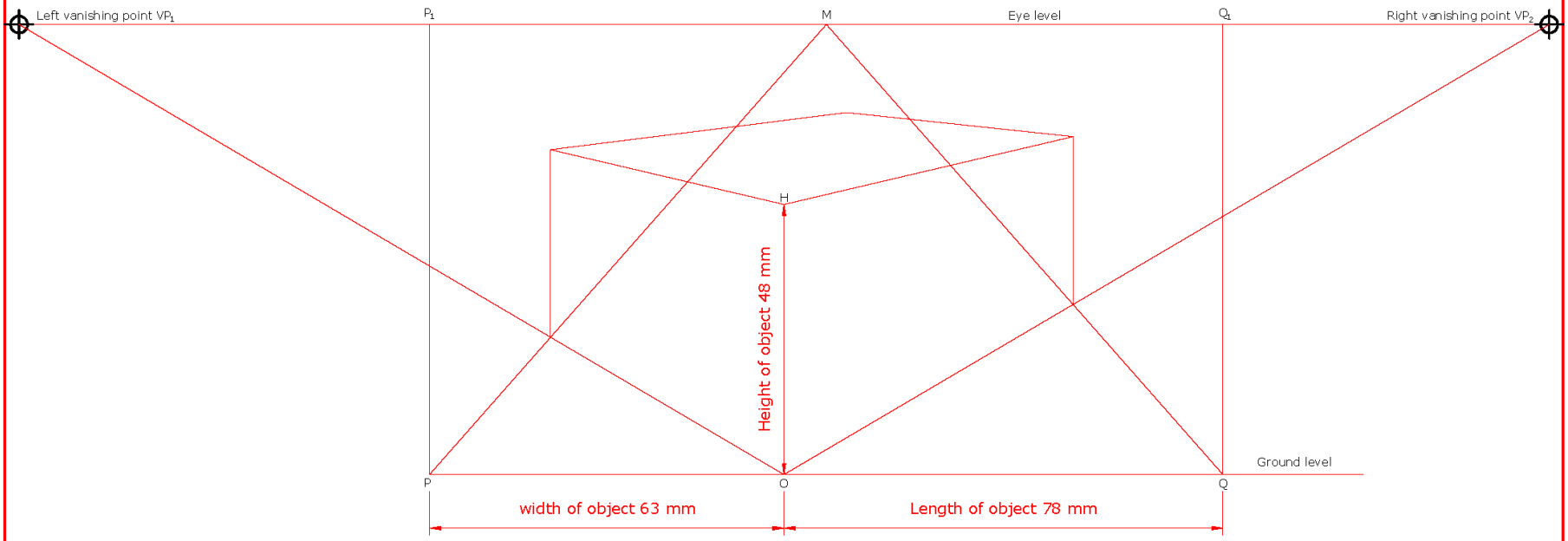
Symmetrical either side of centre line

Estimated Two Point Perspective View

Given: the vanishing points VP_1 and VP_2; point 'O' (starting point);
length, height and width of object

- draw a horizontal line joining VP_1 to VP_2 and label as the 'Eye level'
- mark the full width and length of the object on the horizontal lines OP and OQ
- draw two perpendicular lines PP_1 and QQ_1 to the Eye level
- bisect distance P_1Q_1 to locate mid-point M
- join mid-point M to P and Q to obtain the foreshortened sides of the object
- mark the full height of object OH
- complete the crate by projecting the lines to the two vanishing points.



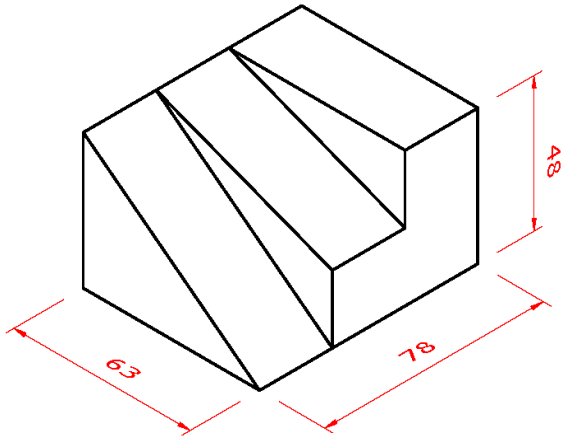


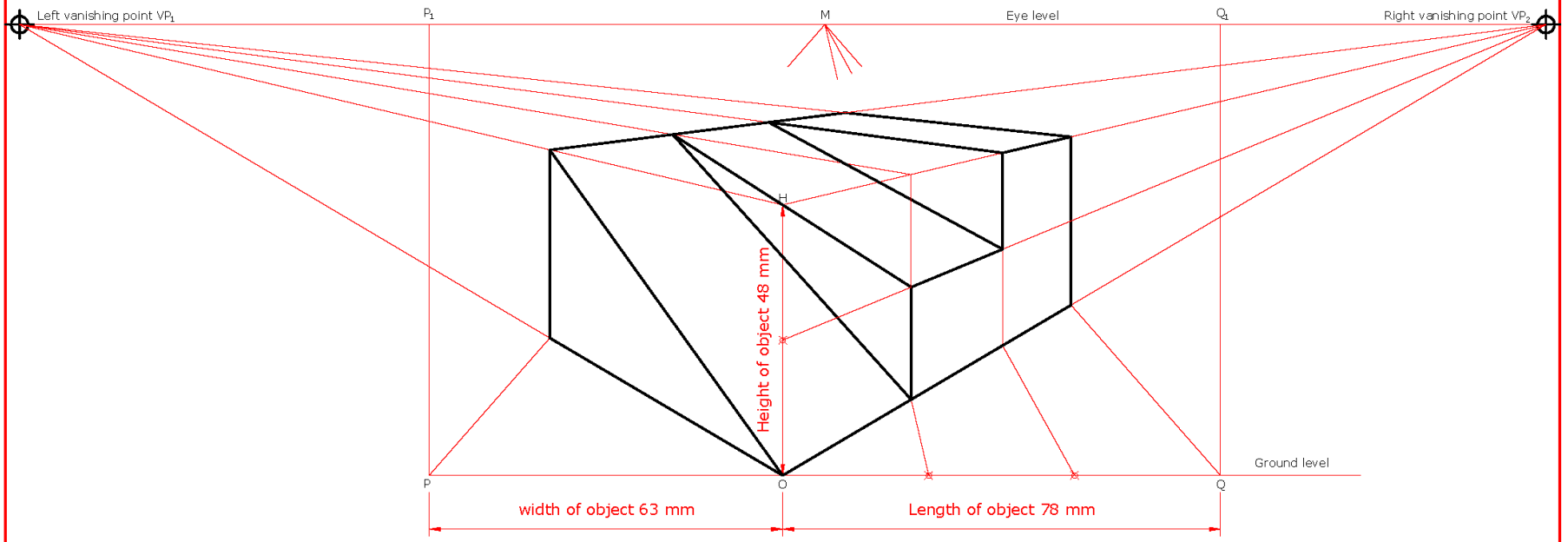
developed by Mr Michael Mallia

Estimated Two Point Perspective View

Given: the vanishing points VP_1 and VP_2; point 'O' (starting point);
length, height and width of object

- mark the full dimensions on lines OP, OQ and OH
- draw all measurements on OP and OQ converging to mid-point M
- from the points of intersection on the orthogonals draw vertical lines and complete the shape



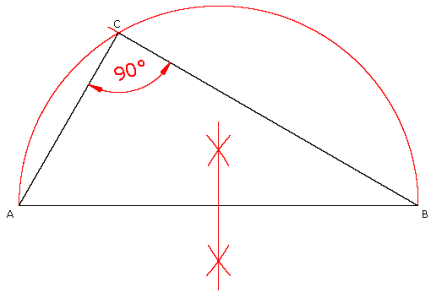


developed by Mr Michael Mallia

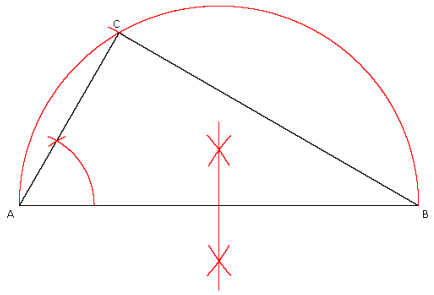
Construction of triangles

1) Length of one side / angle and hypotenuse of a right angle triangle

AB = 80
AC = 40
Angle ACB = 90°

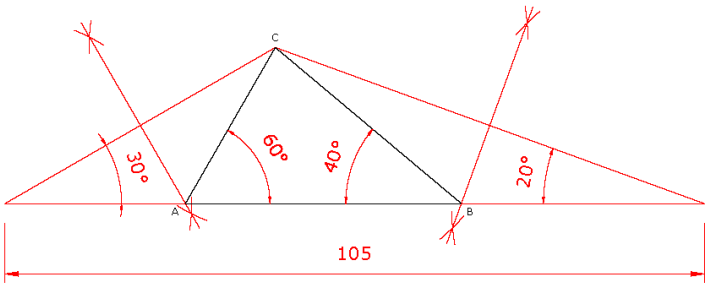


AB = 80
Angle CAB = 60°
Angle ACB = 90°



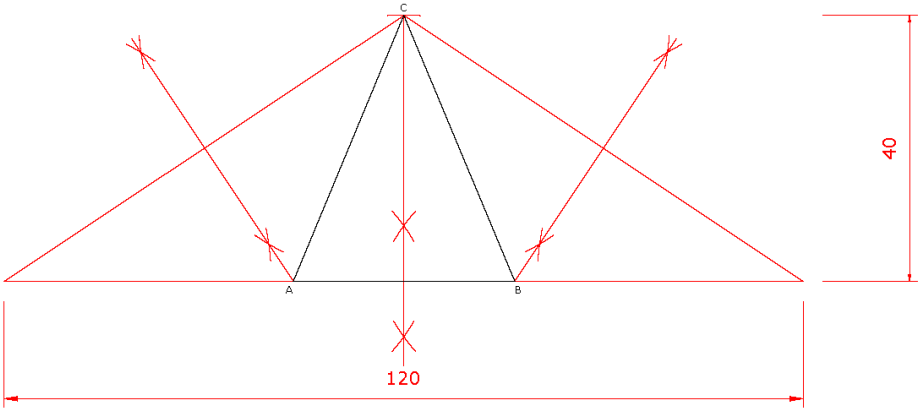
2) Perimeter and two base angles

Perimeter = 105
Angle CAB = 60°
Angle CBA = 40°



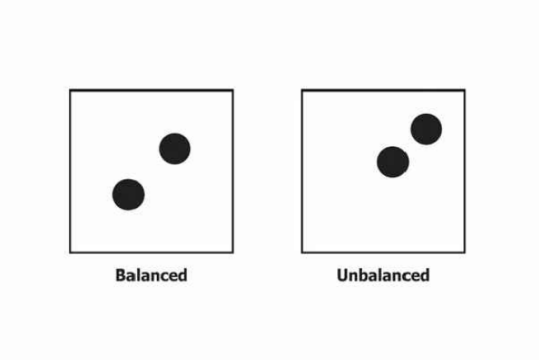
3) Perimeter and altitude of an isosceles triangle

Perimeter = 120
VH = 40

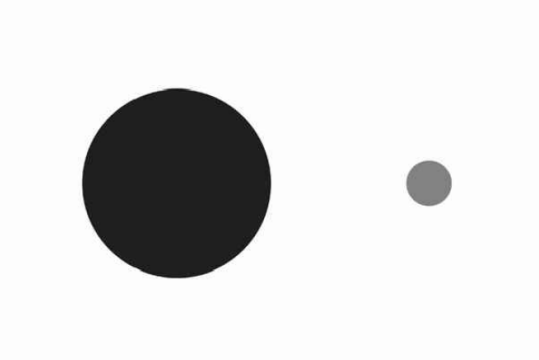


Graphic Design Terminology

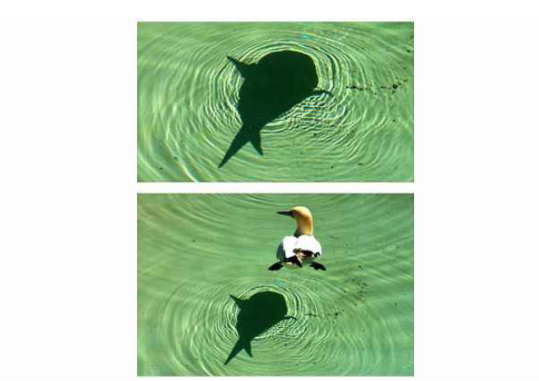
Balance
In visual arts, including graphic design, balance refers to the placement of elements in a design; everything has a visual weight to it (e.g. darker elements feel heavier than lighter ones).



Contrast
In visual arts, including graphic design, contrast refers to the presentation of two elements of the design in opposing ways. Contrast is very useful for creating a focal point, as well as giving objects greater visual weight and balancing the image.

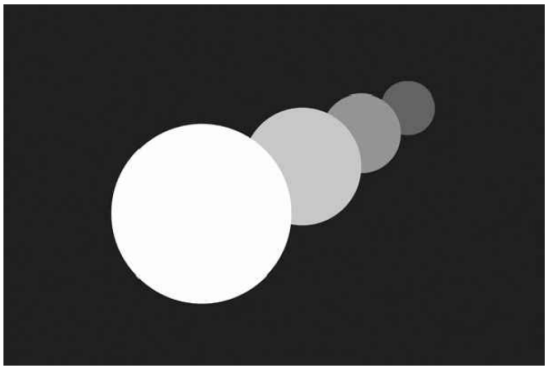


Framing
In visual arts, including graphic design, framing refers to the presentation of visual elements in an image. This is especially true for the placement of the subject in relation to other objects. Framing can make an image more aesthetically pleasing or keep the viewer's focus on the framed object(s).

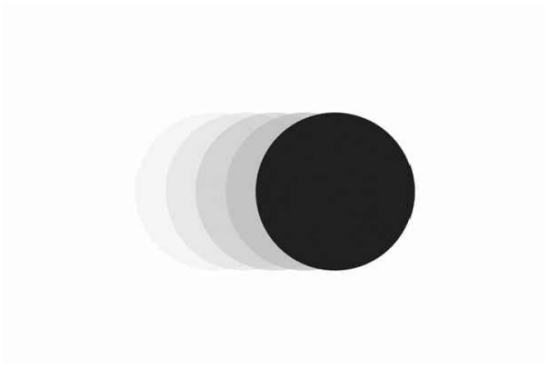


Graphic Design Terminology cont.

Depth
In visual arts, including graphic design, depth refers to the presentation of visual elements in such a way so as to create the illusion of three-dimensionality and volume, on a two-dimensional medium.



Implied Motion
In visual arts, including graphic design, implied motion refers to the presentation of visual elements in order to give the impression that certain objects are moving. This can be done via repetition, scale and the inclusion of additional lines and points.



The SCAMPER process
As an idea generation technique, SCAMPER is used to solve problems and help creativity during brainstorming sessions.

The SCAMPER acronym stands for:

Substitute

Combine

Adjust

Modify

Put to other uses

Eliminate

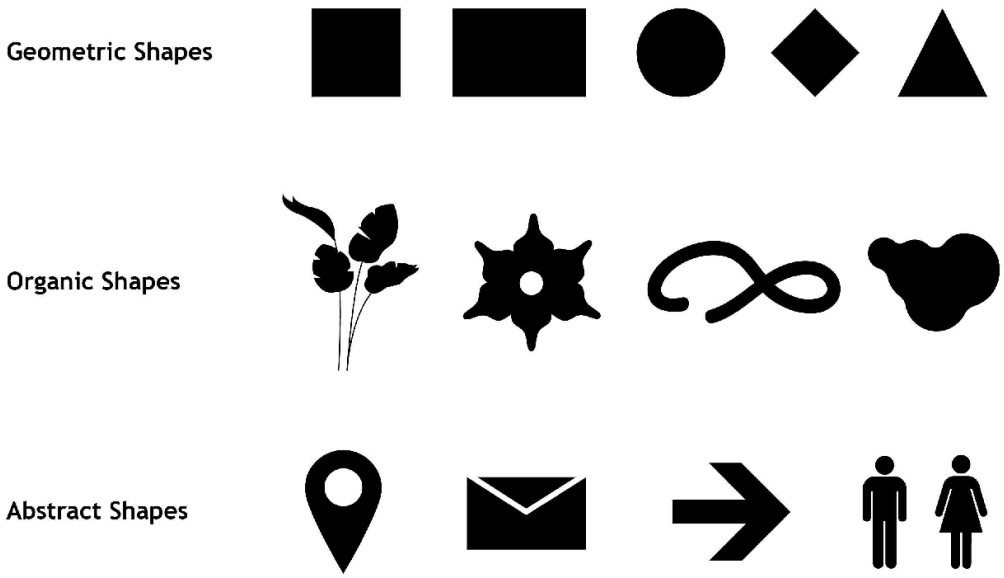
Reverse

Hierarchy
In visual arts, including graphic design, hierarchy is conveyed through variations in and object/s scale, value, colour, spacing, and placement.

Correct Hierarchy:

Disrupted Hierarchy:

Graphic Design shapes

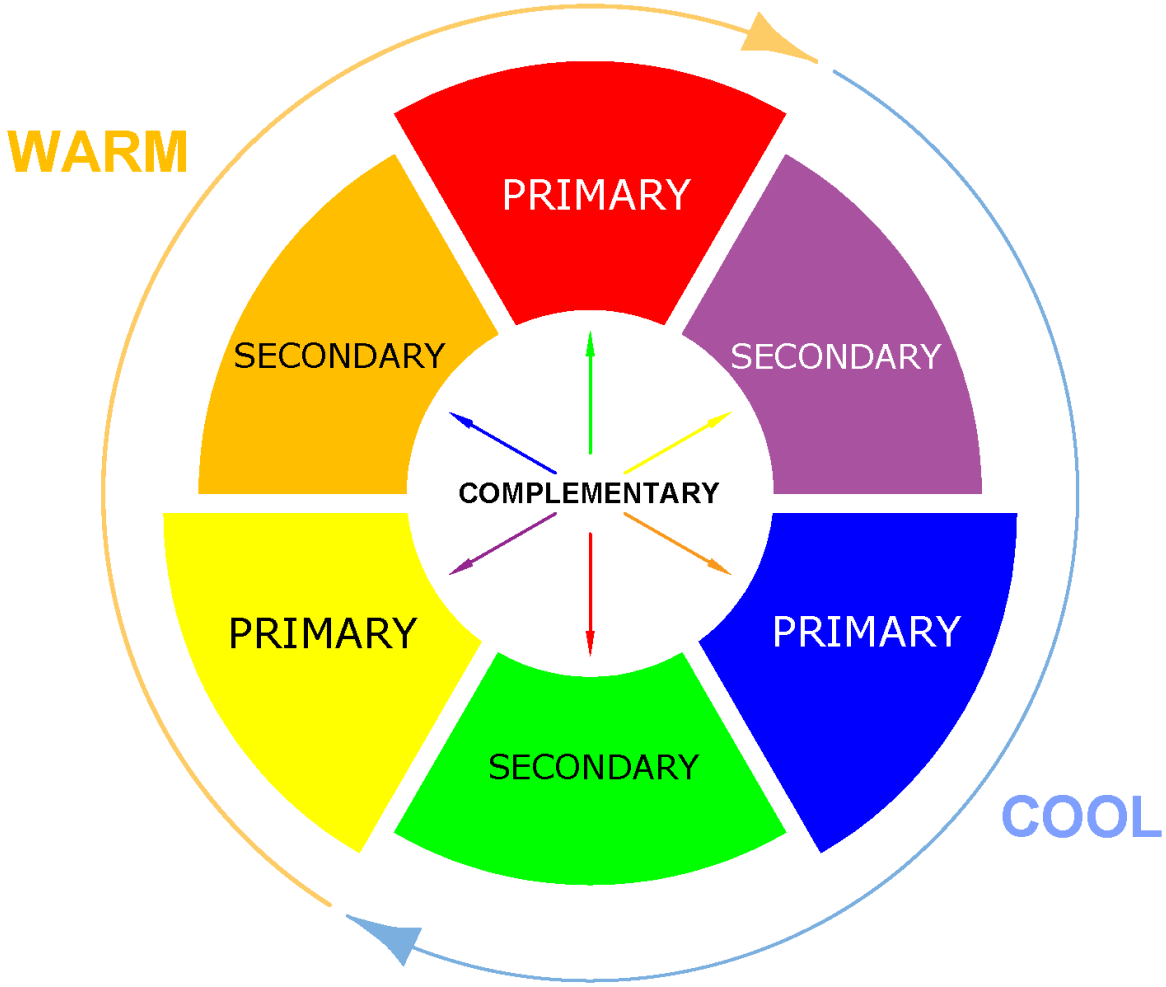


Geometric shapes
Geometric shapes are what most people think of as shapes. Circles, squares, triangles, diamonds are made up of regular patterns that are easily recognizable. This regularity suggests organization and efficiency. It suggests structure. Geometric shapes tend to be symmetrical further suggesting order.

Natural/Organic shapes
Natural/Organic shapes are irregular. They have more curves and are uneven. They tend to be pleasing and comforting. While they can be man-made (ink blobs), they are more typically representative of shapes found in nature such as a leaves, rocks, and clouds. On a web page organic shapes are generally created through the use of illustration and photography. They are free form and asymmetrical and convey feelings of spontaneity. Organic shapes add interest and reinforce themes.

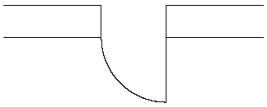
Abstract shapes
Abstract shapes have a recognizable form, but are not real. They are stylized or simplified versions of organic shapes. A stick figure is an abstract shape depicting a person. Typographic glyphs are abstract shapes to represent letters. Icons are abstract shapes to represent ideas and concepts. Some abstract shapes have near universal recognition. Think of some of the icons you see in the software you use daily.

The colour wheel

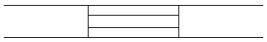


Architectural and furniture symbols

Door

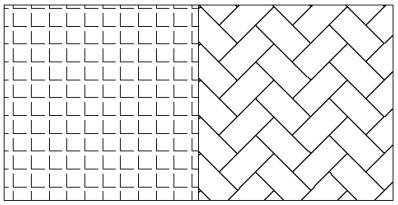


Window

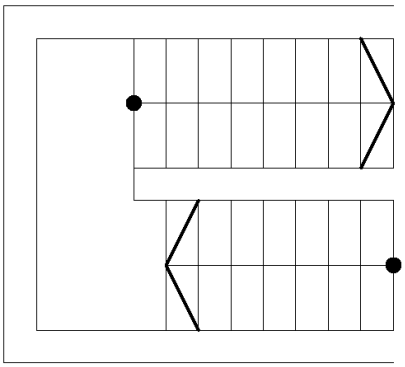


Archway

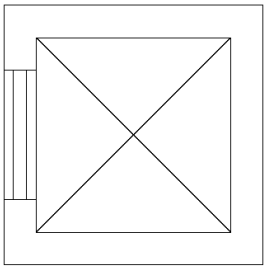
2 examples of tiles



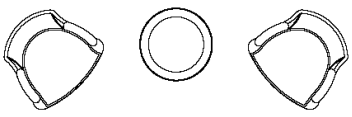
Stairway

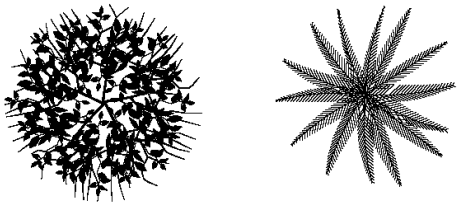


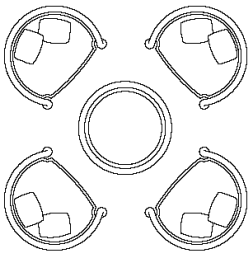
Shaft

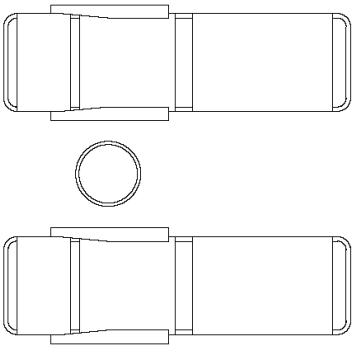


Landscape furniture and decoration examples





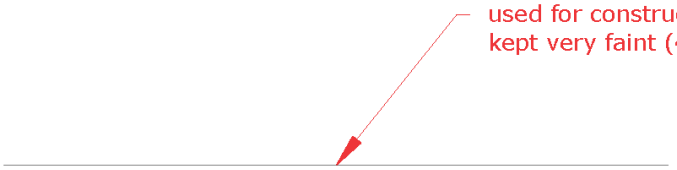




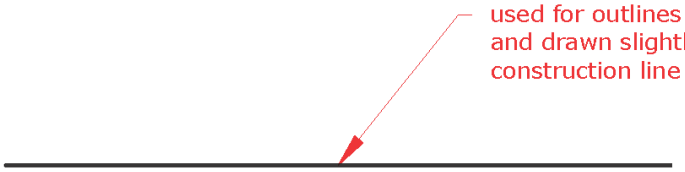
Linetypes used in Graphical Communication

1) Faint line.
2) Bold line.
3) Hidden line.
4) Centre-line / line of symmetry / pitch circle.
5) Fold line.

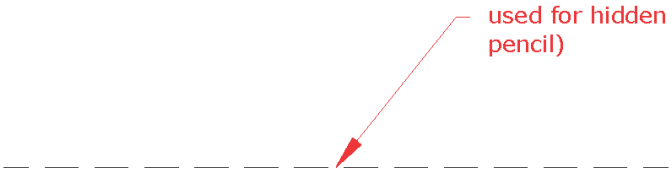
1) Faint line.



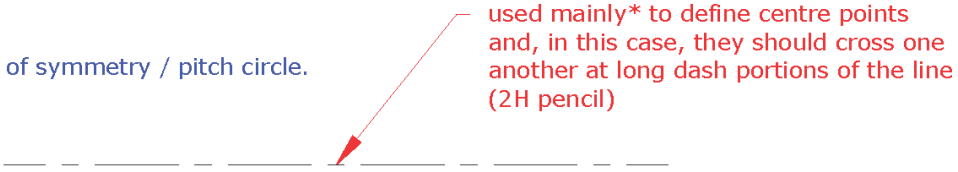
2) Bold line.



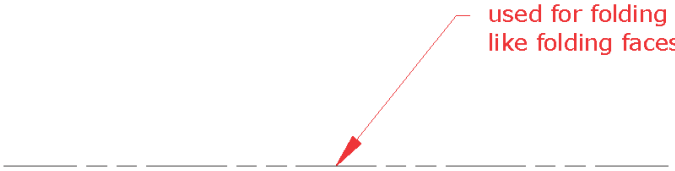
3) Hidden line.



4) Centre-line / line of symmetry / pitch circle.



5) Fold line.



* centre-lines should extend only a short distance beyond the feature or view to which they apply. If required for dimensioning they should continue as extension lines. Common centre-lines should not extend across the space between adjacent views. Centre-lines should not stop at another line of the drawing. Where angles are formed in chain lines, long dashes should meet or cross at corners (BS 8888:2006).