UNIVERSITY OF MALTA

SECONDARY EDUCATION CERTIFICATE
SEC

GRAPHICAL COMMUNICATION

May 2014

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION

CERTIFICATE EXAMINATIONS BOARD

SEC Graphical Communication
May 2014 Session
Examiners' Report

Administration

Four starter drawing A3 sheets were presented to each candidate for Paper One and four starter drawing A 3 sheets for Paper two. Candidates were to present the solutions on these four drawing papers and forward these four drawing sheets to the invigilators at the end of the examination. These four drawing papers were to be presented to the invigilators clipped, tied or stapled together. The index number was to be repeatedly written down on all the four sheets as a security precaution. Candidates were to make sure that their papers were properly banded together before collected by the invigilators. The board wishes to thank the Examination Officers, invigilators and all those concerned for their dedicated work in carrying out this exercise. Although that this was a tedious method one noted that all the A3 drawing papers where presented intact to the markers.

General Comment

Candidates are to be made aware that they are to be prepared for both papers and that they are to satisfy the examiners in both papers. Candidates need to consider the contents of the syllabus of paper one and paper two. It is expected that the questions regarding geometrical construction are to be answered by applying the basic construction stipulated in the syllabus. Markers remarked that there were still a good number of candidates that appeared to consider that the only way to solve a problem is by resorting to the trial-and-error approach. Candidates are to be encouraged to do their utmost to attempt all the questions while making the best use of the allocated time. Candidates would be advised to look carefully at the mark allocation of each question and divide the time accordingly by working out a simple proportion. The usual appeal is to be made, that this subject requires the use of a good quality pencil to draw skilfully the different types of lines that are requested and conform to the current conventional representation. Markers noted that some of the solution was presented with pencils with too soft a grade and not sharp enough to present even density lines. Markers noted improvement in the way in which candidates approached questions, in the way in which diagrams are annotated and technical terms employed. A weakness that needs to be addressed is the lack of creativity expressed by drawing skills. Quite a few candidates are very good at geometrical drawing, yet, they find difficulties when asked to conceive an idea and express it by means of a freehand sketch. During the Graphical Communication course, the students are expected to develop their idea generating and sketching skills. These skills are fundamental if the candidate wishes to pursue a career in design related areas.

Part 1: Statistical Information

The tables below show the distribution of grades for the May 2014 session.

GRADE	1	2	3	4	5	6	7	U	ABS	TOTAL
PAPER A	38	54	79	97	84			61	5	418
PAPER B				14	25	26	26	26	5	122
TOTAL	38	54	79	111	109	26	26	87	10	540
% OF TOTAL	7.04	10.00	14.63	20.56	20.19	4.81	4.81	16.11	1.85	100

Part 2: Comments regarding candidates' performance.

Paper 1

Question No. 1 - Plane Geometry - (10 marks)

In this question the candidates were asked to construct a logo for a rotary cutter manufacturing firm according to the given shape and dimensions. The logo consisted of five blades, each blade being attached to a side of a pentagon. A centre less circle, in which a pentagon had to be constructed, was given.

In the first part of the question the candidates were asked to locate, by construction, the centre of the circle. Less than half of the candidates located the centre by means of the 3-point circle method or by bisecting two chords. A good number of candidates enclosed the circle in a square and found the centre of the square and of the circle by drawing the diagonals of the square. Other candidates tried to locate the centre by trial and error.

In the second part of the question, the candidates were asked to construct a regular pentagon inside the given circle. Slightly more than half of the candidates used the universal method to construct the pentagon. Others used the protractor method while some others tried their luck by using the trial and error approach.

In the last part of the question, the candidates were asked to extend radials and draw the blades. Most of the candidates who managed the first two parts of the questions, found little difficulty to extend the radials and draw the five arcs that represented the blades. However there were some candidates who used the wrong centres to draw the arcs.

Although this question was quite simple and tested basic geometry which is covered during the early years of the course, a good number of candidates seem to have forgotten how to locate the centre of a circle and how to construct a pentagon in a given circle. The basic geometry needs to be practised continually.

The table below shows the performance of the candidates regarding this question.

	0	1 - 4	5 - 9	Full marks	Absent
Option A	18	116	226	53	5
Option B	8	51	55	3	5

Question No. 2 - Pictorial Drawing - (14 marks)

In question 2 the candidates were given three orthographic views of a wooden step stool and were asked to:

a) Draw a freehand sketch of the stool

b) Draw an isometric drawing of the object.

Some very good sketches were presented; however, the majority of the candidates showed that they lack the necessary sketching and visualisation skills. Most students think that, since normally no marks are allotted for preparatory sketches, sketching is a waste of time and opt to go for the solution straight away.

Most of the candidates who managed to visualise the 3-D shape of the stool, found no difficulty to project the isometric drawing correctly. However, some candidates found difficulty when drawing the isometric arcs and when drawing the stiffening back member of the stool. Other candidates could not visualise the stool and although they completed the isometric crate, they reproduced the 2-D images on the facets of the crate without "carving" into the isometric crate.

Another point worth mentioning is the line thickness control. Although this point is emphasised in every report, there is still a considerable number of candidates who make no distinction between faint construction lines and bold outlines. This incorrect attitude affects the accuracy and the presentation of the solution.

The table below shows the performance of the candidates regarding this question.

	0	1 - 6	7 - 13	Full marks	Absent
Option A	7	90	305	11	5
Option B	12	53	52	0	5

Question No.3 - Ellipse - (14 marks)

In this question the candidates were tested for their knowledge on geometric construction of the ellipse and normal. Candidates were expected to construct a vertical ellipse having a major axis of 100mm and a minor axis of 80mm. They were also asked to locate the focal points and construct two normals at given points in order to locate the centres of two blending arcs having a radius of 20mm each. Using the centre of the blending arc and a given centre of arc RY, candidates were instructed to find the unknown radius RY by construction thus finishing the handle profile and complete the profile of the elliptical hand-held mirror.

A considerable number of candidates attempted this question successfully; however, others lost marks and precious time due to the following reasons:

a) Candidates did not locate the focal points correctly. In fact some candidates tried to find the focal points on the minor axis.

b) The normals at the given points were drawn with no apparent construction.

c) The curve on the ellipse was not smooth. In many cases the curve was drawn with several inaccurate dark strokes from one point to another.

d) Some candidates used an X instead of a dot.

e) Some candidates could not find the unknown radius RY thus completing the handle profile.

The table below shows the performance of the candidates regarding this question.

	0	1 - 6	7 - 13	Full marks	Absent
Option A	6	48	320	39	5
Option B	7	50	58	2	5

Question No.4 - Tangential Arcs - (14 marks)

This question tested the candidates' knowledge on tangential arcs (touching circles) and their ability and skill to handle compasses accurately. Candidates were instructed to complete the outline of a hair dryer composed of straight lines and arcs. Candidates had to draw three R10 and an R20 circle on the given central lines and construct internally and externally touching circles (blending arcs). The most difficult part of this question was to find the centre of the R66 arc containing an internal R20 arc and touching externally with an R80 arc. Candidates had also to construct an R10 arc touching externally with the R66 arc and a given straight line.

A considerable number of candidates attempted this question. A few managed to obtain full marks while others lost marks and precious time due to the following reasons:

a) The R10 circles were not drawn accurately. Some candidates also drew arcs made from several dashes, oval curves and freehand circles.

b) Candidates did not know how to construct neither externally nor internally touching circles. Some candidates tried to locate the centres of blending arcs by trial and error.

c) Candidates could not locate the centre of the R80 arc.

d) Candidates did not know how to find the centre of a circle touching a straight line.

e) Some candidates completed correctly all the necessary constructions and arcs by means of compasses however they chose to line in freehand the complete profile by means of a dark pencil. This practice is not recommended as it ruins the finishing of the drawing.

The table below shows the performance of the candidates regarding this question.

	0	1 - 6	7 - 13	Full marks	Absent
Option A	5	125	270	13	5
Option B	2	75	39	1	5

Question No. 5 - Sectional Machine Drawing - (15 marks)

This question tested the candidates' understanding of the principles of orthographic projection and their knowledge about sectioning regulations. Candidates were given a plan and an end elevation of a cast iron bracket in first angle orthographic projection. They were also given an exploded pictorial view to help them visualise the casting. The candidates were asked to project a sectional front elevation, the plane of the section being indicated by cutting plane X-X in the end view. Candidates were instructed to draw the symbol of the projection used.

Most candidates attempted this question. The following being the main hitches which are worth noting:

a)   The regulations regarding sectioning were not followed. A sectioned object should be shown by thin lines drawn preferably at 45° and touching the outline. The lines should be equally spaced.

b)   The regulations regarding the sectioning of pins confused a significant number of candidates. These candidates were unaware of the rule that a pin is not hatched when the cutting plane is along its axis and hatched when the cutting plane is across its axis.

c)   Some candidates did not construct the dovetail correctly that should have been projected from the plan and the end view.

d)   Most candidates did not understand that the pin does not touch the base.

e)   Some candidates did not know that when the two adjacent parts of the assembly are sectioned, the section lines are drawn in opposite directions. Ideally, lines are staggered where the parts are in contact.

f)   A good number of students did not draw the first angle orthographic projection symbol correctly.

The table below shows the performance of the candidates regarding this question.

	0	1 - 6	7 - 14	Full marks	Absent
Option A	15	43	352	3	5
Option B	22	42	53	0	5

Question No.6 - Surface Development - (15 marks)

This question tested the candidates' knowledge how to apply the principles of surface developments. A complete front elevation and an incomplete plan of the top cone of a jug where given. Candidates had to complete the plan and construct a half surface development of the truncated cone.

The following are a list of errors which were noted:

a) A considerable number of candidates did not project generators to the vertex of the cone, thus they could not construct correctly the half surface development of the truncated cone.

b) A significant number of candidates did not know how to complete the plan, mostly the top part of the cut, which was curved. Mostly did well on the bottom cut which was horizontal creating a perfect circle in the plan.

c) Some candidates did not know how to locate the true length to construct the half surface development of the cone.

d) A good amount of candidates did not know how to locate the correct points of the top part of the cut and construct the half surface development, which should have been done by projecting lines on the true length in the front view.

The table below shows the performance of the candidates regarding this question.

	0	1 - 6	7 - 14	Full marks	Absent
Option A	56	176	158	23	5
Option B	41	61	15	0	5

Question No.7 - Estimated Perspective Drawing - (18 marks)

In this question the candidates were given a planometric and two orthographic views of a reception room. They were also given the starter lines of a single-point perspective view of the room.

Most of the candidates used the diagonal method to determine the foreshortened depths of the floor tiles. Others tried to project lines from the given ceiling tiles (which were twice larger than the floor tiles) and then dividing the depths by means of diagonals. This method was lengthy but still gave the required result. Others, however, had no idea that the depth of the tiles had to get smaller as they recede towards the vanishing point and simply divided the depth of the room into the required number of parts equally by using the set square method. Most of the candidates who completed the floor grid correctly found little problems to complete the carpet, the sofa and the cupboard. However, a good number of candidates found difficulty in drawing the reception counter which had two angled corners. These two corners could be projected by either using the given vanishing points (VP1 and VP2) or by projecting the heights from the side walls.

The table below shows the performance of the candidates regarding this question.

	0	1 - 8	9 - 17	Full marks	Absent
Option A	9	100	280	24	5
Option B	8	60	49	0	5

Paper 2

Question No.1 – Vectors - (12 marks)

In this question candidates were tested for their knowledge of vectors. In paper 2A, a real-life situation of a crane being pulled by 4 tug-boats was given. Candidates had to find graphically the resultant / magnitude and direction of the pull on the crane and the pull exerted by tug S. In the second part of the question, candidates were to find the force and direction of the tug-boat R when one of the tug boats (S) leaves the scene. This part of the question was the main difficulty candidates encountered. Although most candidates successfully did the first part of the question, i.e. finding the resultant pull of the crane, some either found difficulty in completing the second part or did not attempt it. In stating the magnitude of the resultant pull of the crane, some candidates added up all the forces even though the drawing was correct. Some common mistakes encountered with this question were with the arrows having incorrect direction or were left out altogether and also in converting magnitude of vectors to KN.

The vectors question for paper 2B consisted of two problems involving ropes and poles, each making up a total of 3 vectors. A considerable number of candidates did not attempt this question, some of which just read off the magnitude from the given diagram, converted it to Newtons and provided it as the answer. Some candidates drew the 3 forces emerging from a single point and introduced a horizontal force (maybe representing the line between A and C in part (a) of the question, or a resultant?). Some solutions also made use of the length given in the diagram of the question and regarded it as being the magnitude of the vector in the force diagram. A small number of candidates tried to solve the vector problem mathematically. This vectors question shows lack of basic knowledge and competence in the topic with candidates sitting for paper 2B.

The table below shows the performance of the candidates regarding this question.

	0	1 -5	6 - 11	Full marks	Absent
Option A	18	116	234	43	7
Option B	39	48	23	5	7

Question No. 2 – Electrical Circuits - (12 marks)

Candidates were presented with a pictorial view of an electrical circuit and were asked to draw a diagram using the correct electrical symbols provided with the question. In paper 2A, the problem involved a 240V AC supply, a switch, a fuse, a transformer and a motor, two lamps and a bell connected in parallel and having a switch that operates these individually. The main problem in drawing the circuit diagram correctly was in either representing or wiring the transformer correctly. Some candidates were also mixed up in connecting correctly the switches and lamps/motor in series and in parallel with each other. Also, a number of candidates used the signal lamp symbol instead of the lamp symbol, and the battery symbol instead of an AC symbol. A circle template may have been used to draw the symbols neatly and improve presentation.

The electrical circuits question in paper 2B involved a 240V AC supply in series with a switch, a fuse and transformer, connected to 2 bulbs in parallel, having a common switch and a bell and push button switch.

Most of the candidates showed that they had no idea on how to present a transformer in a circuit diagram and in wiring the lamps in parallel. A number of candidates mixed up the 240V AC symbol with that of a battery. Knowledge on this subject was very limited; most marks were gained on selecting the correct symbols from those provided in the question and not from understanding the circuit given. There was only one completely correct solution for this problem.

The table below shows the performance of the candidates regarding this question.

	0	1 - 5	6 - 11	Full marks	Absent
Option A	5	93	283	30	7
Option B	8	54	52	1	7

Question No. 3 – Computer Graphics - (12 marks)

In this question candidates were given simple instructions and a printed grid to plot a geometric design. Both Paper2A and Paper 2B questions required knowledge of the MOVE and DRAW commands; however Paper 2A also tested understanding of the MIRROR command. There were no problems in the use of correct colour; however only the specified lines should be drawn in colour, there is no need to fill in the spaces within shape. A good number of candidates successfully completed all the drawing albeit some small errors were made in locating the correct position of the variables.

The table below shows the performance of the candidates regarding this question.

	0	1 - 5	6 - 11	Full marks	Absent
Option A	6	16	86	303	7
Option B	8	25	42	40	7

Question No. 4 – Cycloid - (14 marks)

A rolling circle and a starting point were given to produce the outline of a safety helmet in paper 2A and the outline of an ink blotter in paper 2 B. The question in paper 2A required the skill to pivot the point of contact of the rolling circle at the corner traced by the cycloid about point B and to continue with the locus on line BC. The main difficulty encountered with this problem was in this second part of the question. Some candidates did not redraw the rolling circle after the pivot stage and hence the parallel lines essential in drawing the locus were either drawn haphazardly from the first part of the drawing or omitted. Other solutions showed lack of understanding of the subject with locating the points of the locus as if it was a graph. The problem in paper 2B was more straightforward, it required the drawing of a simple cycloid and most students were successful in dividing the circle in 12 parts, draw lines parallel to AB and marking the centres. However, some were then unable to locate the locus of the points traced. There were also discrepancies in the total length of the rolling circle circumference due to inaccuracies.

The table below shows the performance of the candidates regarding this question.

	0	1 - 6	7 - 13	Full marks	Absent
Option A	8	82	156	165	7
Option B	2	46	51	16	7

Question No. 5 - Statistical Charts - (16 marks)

Paper A. This question involves Chart and graphs knowledge and free hand sketching. For the first part, students were expected to draw a split 3D pie chart. The majority of candidates did a cabinet oblique pie chart. Only a few managed to create a split sector. It was noted that a number of candidates opted to draw an isometric pie chart. This shows that some students are not shrewd enough to select the best technical method for the right situation. The planometric method is convenient and easy to draw, yet it was rarely used. Candidates show a lack of creativity and ideas when asked to create preliminary sketches. The final sketches as a whole were poorly presented. On other hand, the application of colour was good and a good number also rendered the chart and legend using shading and gradients.

Paper B. For this question, candidates were asked to present a 3D pie chart, with all the necessary details and sketches. In this question students were tested in their ability to invent, take decisions and be creative and precise with good presentation of colours. Candidates were left free to decide which 3D pictorial view for the pie chart to adopt; a good number still opted to use isometric view, which is more time consuming than a planometric view. Overall, a good number of candidates answered using cabinet oblique, which is ideal for such a drawing. When it comes to colouring, only a few managed to create an attractive looking desirable pie chart. This could be the case because of time restriction or time management during the examination. Regarding the sketches and final graphic symbol, candidates showed a very poor level. Some candidates even lacked the idea of plain one colour 2D symbol. But overall, the majority of candidates understood and answered all parts of the parts of the question.

The table below shows the performance of the candidates regarding this question.

	0	1 - 7	8 - 15	Full marks	Absent
Option A	0	14	385	12	7
Option B	0	9	106	0	7

Question No. 6 – Auxiliary View - (16 marks)

Paper A. This question involved the projection of an Auxiliary Plan. Almost all candidates divided the circle into a number of parts and projected lines on the front elevation. The Auxiliary view had to show the handle, the truncated cylinder and part of the cylindrical base. Almost all candidates managed to construct the handle correctly. A good number of candidates found it difficult to project the view of the truncated cylinder. Candidates have not mastered the idea of how the same points show in different position in a typical auxiliary view. The majority of the candidates managed to create a decent solution. Only a handful of candidates managed to present the cylindrical base correctly. Overall, the majority of candidates understood the question.

Paper B. Candidates were presented with a restaurant table number consisting of a vertical panel, mounted on a chamfered base. The majority of the candidates projected lines at 30 degrees in the right direction and from the right position. This could be due to the fact that the number 14 was already printed in the answer section. The chamfered part of the base and the upper part of the table number confused a very good number of candidates. Only a small number of the candidates managed to complete the base with the chamfer and all lines in place. Regarding the vertical upright panel, many candidates projected the three lines correctly. However, with the curved upper part, there were a lot of different perceptions. Some, left the curved part unanswered, others did it at random, while others did only the front curves without showing the thickness of the material. Candidates found this question easy to understand. The questions also revealed different abilities of candidates, answering different parts or all correctly.

The table below shows the performance of the candidates regarding this question.

	0	1 - 7	8 – 15	Full marks	Absent
Option A	14	174	205	18	7
Option B	6	49	49	11	7

Question No.7 – Interpenetration - (18 marks)

Paper A. This question showed a toy sports car with a curved cut in the octagonal body. Candidates had to project and complete the plan, showing all lines and curves of intersection. A good number of candidates attempted this question correctly. The pictorial views accompanying the question were clear and helped the candidates to visualise the given situation. However, candidates who tried to give a freehand solution without using the proper method of construction lost a lot of marks.

Paper B. This question was about truncated cylinder. Candidates were presented with a whistle design where the plan had to be constructed to represent the two straight cuts in the main body of the whistle. A good number of candidates understood the question and answered correctly, some of the candidates left out the fine details. Most of the candidates divided the circle into 12 divisions, without taking extra points. Clear illustrations of whistle made the question user friendly and well understood. Most candidates managed to tackle this question appropriately.

The table below shows the performance of the candidates regarding this question.

	0	1 - 8	9 - 17	Full marks	Absent
Option A	3	39	227	92	7
Option B	8	63	35	9	7

Chairperson
2014 Examination Panel