

UNIVERSITY OF MALTA
SECONDARY EDUCATION CERTIFICATE
SEC

GRAPHICAL COMMUNICATION
May 2017

EXAMINERS' REPORT

MATRICULATION AND SECONDARY EDUCATION
CERTIFICATE EXAMINATIONS BOARD

SEC EXAMINERS' REPORT MAY 2017

SEC Graphical Communication May 2017 Session Examiners' Report

Administration

Temporarily stapled A3 drawing sheets with printed questions and starter lines were presented to each candidate for both Paper 1 and Paper 2 (which consisted of four and five sheets respectively). The candidates were asked to remove the temporary staple, write their index number on each sheet and draw their solutions. At the end of the examination, the sheets were permanently stapled together and 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. The board is satisfied that all the drawing papers were presented intact to the markers.

General Comment

As indicated in the statistical chart below, seventy-two percent of the candidates attained a grade between 1 and 5 in the Graphical Communication SEC examination. Eight percent attained a grade between 6 and 7, while seventeen percent failed their examination. One third of the candidates, who attained a grade between 1 and 3, were well prepared for the examination and manifested a good knowledge of geometrical constructions, engineering drawing standards, freehand sketching, drawing and visualisation skills. There were candidates who did well in certain questions and did badly in others. There were other candidates who were unprepared. The following is a general list of shortcomings noted by the markers:

- Lack of pencil control to distinguish between construction lines and outlines.
- Lack of sound knowledge of geometric constructions. Some candidates remember the initial steps of the construction methods but seem to forget or confuse the subsequent steps.
- Poor presentation especially when drawing freehand curves.
- Poor freehand sketching skills.
- Little knowledge of engineering standards and conventions.
- Lack of visualisation skills.
- Poor drawing skills and inability to simplify graphic symbols.
- Poor colouring skills.
- Lack of problem solving skills.

SEC EXAMINERS' REPORT MAY 2017

Part 1: Statistical Information

The table below shows the distribution of grades for the May 2017 session.

Grade	1	2	3	4	5	6	7	U	Abs	Total
Paper A	30	51	66	62	60			43	1	313
Paper B				10	26	19	14	29	11	109
Total	30	51	66	72	86	19	14	72	12	422
% of Total	7.1	12.1	15.6	17.1	20.4	4.5	3.3	17.1	2.8	100

Part 2: Comments regarding the candidates' performance.

Paper 1

Question No.1 – Ellipse and Tangential Arcs (20 marks)

In this question, candidates were tested for their knowledge about geometrical construction of the ellipse, tangent and tangential arcs. Candidates were expected to complete the profile of a stork carrying an elliptical bag.

Most of the candidates who attempted this question were successful in constructing the ellipse. However, the majority of those who sat for Paper B did not manage to locate the focal points successfully and therefore did not construct the required tangent.

Common mistakes in constructing the ellipse were:

- Most candidate did not know how to locate the focal points, with many not attempting this at all while others mistakenly marked the focal points on the wrong axis of the ellipse.
- Many candidates just drew the tangent at random without any construction
- The curve on the ellipse was not drawn smoothly with many dark strokes being evident.

The profile of the stork had to be constructed using tangential arcs. A good number of candidates who attempted this question managed to construct a good portion of the stork. Common mistakes included:

- Clearly some candidates misunderstood the examination question since some did not even manage to draw the circles with the given radii on the given centre lines.
- Some candidates tried to locate the centre of circles by trial and error instead of geometric construction.
- Some candidates managed to construct and locate the necessary centres and drew the required circles successfully but then lined the curves with their freehand thus making all their work look dirty and inaccurate.
- The back of the stork proved to be difficult for most of the candidates. Only a few managed to construct the R75 Arc which was tangential to a R60 circle and a point.

SEC EXAMINERS' REPORT MAY 2017

The table below shows the performance of the candidates regarding question 1.

	0	1 - 10	11 - 19	Full marks	Abs	Total
Option A	2	73	213	24	1	313
Option B	2	61	35	0	11	109

Question No.2 - Polygon with Interlacing Geometric Design (12 marks)

In this question, candidates were given the base of a hexagon. They had to construct the hexagon and subsequently draw a faint grid which was needed to help them copy a given interlacing design. This question tests the candidates' knowledge of polygons, their ability to draw neat and accurate lines using their drawing instruments and their attention to detail.

The majority of candidates who attempted this question were successful. The main difficulties encountered by the candidates were:

- Although most of the candidate attempted to draw the grid, not all of them managed to complete the grid as required. Some, due to inaccuracy, ended up with the grid intersecting at the wrong positions, thus making the rest of the question difficult to complete.
- Neatness and presentation.
- Dividing the given line 'AB' geometrically.

The table below shows the performance of the candidates regarding question 2.

	0	1 - 6	7 - 11	Full marks	Abs	Total
Option A	2	14	155	141	1	313
Option B	3	20	64	11	11	109

SEC EXAMINERS' REPORT MAY 2017

Question No. 3 - Conversion and Calculation of Area (15 marks)

In this question, candidates were given the top view of 3 swimming pools 'A', 'B' and 'C'. Candidates were required to:

- Convert the Area of pool 'A' into a square;
- Determine the Area of pool 'B' by using the counting squares method;
- Determine the Area of pool 'C' by using the mid-ordinate method.

Not all candidates attempted this question with a few opting to leave it completely blank. Others only attempted the conversion of area while leaving part B and C totally blank. For those candidates who attempted the whole question, the main difficulties were:

- While converting the area of pool 'A' into a square, some candidates made a mistake in the steps to follow and ended up measuring one length instead of the other.
- It was apparent that a good number of candidates only knew one method by which they could determine the area of a given shape. This resulted in candidates using the same method for both pools 'B' and 'C' which was not what was required of them.
- When using the counting squares method, some candidates did not use the standard 1 cm by 1 cm square grid and instead opted to use squares of different sizes. This resulted in their calculations being more difficult to complete and thus in more needless mistakes.
- Some candidates did not use the given table to do their calculations and instead used the blank corners of the page to do their calculations.

The table below shows the performance of the candidates regarding question 3.

	0	1 - 7	8 - 14	Full marks	Abs	Total
Option A	28	108	155	21	1	313
Option B	25	52	21	0	11	109

Question No. 4 - Sectional Machine Drawing (15 marks)

This question tested the candidates' understanding of the principle of orthographic projection and their knowledge about sectional regulations. Candidates were given a plan and a half front elevation of a swivel block assembly. The candidates were asked to complete the sectional front elevation on cutting plane A – A. Most candidates performed well in this question. The following being the main hitches which are worth noting:

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

SEC EXAMINERS' REPORT MAY 2017

- A good number of candidates did not know that, when 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.
- Some candidates hatched the web even though it was 'cut' longitudinally. BS308 clearly states that a web is not sectioned even if it lies in a given cutting plane, that is, if it is 'cut' longitudinally.
- A good number of candidates did not draw centre lines, which should also be drawn behind the hatching lines to indicate hidden holes.
- Most candidates did not draw the fillets in the sectional front elevation.

The table below shows the performance of the candidates regarding question 4.

	0	1 - 7	8 - 14	Full marks	Abs	Total
Option A	8	82	203	19	1	313
Option B	5	67	26	0	11	109

Question No. 5 - Isometric view (18 marks)

This question tested the candidates' understanding of isometric views, thus candidates' spatial visualisation ability. Three full size orthographic views of a machined block were given in third angle orthographic projection. Even with a full size orthographic projection all necessary dimensions were given. Candidates had to draw a freehand sketch of the block and construct an isometric view placing a labelled corner X in the lowermost position.

The following is a list of frequent errors, which were noted:

- Incorrect crate dimension or no crate at all.
- Difficulty in visualising the machined block three dimensionally.
- The given orthographic views were full size; thus, candidates could have picked measurements from the given views, even to construct the R30 arc.
- Isometric arcs drawn freehand without any construction.
- Isometric arcs drawn with a compass without using the compass method correctly.
- Difficulty to transfer measurements correctly mostly in the construction of the slanting rectangular hole.
- The freehand sketch helped candidates to visualise the machine block better, however candidates found some difficulty in having a good sense of proportion and to draw good smooth straight lines and arcs. It is suggested that in freehand drawings some guidelines are used.

SEC EXAMINERS' REPORT MAY 2017

The table below shows the performance of the candidates regarding question 5.

	0	1 - 10	11 - 17	Full marks	Abs	Total
Option A	5	187	97	23	1	313
Option B	9	78	11	0	11	109

Question No.6 - Perspective drawing (20 marks).

In this last question, candidates were asked to draw an estimated well-proportioned two-point perspective view of a bunk bed. Two detailed views in first angle projection (a front elevation and end elevation) and a pictorial view were given. Both vanishing points and a starting corner were also given. This question was presented in a sheet on its own thus ample space was given to draw a good solution. The overall shape of the bunk beds was rectangular and all material thickness had to be taken as 10 mm.

One should point out, that like previous years, the perspective topic seems to be very popular amongst candidates. Nearly everyone attempted the question even though this was the last one in the paper. Another thing to point out was that almost all the candidates used the mid-point method to draw the perspective. Only few candidates tried their luck with the diagonal method but their end result was messy and incomplete.

The following are some general observations worth noting;

- The mid-point and the starting vertical line were sometimes confused.
- Sometimes the ladder was taken as a different compartment.
- Most of the rear panels were either shrunk or oversized.
- Overall, the majority of candidates understood and included the four chamfers.
- Some candidates thought that the solution had to be scaled down by half.
- A lot of candidates measured incorrect material thickness.
- The back side of the top mattress support detail was lacking throughout most solutions.
- The overall accuracy and neatness was lacking.

The table below shows the performance of the candidates regarding question 6.

	0	1 -10	11 - 19	Full marks	Abs	Total
Option A	3	117	189	3	1	313
Option B	2	83	13	0	11	109

SEC EXAMINERS' REPORT MAY 2017

Paper 2

Question No. 1 - Computer Graphics (10 marks)

Almost all Paper 2A candidates attempted this questions with the majority gaining most of the marks by following the instructions properly. With regard to neatness and presentation, most candidates failed to obtain the mark due to using unsharpened colour pencils or due to errors which were not rubbed off completely. There were a minority who didn't reflect the drawing and a couple of candidates filled the entire drawing or space with colour rather than the outlines only.

Some Paper 2B candidates seem not to have grasped the topic. There were some who just drew haphazard lines and didn't follow the instructions. There were a few who left the entire question out. A couple of candidates also swapped the X with Y axis. Neatness and presentation were worst in Paper 2B than in Paper 2A. Filling the entire drawing with colour was more recurrent in 2B rather than in 2A.

The table below shows the performance of the candidates regarding question 1.

	0	1 - 4	5 - 9	Full marks	Abs	Total
Option A	3	12	200	97	1	313
Option B	11	10	59	17	12	109

Question No. 2 – Statistical Charts and Graphic Symbol (12 marks)

The majority of Paper 2A candidates answered the question correctly, with many stopping only at the 2D stage of the pie chart. From those who further developed the pie chart in 3D, half opted for an oblique rather than planometric view. Very few candidates drew the positive and negative graphic symbols, and those who did, used freehand in doing so, resulting in lack of neatness.

The majority drew the vertical bar graphs even though there were some who didn't realise that the width of each bar was given and used less width for each. Most candidates didn't even bother to mark construction lines along the horizontal, so as for one to easily read percentage data. A certain level of disappointment was felt with regard to neatness in applying colour to the bars.

With regards to the pictogram, many candidates took the word diving for swimming and drew a figure jumping into the water from a spring board. Since these candidates ignored the words *underwater*, *flippers*, *mask* and *cylinders*, very few or no marks were awarded for such renditions. Others just drew the items mentioned leaving out the human image and thus producing something which was not in line with the other symbols. Such candidates were awarded marks but not full marks. Very few candidates satisfied the criteria needed and properly drew a graphic symbol which was up to standard.

Most Paper 2B candidates seem to find it difficult to use the entire space given for drawing the graphic symbol. Many drew these symbols too small when compared to the space given. Instead of using one colour only, some opted to draw multi-coloured graphics. Even with regard to the items portrayed, many

SEC EXAMINERS' REPORT MAY 2017

opted for the standardised cup with straw and burger, with some opting for either a slice or whole pizza, or even a hot dog. The problem with the latter choices is that some are barely recognisable when drawn in such small spaces and resulted in gaining less marks.

The table below shows the performance of the candidates regarding question 2.

	0	1 - 5	6 - 11	Full marks	Abs	Total
Option A	1	44	264	3	1	313
Option B	1	15	79	2	12	109

Question No. 3 – True Lengths (12 marks)

Most Paper 2A candidates attempted part or all of the question. With regard to the method used, that by rotation seemed to be the most popular. The majority seem to have grasped the idea of rotating the respective lines into a horizontal position, though some just stopped at that point. Others added the subsequent step of dropping or raising a vertical line, but then seemed to be confused to where they should elongate it. There were few candidates who obtained the majority or all of the marks. There were some candidates who had the correct answers which, however, did not correspond to the geometric construction workings. Many didn't realise that they also had to print down the length of AC since this was at the very bottom of the page and was possibly unnoticed.

What applies to the finding of true lengths in 2A also applies to 2B. The majority of those who answered the question opted for the rotation method, even though very few completed the solution from beginning to end. A good number of Paper 2B candidates left the question totally out, not garnering even a single mark. Many candidates seem not to have any idea of what a true shape of lamina is, since this part was totally left out in many questions. When anything was then attempted, the neatness and presentation of the drawings were of low quality.

The table below shows the performance of the candidates regarding question 3.

	0	1 - 5	6 - 11	Full marks	Abs	Total
Option A	83	110	88	31	1	313
Option B	65	21	10	1	12	109

SEC EXAMINERS' REPORT MAY 2017

Question No. 4 – Electrical Circuit Diagram (15 marks)

The candidates were presented with a schematic diagram of a simple circuit which the candidates had to convert to a pictorial drawing as the circuit is seen in real life. The candidates had to draw the sketch and pictorial drawings of the components were also given at the bottom. As a further aid, a typical wiring demonstration was also given. The final version had to be in colour, mainly indicating that the candidates show the bulb lit up and the wiring colour coding (positive red and negative black). The candidates had a large area to draw the final drawing, where the majority laid out their pictorial quite well. The circuit was very straight forward, and only a basic functional understanding of circuitry was required to produce the solution. The 2A question posed one series-parallel circuit involving 1 bell, 1 bulb, 1 knife switch and 2 cells, while the 2B separated the concepts into two smaller circuits involving 2 bulbs, 1 cell and 1 knife switch each.

The following are some general observations regarding the electrical circuit diagram questions;

- Only a few identified that the 2A circuit had 2 cells instead of 1.
- Some copied the exact layout of the schematic and replaced the symbols with the pictorials. Some went even further as to draw the pictorials rotated at 90° to the left just like the schematic. While this still produced functional circuits, the presentation was very lacking.
- Frequently the bulb and the switch were not connected in series, but the bulbs were connected permanently to the cell. This showed that the candidate was missing the basic concept of control in circuitry.
- Some other wiring connection mistakes (like non-joined wires, bulbs connected twice on the same pole, short circuit wires in parallel to the cells etc.) showed clearly that some particular candidates did not grasp the basic concepts.
- Few candidates forgot to draw the sketch.
- Some wires were drawn like pipes.
- Very few just copied the same schematic given in the question.
- Some candidates did not add colour to their solutions.
- The vast majority identified and transferred the components correctly.
- The vast majority attempted this question.

The table below shows the performance of the candidates regarding question 4.

	0	1 - 8	9 - 14	Full marks	Abs	Total
Option A	4	95	211	2	1	313
Option B	5	35	56	1	12	109

Question No. 5 – Locus of moving points (15 marks)

The candidates were given a graphic symbol of a pram. The profile of this symbol consisted of a cycloid, an involute and an arc.

Most candidates divided the rolling circle in 12 and plotted chord distance equivalent to one rotation. However, when it comes to plotting points a good number confused and ended up with a random curve.

SEC EXAMINERS' REPORT MAY 2017

With reference to freehand drawing of curves, only a minority of candidates managed to make a proper decent freehand curve. This shows lack of confidence and practice.

A number of candidates confused the involute with the Archimedean spiral, this shows lack of practice and studying.

With reference to the third part of the Paper 2A question, where candidates were asked to plot the curve with equal distance from C, only a small number of candidates were keen enough to draw a curve with the compass. The majority did a number of equal points equidistant to point C and joined freehand.

The table below shows the performance of the candidates regarding question 5.

	0	1 - 7	8 - 14	Full marks	Abs	Total
Option A	3	49	246	14	1	313
Option B	10	56	31	0	12	109

Question No. 6 – Truncation / Interpenetration / Surface development (18 marks)

In this question, candidates were presented with a Halloween tea light candle holder truncated having the form of a cylindrical mask. The cylinder was truncated at an angle at the top and intersected with an inclined rectangular prism in Paper A and with a triangular prism in Paper B.

Candidates were asked to continue the elevations and construct the surface development. With reference to the upper cut in the end elevation, most candidates did the cut properly. However, others confused the points, others continued the whole curve without even representing the lower half as hidden. Also, some candidates just did freehand at random without gathering points.

With reference to the lower intersection, only a small percentage managed to do it correct. Many missed the extra point where the curve changes direction. This shows lack of experience and practice in subject. With reference to development, the majority divided into twelve. Most candidates managed to do the upper cut. The lower cut proved to be trickier, especially for unexperienced ones. Only a few managed to do it correctly including the curve joining between the upper and lower mouth. The question managed to distinguish between experienced and inexperienced candidates.

The table below shows the performance of the candidates regarding question 6.

	0	1 - 10	11 - 17	Full marks	Abs	Total
Option A	3	150	155	4	1	313
Option B	7	74	16	0	12	109

SEC EXAMINERS' REPORT MAY 2017

Question No. 7 – Auxiliary Projection (18 marks)

Three orthographic views and an illustration of a peace monument were given in this question. The candidates had to project an auxiliary elevation of the monument at 45° from the plan. The starting projection planes ($X-Y$, X^1-Y^1) were given and since the solution was symmetrical, they had the option to project half and mirror the other half. This was also noted in the question. The component heights of the monument were in steps of 10 mm. The 2A paper featured curved sides while 2B featured straight sloping sides. All the other features were identical. Almost all the candidates attempted this question but overall the neatness and accuracy was lacking. The following are some further specific notations to the solutions presented by the candidates.

- Amongst those who attempted this question, everyone projected the lines correctly at 45° .
- Almost everyone projected and constructed the first 2 steps correctly.
- Some candidates confused the flat side that had 3 levels and took the vertical steps as having more than 10 mm.
- Although not required some clever candidates sketched the solution, probably, as a visualisation aid.
- The sloping sides proved to be quite challenging for the 2B candidates and some 2A candidates drew a straight slope instead of a curved one.
- Some candidates tried to draw it in 3D or a combination of 3D and auxiliary projection.
- Instead of projecting the divisions of the curved part, some candidates tried to use the compasses to draw the curved sides.
- Some candidates projected the curved sides correctly and used French-curves to draw the solution. This was both a well-presented and an acceptable method.
- Interestingly, instead of dividing the quadrant traditionally in 30° partitions, some candidates took the divisions in line to the steps. This made it even easier as they did not have to project additional lines and helped with overall neatness.
- Overall the neatness was very weak throughout all the scripts where some solutions were, to say the least, abysmal done with possibly 2B of darker pencils.

The table below shows the performance of the candidates regarding question 7.

	0	1 - 9	10 - 17	Full marks	Abs	Total
Option A	5	151	147	9	1	313
Option B	13	61	23	0	12	109

Chairperson

2017 Examination Panel