

NSC 2016 CHIEF MARKER'S REPORT

SUBJECT	ENGINEERING GRAPHICS AND DESIGN
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PAPER	2
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DATE OF EXAMINATION:	16/11/2016	DURATION:	3HRS
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SECTION 1: (General overview of Learner Performance in the question paper as a whole)

To answer this question you have to look at the province in districts. Some districts performed well while other districts under performed. Some centres within districts were the exception to the rule. These centres must be used to uplift the standards in the rest of the district. It appears that more candidates are attempting the different questions, but the results does not show it (47,2% Failed). This can be attributed to a few factors, namely:

- Inadequately trained or qualified educators
- Learners that did not meet progression requirements in Grade 11, yet were promoted to Grade 12 on age cohort in some instances.
- Disinterested learners
- Poor school attendance of learners
- Learners and schools that do not have the correct drawing equipment and/or facilities
- Inadequate or non-existent LTSM
- Lack of support and/or intervention for under-performing centres and districts

If we have to look at the performance of the candidates then it is clear that the province performed worse than 2015

LEVEL	2016	2015
1	47.2%	33.7%
2	21.4%	24.8%
3	14.3%	18.4%
4	7.8%	10.8%
5	4.5%	5.9%
6	2.5%	3.5%
7	2.2%	2.9%

SECTION 2: Comment on candidates' performance in individual questions

(It is expected that a comment will be provided for each question on a separate sheet).

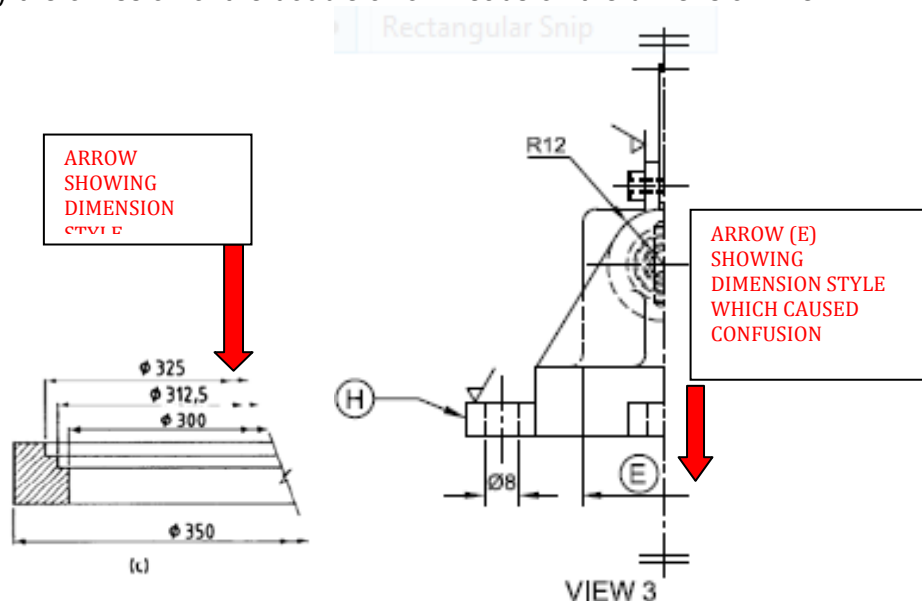
QUESTION 1 (Mechanical Analytical)

(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?

- Sections of the question were well answered by the majority of the candidates, but overall this question was poorly answered.
- The majority of the candidates could at least answer the first 5 questions. These questions are normal “find the answer on the paper” questions.
- Average mark attained for question 1 was 30,4%.

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

- Question 1.1 - 1.5 & 1.19: These questions were lower order cognitive questions and had to be read off the given drawing or title block.
- Question 1.6 & 1.7: Very few candidates managed to answer these questions. The word “finish” should have read “feature” to avoid confusion. Many candidates that answered the two questions referred to the “finish” being “smooth” and “rough”.
- Question 1.9 C - E: This question was testing the candidate's ability to find and calculate three dimensions on the given views. The majority of the candidates obtained the $\varnothing 12$ and the 86 mm distance. The dimension on the right view “E” was confusing and most candidates answered 17 mm instead of 34 mm. The confusion might have been caused by the omission of the double arrow heads on the dimension line.



- Question 1.11: Candidates had to interpret why the enlarged view of the parts of the assembly was given. The answer was “to show detail of small parts”. Very few candidates could answer this question successfully.
- Question 1.12 – 1.14: Candidates had to know machine symbols and specifications to answer these questions. These were higher order questions and was very poorly

answered.

- Question 1.15: Although this question has been asked in previous papers very few candidates knew how to calculate the upper tolerances for the dimension given.
- Question 1.17: This question was a new type of question where the candidates had to construct a R10 curve. This question was extremely poorly answered.
- Question 1.18 & 1.19: These questions were freehand symbols that had to be drawn and very few candidates were able to draw the convention of the coil spring. The candidate also had to draw, in freehand, a third angle orthographic projection symbol. Candidates are still answering this question incorrectly.
- The lack of knowledge of technical terminology was a big factor in the inability of the candidates to answer questions.
- The inability to read/understand a drawing was evident in the wrong answers/dimensions that were given in some questions.
- With the exception of a few questions the majority of questions have been asked in previous papers. This shows that teachers do not consult previous papers when they do their lesson planning and prepare candidates for examinations.

(c) Provide suggestions for improvement in relation to Teaching and Learning

- Teachers must make use of the SABS and DBE approved textbooks to obtain the correct terminology for the subject.
- Exercises in the reading of drawings must be done to improve the candidate's ability to find and calculate dimensions.
- Teachers must make use of old examination papers to guide the candidates in how to answer the analytical question.
- Teachers must teach their candidates how to write dimensions, e.g. A/F97, Ø50, 150°, etc.
- Candidates must answer questions correctly, e.g. if the question states that the projection symbol must be drawn in freehand, then it must be freehand. The opposite is also true; if instruments are required then freehand drawings will not be accepted.
- Time management is essential to complete all the questions.

(d) Describe any other specific observations relating to responses of learners

- The responses from candidates indicate that many of them do not understand the terminology and language that is used in the paper. The answers would reflect that they did not understand what was asked, e.g. dimensions become names of parts, etc.
- It seems to be that candidates leave question 1 for the end of the session which means that they sometimes run out of time and have to rush through the questions and then make mistakes. Time management is very important when completing the question paper.

(e) Any other comments useful to teachers, subject advisors, teacher development etc.

- This is the type of question that you should give to your pupils and they take it home and research the answers. Let the class then decide which answer is the correct one and why.
- To get candidates to learn where the different views must be placed in third angle orthographic projection, let them print the names of the views below the drawings that they do for CASS.
- This type of question should be asked in Grade 10 to start developing their skills in reading drawings.

QUESTION 2

- (a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?

Average mark from the sample of 100 :		
SUB-QUESTION	TOPIC OR ASPECT TESTED	AVERAGE % FROM SAMPLE
2.1	Mechanism	21,5%
2.2	Helix (Auger)	36,3%

Both these questions were answer very poorly.

- Question 2.1 (Mechanism) This question was very poorly answered and many learners did not attempt this question.
- Question 2.2 (Helix) was done with some success, but still poorly answered.

- (b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

Question 2.1

- MECHANISM is in the grade 12 syllabus and it seems that very little attention was paid to this section.
- Very few candidates attempted this question with success.
- Not even the complete given view was copied correctly.
- No proper centre lines were drawn; instead learners drew construction or hidden detail lines.
- Candidates did not divide the circles into 12 equal parts and in some cases they did not divide them in equal parts.
- Learners did not draw the construction lines, but only obtained the points on the line and that cost them marks.
- Learners could not determine point "C", because they did not use the giving dimensions.
- Learners did not understand the movement of the connecting rod AB through swivel point C and thus could not determine the construction lines.
- Learners did not understand what the "use" of the horizontal groove was.
- The construction of the curve was poorly done.
- This drawing had a great amount of construction work to do that took some time to do and counted very little marks.

Question 2.2

- Learners did not copy the given detail correctly.
- Most learners did not insert the centre lines for the two views.
- Some marks were forfeited when learners used the wrong starting point.
- Learners also lost marks for the wrong direction of the auger (left hand instead of right hand).
- The learners could not determine the pitch of the auger (60 mm).
- The learners divided the 90 mm for one and a half turns into 12 parts instead of 18 parts.
- Learners did not divide the left view into 12 equal parts.
- The construction of the curve was poorly done.
- Many learners did not draw an auger, but changed it into screw threads or springs.

<p>(c) Provide suggestions for improvement in relation to Teaching and Learning</p> <p>Question 2.1</p> <ul style="list-style-type: none"> Teachers must teach according to the CAPS document. Work that was done in Grade 10 & 11 must be revised in Grade 12. Dividing circles into equal parts must be practiced more extensively. The different variations of movement must be practiced. Learners must be exposed to the terminology needed to understand this question. <p>Question 2.2</p> <ul style="list-style-type: none"> Teachers must teach according to the CAPS document. Work that was done in Grade 10 and 11 must be revised in Grade 12. Dividing circles into equal parts must be practiced more extensively. Learners must practice how to divide lines (pitch) into 12 equal parts. Learners must be taught the concept of how many parts to use for the amount of turns needed.

<p>(d) Describe any other specific observations relating to responses of learners</p> <p>Question 2.1</p> <ul style="list-style-type: none"> Candidates must read the questions carefully to avoid doing the wrong drawings. The fact that so many learners only copied the given schematic drawing and did not attempt to answer the question give me the suspicion that learners were not taught how to answer the mechanism. Candidates do not understand the different terminology used when describing the movement of the mechanism. <p>Question 2.2</p> <ul style="list-style-type: none"> Learners must read the questions carefully to avoid doing the wrong drawings, eg thread or springs instead of augers. Curve quality and tangential curves need improvement.

<p>(e) Any other comments useful to teachers, subject advisors, teacher development etc.</p> <p>Question 2.1 and 2.2</p> <ul style="list-style-type: none"> More practices in Mechanisms and Helix must be done. They are not drawings that take a long time to do and can easily be practice in class time. Show the learners examples of where mechanism and helix is used. There are animations on the internet that shows how mechanisms work.

<p>QUESTION 3</p> <p>(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?</p> <ul style="list-style-type: none"> Some schools answered the isometric drawing well. There are many centres where there is a lack of understanding the concept of converting from 2D to 3D and learner responses was very poor. The average for this question was 34,6%.

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

- Learners did not construct auxiliary views. Most learners ignored the 120° angle and interpreted the height of the angle as the same as the height of the square.
- The 60° angle given was also interpreted as being the side of a hexagon and they worked out the size of the side as 20 mm.
- The learners did not section the isometric view.
- Drawing the isometric circle was very poorly done and even in well answered questions the learners left out the centre line.
- Learners interpreted the square truncated pyramid as being separate from the main part and that affected their interpretation of the cutting plane.
- Some learners also had a problem placing the pyramid and the square hole in the right position.

(c) Provide suggestions for improvement in relation to Teaching and Learning

- Teachers must make use of previous exam papers to enlighten candidates on how the question is asked and what is expected of them.
- More exercises in isometric drawings must be done in the previous grades to help the candidates to improve on their marks. This question is a good example of why EGD is a skills based subject. Candidates must practice reading the 2D drawing and converting it into an isometric view 3D.
- Make use of solid models so that candidates can relate to what they must do. Start in Grade 10 with simple shaped wooden blocks.
- Visibility of the lines (line quality is poor)
- Auxiliary view construction (hexagonal) must be practiced and shown clearly.
- Some candidates are battling to master the method of constructing a circle. Compass work is poor.
- Attention should be paid to the rules of sectioning.

(d) Describe any other specific observations relating to responses of learners

- Most learners fail to apply the correct line type, visible outlines compared to construction lines.

(e) Any other comments useful to teachers, subject advisors, teacher development etc.

- Pupils must practice isometric drawings in all grades.
- Educators should guide candidates on how to draw precise 90 and 30 degree lines of isometric drawings, using correct scale and given dimensions.
- Construction of orthographic polygons to isometric polygons including circles must be emphasized in all grades.

QUESTION 4

(a) **General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?**

- Most learners attempted the question.
- The question was poorly answered.
- Some centres still performed very poorly in this question.
- The incomplete answers make me believe that the learners might not have had enough time to complete the question.
- The average for this question was 31,3%.

(b) **Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.**

- Planning of the placement of views is critical (3rd angle).
- Learners did not measure properly and drew inaccurately.
- Improper or incorrect placement of parts of the assembly.
- Some learners did not use proper instruments.
- Centre lines were very poorly drawn or omitted.
- Very few learners were able to construct the nut properly.
- Very few learners inserted the cutting plane and did not label it.
- Candidates used civil hatching, hatched at the wrong angle and did not differentiate between parts (spacing and direction).
- Many learners did not hatch the right side, but rather hatched the full front view.
- Parts of the assembly were drawn as unassembled.
- Many candidates did not attempt the top view.

(c) **Provide suggestions for improvement in relation to Teaching and Learning**

Pay attention to drawing TAOP.

- Although line quality is not evaluated, neat drawings are easier to read and clarify the drawing. Learners must practice to draw neatly, because only correctly used line work is marked, e.g. outlines must stand out above construction lines and hidden detail lines. Centre lines must be correctly drawn.
- Pay attention to basic knowledge such as the manual construction of nuts and bolts.
- PARTS MUST BE ASSEMBLED.

Half section rules

Section of adjacent parts

7.3.1 Half section

Components that are symmetrical about a centre line may be drawn with one half in outside view and one half in section. When the sectioned half of the view contains an area of hatching that touches the centre line, the centre line should be changed to a continuous thin line (see figure 22). Hidden features should not be shown unless they are necessary for clarity.

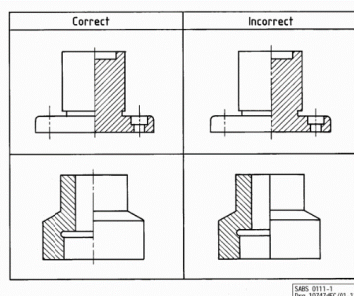
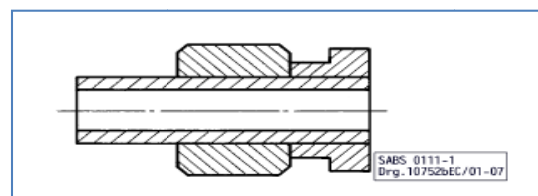
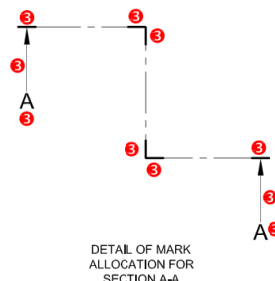
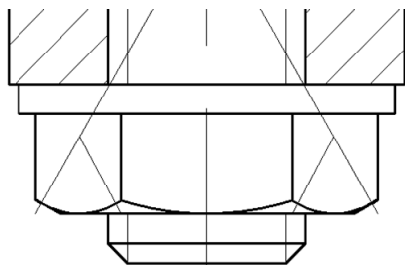


Figure 22 — Half section showing the correct and incorrect presentation



(d) Describe any other specific observations relating to responses of learners

- Planning of time per question is critical. 1.1 marks should be completed per minute. Roughly 36 minutes should be spent on 40 marks.
- Planning of drawing layout needs attention.
- Line quality must improve.
- Learners do not practice the assembly drawings enough.



The ends and corners of a cutting plane must be thickened. The cutting plane must be labelled and the arrows must be in the correct position and touching the thickened part.

- Many candidates used civil hatching and hatched at the wrong angle.

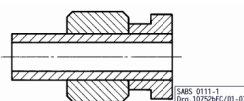
7.2.1 Standard hatching

- a) Hatching should be used (preferably at an angle of 45° to the axis or main outline) to make the area sectioned evident (see figure 16). Hatching may be omitted where the meaning of the drawing is clear without it, but the practice followed should be consistent on any one drawing.



Figure 16 — Hatching of sections

- b) The spacing between the hatching lines may vary according to the size of the section but should be the same in all sectional views of the same component drawn to the same scale. Hatching on adjacent components should be drawn in different directions or to a different spacing (see figure 17).



- Parts of the assembly were often drawn as unassembled and they forfeited marks doing so.
- It appears as if more candidates are attempting this question with some kind of success, but they need more practise in assembling the parts.
- It appears as if some centres/candidates still do not have the basic requirements/equipment to offer the subject, e.g. drawing boards, t-squares, set squares, compasses, flexi-curves, etc.

(e) Any other comments useful to teachers, subject advisors, teacher development etc.

- While preparing learners to answer assemblies special attention must be given to hatching of different components and hatching rules.
- Also revise construction of nuts, washers and bolts again.
- Line types and their use must be stressed.
- Take note of use of centre lines and cutting planes.