Province of the
EASTERN CAPE
EDUCATION

ASSESSMENT AND EXAMINATIONS DIRECTORATE
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NSC 2015 CHIEF MARKER'S REPORT

SUBJECT	ENGINEERING GRAPHICS AND DESIGN

PAPER	2

DATE OF EXAMINATION:	10 / 11 / 2015	DURATION:	3 HOURS

This report is aimed at providing valuable feedback to schools, subject advisors, teachers and learners about common errors committed by candidates in the answering of questions, to assist teachers and subject advisors to identify areas that need to be given special attention in the teaching and learning of the subject in 2015.

Your responses will be based on two parts:

Section 1: General overview of Learner performance in the question paper as a whole

Section 2: Comment on candidates' performance on individual questions (Detailed explanations must be provided **per question** as follows: (You may include sub questions where necessary)

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

(b) Why the question was poorly answered?

(c) Provide suggestion for improvement in relation to teaching and learning

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

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

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 seems that the majority of candidates performed beter than last year but the large amount (33.7%) of candidates that still could only achieve a level one is of great concern. This can be attributed to a few factors, namely: (a) inadequately trained teachers, (b) pupils not interested, (c) pupils not having the correct instruments and learners that did not meet promotion requirements in grade 11, yet were progressed into grade 12.

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 (Analytical - 30 marks)
(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 9 questions. These questions are normal "find the answer on the paper" questions. • Average mark attained for question 1 was 48,3%.

(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 - 1.9, 1.10 & 1.18: These questions were lower order cognitive questions and had to be read off the given drawing or title block. All the questions in paper 2 are based on the candidates knowledge of third angle orthographic projection. The majority of candidates obtained a 70% and above mark for this section. (11 marks) • Question 1.8, 1.12 & 1.13: These questions tested the candidates knowledge of the sectioning of parts. This work has been done since grade 10 and is fundamental knowledge that a candidate should have if he wants to make a success of EGD. The majority of candidates answered question 1.12 & 1.13 incorrectly. (2 marks). • Question 1.15: Candidates had to interpret why two enlarged views of the parts of the assembly was given. The answer was given in the question "to show detail

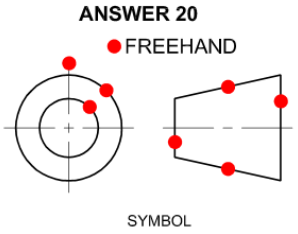
of small parts". Very few candidates could answer this question successfully. (2 marks)

- Question 1.10A-C & 1.14: These questions were testing the candidate's ability to find three dimensions on the given views and to calculate a distance where two dimensions were to be added together. The majority of the candidates obtained only 1 - 2 marks out of 3 for the finding of the dimensions and for 1.14 very few candidates could work out the distance. Some candidates could not find any of the answers. (4 marks)
- Question 1.11: Very few candidates could identify the feature as a "fillet", which indicates that candidates do not know the terminology used in EGD. (1 mark)
- Question 1.16: Candidates do not know what the conventions in mechanical drawings are used for. This question was poorly answered. (1 mark)
- Question 1.17 & 1.18: Although this question has been asked in previous papers very few candidates knew how to calculate the upper and lower tolerances for the dimension given. (4 marks)
- Question 1.19: This question was answered extremely poorly. This question has to do with the critical knowledge of sectioning. Without the knowledge of where to place a cutting plane, a candidate can not answer any question on sectioning. This question counts 3 marks and very few candidates could obtain more than 1 out of 3 marks.
- Question 1.20: This question has been asked in every question paper since 2008. The candidate had to draw, in freehand, a third angle orthographic projection symbol. Candidates are still answering this question incorrectly. There was, however, an improvement on the amount of candidates that did answer this question correctly.
- 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 question 1.13 and 1.15, all the 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.



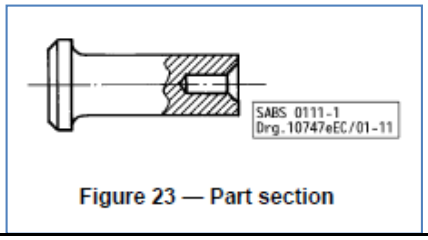
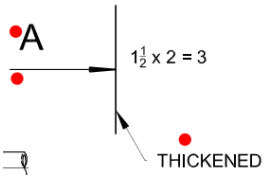


Figure 23 — Part section



(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. • In 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 (MECHANISM AND CAMS - 40 marks)
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?
• 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. • The basics for the CAM is done in grade 11 and that part of the question was done with

some success. (Dividing profile in 12 parts, horizontal projection and circular projection)

- Most candidates attempted this question with some success.
- Average mark attained for question 2.1 was 24,8%.
- Average mark attained for question 2.2 was 42,8%.

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

The following common errors were made:

Question 2.1 MECHANISM

- Given circles could not be drawn or drawn inaccurately or to incorrect scale (Inadequate drawing instruments) (2 marks)
- No centre lines were drawn (1½ marks)
- The candidates struggled to divide the bottom circle into 12 parts, because the point was placed on the 45° line.

Question 2.2 CAM

- Many candidates did not read the question properly and changed the roller follower to a wedge-shaped follower.
- The roller follower was not drawn.
- The roller follower was not drawn in its given position at 30° from the vertical.
- The extra divisions (15°) of the simple harmonic movement were not used.
- Rollers were not drawn around cam profile.
- Direction correctly noted but incorrectly applied.
- Curve quality and tangential curves need improvement.

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

Question 2.1 & 2.2

- 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 (30°) must be practised more extensively.
- The different variations of movement must be practised.

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

- Candidates must read the questions carefully to avoid doing the incorrect drawing.
- Candidates do not understand the different terminology used when describing the movement of the mechanism.
- Curve quality and tangential curves need improvement.

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

- More practice in Mechanism and Cams must be done. They are not drawings that take a long time to do and can easily be practised in class time.

QUESTION 3 (Isometric – 34 marks)

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

- Most schools answered the isometric drawing well. There are still some centres where there is a lack of understanding the concept of converting from 2D to 3D.
- Average mark attained for question 3 was 37,6%.

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

- Candidates could not read the drawing and change it from an orthographic view (2D) to an isometric view (3D).
- The question stated clearly that all constructions should be shown; some candidates rubbed out their constructions. They forfeited marks if they did that.
- Candidates must show the construction (auxiliary view) of the hexagon.
- Construction of the isometric circle is still a problem for many candidates. This is work that should have been covered in grade 11.
- Very few candidates inserted the centre lines in the isometric circle.
- Many candidates did not attempt the sectioned part of the question.
- Sectioning techniques in isometric are problematic.

(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 skills based subject. Candidates must practise 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.

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

- A few candidates still did not place point P as the lowest point of the drawing as required.

- Most candidates attempted this question and had good results, but the sectioning part of the isometric was poorly answered and the candidates did not know the rules of sectioning isometric views.

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

- Pupils must practice isometric drawings in all grades.
- Teachers must show pupils how to look for non isometric lines and identify when it is necessary to construct an auxiliary view and how to copy that view to isometric.
- Practice the constructing of circles and semi-circles and inserting centre lines.
- Practise various isometric sections.

QUESTION 4 (Assembly – 96 marks)

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

- Most candidates attempted this question with some degree of success and the marks for this question varied from centre to centre.
- Some centres still performed poorly in this question.
- Average mark attained for question 4 was 39,5%.

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

- Many candidates did not read the question and placed the parts in the wrong positions. The Lever was supposed to be placed centrally and the Strong Arms had to be placed against the Beam.
- Many candidates have a problem with drawing accurately and they forfeited marks.
- Many of the candidates do not know their rules of sectioning, e.g. (a) not changing the direction of sectioning for adjacent parts, (b) part-sectioning of changes to the lever and worm screw, and (e) using civil hatching in mechanical drawing.
- Construction of the nut is still problematic.
- Many candidates did not draw the top view in the correct position.
- Some candidates also drew the views in first angle orthographic projection instead of third angle.
- Very few candidates inserted the centre lines and cutting plane.

(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 rules of sectioning. The rules for half sectional views must also be practised.

Part Sectioning

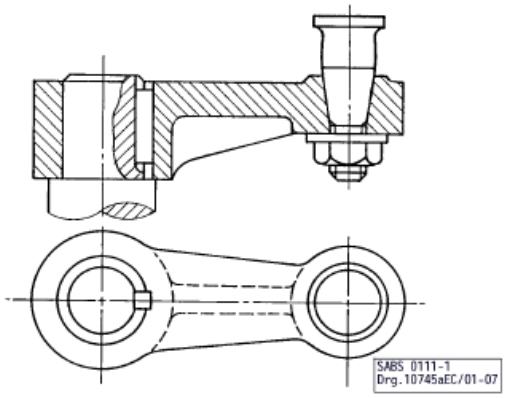
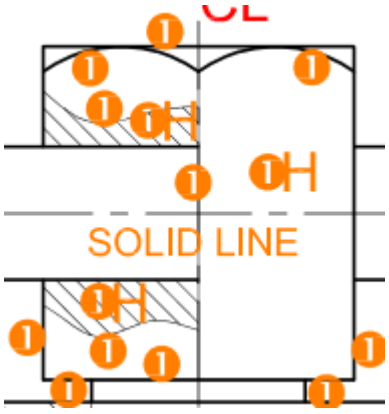


Figure 28 — Rib, shaft, key, crank pin, nut and washer, not sectioned



Sectioning of the Lever and Worm Screw (Part Sectioning).

Half section rules.

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.

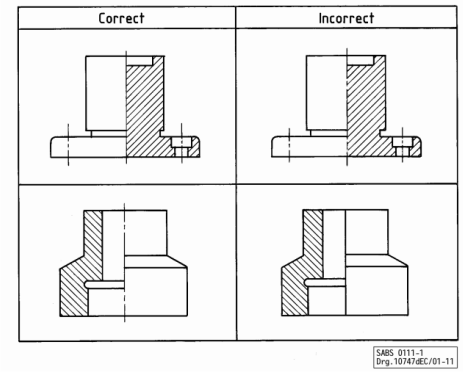
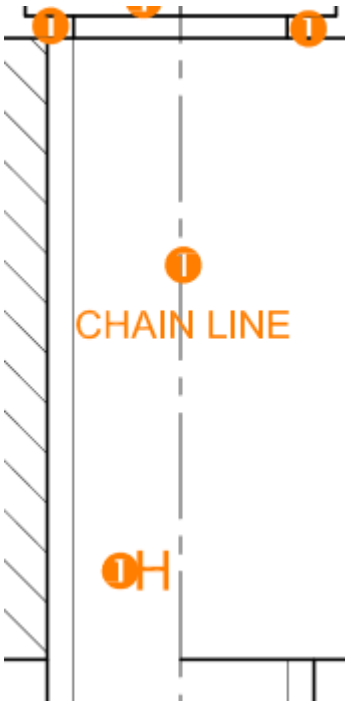
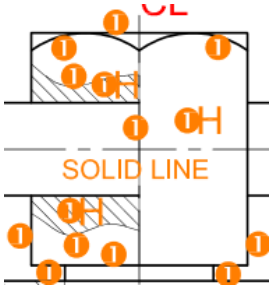


Figure 22 — Half section showing the correct and incorrect presentation

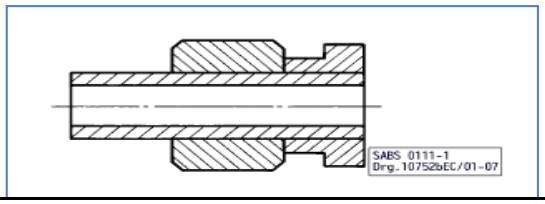


Worm Screw and Beam



Worm Screw and Lever

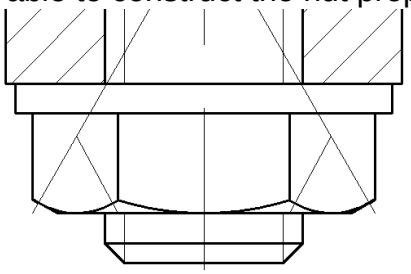
Section of adjacent parts



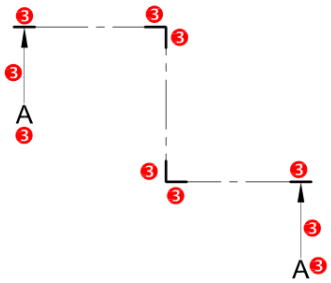
- Exercises in the reading of drawings must be done to improve the candidate's ability to fit the different parts together.
- Teachers must make use of old examination papers to guide the candidates in how to answer the assembly question.
- Teachers must make sure that the candidates understand the rules of sectioning and do relevant exercises to improve their understanding.

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

- Planning of the placement of views is critical.
- Centre lines were very poorly drawn or drawn in construction.
- Assembly parts drawn to the incorrect scale.
- Very few learners were able to construct the nut properly.



- Very few learners labelled the cutting plane and drew centre lines correctly.



DETAIL OF MARK ALLOCATION FOR SECTION A-A

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.

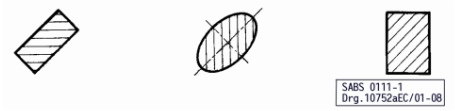
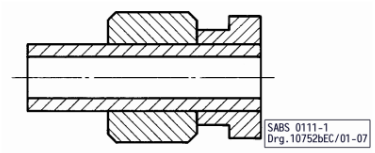


Figure 16 — Hatching of sections

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.

- In grade 10, pupils are required to section simple castings. Let the grade 10 pupils do the sectioning of one of the components of the grade 12 exam paper. Do not let them assemble the components, but let them section all the parts separately. When they get to grade 12, they will not see it as an impossible task.
- Teachers must make use of the SABS and DBE approved textbooks to obtain the correct rules of sectioning.
- Exercises in the reading of drawings must be done to improve the candidate's ability to fit the different parts together.
- Teachers must make use of old examination papers to guide the candidates in how to answer the assembly question.
- Teachers must make sure that the candidates understand the rules of sectioning and do relevant exercises to improve their understanding.

NAME OF THE CHIEF MARKER: **SIGNATURE** **DATE**