Province of the
EASTERN CAPE
EDUCATION

ASSESSMENT AND EXAMINATIONS DIRECTORATE
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REPUBLIC OF SOUTH AFRICA, Website: www.ecdoe.gov.za

NSC 2016 CHIEF MARKER'S REPORT

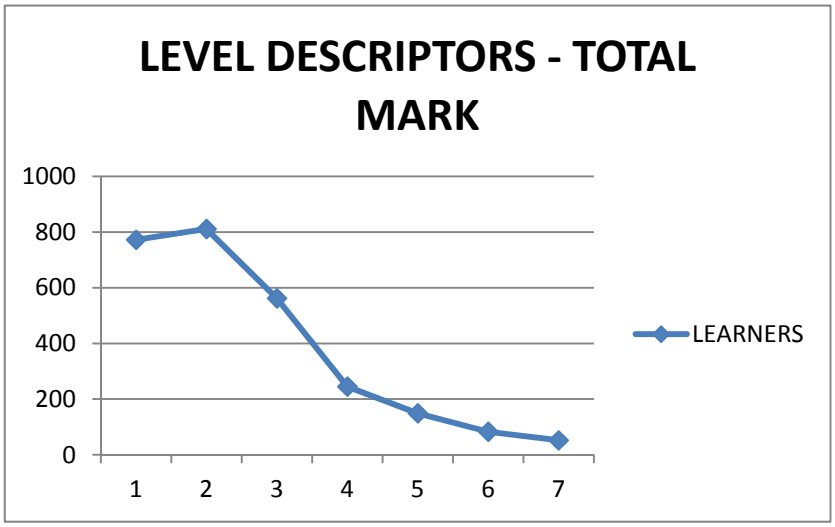
SUBJECT	ENGINEERING GRAPHICS AND DESIGN

PAPER	1

DATE OF EXAMINATION:	14/11/2016	DURATION:	3

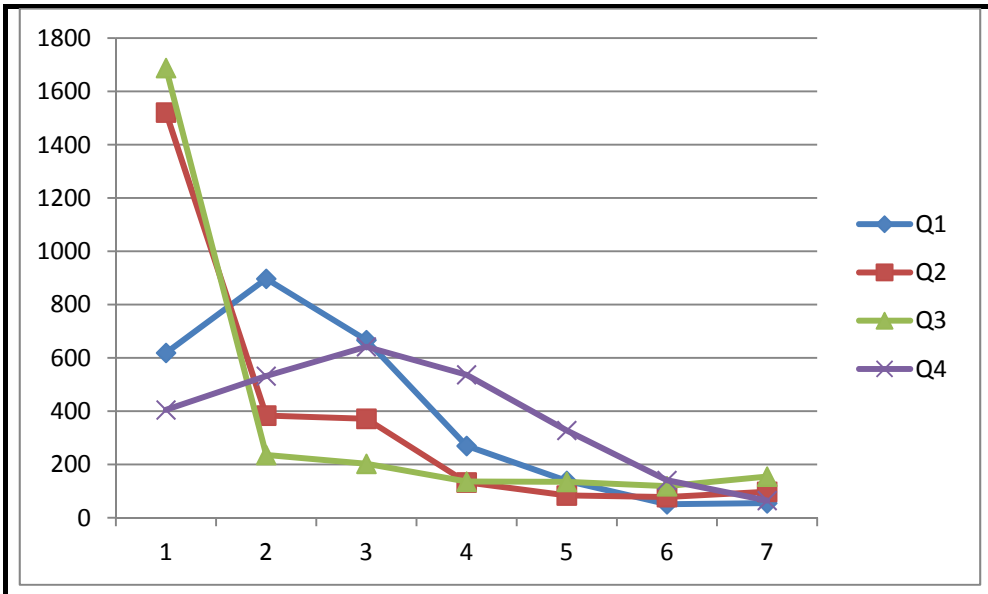
SECTION 1: (General overview of Learner Performance in the question paper as a whole)

The learners found the paper a challenging paper.
772 achieved a level 1
811 achieved a level 2
52 achieved a level 7



The following was the average percentage achieved per question:
Question 1 ANALYTICAL = 39% of 30 marks
Question 2 SOLID GEOMETRY = 29% of 37 marks
Question 3 TWO POINT PERSPECTIVE= 31% of 40 marks
Question 4 CIVIL DRAWING = 45% of 93

The level descriptors per question are shown in the graph:



Learners found Question 2 and three very challenging, Question 1 is of concern as this question is generally aimed at Low to Middle order questions with very few higher order questions.
Most learners attempted all the questions.

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

(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**
Q 1	ANALYTICAL	39%

- Question 1 was attempted by all learners.
- Q 1.16, 1.17, 1.18 , 1.19 and 1.20 were not answered well

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

- The lack of knowledge of technical terminology was a factor in the inability of the learners to answer question 1.9 - 1.17.
- Question 1.18 is a simple addition and subtraction calculation and 1.19 is a simple multiplication, addition and subtraction calculation, it seems the learners have no experience in simple mathematical calculations.
- Question 1.20 the symbols are in the SANS 1-10143 document on pages 49 to 51, all these symbols must be discussed with learners.

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

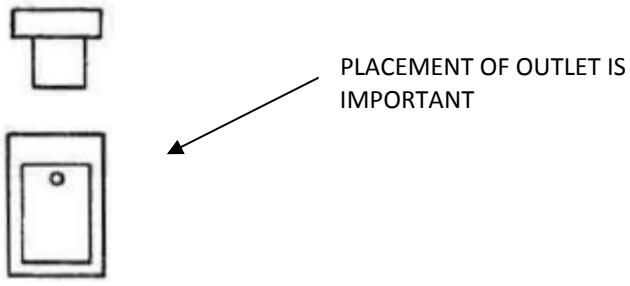
- Teachers must make use of the SABS and DBE approved textbooks to obtain the correct terminology and graphical symbols for the subject. The relevant SANS document can be obtained from the Subject advisors.
- Exercises in the reading of drawings must be done to improve the learners ability to find information and dimensions.
- Teachers must make use of old examination papers to guide the learners in how to answer the analytical question.
- Teachers must teach their learners how to write dimensions, mm or m or m^2
- Learners must answer questions correctly, e.g. if the question states that the projection symbol must be drawn in freehand, then it means freehand, and it will in future be marked as a drawing method, which means no instrument drawing will then be accepted. The opposite is also true, if instruments are required freehand drawings will not be accepted as per decision at the memo discussion where all provinces were present. Time management is essential to complete all the questions.
- The graphical symbos MUST be drawn in free hand. The graphical symbol MUST be exactly correct for marks to be allocated.
- Dimensions must be read of the drawings not measured as the drawings are deliberately not done to scale.
- When calculations are required write down the values and clearly show the calculations. The writing down of the formula will aid the learner.
- PRINT the answers neatly in capital letters to make them legible.

SPECIFIC COMMENTS ON QUESTIONS

- Question 1.1 - 1.8: These questions were lower order cognitive level. The learner is required to read the information of the drawing.
- Question 1.9 - 1.14: These questions were more lower to medium order cognitive questions and the learners had to know some associated technical/civil/ drawing terminology to answer these questions. The list of symbol/abbreviations can be found in SANS 1-10143 on page 53 – 53b.
  The colours to be used on civil drawings are found in the National Building regulations

a	***Material***	***Colour (in plan or section)***
i	New masonry	Red
ii	New concrete	Green
iii	New iron or steel	Blue
iv	New wood	Yellow
v	New glass	Black
vi	Existing materials (all materials)	Grey
vii	All other new materials	To be clearly indicated in colours other than the above
b	***Site plans***	***Colour***
i	Proposed work	Red
ii	Existing work	Not coloured
iii	Work to be demolished	Drawn with black dotted lines
c	***Drainage installation contemplated in regulation A2(1)(d)***	***Colour***
i	Drains and soil pipes	Brown
ii	Waste pipes	Green
iii	Soil and combined vents	Red
iv	Waste vents	Blue
v	Pipes for the conveyance of industrial effluent	Orange
vi	Existing drains	Black
vii	Stormwater drains	Not coloured

- Question 1.15 -1.17: These questions are medium to higher order questions.The learners are required to apply knowledge to associated technical/civil/ drawing terminology to answer these questions.
- Question 1.18: This question required the learner to calculate the perimeter. The basic formula is Perimeter = 2 (L x B). The gate is not indcated the same as the electrical fence. It was expected that the learner must subtract the gate from the total perimeter. In this case it is suggested to convert the mm dimensions to meter BEFORE calculating the perimeter. PLEASE NOTE, marks are allocated for calculation, correct answer and conversion to the required unit of measurement (m).
- Question 1.19: This question required the learner to calculate the total area of the buildings. The basic formula is Area = L x B. The calculation requires the addition and subtraction of areas to reach the answer. In this case it is suggested to convert the mm dimensions to meter BEFORE calculating the area. PLEASE NOTE, marks are allocated for calculation, correct answer and conversion to the required unit of measurement, as well as writing the unit of measurement correctly (m^2).
- Question 1.20: SANS graphical symbols must be absolutely correct for marks to be allocated. Freehand must be neat. The correct placement (FAOP)of the views is very important.



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

- The responses from learners 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. names become dates, dimensions become line types, etc. This is possibly a result of the language barrier (learners are taught in their second language)
- LEARNERS DO NOT READ THE INSTRUCTIONS ON THE COVER PAGE. And if they read them they do not do as the instructions require.

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

- 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 learners ability to find dimensions.
- Teachers must make use of old examination papers to guide the learners in how to answer the analytical question.
- Teachers must teach their learners how to write dimensions, mm, m and m^2, etc.
- Learners must answer questions correctly, e.g. if the question states that the graphical symbol must be drawn in freehand, then it means freehand, and it will in future be marked as a drawing method, which means no instrument drawing will then be accepted. The opposite is also true, if instruments are required freehand drawings will not be accepted as per decision at the memo discussion where all provinces were present. Time management is essential to complete all the questions.
- Learners must be trained to manage their time spent per question, a guideline time of 1.1 marks per minute is suggested.

QUESTION 2

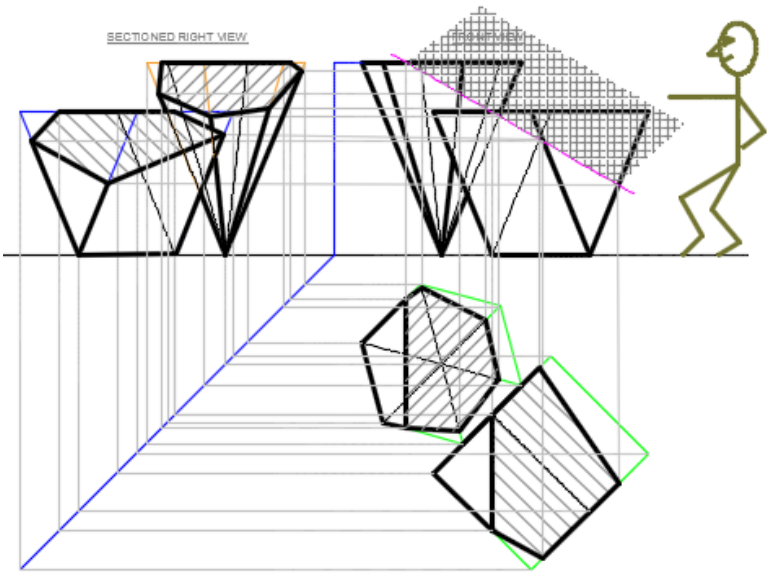
(a) General comment on the performance of learners in the specific question. Was the question well answered or poorly answered?

Average mark from the sample of 100 :		
SUB-QUESTION	**TOPIC OR ASPECT TESTED**	**AVERAGE % FROM SAMPLE**
Q 2	SOLIDS	29%

- This question was very poorly answered by most learners. Only a few learners managed to get a good mark in this question, with the majority of learners getting marks for reproducing the given views only.
- Very few candidates could answer the question correctly.
- Copying the given is not done in the correct order

(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.
• The reading/understanding skills of the learners were again a problem with this question. • The given is not drawn correctly, the top view of the hexagon should be drawn first, the front view is projected from the top view. The triangular prism require the learner to first draw an auxiliary view the project to the top view then project to the front view. • The right view should be projected and drawn to the left of the front view, this requires the learner to plan the layout of his page before starting the drawing. • Learners must complete the projection lines to aid in the following of points, POINTS MUST BE LABLED to decide what point is visible and what point is invisible • The instruction to draw invisible detail is ignored. • The different views should be labled although this is not a requirement of the question • Constructions should not be erased • Attention must be paid to the use of the correct line types.

(c) Provide suggestions for improvement in relation to Teaching and Learning
• Exercises in the reading of drawings must be done to improve the learners' ability to understand what is asked of them to draw. • Teachers must make use of past exam papers to help the learners to understand how the questions could be asked. • Avoid using prepared answersheets for all exercises. Learners must practice to draw both the given and the answer. • At first glance the question is complex. When you break up the question, a hexagonal pyramid with a cutting plane and then a triangular prism with a cutting plane, it is no more than two grade 10 level exercises that are combined. • Care must be taken in planning the placement of the views. FAOP and TAOP must not be used in one drawing. The learners started drawing the given views without reading the question that requires a right view to be drawn as well. • Principles of the viewing of cutting planes must be adhered to. In simple terms, the part closest to the observer from the cutting plane, is the part that must be removed.



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

- Learners must complete the projection lines to aid in the following of points, POINTS MUST BE LABLED to decide what point is visible and what point is invisible
- The instruction to draw invisible detail is ignored.
- The different views should be labelled although this is not a requirement of the question
- Constructions should not be erased
- Attention must be paid to the use of the correct line types

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

- The fact that so many learners did not even attempt this question makes one wonder if this part of the syllabus have been covered in gr 12.
- Teach the principal of cutting planes correctly.
- Include exercises cutting through the base of the pyramid

QUESTION 3

(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**
Q 3	TWO POINT PERSPECTIVE	31 %

- Learners did not manage to interpret the part of the building that was against the picture plane.
- The learners moved the ground line to suite them
- The station point was also moved to suite the learners

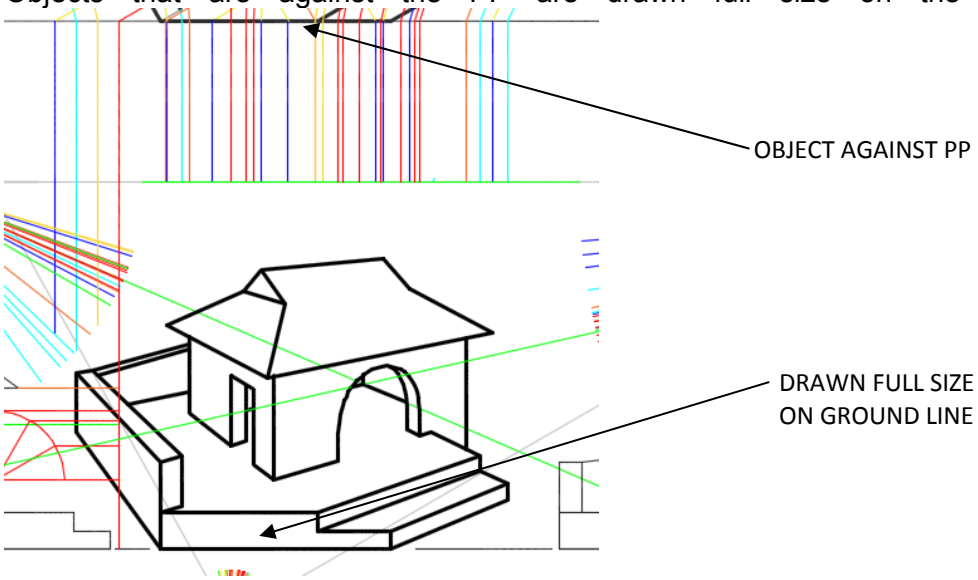
(b) Why was the question poorly answered? Also provide specific examples, indicate common errors committed by learners in this question, and any misconceptions.

- Learners got confused when multiple points touch the picture plane especially when they are not in the same perpendicular line as the station point
- The learners do not use correct approach to objects against the PP and object behind the PP

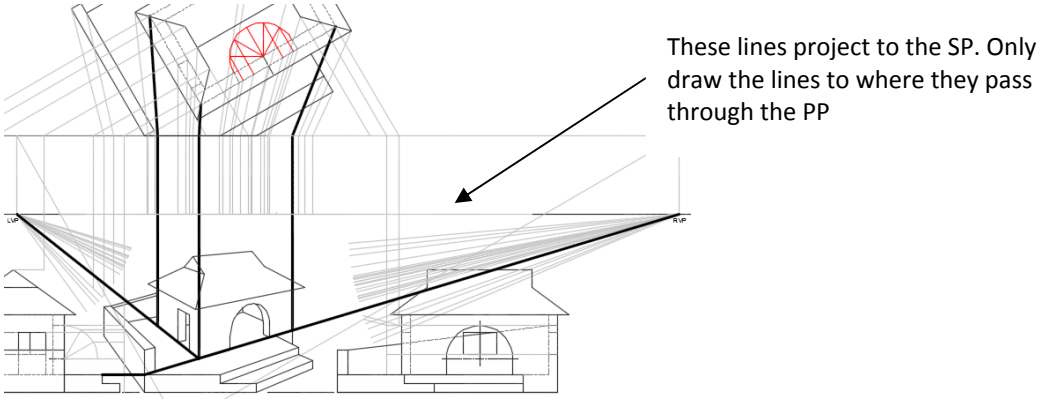
(c) Provide suggestions for improvement in relation to Teaching and Learning

- Learners have mostly mastered the determining of the vanishing points. The vanishing points are determined by drawing lines parallel to the sides of the object from the SP to the PP. From the intersect on the PP a line is drawn perpendicular to the HL, the intersect on the HL is the vanishing point, LABEL the vanishing point LVP and RVP. Learners must align the drawing to the ground line ie the T-square must be on the ground line before the page is fixed to the drawing board.

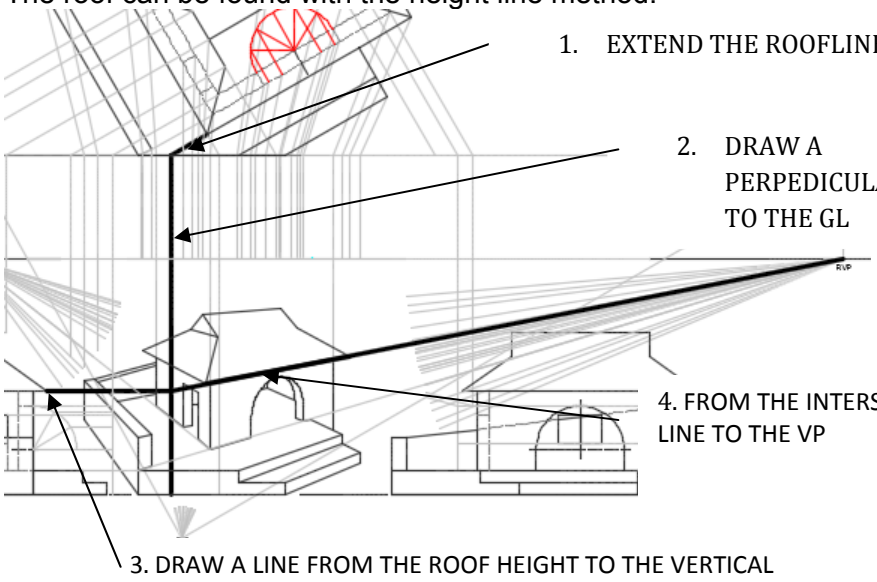
- Objects that are against the PP are drawn full size on the ground line.



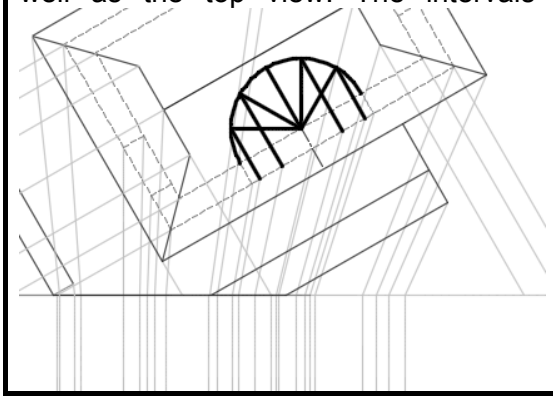
- In drawing perspective two methods can be used: the block method and the heightline method
  The block method can be used for the walls and steps. The building can be found with the block method



- The roof can be found with the height line method.



When drawing circles the construction should be used in the view that is placed on the GL as well as the top view. The intervals should be projected to the wall in the top view.



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

- This question contains a large number of construction lines that must not be erased as valuable marks can be lost.
- If the candidate determines the vanishing points incorrectly, he/she only loses the marks for the vanishing points.
- The rest of the question is marked according to his/her mistake.
- These construction lines assist the markers if the drawing is slightly inaccurate or even incorrect.
- Particular attention must be paid to accuracy and neatness.
- Learners must be taught a variety of possible starting points for these type of drawings. Arcs and circles on vertical and horizontal surfaces have to be practiced.
- Learners thought that the left view door was a window that can be seen from the front of the building
- More than one point touching the groundline seemed to be challenging to the learners

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

- The only way to improve the marks in this question is by working consistently throughout the year.
- There are many examples available from past exam papers that could be used to entrench the principles required to draw good accurate perspective drawings.
- Teachers must make sure that learners know how to plot points that do not touch the picture plane.
- Teachers must make use of previous exam papers to enlighten learners on how the question is asked and what is expected of them.
- More exercises in perspective must be done during the year to help the learners to improve on their marks.
- More revision is required on exercises with points not touching the picture plane. This requires the use of the heightline method

QUESTION 4

(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**
Q 4	CIVIL	45%

CIVIL DRAWING:

The entire question or part of the question was attempted by all candidates. The performance of the candidates varied from fair to very good. Unnecessary marks were forfeited simply because candidates do not read the question paper properly before attempting the question. Learners must be made aware that there are always notes to be read and schedules to check. If the candidate did not read the question properly, the incorrect scale was used for the sectional elevation in many cases. It can be clearly seen from these mistakes that attention was not given to the notes and schedules. This question consists of three sections. Completing the floor plan, drawing a south elevation and a sectional elevation through a cutting plane.

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

Learners lost many marks through not reading the question properly. In this question you cannot assume what is required by the examiner - you have to read the question. By not doing so, candidates will lose many marks. The main reasons why learners performed badly in this question are:

FLOOR PLAN

(1) Labels - inserting the room designation and floor finish was often neglected. In many cases only the one component was given, either the room designation or the floor finish. Learners were also penalised for not printing neatly in capital letters.

(2) Electrical - the graphical symbols must be used from the given legend
- incorrect symbols were used at the designated points
- fluorescent lights were drawn without it's designated wattage as indicated on the legend
-the electrical wiring must not be drawn as a straight line with a straight edge but curved freehand.
- the switch socket outlets were often omitted.
- the symbol for the ceiling light was often incorrect.

(3) Windows and doors – marks were deducted for not being the correct length, window frame incorrectly positioned and not showing the window sill.
- In some cases the swing of the doors were not shown or done free hand – similar mistakes occurred last year.
- marking this view would be made much easier if the gaps for the windows were on size.
- most learners only fill the space without calculating the actual width of the window.
- there are many other places in this question where learners ability to convert scales are tested.

(4) Hatching - hatching was not always compliant with the SANS 10143 document.
- Often done freehand and mechanical representation was used. Some of the walls were only partially hatched.

(5) Fixtures - the exact graphical symbols must be used as specified in the question paper.
- the symbol was either correct or wrong.
- Consult the SANS 101143 document for the correct graphical symbol.
- No marks were awarded if the pictorial view from the exam paper was used.

SOUTH ELEVATION

The instructions on the front cover clearly states that first angle principles must be used. However, candidates seem to ignore this instruction, with the result that they are penalised for incorrect alignment or rotation of views.
Common mistakes that were observed are:
(1) The roof height in many cases was incorrect. In spite of the fact that the roof height from

ground level is given.
(2) The vertical lines where the barge boards meet was often left out.
(3) The rain water down pipe was often not drawn.
(4) The window was often incorrectly placed with no window sill and inaccurate.
(5) The FFL line often omitted.
(6) The required labels were very untidily placed anywhere near the view. Labels must be placed in the appropriate places. The correct abbreviation must be used and printed horizontally so that it is legible.

SECTIONAL ELEVATION
This elevation had to be drawn to a scale of 1:20. Many learners lost marks for using an incorrect scale.

The following mistakes were commonly made.

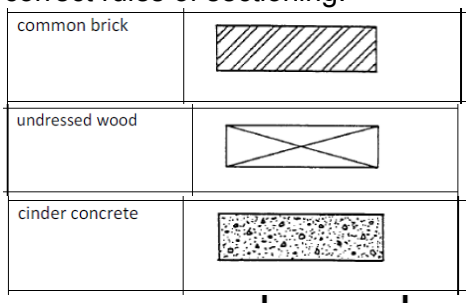
(a) the roof pitch is set at 20° which was not always the case from the candidates answers
(b) the purlins spacing and size was incorrect
(c) the wall plates are not shown
(d) the fascia's and gutters were often omitted
(e) Incorrect and incomplete roof truss
(f) the roof cover was in many cases omitted.

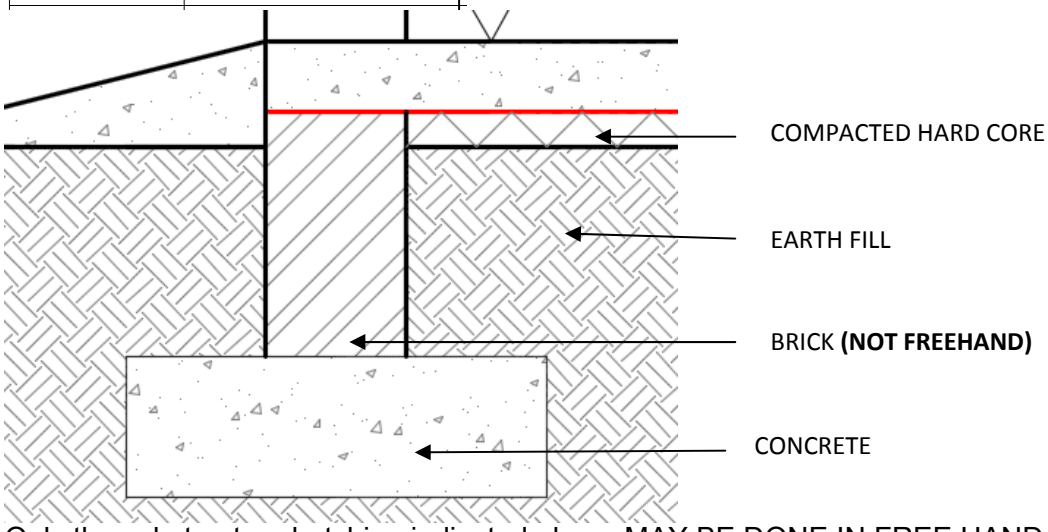
For the roof to be constructed correctly the schematic diagram of the roof truss and the given information must be analysed.
The foundation detail was not badly drawn but in some cases inaccurate. A lot of attention to detail becomes possible on a scale of 1:20 and learners must realise that they will be penalised for any guesswork. Although substructure hatching may be done in freehand, learners often do this untidily and incorrectly .This entire substructure should be covered from grade10 already according to the syllabus.
(3) The window and bathroom fixtures were often the wrong size and position.
(4) The placing and inserting of required labels was poorly and untidily done.
(5) The wall filling on the top of the outer walls were mostly omitted.

- The wall on the left (west side) of the cutting plane was not drawn by many learners, the result is that the marks for the following was lost: Barge board; Step; RWDP. The roof angle was drawn incorrectly.
- Dimensions given are ignored
- Learners did not plan their use of the given time wisely
- The graphical symbols are not drawn absolutely correctly according to SANS 1-10143.
- Electrical symbols are not drawn as per the examples given in the data sheet.

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

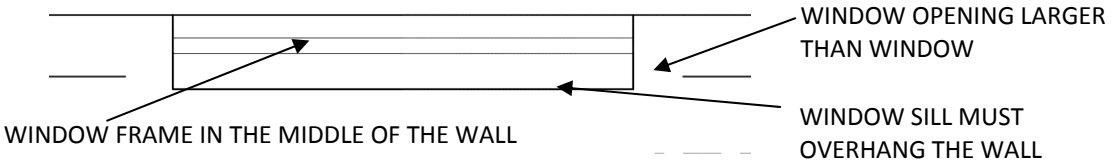
- All drawing must be done with instruments, free hand may be used for substructure hatching as well as electrical symbols. Any other freehand work will NOT be assessed.
- Teachers must make use of the SABS and DBE approved textbooks to obtain the correct rules of sectioning.





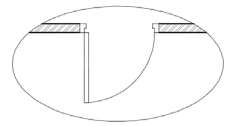
Only the substructure hatching indicated above MAY BE DONE IN FREE HAND, BRICKWORK IS NOT DRAWN IN FREEHAND.

- The given floor plan must be completed. Learners must measure the sizes of the windows, the opening left in the floor plan for the window is always larger than the window complete the walls to end against the window.

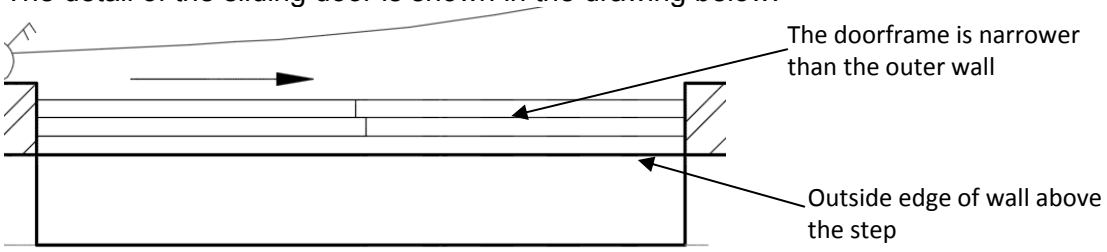


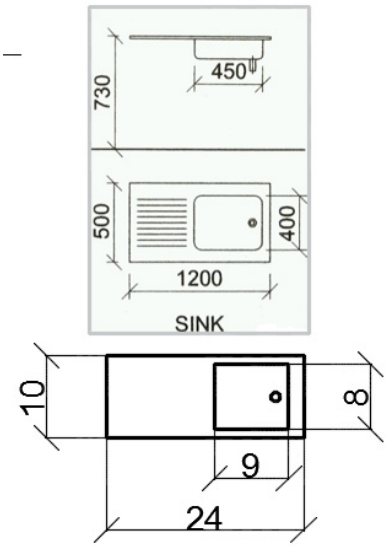
The window frame indicated by two lines must be in the middle of the wall.
The window sill must overhang the wall.
No other lines may be drawn within the window.

- Doors must be drawn on the doorframe given, the swing of the door must be drawn with instruments, the door can be a single line.



- The detail of the sliding door is shown in the drawing below.

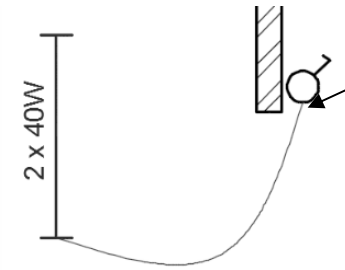




- SANS 1-10143 and relevant sections of the NBR must be given to learners to study. Information can be requested from the subject advisor.
- SANS symbols must be drawn to scale using the information in the question.
- The SANS symbols must be absolutely correct for marks to be allocated. Pay specific attention to the position of the outlet. If there are extra lines on the symbol NO marks will be allocated.

NOTE WHERE THE WIRING ATTACHES TO THE SWITCH

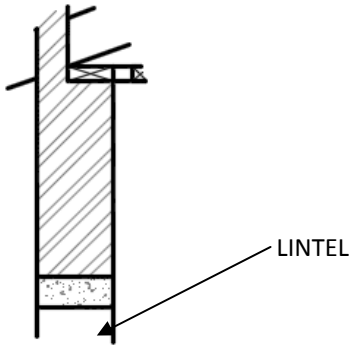
- Electrical symbols may be drawn in neat freehand. Do not draw the symbols to touch the walls.



The fluorescent light should be indicated as above, to obtain the full marks.

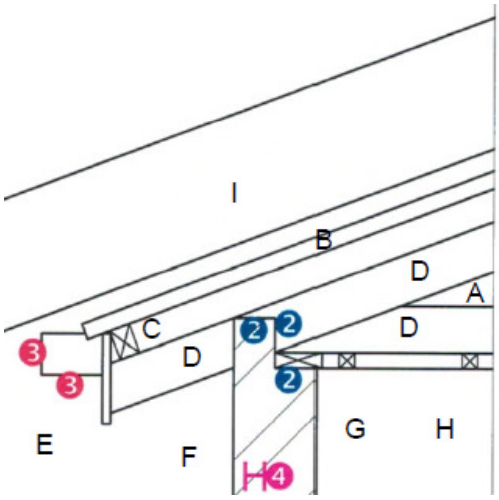
- Learners must practice using scale. Elevations will be the same scale as the floor plan, usually in examinations it is 1 : 50. Elevations must be aligned to the floor plan using projection lines for the position of the walls and the roof line. Use the heights given in the information sheet to the correct scale.

- The section view will be done to a scale of 1 : 20. The detail at the lintel top need not be drawn, a straight line is sufficient.



The roof detail should be done as per the drawing below. Pay attention to the position of the parts of the roof.

- The roof overhang is measured from the outside of the wall to the end of the rafter.



1. MARK ALLOCATION FOR SECTION OF ROOF	
A. ROOF ANGLE	1
B. ROOF SHEET	1
C. PURLIN	1
D. TRUSS	2
E. FASCIA BOARD	1
F. WALL PLATE	1
G. BRANDERING + SPACING	1
H. CEILING BOARD	1
I. BARGE BOARD	2
TOTAL	11

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

- First angle principles must be used in this question when looking at the required view.
- The sectional view must be drawn in the direction of the arrows and the correct scale must be used.
- Learners often don't know how to interpret a cutting plane.
- Attention must be given to correct sizes and placement of all components especially on a scale of 1 : 20.
- There are penalties for not adhering to this.
- Electrical symbols may be drawn in neat freehand.
- Substructure hatching may done in neat freehand.
- Labelling of rooms and finished is not done neatly, text must be either horizontal or vertical in capital letters only. Labelling of views also must be neat.
- Pay attention to the neat connection of electrical symbols to wiring

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

- Teachers must emphasise that the various parts i.e. fixtures and all roof detail must be according to the scale given.
- Many of the components were out of proportion.
- Teachers must make use of old examination papers to guide the learners in how to answer the assembly question.
- Teachers must make sure that the learners understand the rules of sectioning and do relevant exercises to improve their understanding
- Subject advisors must supply the SANS and relevant sections of the NBR to teachers, teachers must teach these symbols and study them in depth.
- Accurate use of the symbols is required

PLEASE NOTE:
Most of the mistakes made by the candidates mentioned above were also made in previous years. It appears as if this report is not read by the teachers or conveyed to the learners. Teachers and subject advisors must please scrutinise this report thoroughly and make sure that it is implemented.