THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

STUDENTS' ITEMS RESPONSE ANALYSIS REPORT ON THE FORM TWO NATIONAL ASSESSMENT (FTNA) 2023

ARCHITECTURAL DRAUGHTING

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

STUDENTS' ITEMS RESPONSE ANALYSIS REPORT ON THE FORM TWO NATIONAL ASSESSMENT (FTNA) 2023

072 ARCHITECTURAL DRAUGHTING

Published by
National Examinations Council of Tanzania,
P.O. Box 2624,
Dar es Salaam, Tanzania.

TABLE OF CONTENTS

FOREWORD

This report presents the Students' Items Response Analysis (SIRA) on Form Two National Assessment in the Architectural Draughting subject conducted in November 2023. This report aims at providing feedback to all education stakeholders on the factors that contributed to students' performance in Architectural Draughting.

The Form Two National Assessment (FTNA) is a formative evaluation that intends to monitor students' learning and to provide feedback that teachers, students and other education stakeholders can use to improve teaching and learning processes. This analysis justifies the students' performance in the Architectural Draughting subject. It reveals that students had good performance in the topics of *Instruments Equipment and Materials; Lettering; Layout of the Drawing or Paper Formatting; Geometrical Figures; Auxiliary View* and *Perspective Drawing*. However, in the topic *Architectural Draughting and Occupation Information* and *Orthographic Projection*, the performance is average. The factors that may have affected the students' responses include inadequate knowledge on particular concepts, failure to interpret the requirements of questions, poor command of English Language and lack of basic practical in technical drawing techniques.

This report will help to identify students' strengths and weaknesses to improve learning before sitting for their Certificate of Secondary Education Examination (CSEE). It will help teachers to identify the challenging areas and take appropriate measures during the learning and teaching processes.

The National Examinations Council of Tanzania (NECTA) expects that the feedback provided in this report will enable the education stakeholders to take proper measures to improve the learning and teaching of the Architectural Draughting subject. Consequently, students will acquire knowledge, skills and competence indicated in the syllabus for better performance in future assessments and examinations.

The Council appreciates the contribution of all those who participated to preparing this report.

Dr. Said A. Mohamed
EXECUTIVE SECRETARY

1.0 INTRODUCTION

This report provides a detailed analysis of student's performance on Form Two National Assessment (FTNA) 2023 in the Architectural Draughting subject. The assessment adequately met the requirements of the Civil Engineering Syllabus for Technical Secondary School Education issued in 2019. In addition, the assessment was set according to the Format issued by NECTA in 2021.

The paper had seven (7) questions distributed in three sections namely A, B, and C. Section A comprised of two (2) objective questions: multiple-choice items and matching items. This section carried a total of 15 marks. Section B consisted of three short answer questions with a total of 45 marks. Section C had two (2) structured questions each weighing 20 marks. All questions in all sections were compulsory.

A total of 526 students sat for this paper in 2023 assessment. The number of students who sat for this paper in the previous year 2022 was 490, this indicates an increase of students by 6.84% in 2023. Generally, the performance of students was average as only 58.56% of the students who sat for the assessment passed, whereas 41.44% failed. The distribution of the scores and students' performance is shown in Table 1.

Table 1: Students' Performance in Architectural Draughting Subject

Range	Remarks	General Students' Performance	
		Number	Percentage (%)
0 – 29	Weak	218	41.44
30 - 64	Average	270	51.34
65 – 100	Good	38	7.22
Total		**526**	**100**

This report analyses students' responses and their abidance by the requirements of questions. In this analysis, a brief note is provided on what the students were required to do and the reasons for their performance. Samples of students' correct and incorrect responses are also inserted in the form of extracts to illustrate the cases presented. Histograms, pie charts and tables are also used to summarize the students' performance in a particular question. The analysis categorizes the performance of the students into three groups namely good, average and weak, manifested by score ranges: 65–100, 30–64 and 0–29, respectively. Green, yellow and red colours are used to represent the three categories of performance. Finally, the report gives the conclusion and recommendations for improvement.

2.0 THE ANALYSIS OF THE STUDENTS' RESPONSES IN EACH QUESTION

2.1 SECTION A: OBJECTIVE QUESTIONS

This section consisted of two questions that covered concepts from different topics. Question 1 consisted of 10 multiple-choice items, each carrying 1 mark, making a total of 10 marks. Question 2 consisted of 5 matching items, each carrying 1 mark, making a total of 5 marks. The score ranges used for grading the student's performance in this section have been shown in each question.

2.1.1 Question 1: Multiple Choice Items

This question had ten (10) multiple-choice items from (i) to (x). It required students to choose the correct answer from the four (4) alternatives (A – D) and write its letter in the box provided. The items were constructed from eight (8) topics namely *Instruments, Equipment and Materials; Lettering; Layout of the Drawing or Paper to Formatting; Geometrical Figures; Scales; Orthographic projection; Auxiliary Views* and *Perspective Drawing.*

A total of 526 students attempted the question, where 30 (5.70%) students scored from 0 to 2 marks, 378 (71.87%) students scored from 3 to 6 marks and 118 (22.43%) students scored from 7 to 10 marks. Figure 1 summarizes the students' performance in this question.

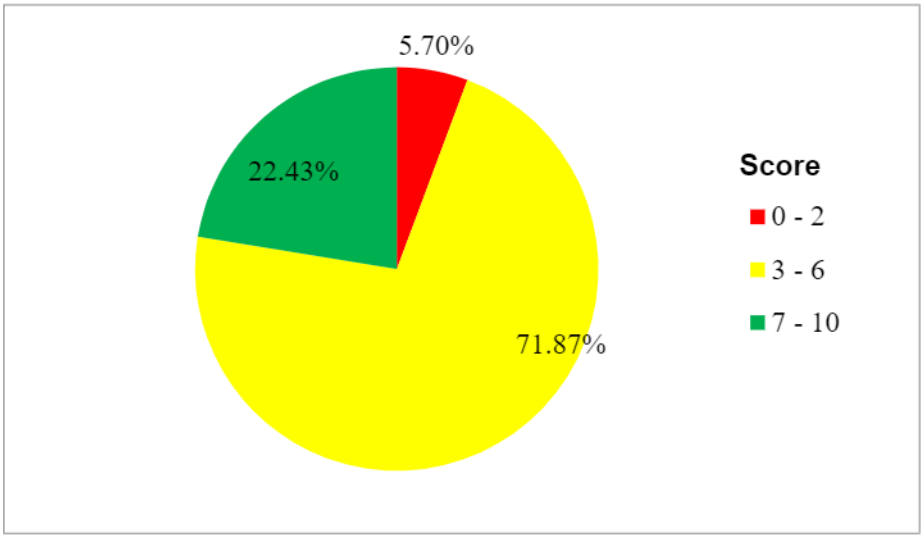


Figure 1: The Students' Performance in Question 1

Figure 1 shows that the student's performance in this question was good since the majority of the students scored average marks and above. This means that most students managed to choose the correct answers in many items. However, 30 (5.70%) students performed poorly in the question because of insufficient knowledge and skills related to the requirements of the question.

Students who performed well in the question demonstrated a good ability to apply knowledge of various topics in identifying the correct answers among the given alternatives. However, most of the students failed in items (v) on the topic of *Auxiliary Views* and (vi) on the topic of *Orthographic Projection*. The analysis of the students' responses shows that most of the students correctly chose items (i) from the topic of Layout *of the Drawing or Paper to Formatting* and (ii), (ix) from the topic of *Instruments, Equipment and Materials.* The rest of the items were performed on average. The strengths and weaknesses of the students in choosing correct answers for individual items in the question are analysed as follows:

Item (i) was constructed from the topic of Layout *of the Drawing or Paper Formatting.* The question requires the students to identify the reason of keeping more space in the left side of a paper when drawing the boarder lines in a drawing sheet. The question stated:

Why is it required to keep more space in the left side of a paper when drawing the borderlines in a drawing sheet?

A *For filing or binding of a paper*
B *For fixing papers on the board*
C *For numbering of papers*
D *For folding of papers*

Alternative A, '*For filing or binding of a paper'* was the correct response. Students who chose this item knew the layout of the drawing sheets. These students were aware that leaving extra space on the left side of the drawing sheet ensures that the binding or holes do not obscure the content, especially text or important information. Students who chose distractors B, C and D lacked knowledge and practical skills in the layout of drawing papers, specifically on binding or filling of drawing papers. The students who opted for alternative B, '*For fixing papers on the board'* may have misunderstood the contents of the drawing sheet layout, as fixing papers on a board is not included in such layouts. Other students who opted for distractors C, '*For numbering of papers'* and D '*For folding of papers'* at random were not aware the sheet number is recorded below the drawing sheet in the designated space and the folding marks are laid according to the size of drawing sheets respectively.

Item (ii) was set from the topic of *Instruments, Equipment and Materials.* It tested students' ability to identify the reasons for sharpening the lead of a pencil to a chisel point. The question stated:

What is the purpose of sharpening the lead of a pencil to chisel point?

A *To draw long thin lines with uniform thickness*
B *To draw long thin lines with non-uniform thickness*
C *For sketching works and lettering*
D *For drawing thick lines with non-uniform thickness*

Alternative A, '*To draw long thin lines with uniform thickness'* was the most correct response. Students who chose this response were aware when a pencil lead is sharpened to a chisel point it allows the artist or user to create consistent and uniform lines, especially when drawing long thin lines. This is because the flat edge of the chisel point provides stability and control resulting in lines that maintain a consistent thickness

throughout their length. Options B, C, and D are not typically associated with sharpening a pencil lead to a chisel point. Option B, '*To draw long thin lines with non-uniform thicknesses* is not a typical outcome of using a chisel point. Option C, '*For sketching works and lettering'* is a more general statement and does not specifically address the purpose of a chisel point. Option D, '*For drawing thick lines with non-uniform thicknesses* is contrary to the intended outcome of sharpening to a chisel point, which is to achieve uniform thickness in lines.

Item (iii) was extracted from the topic of *Scales*. It required students to recall a type of scale to use when one is supposed to draw a floor plan of a classroom, which is 9 m long and 6 m wide in A4 drawing paper. The item was as follows:

Suppose you are required to draw a floor plan of a class room which is 9 m long and 6 m wide in A4 drawing paper, what scale will you use?

A	*Mixed scale*	*B*	*Enlarging scale*
C	*Full scale*	*D*	*Reduced scale*

The correct answer was D, '*reduced scale'*. Students who chose this response were familiar with the scale. Students who chose alternative A, *'Mixed scale'* were incorrect because in architectural drafting, a mixed scale refers to a drawing that utilizes more than one scale within the same drawing. This approach is used when certain elements of the drawing need to be depicted in detail or at a larger scale while other parts of the drawing can be shown at a smaller scale to fit the entire design onto a single sheet of paper. Students who chose response B, *'Enlarging scale'* were also incorrect because the enlarging scale is used to enlarge the size of the object to be represented on a piece of paper. Furthermore, students who opted for the response C, *'Full scale'* were also incorrect because a full scale is used to represent full sized object.

Item (iv) was set from the topic of *Perspective Drawing.* It tested students' ability to identify a type of effect that would occur when an angle of view is placed too near to the object in a perspective view. The item was as follows:

Which effect will occur when an angle of view is placed too near to the object in a perspective view?

A *large projection view will be formed*
B *projection view will be inverted*
C *projection view cannot be formed*
D *distortion of projection view will occur*

The correct response was *D, 'distortion of projection view will occur'*. Perspective drawing is a technique that creates a linear illusion of depth because as objects get further away from the viewer, they appear to decrease in size at a constant rate. Students who chose this response possessed the knowledge on perspective drawing and they were aware that there would be distortion of the projection view when viewed closer to the object. Alternative A, '*large projection view will be formed'* is not a correct response because a larger projection is formed when the angle of projection is far away from the object. Alternative B, '*projection view will be inverted'* is not a correct response because inverted perspective view is formed when the object depicted in a scene are placed between the projective point and the viewing plane. Alternative C, '*projection view cannot be formed*', is not a correct response because projection view is formed when the projection angle is close but the view must be distorted. Generally, students who chose distractors either A, B or C lacked knowledge and skills on the effect observed when the angle of view is closer or near to the object.

Item (v) was extracted from the topic of *Auxiliary Views.* Students were required to identify a drawing technique, which would show a true sectional view of a sloped surface of an object. The question stated:

Which drawing technique shows a true sectional view of a sloped surface of an object?

A *Orthographic* *B* *Auxiliary*
C *Pictorial* *D* *Perspective*

The correct answer was B, *'Auxiliary'*. Students who chose this response had knowledge of auxiliary views. They were awere that when dealing with sloped surfaces, especially those that are not parallel to any of the primary planes, an auxiliary view is necessary to represent accurately the sectional view of the surface. Another options A, C and D were not

correct. Alternative A, '*Orthographic projections'* was not correct because it shows the object from multiple views along the principal planes, and they may not accurately represent the true shape of a sloped surface.

Alternative C *'Pictorial views'* and D, '*Perspective views'* are types of drawings that provide a more realistic representation of objects but do not necessarily focus on showing true sectional views of specific features, especially sloped surfaces, as accurately as auxiliary views do.

Item (vi) was extracted from the topic of *Orthographic Projection.* In this item, students were required to use knowledge of Orthographic Projection to identify what do hidden lines denote or represent in orthographic projection. The question stated:

What do hidden lines in orthographic projection denote?

A	*Holes and slots*	*B*	*Change of plane*
C	*Position of cut*	*D*	*Centre of a circle or cylinder*

The most correct alternative was A*, 'Holes and slots'.* The hidden lines represent holes and slots in the orthographic projection. The students who chose this option were familiar with the various types of lines and their functions in orthographic projection. Other alternatives were not correct. Students who chose alternative B, *'Change of plane',* were not aware that change of plane uses full lines. They can also be used to indicate parts or components situated in front of the cutting plane to give reference to the part shown.

Alternative C, '*Position of cut',* was an incorrect response. These lines are used to show the cut. The last alternative D, *'Centre of a circle or cylinder',* was an incorrect response because these lines are used to indicate the center of a circle or a cylinder.

Item (vii) was set from the topic of *Lettering.* Students were required to use their knowledge of lettering to recall and identify factors affecting legibility, as the first principle to be observed when lettering, dimensioning and writing notes on a drawing. The question was as follows:

Legibility is the first principle to be observed when lettering, dimensioning and writing notes on a drawing. Which factors will affect this principle?

A *Spacing and arrangement of letters*
B *Number and arrangement of letters*
C *Spacing and number of letters*
D *Arrangement and suitability of letters*

The correct answer was option A, '*Spacing and arrangement of letters'*. The alternative was chosen by students who know legibility in drawing, especially when it comes to lettering, dimensioning, and writing notes, primarily depends on how the letters are spaced and arranged. Proper spacing ensures that each letter is distinct and easily readable. Additionally, arranging the letters appropriately on the drawing ensures clarity and readability.

Alternative B, *'Number and arrangement of letters'* may also affect legibility to some extent, but the primary concern is how the letters are spaced and arranged, rather than the number of letters. Alternative C, *'Spacing and number of letters'* is partially correct in recognizing the importance of spacing but does not address the arrangement of letters, which is equally crucial for legibility. Alternative D, *'arrangement and suitability of letters*, touches on the arrangement aspect, but it's not as comprehensive as option A, which explicitly mentions both spacing and arrangement. Additionally, suitability of letters is more about choosing appropriate fonts or styles rather than directly affecting legibility.

Item (viii) was set from the topic of *Scales.* Students were required to convert the given scale of building's foundational detailed drawing to the representative fraction. The question was:

Suppose the scale of drawing a detail of a foundation of a building is 1:20, what is the representative fraction?

A *20* *B* *0.02*

C *0.5* *D* $\frac{1}{20}$

The correct alternative was D, '$\frac{1}{20}$'. Students who were able to answer this item correctly managed to recall that to find the representative fraction (RF) of a scale, you need to express it as a ratio where the first number represents one unit on the drawing and the second number represents the equivalent unit in real life. In this case, the scale is 1:20, which means that 1 unit on the drawing represents 20 units in real life. Students who opted for options A, '*20*', B, '*0.02*' and C, *'0.5'* failed to differentiate the alternatives.

Item (ix) was set from the topic of *Layout of the Drawing or Paper to Formatting.* In this item, students were required to identify the next size of drawing paper after the 210 mm × 297 mm size. The item stated:

What is the next size of drawing paper after the 210 mm × 297 mm size?

A	*148 mm × 210 mm*	*B*	*297 mm × 420 mm*
C	*420 mm × 594 mm*	*D*	*105 mm × 148 mm*

The correct responses were A, '*148 mm × 210 mm*' and B, '*297 mm × 420 mm*' respectively. The next size of drawing paper after the 210 mm × 297 mm (A4) size is 148 mm × 210 mm (A5) in ascending order and 297 mm × 420 mm (A3) in descending order. Students who were able to choose the correct alternatives were conversant with A sizes drawing paper. These students were aware that sizes are designed to maintain a consistent aspect ratio (1:√2) as you move from one size to the next. A0 is the largest size, and each subsequent size is half the area of the previous size. Alternatives C, '*420 mm × 594 mm'* was not correct because this is A2 series. Alternative D, '*105 mm × 148 mm'* was also not correct because this is A6 size of paper and is not used as a drawing sheet.

Item (x) was constructed from the topic of *Geometrical Figures and Blending Lines.* Students were required to identify the angle among the given alternatives that would be used when producing the plan of an irregular hexagon. The question asked:

Which angle among the following will you use when producing the plan of an irregular hexagon?

A	*90º*	*B*	*70º*
C	*30º*	*D*	*15º*

The correct alternative among the given distractors was B, '*70º*'. Students who got this item correctly were aware this angle is used to produce plan of an irregular hexagon particularly for specific angles or measurements within the hexagon. Students who opted for A,90^0 C,30^0 and D,15^0 provided incorrect answers as these angles do not offer the versatility required for accommodating irregular shapes or specific design requirements.

2.1.2 Question 2: Matching Items

This question was derived from the topic of *Instrument, Equipment and Materials*. Students were required to match the uses of the drawing instruments given in List A with their corresponding drawing instruments in List B by writing letters of the correct responses in the table provided. The question stated as follows:

*Match the descriptions of uses of the drawing instruments given in **List A** with their corresponding drawing instruments in **List B** by writing a letter of the corresponding response below the item number in the table provided.*

List A	List B
(i) A drawing instrument used to draw angles from 0º-90º	*A T-square*
(ii) A drawing instrument used to transfer similar dimensions	*B Set- squires*
(iii) A drawing instrument used to draw circles and arcs	*C Adjustable square*
(iv) A drawing instrument used together with T-squire to draw the vertical and inclined lines	*D Protractor*
(v) A drawing instrument used to draw curves	*E Compass*
	F French curve
	G Divider
	H Scale

Statistics show that 526 students attempted this question. Out of those students, 30 (5.70%) scored from 0 to 1 mark. Students who scored from 2 to 3 marks were 243 (46.20%). Moreover, 253 (48.10%) students scored from 4 to 5 marks. Generally, the students' performance on this question was good since 496 (94.30%) scored above average. Figure 2 summarizes the students' performance in this question.

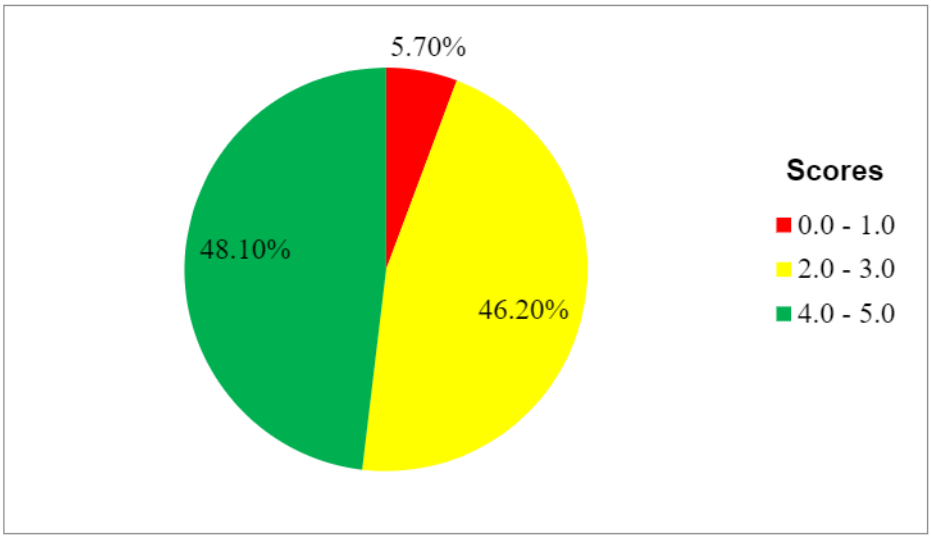


Figure 2: The Students' Performance in Question 2

The analysis of the students' performance in each item is as follows:

In item (i), students were required to match '*A drawing instrument used to draw angles from 0º-90º'*. The correct response was D, '*Protractor*'. Fewer students were able to match this item correctly. However, some students matched it with C, '*Adjustable set square.'* Such students failed to recall that adjustable is a versatile tool that can measure various angles, including right angles 90 degrees. Typically, does not measure angles from 0 to 90 degrees as precisely as a protractor does. The primary function of an adjustable square is to measure and mark right angles accurately.

In item (ii), students were required to write the correct response that matched '*A drawing instrument used to transfer similar dimension'*. The correct response was G, '*Divider'*. The majority of the students were able to match this item correctly. The students' performance in this item was good. However, some students matched it with F, '*Compass*. Such students failed to recall that a compass is used to draw circles and arc.

In item (iii), students were required to identify the correct response that matches '*A drawing instrument used to draw circles and arc'.* The correct response was E, *'Compass'*. This item was chosen by most of the students. The students were able to understand and identify the tool and its uses.

In item (iv), students were required to identify the response which matches correctly with '*A drawing instrument used together with T-squire to draw the vertical and inclined line'.* The correct response was B, *'Set Square'.* The majority chose this alternative implying that the students mastered the knowledge on the topic of *Instrument, Equipment and Materials.*

In item (v), students were required to write the correct match of the phrase '*A drawing instrument used to draw curve'*. The correct response was F, '*French curve*'. The majority of student who opted for this alternative were aware that french curve is a drawing instrument specifically designed to draw smooth curves and irregular shapes. It is particularly useful for drawing freehand curves that are difficult to create with other drawing instruments.

2.2 SECTION B: SHORT ANSWER QUESTIONS

This section consisted of three (3) questions constructed from the following topics: *Architectural Draughting and Occupation Information, Pictorial Drawings and Geometrical Figures.* Each question carried 15 marks, making total of 45 marks. The score intervals used for grading performance of the students for each question in this section are indicated in Table 2.

Table 2: Score Intervals for Question 3 to 6.

Score Range (Marks)	Remarks
0 – 4.0	Weak
4.5 -9.5	Average
10 - 15	Good

2.2.1 Question 3: Architectural Draughting and Occupation Information

This question had two parts: (a) and (b). Students were required to explain the reasons for an architect to study technical drawing and

explain the duties of the building team members for the successful completion of the building. This question intends to test the ability of students to recall the importance of an architect in studying technical drawing and the duties of the building team members. The question stated that:

(a) Briefly explain five reasons for an architect to study technical drawing?

(b) What are the duties of the following building team members in successfully complete the construction of the building? (i) Clerk of work, (ii) Quantity surveyor (iii) Engineers, (iv) Client and (v) Site agent.

The question was attempted by a total of 526 (100%) students, out of which 225 (42.78%) scored from 0 to 4 marks. 233 (44.29%) scored from 4.5 to 9.5 marks and 68 (12.93%) scored from 10 to 15 marks. Figure 3 summarizes the students' performance in this question.

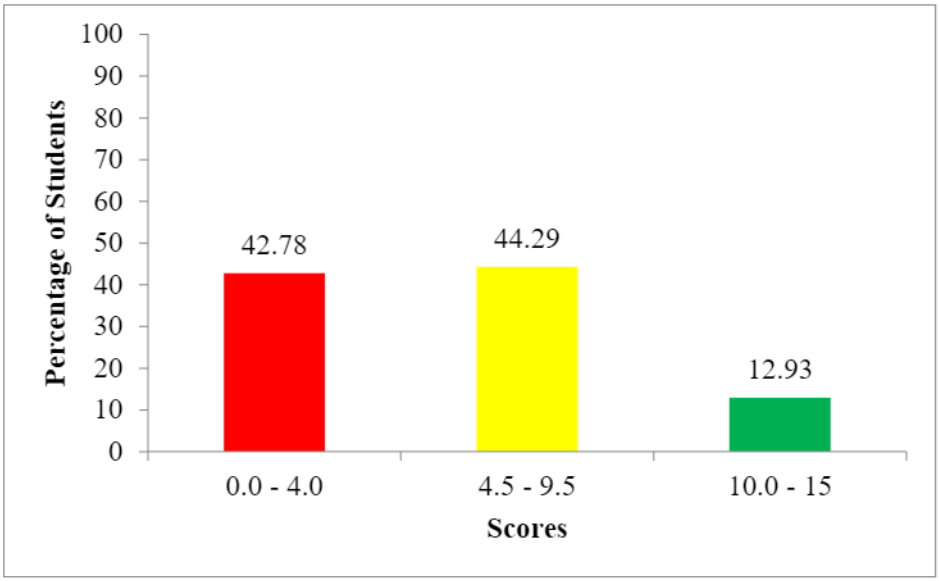


Figure 3: The Students' Performance in Question 3

Figure 3 illustrates that the general performance of students in this question was average, with 301 (57.22%) students scored 4.5 and above marks. Analysis of the students' responses shows that many were able provided correct answers for either part (a) or part (b). However, a few students applied their knowledge of architectural draughting and occupation information correctly hence scored full marks.

Majority of these students explained accurately the reasons for an architect to study technical drawing in part (a). However, in part (b), they confused the roles of the clerk of work and the site agent. A clerk of work serves as the site representative of an architect or client, responsible for checking materials, levels, setting out, testing materials, and ensuring the quality of executed works. Conversely, a site agent acts as the contractor's representative on large contract sites tasked with managing the site on a day-to-day basis. Extract 1.1 is the sample responses from a student who had correct responses.

3. (a) Briefly explain five reasons for an architect to study technical drawing.

(i) Architect study technical drawing because helps in designing of materials example houses, buildings, roads and others through drawings.

(ii) Helps in representation, architect study technical drawing helping him in representation of object or material in drawings.

(iii) Helps to acquire skills, architects acquire skills like setting out and designation of object through studying technical drawing.

(iv) Helps in gaining of knowledge, an architects gains knowledge about the drawings and how to draw when he studies technical drawing.

(v) Helps the work of architect to function better. when an architects studies technical drawing helphe perform her/his work better.

(b) What are the duties of the following building team members in successfully complete the construction of the building?

(i) The clerk of work

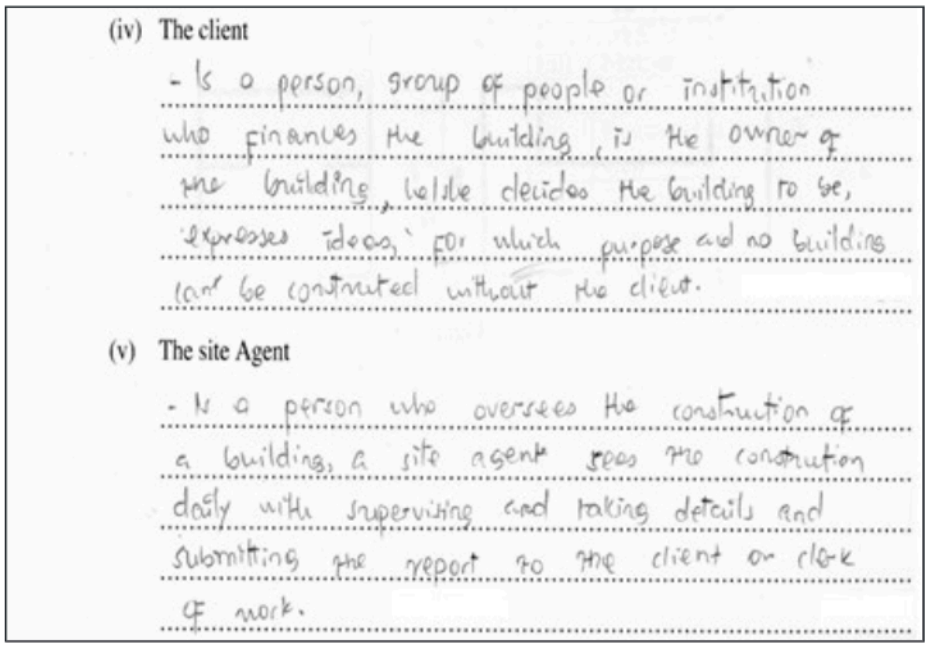
- Is a person who is employed by a client in order to represent him/her on site and ensuring that the work, labour and material are better supplied on the construction site. all things must be done according to the client needed.

(ii) The quantity surveyor

- Is a person who prepares the quantity of the material needed for the construction, the quantity surveyor prepares the bill of quantity (BOQ), is the amount approximated for the construction to complete.

(iii) An engineer

- Is a person who supervises the work of the building under construction, an engineer helps in constructing of the building including building, setting out and supervises the labour to do as work to be done.


(iv) The client

- Is a person, group of people or institution who finances the building, is the owner of the building, he/she decides the building to be, expresses ideas, for which purpose and no building can be constructed without the client.

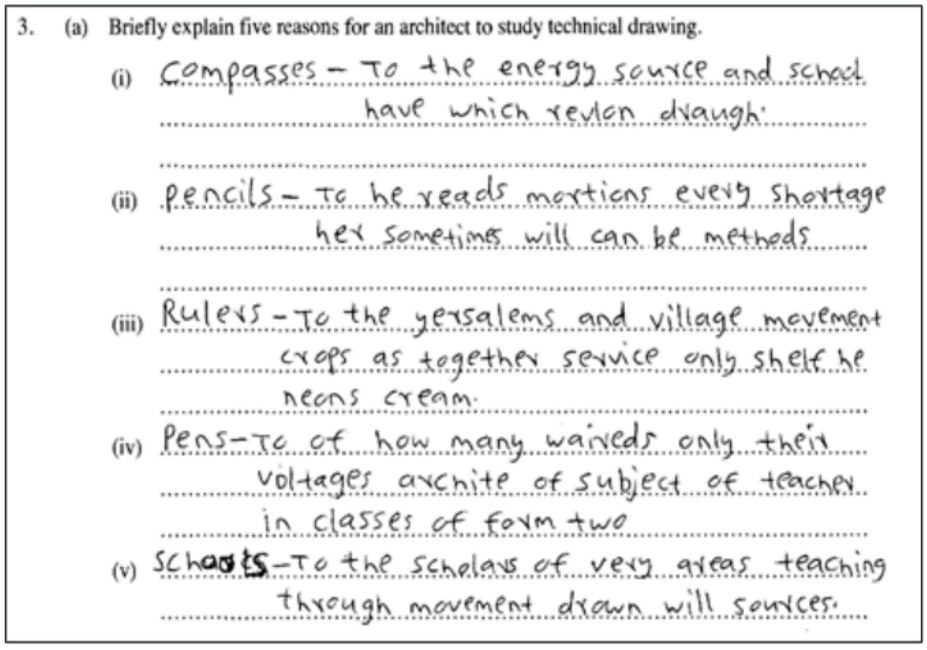
(v) The site Agent

- Is a person who oversees the construction of a building, a site agent goes the construction daily with supervising and taking details and submitting the report to the client or clerk of work.

Extract 1.1: A sample of correct responses to Question 3

Extract 1.1 is a response from a student who managed to explain the reason for an architect to study technical drawing in part (a) and outlined the duties of building team member in part (b) of the question.

Despite of the average performance by most of the students, 225(42.78%) students performed poorly. Analysis of their responses shows that the majority provided irrelevant answers in part (a) due to a lack of understanding of the importance of architects studying technical drawing. In part (b), most students were able to identify the duties of an architect but failed to identify the duties of other building team. Their responses reveal a lack of understanding and competence in the topic of architectural drafting occupation information. Extract 1.2 is the sample responses from a student who had poor performance.


3. (a) Briefly explain five reasons for an architect to study technical drawing.

(i) Compasses – To the energy source and school have which revlon dvaugh·

(ii) pencils – To he reads mextions every shortage her sometimes will can be methods

(iii) Rulers – To the yersalems and village movement crops as together service only shelf he neons cream.

(iv) Pens – To of how many waireds only their voltages arcnite of subject of teacher in classes of form two

(v) Schools – To the scholars of very areas teaching through movement drown will sources.

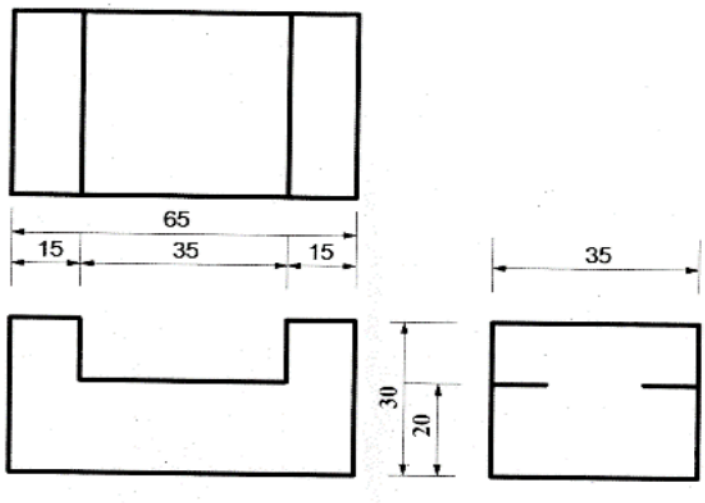
Extract 1.2: A sample of incorrect responses to Question 3

Extract 1.2 shows the incorrect response provided by a student who wrote irrelevant answers by writing types of drawing instruments in part (a) of the question.

2.2.2 Question 4: Pictorial Drawings

The question consisted of two parts (a) and (b). Students were required to: (a), differentiate between axonometric and oblique projections. (b), draw an isometric pictorial projection from the given orthographic drawing of a kitchen chair using a scale of 1:10. This question intended to test the student's ability to differentiate pictorial projections and the use of drawing technique to convert orthographic project to isometric projection. The question stated that:

(a) What is the difference between axonometric and oblique projections?
(b) Figure 1 is an orthographic drawing of a kitchen chair. By using a scale of 1:10, draw an isometric pictorial projection of the chair



A total of 526 students attempted the question. The analysis of the students' performance shows that 260 (49.43%) scored from 0 to 4 marks, 105 (19.96%) scored from 4.5 to 9.5 marks, whereas 161 (30.61%) scored from 10 to 15 marks. Figure 4 summarizes the students' performance in this question.

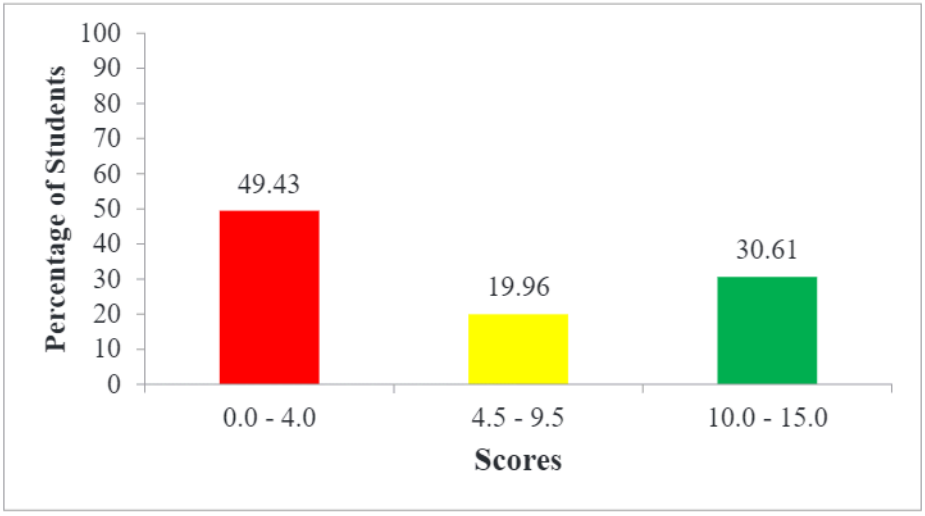
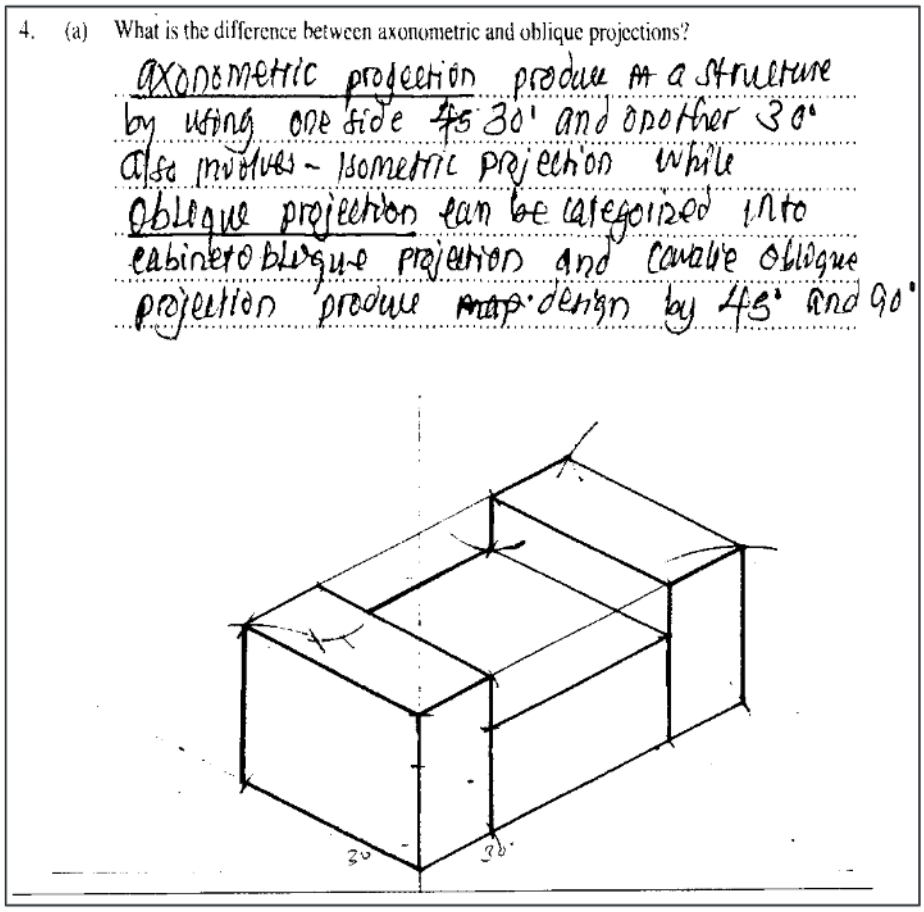


Figure 4: The Students' Performance in Question 4

Figure 4 indicates that the general performance of the students in this item was average as 266 (50.57%) students scored 4.5 and above marks. The analysis shows that the majority of these students were able to differentiate between axonometric projection and oblique projection in part (a) of the question. In part (b), students were able to demonstrate skills in drawing an isometric projection of a kitchen chair. Their

variation on marks depends on presentation of the drawing using construction, visible, dimension and extension lines; they also depend on the use of scale, dimension and neatness. Extract 2.1 illustrates a good response from one of the students who attempted the question.

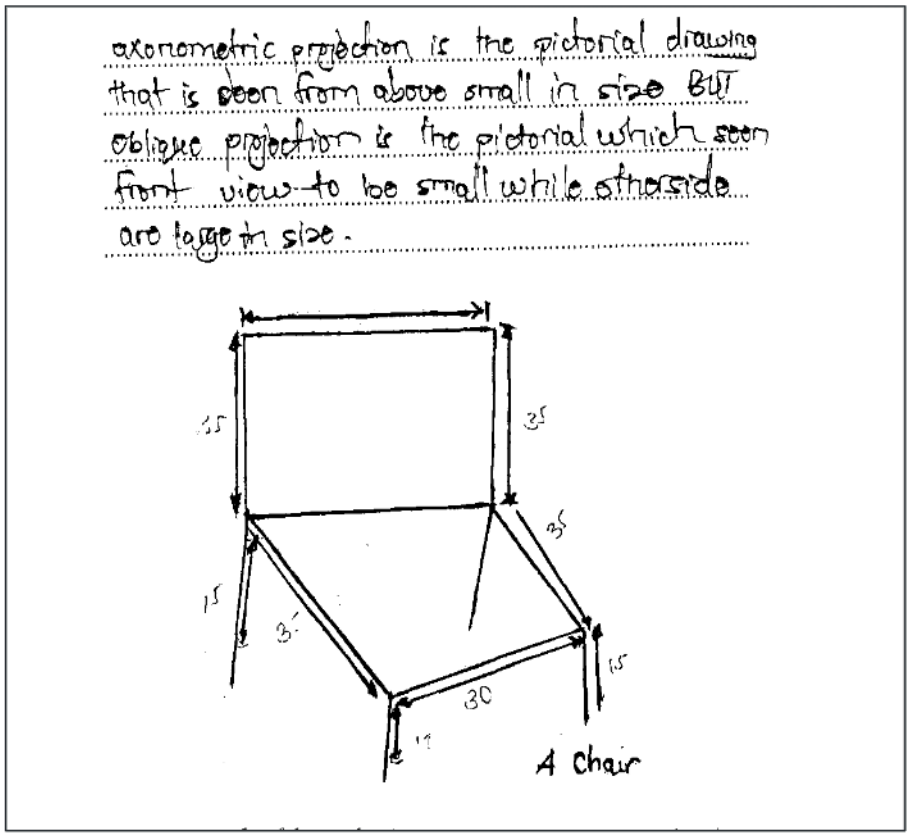


Extract 2.1: A sample of correct responses to Question 4

Extract 2.1 is a sample of responses from a student who managed to differentiate between axonometric and oblique projections in parts (a) and drew the kitchen chair in isometric projection in part (b) of the question.

Despite the average performance of students in this question, 260(49.43%) students performed poorly. The majority of these students failed to difference between axonometric and oblique projections in part (a). In part, (b) they partially or completely failed to translate the given orthographic view, thus unable to identify the front, plan and side view

of a kitchen chair. Further analysis of the students' responses reveals that those who scored 0 mark provided irrelevant answers in both parts of the question. The failure of students' in this question might be attributed to inadequate knowledge and practice in technical drawing specifically on orthographic and pictorial drawing. Extract 2.2 illustrates a poor response from one of the students who attempted the question.



Extract 2.2: A sample of incorrect responses to Question 4

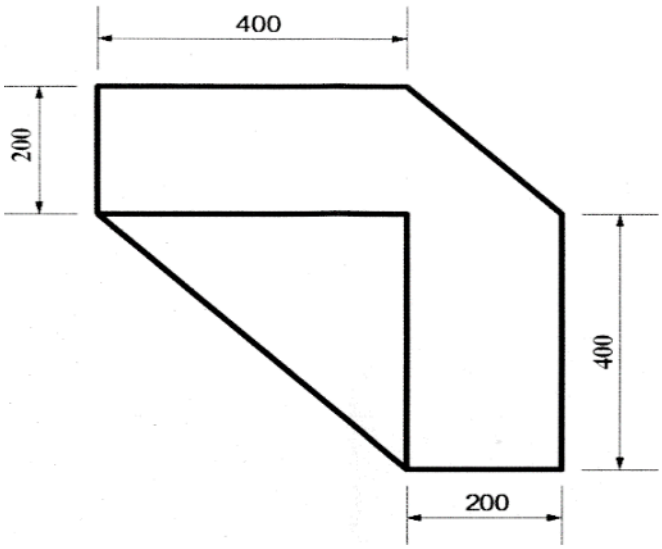
Extract 2.2 shows a sample of the responses from one of the students who wrote irrelevant answers in part (a) of the question. Contrarily, he/she failed to translate the orthographic view of a kitchen chair and hence drew a single line common chair in part (b).

2.2.3 Question 5: Geometrical Figures

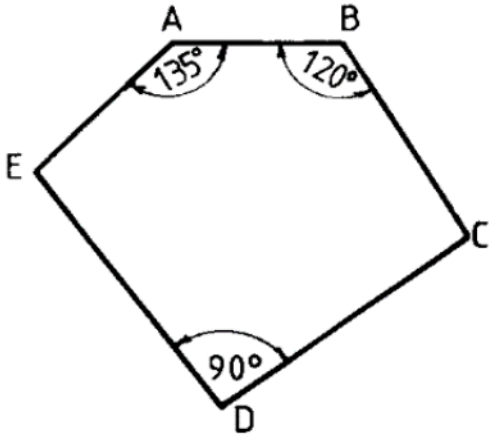
This question had two parts: (a) and (b). The students were required to use the concept of geometrical figures in reducing and enlarging the similar figure using the given ratio. This question intended to test the

student's ability to reduce or enlarge similar geometrical figures The question stated that:

(a) *The figure is a wooden bracket to support a kitchen cabinet. In order for the bracket to carry more loads, its area should be enlarged by the ratio of 4:5. Draw the given view and construct a similar figure whose area is enlarged by the given ratio*



(b) *The figure shows the plan of a pentagon ABCDE; given that AB = 55 mm, BC = 80 mm, CD = 100 mm and EA = 63 mm; draw the given view and reduce it to a similar figure having an area one third* $\left(\frac{1}{3}\right)$ *of that of the figure ABCDE.*



A total of 526 (100%) students attempted the question and, out of them, 367 (69.77%) scored from 0 to 4 marks, 133 (25.29%) scored from 4.5 to 9.5 marks and 26 (4.94%) scored from 10 to 15 marks. Figure 5 summarizes the overall performance of the students to the question.

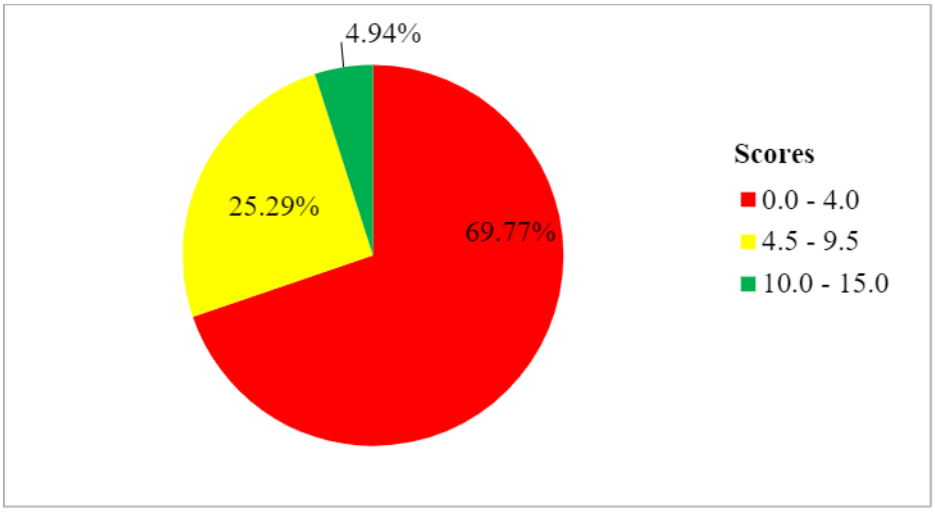
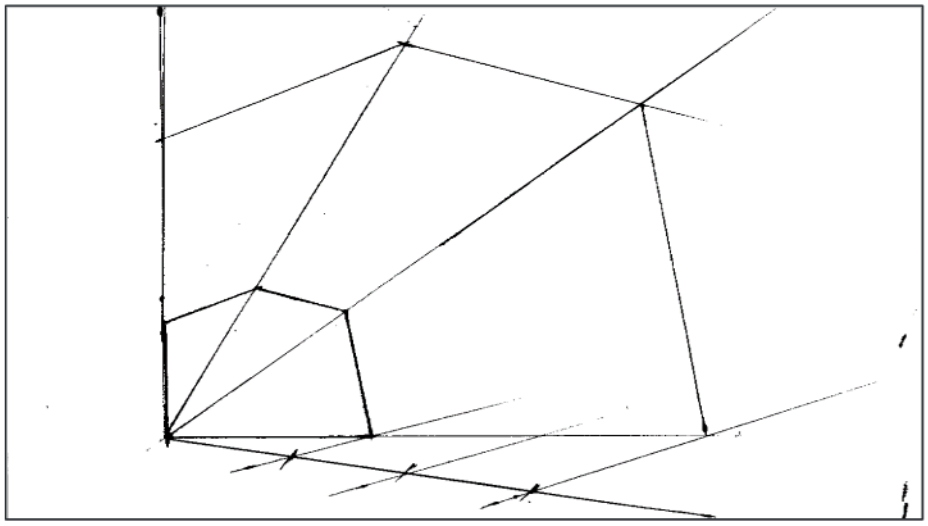


Figure 5: The Students' Performance in Question 5

Figure 5 indicates that the general performance of the students in this question was average, with 159 (30.23%) students scoring 4.5 and above marks. Among them, 133 (25.29%) student who scored average marks managed to redraw the given figure but failed to enlarged the bracket in ratio 4:5 in part (a). In part, (b) they successfully to redraw the given figure and extend one side while dividing it into three equal parts. However, their resulting figure had poor visibility and construction lines that were indistinguishable. Some students constructed poorly parallel sides resulting in a partially completed required diagram.

Nevertheless, 26 (4.94%) students scored from 10 to 15 marks. such students managed to redrawn the figure in part (a), divided the side into five equal parts, extended one side, constructed parallel sides, and correctly marked the visible line of the required enlarged figure. Similarly, in part (b), they redrawn the given figure, extended one side, divided it into three equal parts, and drew the required reduced figure. The students in this category mastered the concept of the development of similar figures. Extract 3.1 is a sample of good response from the script of one of the students who attempted this question.



Extract 3.1: A sample of correct responses in Question 5

Extract 3.1 shows a drawing from the student script who successfully drew the reduced irregular polygon in part (b) of the question. He/she followed the procedures to reduce the figure in the ratio of $\left(\frac{1}{3}\right)$.

Despite the average performance of most of the students, 367(69.39%) students performed poorly. These students failed to follow procedures and either completely or partially failed to draw the given figures and accurately enlarge or reduce them. Those who scored 0 marks provided entirely irrelevant responses to the entire question. The factors contributing to poor performance were attributed to misconceptions about the question, insufficient practical skills in drawing, failure to follow procedures, and a lack of comprehension of concepts related to the construction and enlargement of geometrical figures. Extracts 3.2 provides samples of the students' incorrect responses.

(b) Figure 3 shows the plan of a pentagon ABCDE; given that AB = 55 mm, BC = 80 mm, CD = 100 mm and EA = 63 mm; draw the given view and reduce it to a similar figure having an area one third $\left(\frac{1}{3}\right)$ of that of the figure ABCDE.

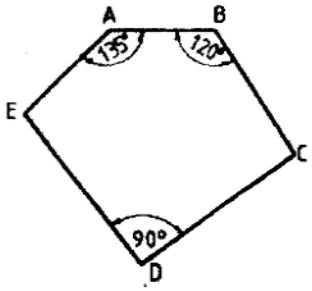
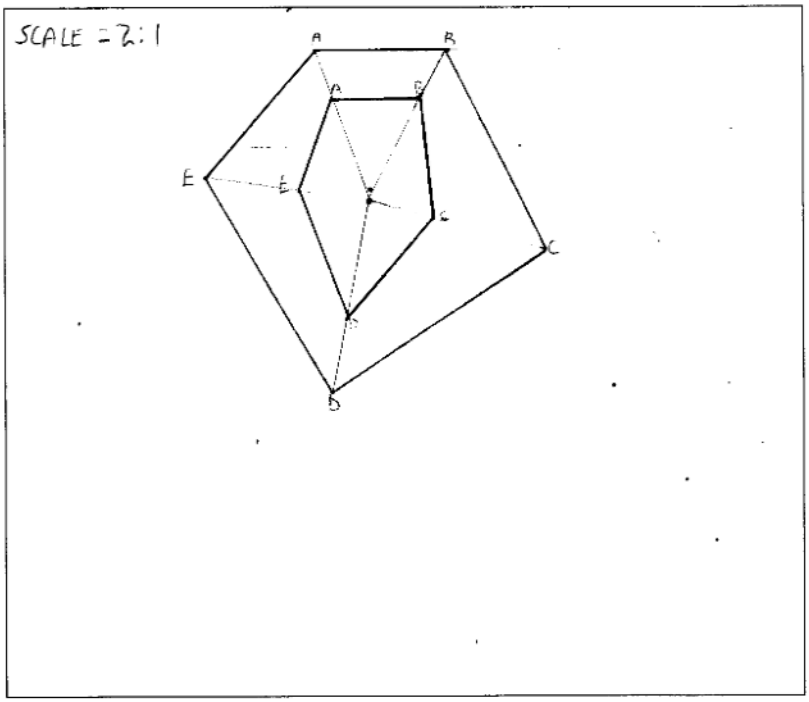


Figure 3



Extract 3.2: A sample of incorrect responses in Question 5

Extract 3.2 shows a sample of incorrect responses from a student who did not adhere to the principles of reducing similar figures. Consequently, she/he drew an irrelevant figure in part (b) of the question which was not reduced in the ratio of $\left(\frac{1}{3}\right)$.

2.3 SECTION C: STRUCTURED QUESTIONS

This section consisted of two questions, and students were required to attempt all question. Each question carried fifteen (20) marks. The score ranges used for grading the performance of candidates in this section are indicated in Table 3.

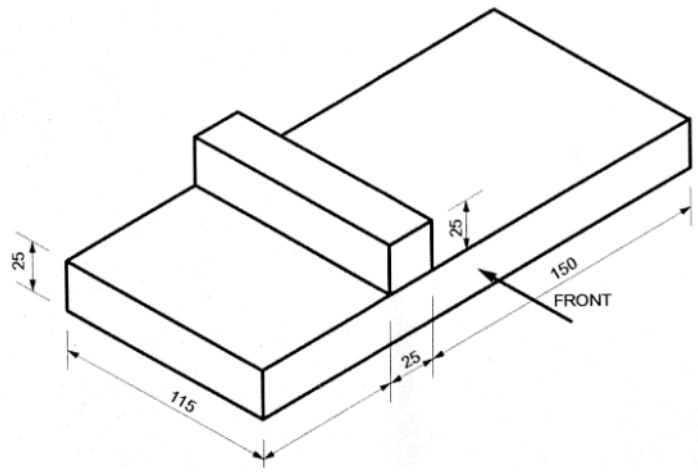
Table 3: **Score Ranges for in Question 6 and 7.**

Scores range	General Performance
0.0 – 4.0	Weak
4.5 – 9.5	Average
10.0 – 15.0	Good

2.3.1 Question 6: Orthographic Projection

This question had two parts: (a) and (b). In this question, students were required to use a scale of 1:100 to draw the front, side and plan elevations in third angle projection and its oblique projection. The question intended to assess the student's understanding and ability to apply the concepts pictorial drawing and orthographic projection. The question stated that:

The figure is a wooden brick closer gauge which will help a mason to cut a brick in a quarter or three quarter closer. By using a scale 1:100, draw;
(a) The front elevation, side elevation and plan in third angle projection.
(b) Its oblique projection.



A total of 526 (100%) students attempted the question, out of which 249 (47.34%) students scored from 0 to 5.5 marks. Students who scored from 6 to 12.5 marks were 176 (33.46%), whereas 101 (19.20%) students

scored from 13 to 20 marks. Figure 6 summarizes the overall performance of the students to the question.

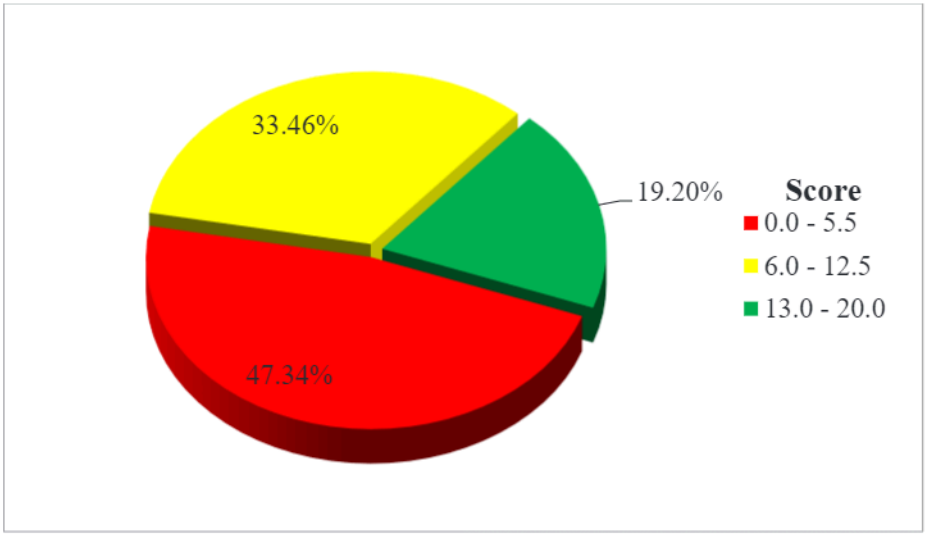
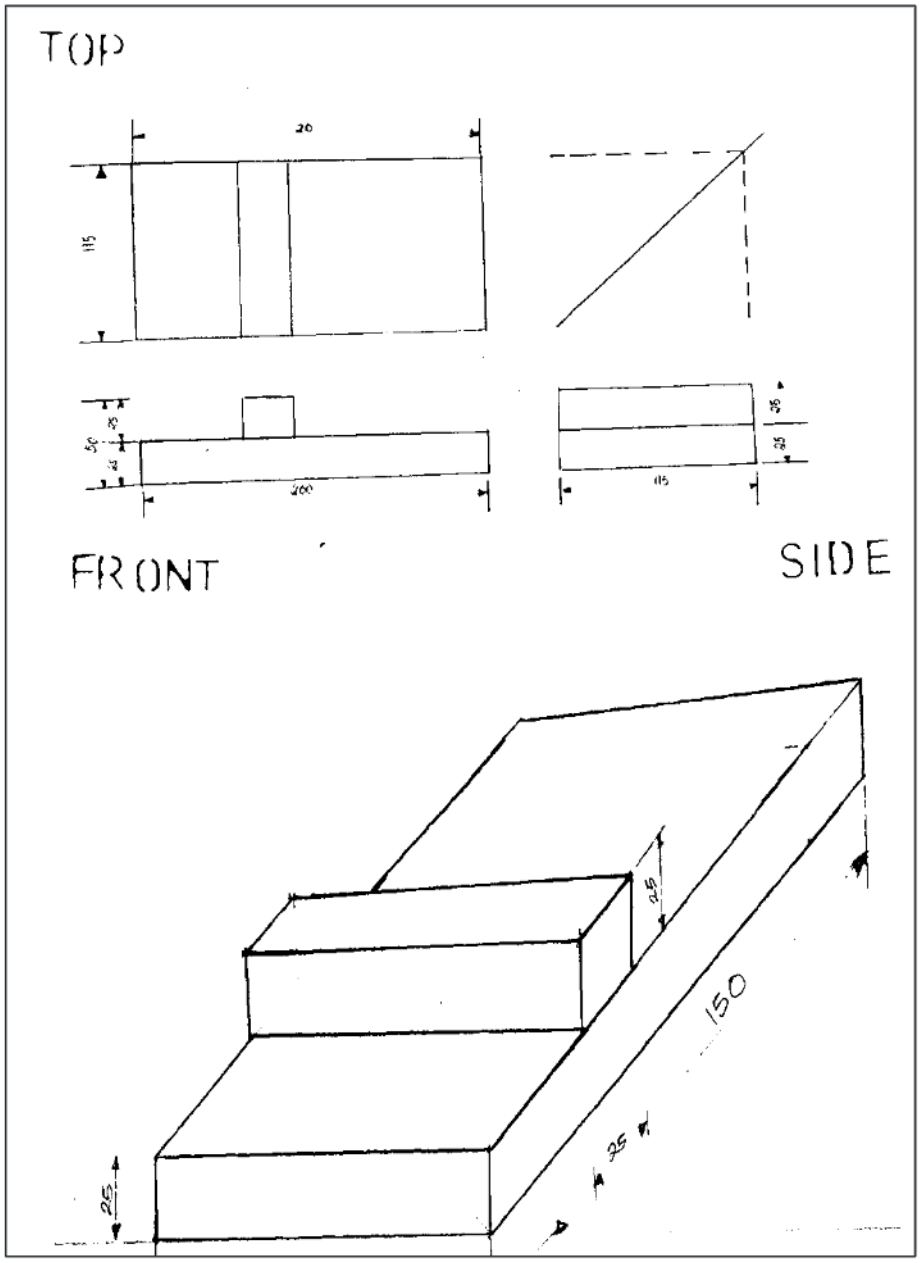


Figure 6: The Students' Performance in Question 6

Figure 6 shows that students' performance in this question was average since 277 (52.66%) students were able to score above 6 marks. Those with average scores managed to draw required drawings but omitted some procedures in the process. For instance, in part (a), students successfully drew an orthographic view of a wooden brick closer gauge but omitted the construction lines projecting in relation to the front, plan and end elevations. In part (b), students in this category were able to draw the required oblique view but failed to differentiate between the object lines and construction lines used to draw the visible edges and guide the construction of the object.

Nevertheless, 101 (19.20%) students scored from 13 to 20 marks. Such students managed to identify the three views of the wooden brick closer gauge and draw its orthographic and oblique projection. Students in this category mastered the concept of pictorial and orthographic projections well as stipulated in the syllabus. Extract 4.1 provides a sample of the students' good responses in this question.

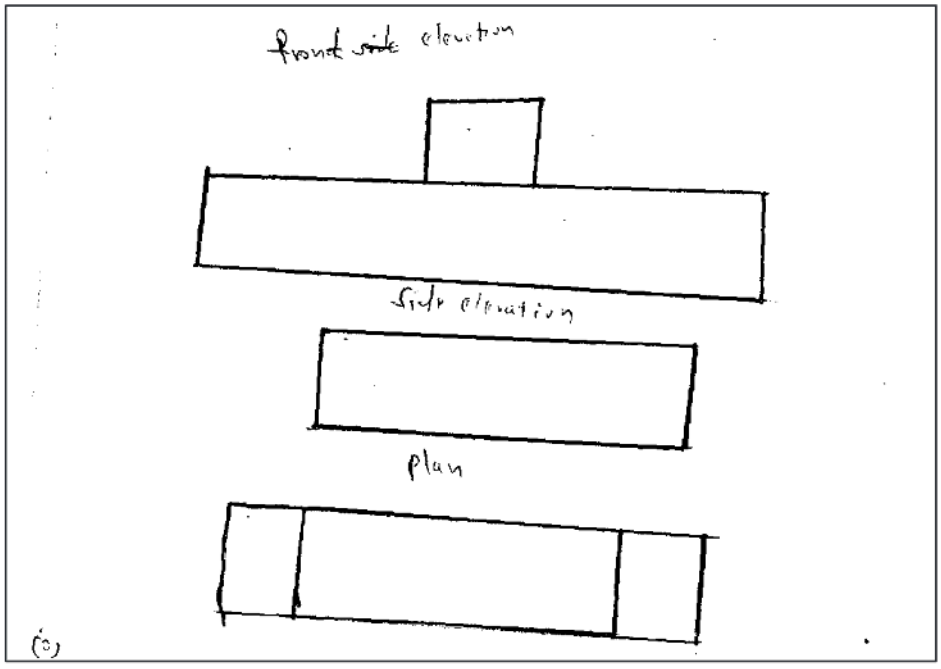


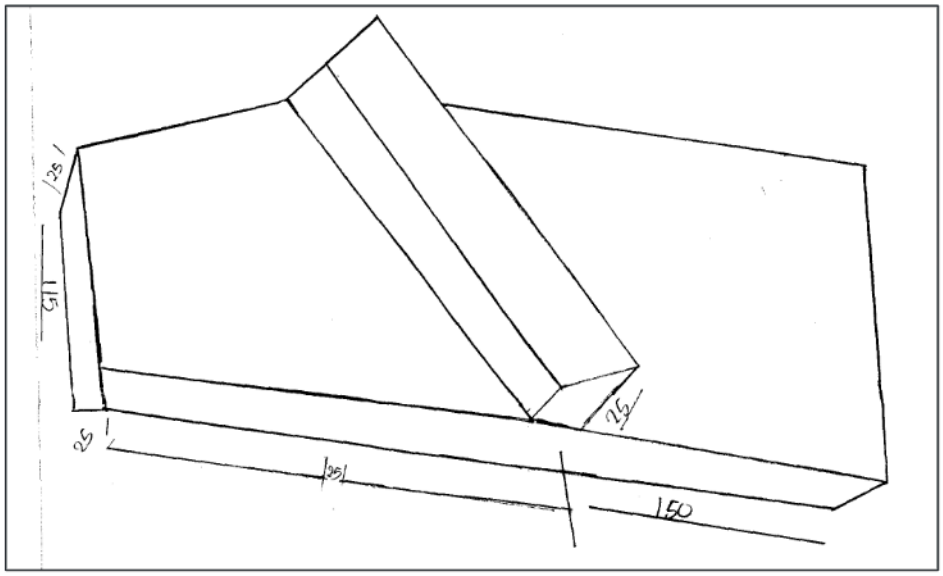
Extract 4.1: A sample of correct responses to Question 6

Extract 4.1 is a response from a student who managed to draw in part (a), the front elevation, side elevation and plan of wooden brick closer gauge in third angle projection. In part (b), its oblique projection.

Despite the average performance of the students, 249(47.34%) students performed poorly by scoring below 5.5 marks. Further analysis shows that the majority of the students who scored low marks had insufficient skills in drawing views in the orthographic and oblique projection. In part (a), students failed to demonstrate understanding on the properties of orthographic projection in case of position and number of views. Principally, in the third angle projection the object to be projected is placed in the third quadrant and is positioned behind the vertical plane and below the horizontal plane. Moreover, some students drew two views instead of three views, which were required, which causes them to score low marks.

In part (b), the students' poor performance was due their failure to recall that in the oblique projection, the front view of the object is drawn to the correct size, and its side surfaces are drawn at an angle to give a pictorial appearance. Further analysis shows that the students who scored 0 marks failed to draw the required orthographic and oblique views. The complete failure is an indicator that the students were completely unaware of the concept of the orthographic and oblique. Extract 4.2 shows a sample of incorrect responses from one of the students in this category.





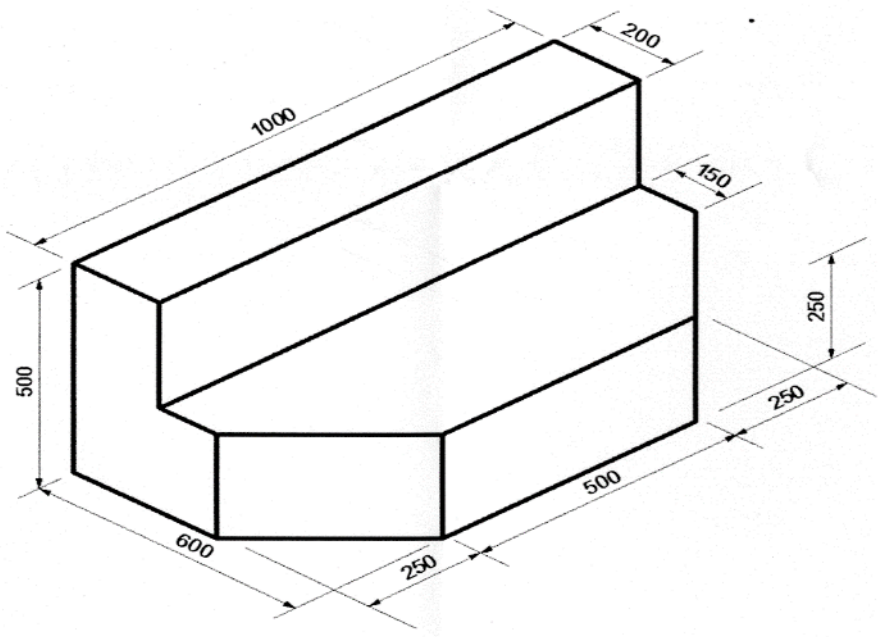
Extract 4.2: A sample of incorrect responses to Question 6

Extract 4.2 shows a sample of incorrect responses from a student who did not adhere to the principles of orthographic and oblique projection. Hence, she/he failed to draw orthographic and oblique views in accordance to the given information.

2.3.2 Question 7: Pictorial Drawing

This question had two parts; (a) and (b). In part, (a) students were required to draw front, side and plan elevations in first angle projection and in (b) students were required to draw an isometric projection of a coach. The question tested students' ability on pictorial an orthographic projection. The question stated that:

The figure is a wooden model coach to be constructed at a recreation center. By using a scale of 1:10, draw;
(a) The front elevation, side elevation and plan in first angle projection.
(b) An isometric projection of a coach.



This question was attempted by 526 (100%) students. Out of those students, 280 (53.23%) students scored from 0 to 5.5 marks. The number of students who scored from 6 to 12.5 marks was 114 (21.67%) and 132 (25.10%) scored from 13 to 20 marks. Figure 7 summarizes the students' performance in this question.

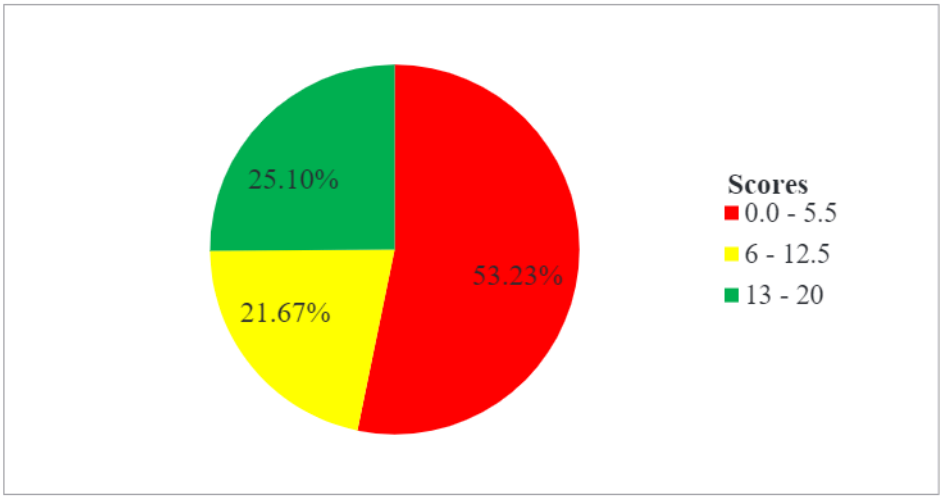
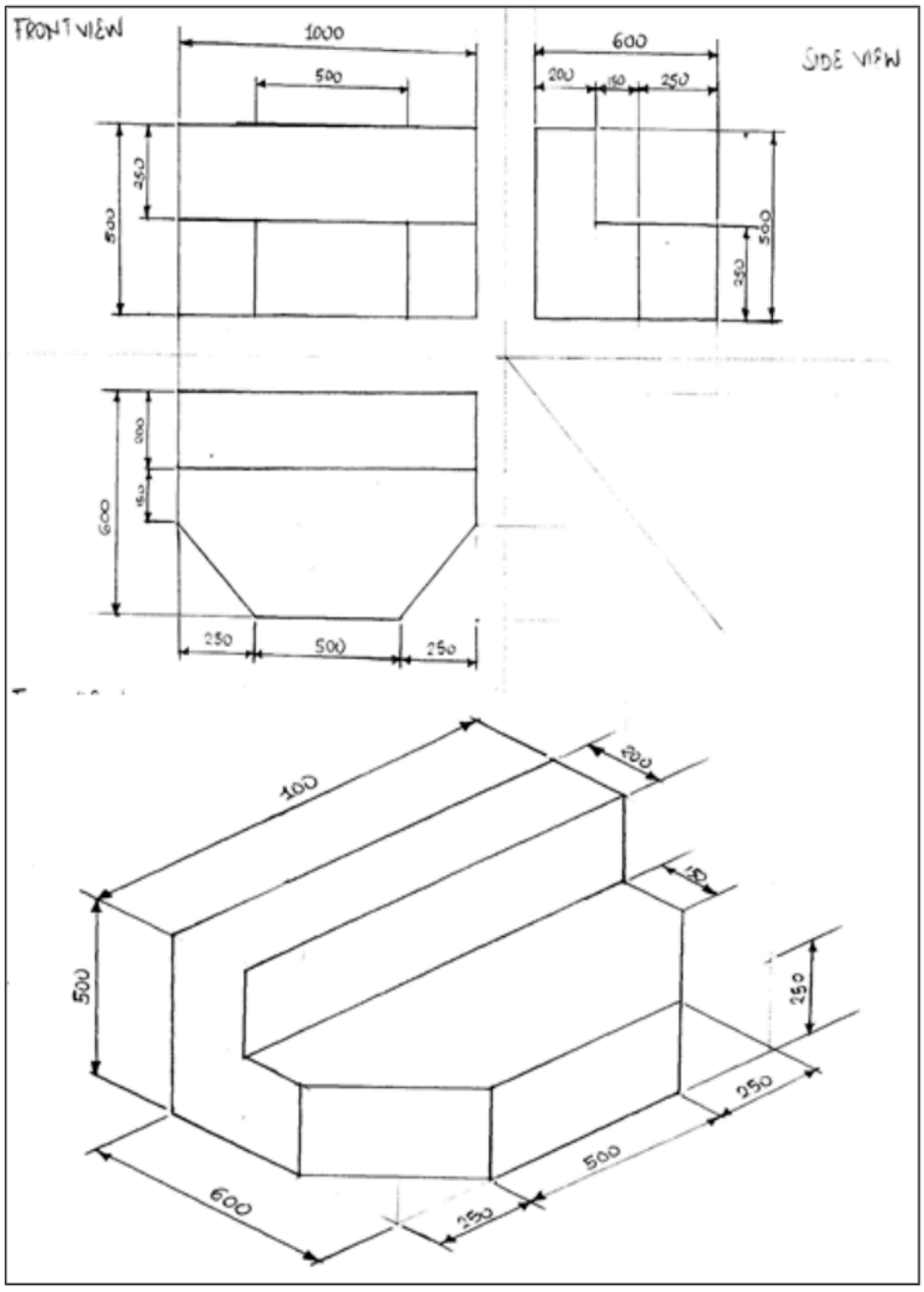


Figure 7: The Students' Performance in Question 7

Generally, the performance of the students in this question was average, because 246(46.77%) scored 6 to 20 marks, as illustrated in Figure 7. These students managed to interpret the given information and

appropriately drew the required first angle orthographic and isometric projections. The variation in their marks was caused by differences in the use of various types of lines, scale, dimensions and neatness of their drawings. Extract 5.1 shows a sample of good responses from one of the students in this category.



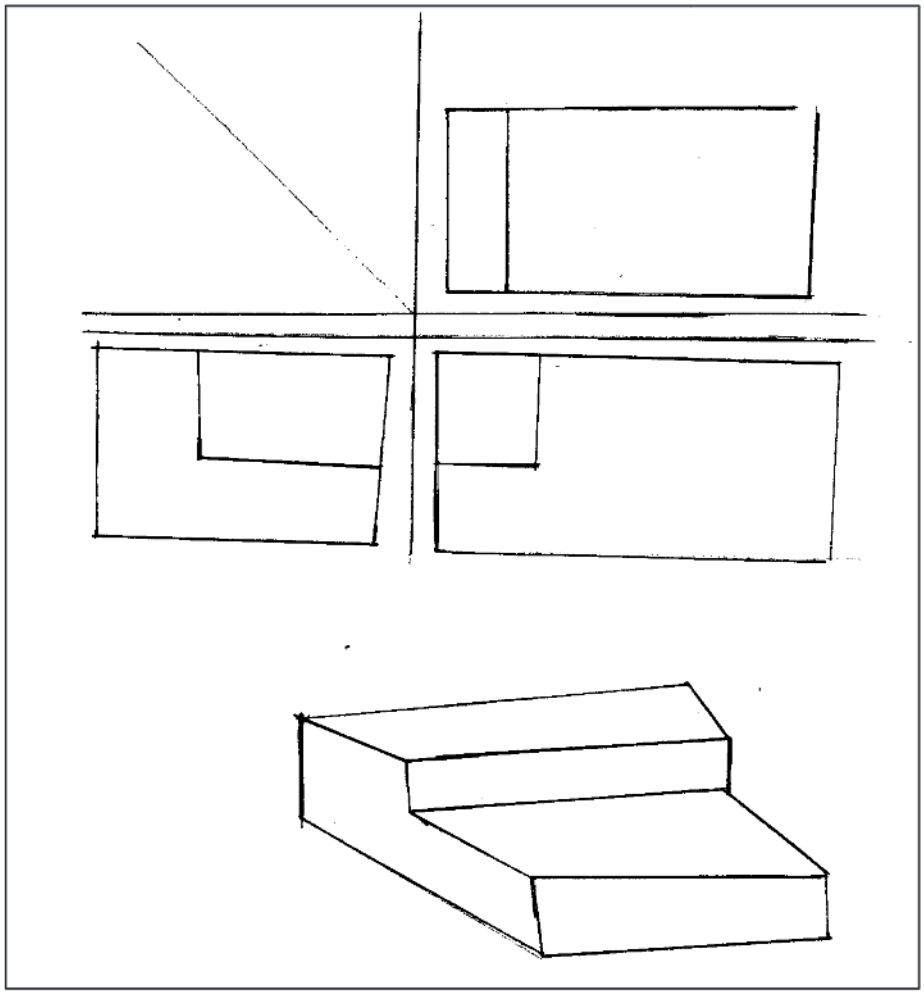
Extract 5.1: A sample of correct responses to Question 7

Extract 5.1 is a response from a student who managed to draw in part (a), first angle orthographic projection of a coach. He/she also drew its isometric projection in part (b).

Despite the average performance of most students, 280(53.23%) students performed poorly. Most of the students who scored low marks demonstrated insufficient skills in drawing views in orthographic and isometric projection.

In part (a), the students' performance was weak because of their failure to comprehend the requirement of the question regarding the position and number of views. For example, some students were not able to draw the plan views, front views and side elevations of the given wooden model coach. In the first angle projection, the object's right-hand side should be projected only if we observe the object from its right-hand side. Further, the impression will fall to the left-hand side of front view; the similar is applied to the other side, whereby the right-hand side view is placed on the left side of the front view of the object.

In part (b), the students' poor performance was attributed to their failure to recall the properties of an isometric projection. For instance, some students failed to recall that the isometric projection is drawn at an angle axis of 30^0 in both directions with the datum line. On the other hand, students failed to use the correct scale and indicate of dimensions accurately. The majority of students who scored zero marks lacked basic knowledge of the concepts tested. Extract 5.2 provides a sample of poor responses from one of the students.



Extract 5.2: A sample of incorrect responses to Question 7

Extract 5.2 shows a sample of incorrect responses from a student who did not adhere to the principles of fist angle orthographic and isometric projection. He drew a wooden model coach in first angle orthographic projection with wrong positioning of the views in part (a). He/she also drew the figure in oblique projection.

3.0 ANALYSIS OF THE STUDENTS' PERFORMANCE IN EACH TOPICS

The Form Two National Assessment Architectural Draughting paper had seven (7) questions set from 10 topics as per Form I and Form II syllabus. The analysis of the performance show that question 1 had good performance since the percentage of the students who passed were 94.30 in each question. Questions 1 and 2 were set from the following various topics: *Instruments, Equipment and Materials; Lettering; Layout of the Drawing or Paper to*

Formatting; Geometrical Figures; Scales; Orthographic projection; Auxiliary Views and *Perspective Drawing* while question 2 was matching items set from the topic of *Instruments, Equipment and Materials.* The good performance in these topics is associated with students' ability to employ knowledge acquired from different topics to identify the correct answers from the given options.

The topics in which the students performed averagely were *Architectural Draughting and Occupation Information (57.22%), Orthographic Projection* (52.66%)*, Pictorial Drawing (48.67%);* and *Geometrical Figures (30.23%)* tested in questions 3, 4, 5, 6 and 7. The average performance shows that the students had insufficient drawing skills that enabled them to perform above average in the topics concerned. There was no topic that were performed poorly.

4.0 CONCLUSION

The analysis of the students' performance was done in all questions assessed in the Architectural Draughting paper in 2023. Generally, the performance of the students in Architectural Draughting was average, as only 58.56 % of the students were able to score pass and above marks.

The average performance of the students was attributed by insufficient information to interpret correctly the requirements of the questions; inability to follow drawing procedures; inadequate knowledge and skills acquired in the tested topics including lack of practical drawing skills in the topics of *Geometrical Figure*, *Pictorial and Orthographic Projections.* Poor command of the English language was also a factor for their average performance.

The students' performance in questions 1 and 2 was 'good' while the performance of students in questions 3, 4, 5, 6 and 7 was 'average'.

The analysis concludes that drawing equipment, instruments, materials and more involvement in drawing practical works are required to improve the prospective students' performance. This will help them acquire logical and technical understanding of the subject matter.

5.0 RECOMMENDATIONS

Basing on the shortcomings observed in the analysis, it is recommended that:

(a) School administrators and subject teachers should provide enough practice to students. This involves ensuring the availability of learning and teaching facilities. The practice will foster the acquisition of knowledge and competence by students. As a result, their performance will improve at both school and national levels.

(b) Regular exercises and tests should be given to students and immediate feedback provided to students on key issue including how to identify the requirements of questions and presentation of their responses.

(c) Students should be provided with various drawing practices and access to various sources of drawing techniques to enhance their competence. This can be made possible by ensuring access to the internet, relevant books and study tours.

(d) Students should be encouraged to search and read relevant materials such as books or websites so that to widen their knowledge and skill on technical drawing.

(e) Students should be encouraged to read carefully the instructions on the question papers so that they can attempt questions in accordance to their specific requirements.

Appendix

Analysis of the Students' Performance in Different Topics in FTNA 2023

S/N	Topic	Question Number	Percentage of Students who Scored 30% or Above	Remarks
1	Instruments, Equipment and Materials; Lettering; Layout of the Drawing or Paper to Formatting; Geometrical Figures; Scales; Orthographic projection; Auxiliary Views and Perspective Drawing	1 (Multiple Choice Items)	94.30	Good
2	Instruments, Equipment and Materials	2 (Matching Items)	94.30	Good
3	Architectural Draughting and Occupation Information	3	57.22	Average
4	Orthographic Projection	6	52.66	Average
5	Pictorial drawing	4 & 7	48.67	Average
7	Geometrical figures	5	30.23	Average