Lubulwa Aasam S.4 Central U0025/181

456/1
MATHEMATICS
Paper 1
July – August 2025
2 ¼ Hours

UGANDA MUSLIM TEACHERS' ASSOCIATION

UMTA JOINT MOCK EXAMINATIONS – 2025

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 Hours 15 Minutes

INSTRUCTIONS TO CANDIDATES:

- *This paper consists of* **two** *sections;* **A** *and* **B**. *It has* **six** *examination items.*
- *Section* **A** *has* **two** *compulsory items.*
- *Section* **B** *has* **two** *parts;* **I** *and* **II**. *Answer* **one** *item from each part.*
- *Answer* **four** *examination items in all.*
- *Any additional item(s) answered will* **not** *be scored.*
- *All answers* **must** *be written in the answer booklet(s) provided.*
- *Graph paper should be provided.*
- *Silent non-programmable scientific calculators and mathematical tables with a list of formula may be used.*

SECTION A

Answer **both** *items in this section.*

Item 1.

A community is planning to build a new community center. The initial budget is "five billion seven hundred million Uganda shillings." The project involves various stages.

In the initial stages, they will need **48700** concrete bricks at **UGX 8,930** each, **891** bags of cement at **UGX 28,500** each, **553** steel bars at **UGX 69,000** each, **143** trips of sand at **UGX 280,000** each, and project labor which is **25%** of the initial budget. They will mix water, cement and sand in the ratio **1:2:4.**

The architects use Computer-Aided Design **(CAD)** software. Some of the software's file formats involve storing measurements using binary **(base-2)**. Two specific points, **D** and **T**, on the blueprint are represented as **101101** and **000000** respectively. The blueprint is on a scale of **5cm** to **5m**.

Task:

(a) How much of the initial budget is not used after the initial stages of the project?

(b) If they need **18** cubic meters of mixture (water, cement and sand), how many cubic meters of water, cement and sand are required.

(c) Help the construction team interpret length **DT** in feet **(1 ft = 0.3048m)**.

Item 2.

An entrepreneur acquired a piece of land and she was excited to build a small poultry farm with **two** types of chicken layers (for eggs) and broilers (for meat).

The cost of raising one-layer chicken until it starts laying eggs is **UGX 15,000**, and the cost of raising one broiler chicken to market weight is **UGX 10,000**. She has a total budget of **UGX 500,000** for purchasing and raising the initial batch of chicks. Each layer chicken produces an average of **250** eggs per year, and each egg sells for **UGX 200**. Each broiler chicken can be sold for an average of **UGX 25,000** UGX. She wants to achieve a target Annual Revenue of **UGX 1,500,000.**

Her chicken house has a limited capacity. Each layer chicken requires **0.5** square meters of space, and each broiler chicken requires **0.3** square meters. Her chicken house has a total usable floor area of **30** square meters. At the store, she was offered **two** options that fit in her budget: either **35** broilers and **10** layers, or **27** broilers and **15** layers.

Based on data from other farmers, the demand of broilers in the local area has been steadily growing as: **Year 2021: 15000, Year 2022: 16500, Year 2023: 18500,** and **Year 2024: 21000.**

Task:

(a) Find the number of layer and broiler chickens that satisfy both her budget and revenue goals.

(b) Help her figure out the option at the store that optimizes the capacity of her chicken house.

(c) Estimate the demand of broilers in the year **2029**.

SECTION B

This Section has **two** *Parts;* **I** *and* **II.**

Part I

Answer **one** *item from this part.*

Item 3.

A manager of a small but popular restaurant in his town wants to understand the dining habits of his customers to optimize staffing, manage inventory, and plan promotions. Over a busy weekend (Friday and Saturday), he decided to record the total amount (in Ugandan Shillings) spent by each customer group.

Here's the data he collected from **50** customer groups:

25000,	38000,	15000,	52000,	40000,	30000,	28000,	65000,	22000,	45000,
35000,	58000,	18000,	48000,	32000,	55000,	20000,	42000,	37000,	60000,
27000,	50000,	16000,	44000,	33000,	59000,	23000,	47000,	39000,	62000,
31000,	53000,	19000,	49000,	36000,	57000,	21000,	43000,	34000,	61000,
26000,	51000,	17000,	46000,	35000,	56000,	24000,	41000,	30000,	63000

Additionally, it is known that the manager records the average spending of every **50** customer groups and he is also curious to know the amount spent by half of the customers. He requested one of the waiters to organize the data collected but the waiter did not know how to do it.

Task:

(a) (i) By creating a frequency table using groupings of the spending amounts into intervals of **UGX 10,000**, help the waiter to organize the data collected.

(ii) Using the frequency table in **(a) (i),** help the waiter to determine the average spending of customers.

(b) Using a Cumulative Frequency Curve (Ogive), help her to determine the typical spending amount, where half the customers spend less and half spend more.

Item 4.

A certain district's youth development fund is **UGX 236,000,000**. This district has an offer of free airtime on its local radio station of **90 hours** a month. A newly appointed District Youth Officer wants to understand the participation of youth in different community activities. She conducted a survey of **100** youths in the district, asking about their involvement in **three** key areas: Sports (Participating in any organized sports team or individual sporting activity), Volunteering (Regularly volunteering time for community projects or organizations) and Entrepreneurship (Actively running their own small business or involved in income-generating activities). After collecting the data, she found the following: **45** participate in Sports, **30** are involved in Volunteering, and **35** are involved in Entrepreneurship, **15** participate in both Sports and Volunteering, **10** participate in both Sports and Entrepreneurship, **8** are involved in both Volunteering and Entrepreneurship and **5** participate in all the **three** activities. This data will enable her understand the overlaps and make informed decisions about resource allocation and program development.

Task:

(a) Three youths are randomly selected one after the other. Find the probability that the 3 are in the same community activity.

(b) Using the ratio of; numbers in sports only numbers in volunteering only: numbers in entrepreneurship only, distribute the youth development fund.

(c) Using the ratio of; numbers in sports and volunteering only: numbers in volunteering and entrepreneurship only: numbers in entrepreneurship and sports only, distribute the radio airtime.

Part II

Answer **one** *item from this part.*

Item 5.

A family purchases a plot of land, with no deed, to build a house. The plot is an irregular quadrilateral marked **ABCD** such that **AB = 30m**, **BC = 12m**, **AD = 20m** and **DC = 29m**. The side **AB** is directly in the line of movement of the sun with mark **B** in the direction of the sun set.

The family works with an architect to design their house. The architect has advised that the house be positioned in a circular space with the boundaries of this circular space just touching sides **AB**, **AD**, and **DC**. Interlocking blocks of length **440mm** are to be used to demarcate this boundary.

The architect is to be paid a monthly gross salary **UGX 4,867,000**. Her plan is to save **25%** of her net pay. Her salary is subject to income tax as charged below.

Monthly gross pay	**Tax rate (%)**
Not exceeding 235,000	Nil
Exceeding 235,000 but not exceeding 335,000	10
Exceeding 335,000 but not exceeding 410,000	20
Exceeding 410,000	30

Task:

(a) The deed to the land describes its area and boundaries using bearings to define the direction of each side relative to North. Using an accurate drawing of the plot of land, help the family present a deed to the land.

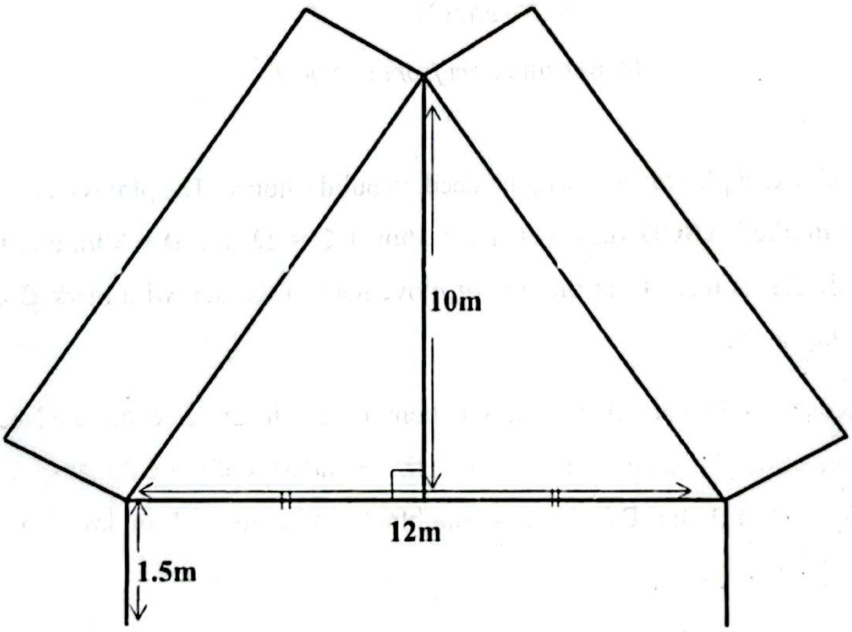
(b) How many interlocking blocks will be used to demarcate the boundary of the circular space?

(c) Compute the amount the architect saves monthly.

Item 6.

An architect has designed an outdoor stage for a performing arts center.

Two-dimensional illustration of the stage



The whole outside surface of the stage is to be covered with wood panels of uniform thickness measuring **20cm** by **80cm** each.

Task:

(a) Draw an accurate **three-dimensional** illustration of the stage stating all the lengths involved.

(b) How much space is occupied by the stage?

(c) How many pieces of wood will be just enough to cover the outside of the stage?

Thurs -

END

Mkunda Eric

Guidance — 456/1 MATHEMATICS

⇒ Each grid is used to measure the learner's performance using a scale of 0 to 3.

⇒ Score 3: If a learner gets at least 3/4 of all Indicators in an item

⇒ Score 2: If a learner gets at least 1/2 of all Indicators in an item

⇒ Score 1: If a learner get at least 1/4 of all Indicators in an item

⇒ Score 0: If a learner gets none of the Indicators in an item

Item one

I =	5
M_1 =	6
Ap_1 =	3
	14

Item

I —	06
M_2 —	02
Ap_2 —	03
TT	11

Item one

P —	
A_2 —	
IN —	

		IN NE
1	—	
2		
3		
4		
5		
6		

Item	Solution	Indicator (Competency)	Score Code	Score
1(a)	Initial budget is 5,700,000,000 Bricks 45700 x 8930 Cement 891 x 28500 + steel bars 553 x 67000 Sand 143 x 250,000 538,451,500	Words to figures Addition Multiplication	I M_1 M_1	1 1 1
	labour is: $\frac{25}{100}$ x 5700,000,000 = 1,425,000,000	Percentage on quantity	I	1
	Total used in initial stages is 538,451,500 + 1,425,000,000 1,963,451,500			
	initial budget NOT used in initial stages is 5700,000,000 − 1,963,451,500	Subtraction	M_1	1
	3,736,518,500 is not used after the initial stages of the project	Response	AP_1	1
				06
1(b)	Total ratio is 1+2+4 = 7			
	water required is $\frac{1}{7}$ x 18 = 2.6	ratio to fraction	M	1
	Cement required is $\frac{2}{7}$ x 18 = 5.1	ratio on quantity Approximation	M (for 7) M_1	1 1
	Sand required is $\frac{4}{7}$ x 18 = 10.3	1 decimal to nearest 1dp		
	The will require 2.6m³, 5.1m³ and 10.3m³ of water, Cement	Response	AP_1 M	1
				04

2 - L

(a)

Solution

(c) 1011.01_2 to base ten is

$1 \times 2^5 + 0 \times 2^4 + 1 \times 2^3 + 1 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$

$= 32 + 0 + 8 + 4 + 0 + 1$

$= 45$

$\overline{DT} = 45$ cm in blue print

But 5cm : 5m

$\therefore$ 45cm : 45m

also 1ft = 0.3048m

$\therefore$ 45m $= \frac{45}{0.3048}$

$= 147.6$ ft

Let $\overline{DT}$ is 147.6 ft

I	M_1	AP_1	Total
06	05	03	14
05	06	03	14

2 (a) Let x and y be the number of layers and broilers respectively

$15\,000x + 10\,000y = 500\,000$

$50\,000x + 25\,000y = 1500\,000$

$x = 20$

$y = 20$

20 layers and 20 broilers satisfy both her budget and revenue goals

Space: $0.5x + 0.3y$

(b) option 1: $35 \times 0.3 + 10 \times 0.5$

$= 15.5$

option 2: $27 \times 0.3 + 15 \times 0.5$

$= 15.6$

The option of 27 broilers and 15 layers optimises the capacity of her chicken house

Indication Competence	Score Code	Score
Converting base	I	1
~~Applying~~ Correct output of 45cm	M_1	1
Converting Units	I	1
Response	AP_1	1
		04
Define variables	F	1
Forming linear equations	F	1
Forming simultaneous equations	F	1
Solving for variables	M_2	1
Response	AP_2	1
		05
Building expression	F	1
Substitution	M_2	1
any of the two.		
Response with a reason.	AP_2	1
		03

(3)

Item	Solution	Indicator (Competence)	Score Code	Score
2(c)	Year: 2021, 2022, 2023; Demand: 15000, 16500, 18500; differences 1500, 2000	Building pattern	F	1
	2024, 2025, 2026, 2027; 21000, 24000, 27500, 31500; differences 2500, 3000, 3500, 4000	Building sequence	F	1
	~~2028~~ 2028, 2029; 36000, 41000; differences 4500, 5000			
	The demand of broilers in 2029 is estimated at 41,000	Response	A_2	1
				03

F	M_2	A_2	Total
06	02	03	11

3 (a)

(i) Frequency table

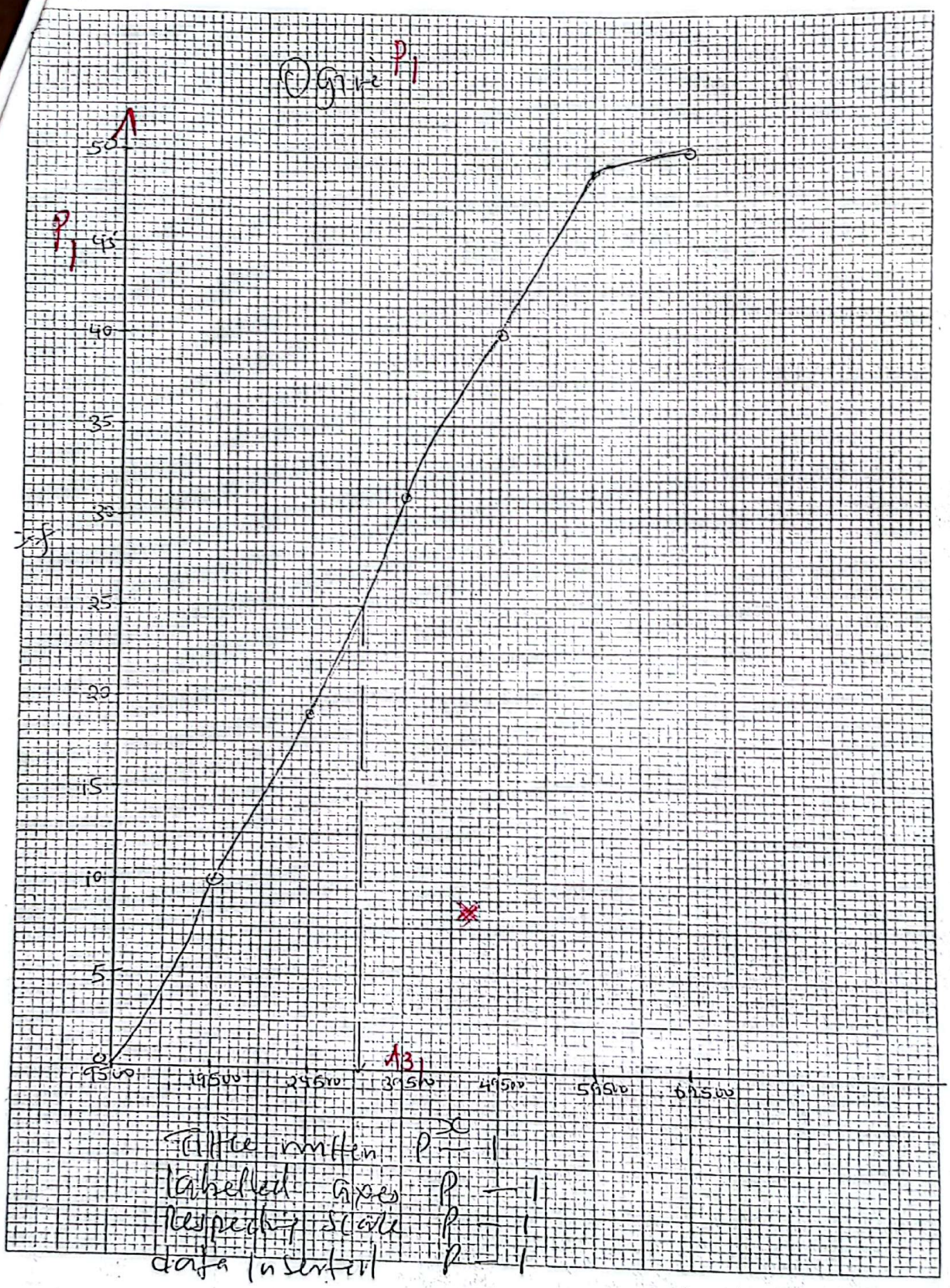
Amount spent	Number of customers
15000 − 24000	10
25000 − 34000	9 10
35000 − 44000	12 11
45000 − ~~54~~54000	9
55000 − 64000	9
65000 − 74000	1

Indicator (Competence)	Score Code	Score
Title written	P	1
Columns labelled	P	1
Data inserted	P	1
Computing class boundaries	A_3	1
~~to~~ output (freq table)	IN	1
		~~04~~ 05

3(a) (ii)

Midpoint x	fx
19500	195000
29500	~~265500~~ 295000
39500	~~474000~~ 434500
49500	445500
59500	535500
69500	69500
	~~1,985,000~~ 1975,000.

Indicator (Competence)	Score Code	Score
Computing x	A_3	1
Computing fx	A_3	1


Office written
labelled axes
respective scale
data inserted

Range of $\bar{x}$ 38500 – 39800.

Item Solution

$$\text{Average} = \frac{1975000}{50}$$

$= 39,500$

The average spending of the customers is UGX 39,500

Indicator (Competence)	Score Code	Score
Substitution in mean formula	A3	1
Correct output	A3	1
Conclusion/output	IN	1
		03

3 (b)

x	cf
19500	10
29500	20
39500	31
49500	40
59500	49
69500	50

$\frac{50}{2} = 25$

Estimate value = 35000 ± 500

38500 – 39800

The typical spending amount is 35000 UGX (± 500)

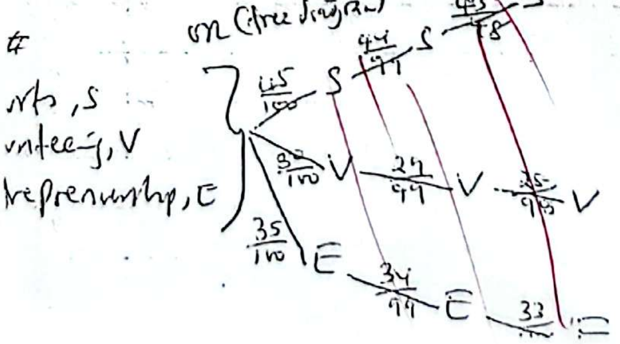
Indicator (Competence)	Score Code	Score
Computing cf	A3	1
Substitution for $\Sigma f/2$	A3	1
Correct output	A3	1
Estimation from graph	A3	1
Conclusion	IN	1
Graph made	[illegible]	4
		09

P	A3	IN	Total
07	09	3	19

(a) Probability that 3 youths are in same community activity is either sports or volunteering or entrepreneurship

$$= \frac{45}{100}\times\frac{44}{99}\times\frac{43}{98} + \frac{30}{100}\times\frac{29}{99}\times\frac{28}{98} + \frac{35}{100}\times\frac{34}{99}\times\frac{33}{98} = 0.1533$$

or (tree diagram)



Indicator (Competence)	Score Code	Score
Analysis of data; Title given independent data extracted	A3	1
Computing probabilities; Interpret data correctly	P A3	1
Computing probabilities	A3	1
Substitution in formula for probability	A3	1

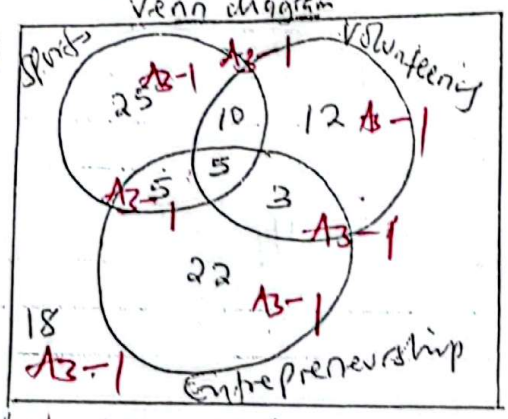
(5)

Solution

(a) The probability that 3 youths randomly selected are in the same community activity is 0.15

Indicators (Competence)	Score Code	Score
~~Correct~~ Conclusion	IN	1
		05
title written	P —	1
data ~~inserted~~ presented	P —	1

(b) Venn diagram



~~Sports only: 115~~

Sports only : Volunteering only : entrepreneurship only

25 : 12 : 22

25+12+22 = 59 A3-1

$\frac{5}{59} \times 236,000,000 = 100,000,000$

$\frac{2}{59} \times 236,000,000 = 48,000,000$ A3-1 (sharing don't find)

$\frac{22}{59} \times 236,000,000 = 88,000,000$

The youth development fund will be distributed as: UGX 100,000,000 to sports only, UGX 48,000,000 to Volunteering only and UGX 88,000,000 to Entrepreneurship only

Conclusion	IN	1
		03

(c) $\frac{10}{18} \times 90 = 50$

$\frac{3}{18} \times 90 = ~~15~~$ 15 A3-1

$\frac{5}{18} \times 90 = ~~25~~$ 25

The radio airtime will be distributed as: 50min to sports and Volunteering only,

Distribution of time.		
Conclusion ~~A1~~	IN	1
		01

Deed

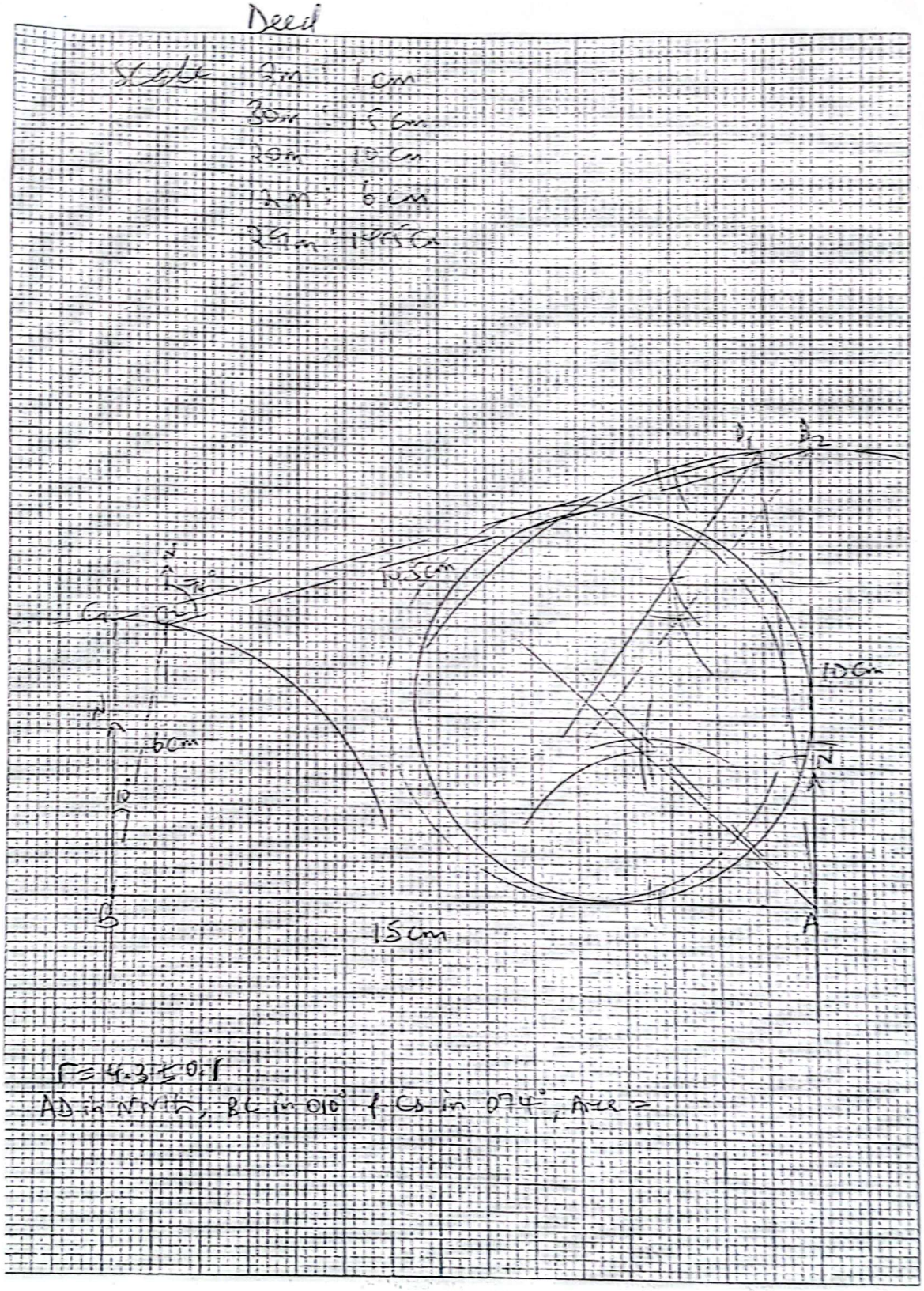
Scale 2m : 1cm

30m : 15cm

20m : 10cm

12m : 6cm

24m : 12cm



$\Gamma = 4.3 \pm 0.1$

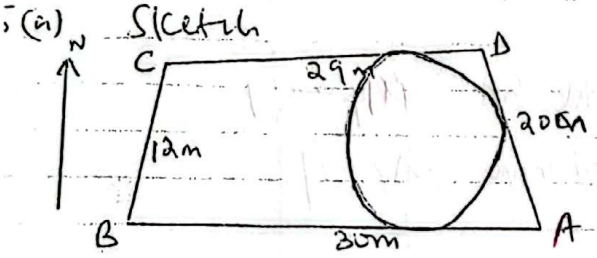
AD in NW, BC in 010° & CD in 074°, Area =

(b)

1 hour 30 minutes to volunteering and entrepreneurship only, and 2 hours 30 minutes to entrepreneurship and sports only.

P	A3	IN	TOTAL
~~04~~ 02	~~02~~ 02	~~03~~ 14	~~09~~ 19

(a) Sketch



Scale drawing

1cm = 5m

$r = 4 \pm 0.5$

$C = 2\pi r$

$= 2 \times 3.14 \times 4.5$

$= 53.43cm$

$= \frac{53.43cm}{440} = 121.45$

$= 122$ interlocking blocks

(b) Circumference, C =

No. of blocks = $\frac{C}{0.44}$

=

__ blocks will be used to enarcate the boundary of the circular space

(c)

Indication (Competence)	Score Code	Score
Correct/ Complete Sketch	Ap — 1	
Choosing scale	Ap — 1	
Conversion of unit	M_{1p}	1
Measurement of lines	M_{1p}	1 (07)
Bearing	M_{1p}	1
Bisecting angles	M_{1p}	1
Correct diagram	AP_{1p}	1
~~Area~~	$A_{1p}M_{1p}$	2
		~~09~~
Circumference	$A_{1p}M_{1p}$	2
operation (division)	A_{1p}	1
Conversion (mm→m)	A_{1p}	1
output	M_{1p}	1
~~Appropriate~~ Response	AP_{1p}	1
		06

(7)

Item | Solution | Indicator (Competence) | Score Code | Score

5(c)

Monthly Gross Pay	Tax
Not exceeding 235,000	0
Exceeding 235,000 but not exceeding 335,000	100,000 × 10/100 = 10,000
Exceeding 335,000 but not exceeding 410,000	75,000 × 20/100 = 15,000
Exceeding 410,000	4457,000 × 30/100 = 1,337,100
	1,362,100

Net pay is
4867,000 − 1362,100
= 3,504,900

Saving is 25/100 × 3,504,900
= 876,225

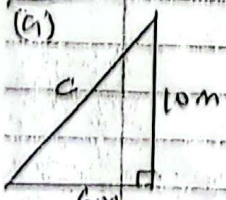
The architect will save 876,250 Monthly

Acp	Mcp	APcp	Total
08	08	03	19

Net Income tax rates on tax bands	Acp	1	(Tax rate)
Acp — 1			
Total tax — Acp — 1			
Net Income — Acp — 1			1
Approximate answer to reality	Mcp —	1	
Response	APcp —	1	
			04 06

Item 6

(a)

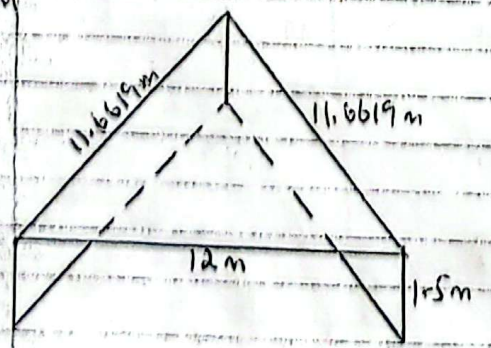


$c^2 = 10^2 + 6^2$

$c^2 = 136$

$c = 11.6619$ m

Pythagoras theorem (or measurement)	Acp	1	
3D drawing (Sketch)	Acp —	1	
			02



(8)

(a) Solution

(b) (i) Space occupied by the stage $= \left(\frac{1}{2} \times 12 \times 10\right) \times 1.5$

$= 90\ m^3$

$90\ m^3$ is occupied by the stage

(c) Surface area is

$12 \times 1.5 + 2(1.5 \times 11.6619) + \frac{1}{2} \times 12 \times 10$

$\frac{1}{2} \times 12 \times 10 + 2(11.6619 \times 1.5)$

$= 112.9857\ m^2 = 94.8\ m^2$

Surface area of one wood panel

$= 0.2 \times 0.8$

$= 0.16\ m^2$

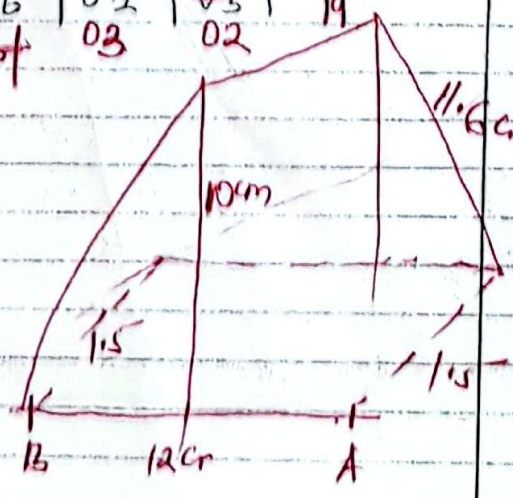
No. of wood panels is

$\frac{112.9857}{0.16}$ $\frac{94.8}{0.16}$ A4-1 (Division)

$= 706.1607 = 593$ pcs.

706 pieces of wood will be just enough to cover the outside of the stage

A4	M4	AP4	Total
06	02	03	19
13	03	02	



Indicator (Competence)	Score Code	Score
Area of 3D (A)	A4	1
Volume	A4	1
Correct output	M4	1
Response	AP4	1
		04
Surface Area	A4	1
Operations	A4	1
Conversion of Units	A4	1
M4-1 (output).		
A4-1 (Division).		
Approximate to reality	M4	1
Response	AP4	1
		05

A4 – 1 measurement

A4 – 1 Bisecting sides

A4 – 1 Bisecting angles

A4 – 1 scale.

A4 – 1 Angle measurement.

A4 – 1 – Joining the form a 3D shape.

AP4 – 1 (Correct out of a diagram)