PROPOSED SCORING GUIDE

NEW LOWER SECONDARY SCHOOL CURRICULUM

S.4 MATHEMATICS SEMINAR

SLATED FOR 22/06/2024

ITEM 1

a)

Let's call the second digit "x". Since the first digit is 4 greater than the second, the first digit is x + 4.
We know that the sum of the digits is 16, so we can write the equation:
x + (x + 4) = 17
2x + 4 = 17
2x = 13
x = 6
So, the second digit is 6, and the first digit is 6 + 4 = 10 = t in base eleven.
Therefore, the two-digit base eleven numeral is t 6 (in base 11)

t 6 (base 11) = 10 × 11^1 + 6 × 11^0
= 10 × 11 + 6 × 1
= 110 + 6
= 116 **(in numeral base) (taking x = 7 will not bring a valid soln)**

b)

Total land area = x
Corn allocation = 14% of x = 0.14x
Wheat allocation = 30% of x = 0.30x
Soybeans allocation = remaining land = x - (0.14x + 0.30x)
= 0.56x
Corn planting area = 42 acres
Farm workers' cultivation rate = 15 acres / 4 days
Since the farmer wants to plant corn on 42 acres, we can set up the equation: 0.14x = 42
x = 42 / 0.14
x = 300 acres
So, the farm has a total of 300 acres available for crop cultivation
Now, we can find the period for wheat and soybeans:
Wheat allocation = 0.30x = 0.30(300) = 90 acres
Soybeans allocation = 0.56x = 0.56(300) = 168 acres

c)

First, convert the cultivation rate to acres per day:
15 acres / 4 days = 3.75 acres / day
Now, divide the total land area by the cultivation rate:
300 acres / 3.75 acres/day = 80 days
Therefore, it would take the 12 farm **workers 80 days** to prepare the entire 300-acre land for plantation.

ITEM 2

a) The perimeter of a rectangle is given by: P = 2(l + w)

The problem states that the perimeter is (14+6√3) units, so we can set up the equation: 2(l + w) = 14+6√3

Simplify the equation: l + w = $((14 + 6\sqrt{3}))/2$

The problem also states that the length (l) is √3 times the width (w), so we can write: l = √3w

Substitute this expression for l into the equation √3w + w = $((14 + 6\sqrt{3}))/2$

Combine like terms: (√3 + 1)w = $((14 + 6\sqrt{3}))/2$

Divide both sides by (√3 + 1) and simplify: w = $((7 + 3\sqrt{3}))/((\sqrt{3} + 1))$

To find the length (l), multiply the width by √3: l = √3w = $(\sqrt{3}(7 + 3\sqrt{3}))/((\sqrt{3} + 1))$

(A) using: A = lw

$A = (\sqrt{3}w)w = (\sqrt{3}(7 + 3\sqrt{3}))/((\sqrt{3} + 1)) \times ((7 + 3\sqrt{3}))/((\sqrt{3} + 1))$

Simplify the expression to find the area.

$A = (\sqrt{3}(49 + 42\sqrt{3} + 27))/((3 + 2\sqrt{3} + 1))$

$A = (\sqrt{3}(76 + 42\sqrt{3}))/((4 + 2\sqrt{3}))$

$A = ((76\sqrt{3} + 126))/((4 + 2\sqrt{3}))$

$A = ((38\sqrt{3} + 63))/((2 + \sqrt{3}))$

Multiply the numerators and denominators: $A = ((38\sqrt{3} + 63)(2 - \sqrt{3}))/((2 + \sqrt{3})(2 - \sqrt{3}))$

Simplify the fraction: $A = ((76\sqrt{3} - 114 + 126 - 63\sqrt{3}))/((4 - 3))$

Combine like terms: $A = ((12 + 13\sqrt{3}))/1$

$A = (12 + 13\sqrt{3})$ square units

So, the area of the rectangular hostel is $(12 + 13\sqrt{3})$ square units

Now, the school administration can use this result to plan the construction of the new hostels and address the shortage of dormitory space for students.

b) Let x be the total number of students in the school. Then:

Simplify the equation: (2/3)x = (3/4)x - 100

Subtract (3/4)x from both sides:

(1/12)x = 100

Multiply both sides by 12:

x = 1200

So, there are 1200 students in the school.

c) Initial collection rate: $2/3$ of the school population (x)

Additional payments: 100 students paid their fees

Total collection by end of week two = $2x/3$ + 100 = 3/4 or 75%.

Required collection rate: 97% of school fees must be collected to undertake the construction.

Since the current collection rate **is 75%,** which is still short of the **required 97%,** the administration should not yet undertake the construction. However, they are getting close, and with some additional efforts, they might reach the required threshold.

To bridge the gap, the administration could consider the following options:

- Intensify efforts to collect fees from the remaining students
- Offer incentives for prompt payment
- Communicate with parents and students to emphasize the importance of meeting the required collection rate

Once the collection rate reaches 97%, the administration can proceed with the construction, ensuring a stable financial foundation for the project.

ITEM 3

a) Shorter Route:

Average speed = Total distance / Total time

Total time = 2 hours 26 minutes = $2\ 26/60$ = $2\ 13/30$ = $2\ 26/60$ = $(73)/30$ $hours$

1st x km; $T_1 = \frac{x}{54}$ hours

2nd y km; $T_2 = \frac{y}{37.5} = \frac{2y}{75}$ hours

But $T_1 + T_2 = \frac{73}{30}$

$\frac{x}{54} + \frac{2y}{75} = \frac{73}{30}$ LCM = 1350

$25x + 36y = 3285$ ……..(i)

Longer route

Total time = $2\ 12/60 = 11/5$ $hours$

Distance =(5 + x + y) km

Speed = distance / time

$(5 + x + y)/(11/5) = 60$

5 + x + y = 132

x + y = 127 ……(ii)

The two mathematical models are: $\mathbf{25x + 36y = 3285}$ and **X + y = 127**

b) $25x + 36y = 3285$

$25 : x + y = 127$

$25x + 36y = 3285$

$-:25x + 25y = 3175$

$11y = 110$

$y = 10$ Km

$25x + 36(10) = 3285$

$25x = 2925$

$\boldsymbol{x = 117km}$

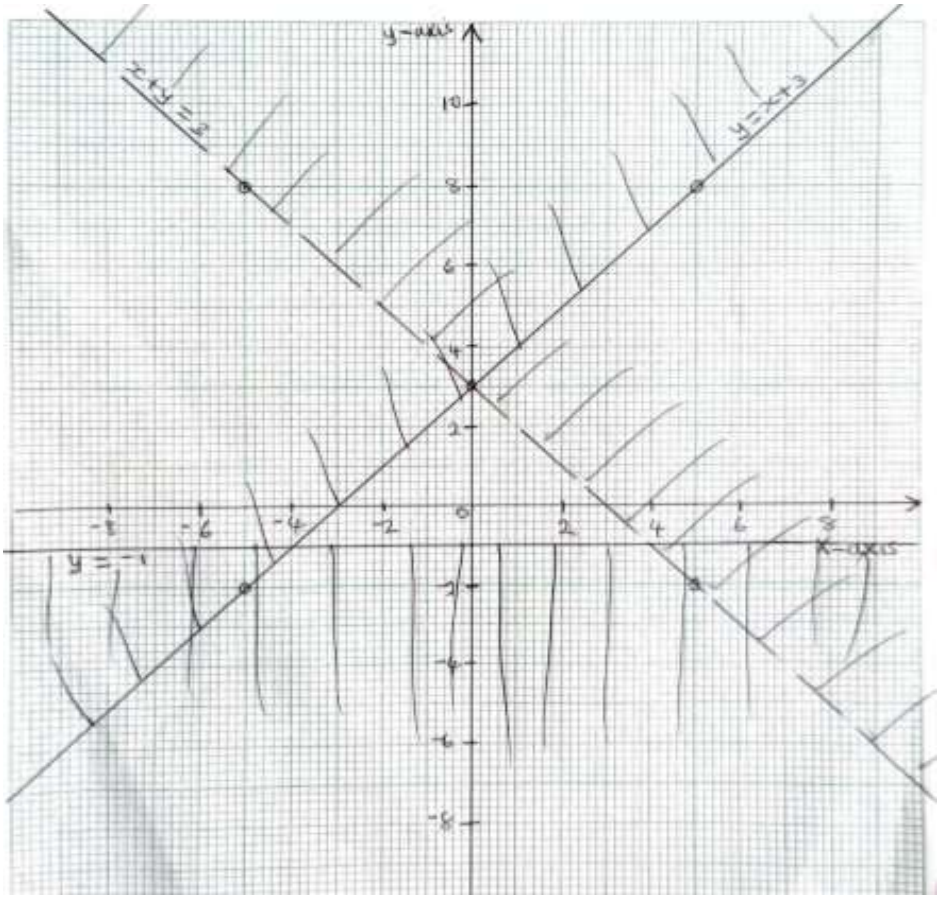
c) shorter route: distance = x + y = 117 + 10 = **127 Km** and total time = 2 hours and 26 minutes.
longer route: total distance = 127 + 5 = **132 km** and total time = 2 hours and 12 minutes. The advice is to use a longer route since it uses the least time.

ITEM 4 (a)

Inequality	Line	Nature	Points
$x - y \geq -3$	$x - y = -3$	———	(0, 3), (5, 8), (-5, -2)
$x + y < 3$	$x + y = 3$	- - - - -	(-5, 8), (0, 3), (5, -2)

$y \geq -1$	$y = -1$	———	(0,-1), (5, -1) , (-5, -1)

Check graph



a) The vertices are (0, 3), (-4, -1) and (4, 1)

Area of triangular parking = $\frac{1}{2} \times base \times height$

$= \frac{1}{2} \times 8 \times 4$

= 16 square units

b) Since the given area (12.4 square units) $<$ the actual area of the parking (16 square units), then it will accommodate the anticipated number of cars.

Maximum Number of cars = $\frac{Area\ of\ parking\ lot\ specified}{Area\ of\ each\ car}$

$= \frac{12.2}{0.2}$

= 62 cars

c) The mall's daily highest revenue on a peak day

= charge per car × maximum no. of cars

= Shs: 2500 × 62

= Shs 155, 000

ITEM 5

a) 31 to base three

3	31	1
3	10	1
3	3	0
	1	

1011_{three}

The code to the safe was 1011_{three}

b) Three hundred forty-nine million shillings

= 349,000,000

Wife 40% = $\frac{40 \times 349{,}000{,}000}{100}$

= 139,600,000

Remaider = 349,000,000 – 139,600,000

= 209,400,000

Eldest son $\frac{1}{3}$ x 209,400,000 = 69,800,000

209,400,000 – 69,800,000

= 139,600,000

Sharing in the ratio 2:3 3+2 = 5

= 2 x 139,600,000 / 5 = 55,840,000

Youngest child will get 139,600,000 – 55,840,000

= 83,760,000

ITEM 6

Let the number of trips be made by the bus be x

Let the number of trips to be made by the van be y

$57x + 19y \geq 171$ ---------(i)

$80{,}000x + 50{,}000y \leq 400{,}000$

$8x + 5y \leq 40$ ------ (ii)

$y > x$ ---------- (iii)

$y \geq 0 \quad x \geq 0$

Lines

For $57x + 19y = 171$

X	0	3
y	9	0
	(0,9)	(3,0)

for $8x + 5y = 40$

X	0	5
y	8	0
	(0,8)	(5,0)

y = x

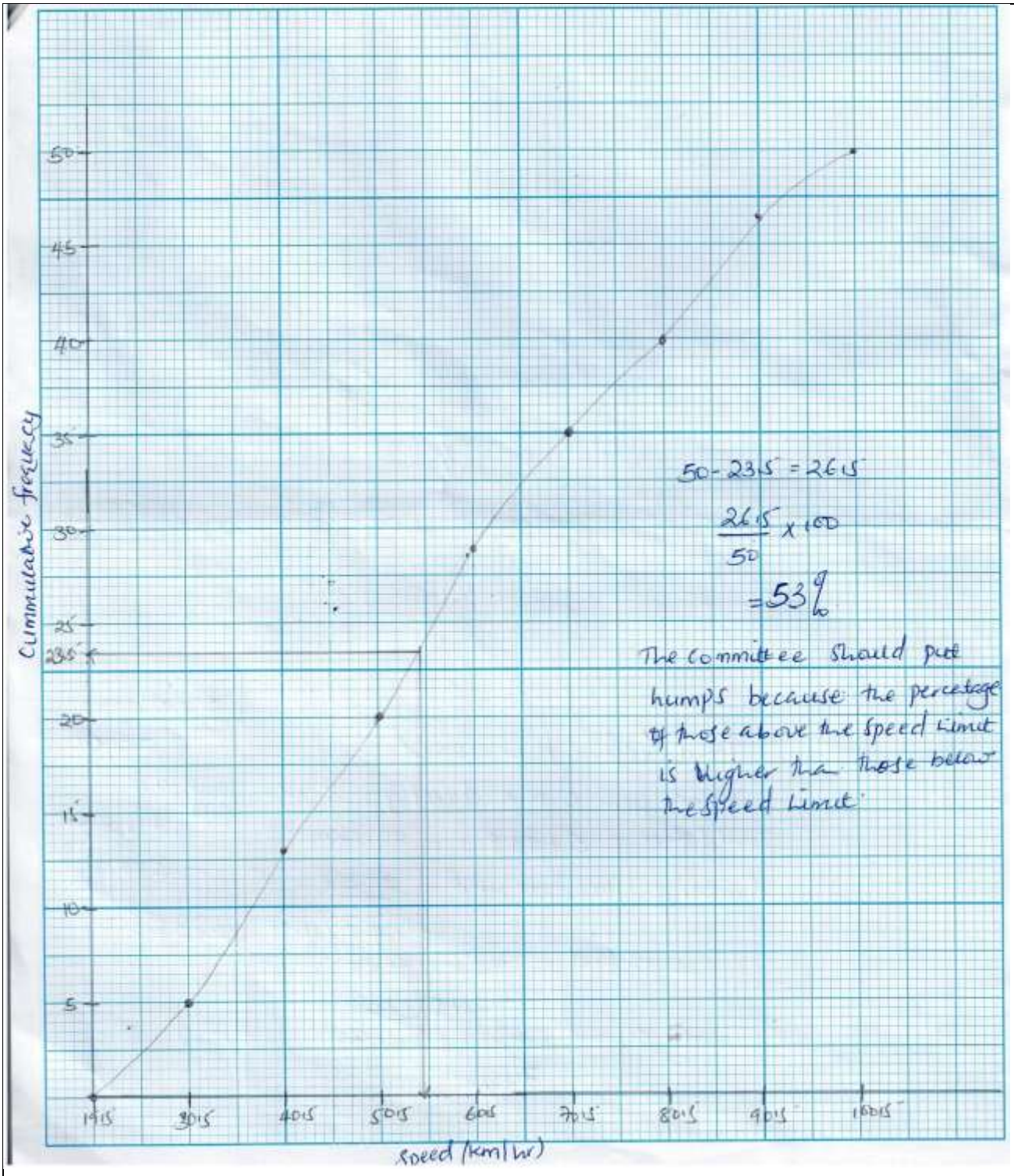
X	0	2	3
y	0	2	3

(x,y) (2,3) (2,4) (1,6)

(2,3) 80,000 x 2 + 50,000 x 3 = 310,000

(2,4) 80,000 x 2 + 50,000 x 4 = 360,000

(1,6) 80,000 x 2 + 50,000 x 6 = 380,000



The bus should make 2 trips and the van should make 3 trips.

ITEM 7

a) (i)
Profits =Ugx.1, 500,000 (I =1)
Profits to re-invest = $^{20}/_{100}$ X 1,500,000 (I =1)
UGX.300, 000 (m=1)

a (ii)
Total ratio =1+3 =4 (I=1)
Fraction for ¾ (I =1)
Personal expenses
Personal Expenses =$^{3}/_{4}$ x (1,500,000 -300,000) (I=1)
¾ x 1,200,000 (I=1)
UGX. 900,000 (m=1)

Expected personal expenses = 300,000 +200,000 +100,000 (I =1)
Ugx.600, 000 (m=1)
Conclusion: Yes because the amount she plans to spend on her personal expenses can cover all of them.

A=2
C=1
R=1

(c)

2	18	36	(I = 1)
3	9	18	
3	3	6	(m = 1)
2	1	2	
	1	1	

H.C.F =2 X 3 X 3 (M=1)
= 18

The worker was able to make 18 packages out of the items bought. (A=1)
Note: Where you see the following letters below is the meaning.

I =Identification

M = Manipulation

A = Application

ITEM 8

Let x profit from each cake (F = 1)
y = Profit from each cake.
40x + 30y = 29000
⟹ 4x + 3y =2900 .....(1)

50x + 20y =31000
⟹ 5x + 2y = 3100 ..... (m = 1) .(2)

(4x +6y =2900) x 2
(5x + 2y = 3100) x 3 (m = 1)

8x + 6y = 5800
15x + 6y = 9300
$^{-7x}/_{-7}$ = $^{-3500}/_{-7}$ (m=1)
X =ugx.500 (m-1)

Using 4x +3y = 2900
(4 x 500) +3y =2900 (m = 1)
3y =2900 -2000
$^{3y}/_{3} = ^{900}/_{3}$ (m-1)
Y = UGX. 300 (m=1)

He can expect UGX 500 as profit from each cake and UGX 300 as profit from each cookie (A= 1)
(b) (ii)
Let x = Number of cakes (F-1)
Y = Number of cookie

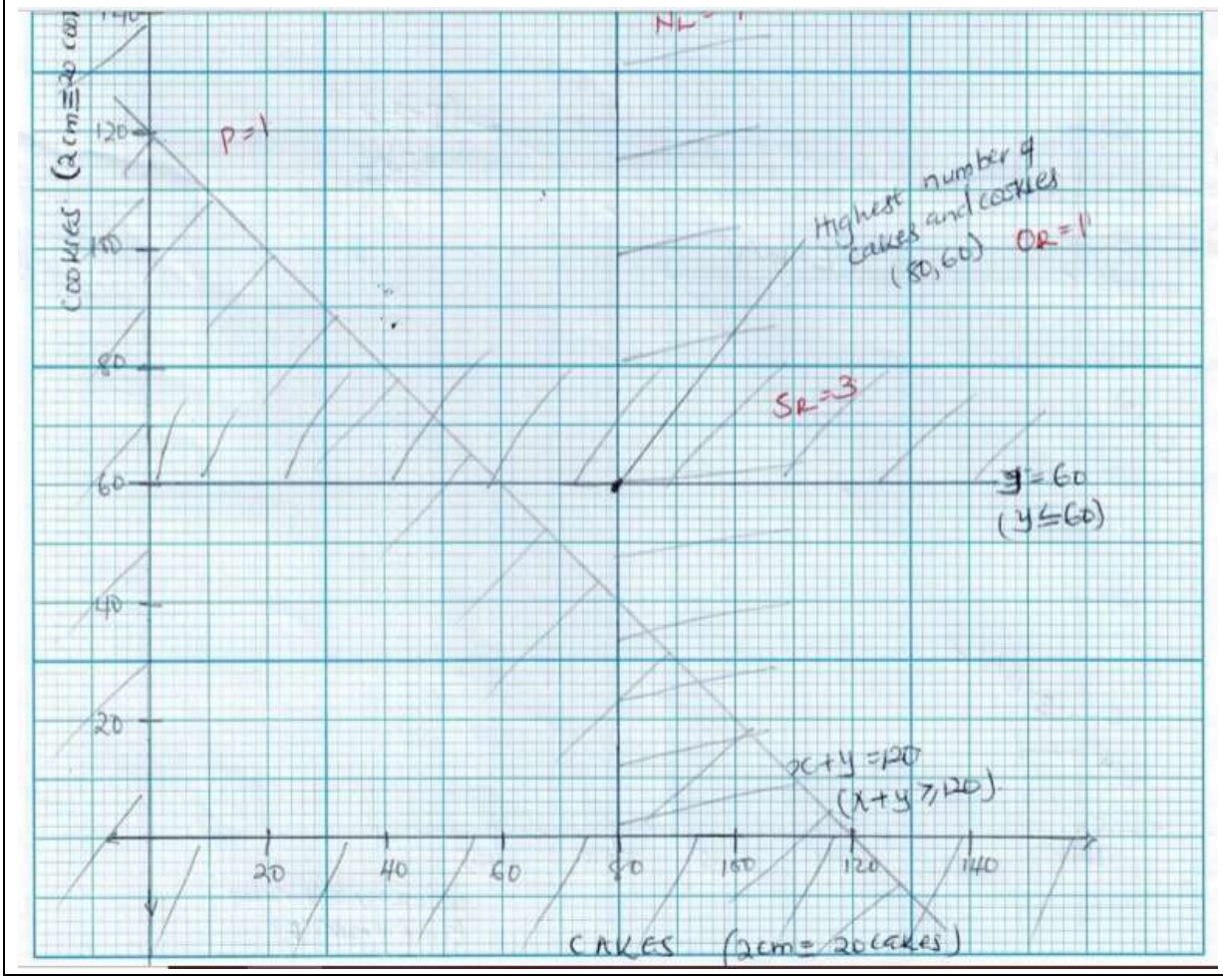
Inequalities: X ≥0
Y ≥ 0
X + Y ≥ 120 (F = 3)
X ≤ 80
Y ≤ 60

Linear equations x = 0
Y = 0
X +y = 120 (F = 1)
X = 80
Y = 60

Coordinates: x +y = 120 (M = 1)

X	120	0
Y	0	120

(120, 0) and (0, 120)



Conclusion

He can make 60 cookies and 80 cakes

(A= 2) Rc =1

Op = 1

MEANING OF USED LETTERS

F =Formation of algebraic equations and inequalities

M = Manipulation

A = Application

Rc = Reading coordinate

OP = Optimal region

SECTION B: PART 1

ITEM 9

Let x ≡ number of farmers that grow all the four crops:

45 + x + x – 5 + 5 + 5 = 80

2x = 30

x = 15

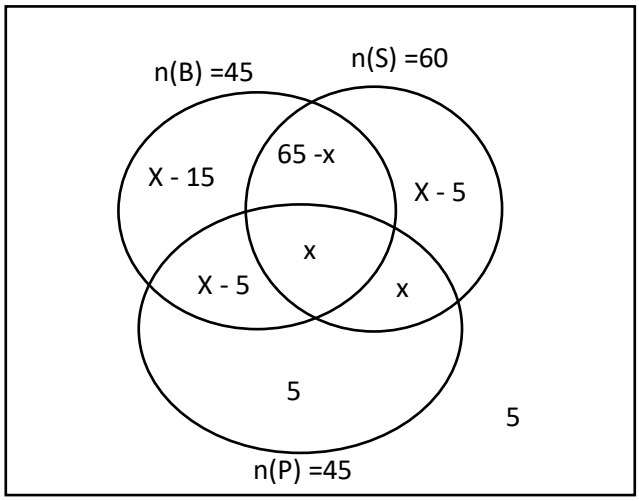
Number of farmers that plant all four crops = 15

Number of farmers that plant only three crops = (x -5) + (65 – 3x) + x

= 10 + 20 +15 = 45

Chance of selecting a farmer that plants only two crops = $\frac{0+10+5}{80} = \frac{3}{16}$

chance of selecting a farmer that does not plant Peas $\frac{80-45}{80} = \frac{35}{80} = \frac{7}{16}$



category of crops planted	number of tractors	Extra money given to farmers
4	$4 \times 15 = 60$	$15 \times 3m = 45m$
3	$3 \times 45 = 135$	$45 \times 2m = 90m$
2	$2 \times 15 = 30$	$30 \times 1.5 = 45m$
1	$1 \times 5 = 5$	$5 \times 1m = 5m$
total	$230\ tractors$	$shs\ 185{,}000{,}000$

$$budget\ for\ tractors\ 230 \times 68m = shs\ 15{,}640{,}000{,}000$$
$$budget\ for\ money\ shs\ 185{,}000{,}000$$
$$total = Shs\ 1.5825 billion$$

ITEM 10

a) (i)

Battery life	tally	f	X	fx	CF	CB
360 - 369	*IIII*	4	364.5	1458	4	359.5 - 369.5
370 - 379	*IIIII*	5	374.5	1872.5	9	369.5 – 379.5
380 - 389	IIIII I	6	384.5	2307	15	-389.5
390 - 399	IIIII IIIII III	13	394.5	5128.5	28	-399.5
400 - 409	IIIII IIIII	10	404.5	4045	38	-409.5
410 - 419	IIIII	5	414.5	2072.5	43	-419.5
420 -429	IIII	4	424.5	1698	47	-429.5
430 - 439	III	3	434.5	1303.5	50	-439.5
		50		19885		

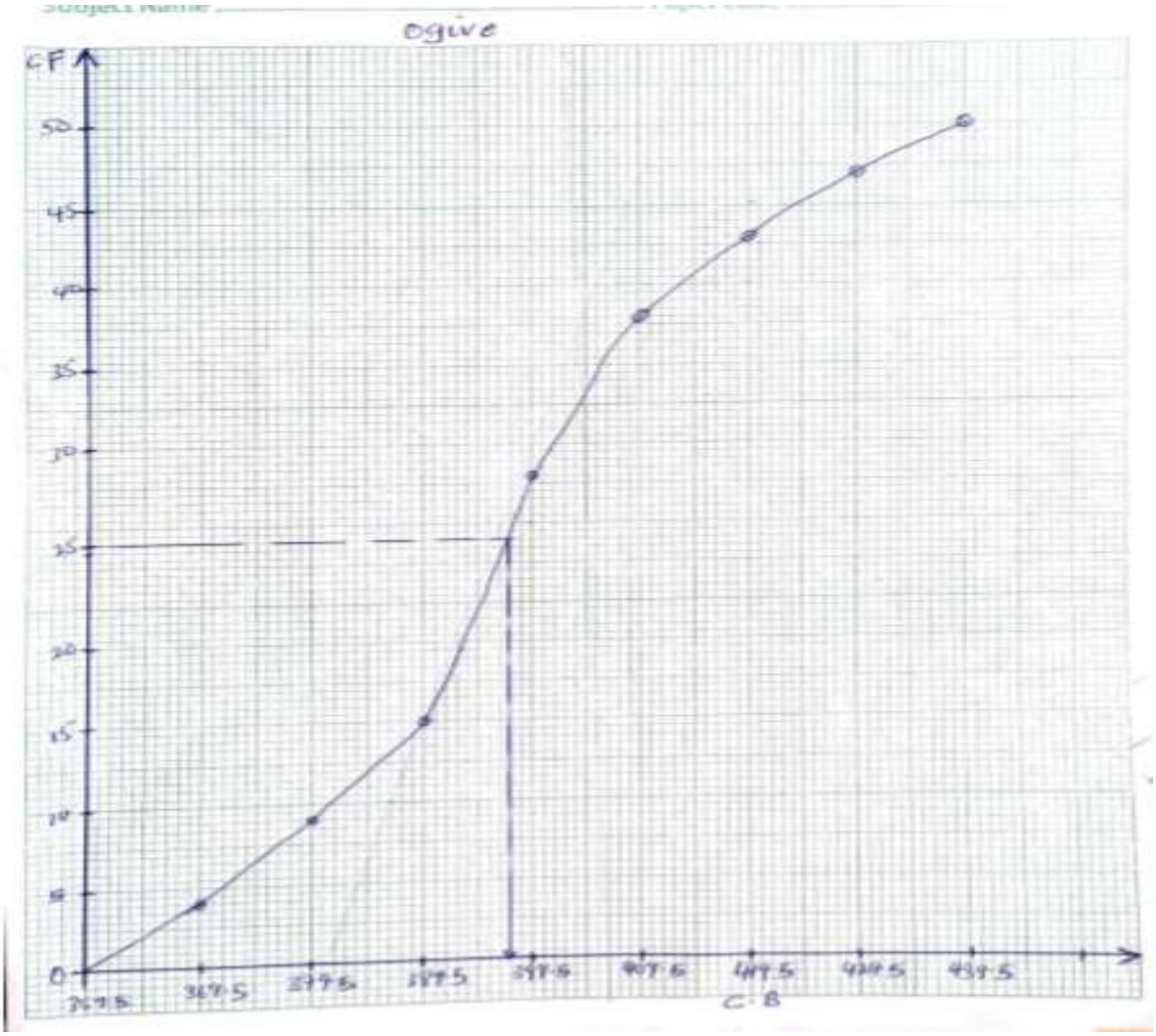
Average = $\frac{\sum fx}{\sum f} = \frac{19885}{50} = \mathbf{397.7}$

All batteries with battery life equal or less than **397.7** should be replaced.

(ii) they have life span less than or equal to the one specified by the director

b)

(i) Graph paper



From ogive, median = $(\frac{\sum f}{2})^{th}$ position

$= (\frac{50}{2})^{th}$ position = 25^{th} position = 389.5 + 8 = 397.5

(ii) the target battery lifespan for manufacturing, as recommended by the director $\geq \frac{99}{100} \times 397.5 = 393.525$

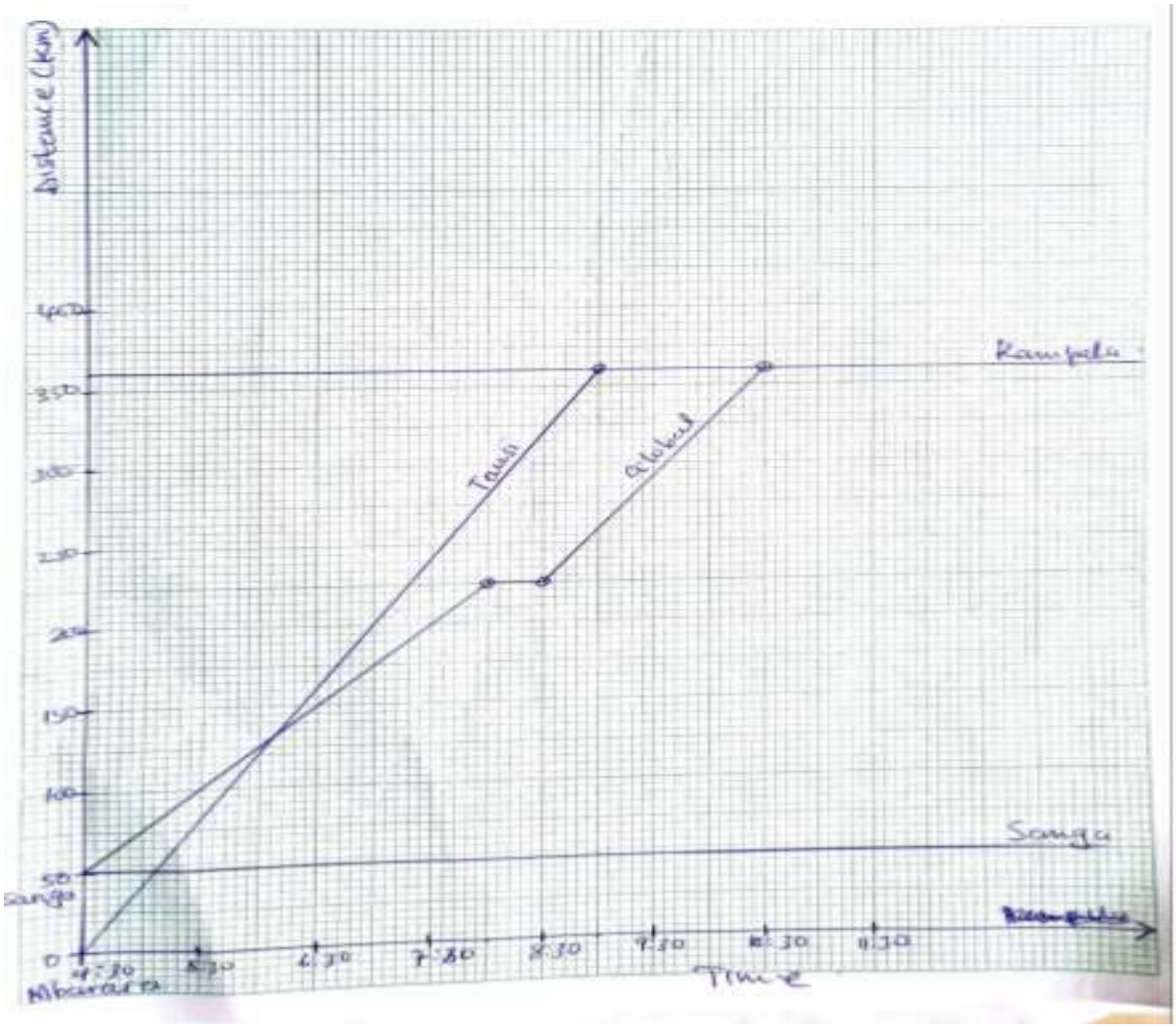
(iii) I don't advise the director to consider this value (393.525) since its less than the mean

c) Number batteries with life greater than or equal to the median = 25

Probability $\frac{25}{50} = 0.5$

ITEM 11

a) (i) Graph



(ii) Each school's transportation expenditure

$$Tausi: \quad 24{,}000 \times 360 \ = Shs.\, 8{,}640{,}000$$

$$Each\ school: \ \frac{8{,}640{,}000}{2} = \ Shs.\, 4{,}320{,}000$$

$$thus: \ \textbf{Fort Porto} \ \text{got} \ Shs.\, 4{,}320{,}000$$

And **Tororo** got $Shs.\, 4{,}320{,}000$

$$Global: \quad 28{,}000 \times 310 \ = Shs.\, 8{,}680{,}000$$

$$Each\ school: \ \frac{8{,}680{,}000}{2} = \ Shs.\, 4{,}340{,}000$$

$$thus: \ \textbf{Kogera} \ \text{got} \ Shs.\, 4{,}340{,}000$$

And **Nyakasura** got $Shs.\, 4{,}340{,}000$

(iii) Tausi bus arrived first

Time difference was 10:30 – 9:00 = 1 hour amd 30 minutes

b) $let\ A = \begin{pmatrix} 1 & 3 & 2 \\ 2 & 2 & 2 \\ 3 & 2 & 1 \\ 0 & 2 & 4 \end{pmatrix} \quad and \quad B = \begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 2 & 1 & 3 \\ 1 & 4 & 1 \end{pmatrix}\ represent the$

First-round and 2nd round performance

$for\ the\ two\ rounds\ ;\ A + B = \begin{pmatrix} 2 & 5 & 5 \\ 4 & 3 & 5 \\ 5 & 5 & 2 \\ 1 & 6 & 5 \end{pmatrix}$

$let\ C = \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix}\ represnt\ the\ possible\ points$

Determining the total number points by each team;

$\begin{pmatrix} 2 & 5 & 5 \\ 4 & 3 & 5 \\ 5 & 5 & 2 \\ 1 & 6 & 5 \end{pmatrix} \begin{pmatrix} 3 \\ 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 11 \\ 15 \\ 20 \\ 9 \end{pmatrix}$ Nyakasura was the winner and Kyogera last

the financial prizes awarded;

total number of points collected by all the teams = 11+15+20+9 = 85

Nyakasura: $\frac{20}{85} \times 24{,}000{,}000 = Shs\ 5{,}647{,}058.824$

Tororo: $\frac{15}{85} \times 24{,}000{,}000 = Shs\ 4{,}235{,}294.118$

Fortpoto: $\frac{11}{85} \times 24{,}000{,}000 = Shs\ 3{,}105{,}882.353$

Kyogera: $\frac{9}{85} \times 24{,}000{,}000 = Shs\ 2{,}541{,}176.471$

ITEM 12

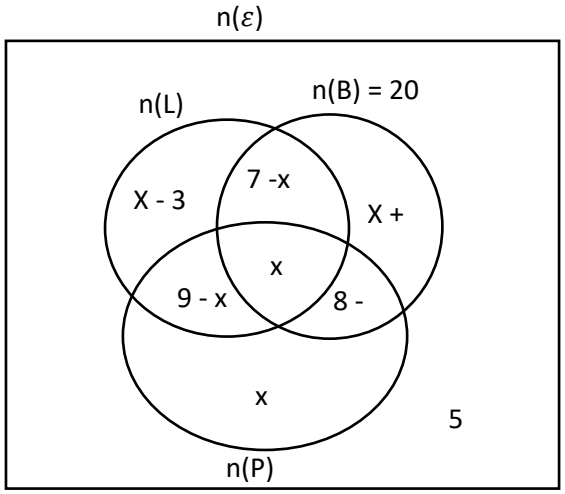
a) Determining class average for **E.T.1** this year;

Class	tally	f	X	fx
20 - 29	*IIII*	4	24.5	98
30 - 39	*IIIII II*	7	34.5	241.5
40 - 49	IIIII III	8	44.5	356
50 - 59	IIIII IIIII	10	54.5	545
60 - 69	IIIII III	8	64.5	516
70 - 79	IIII	4	74.5	298
80 - 89	IIIII	5	84.5	422.5
90 - 99	IIII	4	94.5	378
		50		2,855

Average = $\frac{\sum fx}{\sum f} = \frac{2855}{50} = 57.1\%$

They must add a **teacher and buy more books,** since the calculated current class average (57.1%) is less than the last year's average of 64%

b) (i)



$20 + x - 3 + 9 - x + x + 5 = 35$

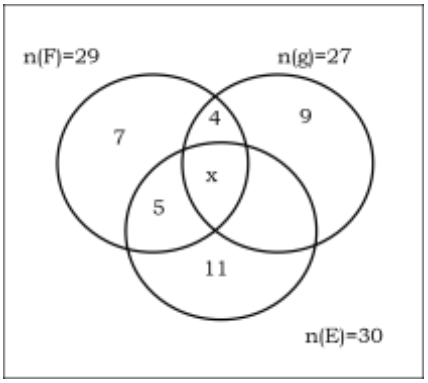
$31 + x = 35$

$\boldsymbol{x = 4}$

required number of text books to be bought = $4 \times 2 = 8$

ii) I recommend the purchase of the 8 text books and some text books from different authors to cater for those who do not read any.

ITEM 13



Those who can teach 3

x = 29 – (7+5+4)

= 29 – 16

= 13

Those who can teach Germany and English only

30 – (5 + 11+13)

30 – 29 = 1

a) Those who will be interviewed orally are

= 4+5+13+1 **= 23**

b) Total number of applicants

= 7+9+11+4+13+5+1 **= 50**

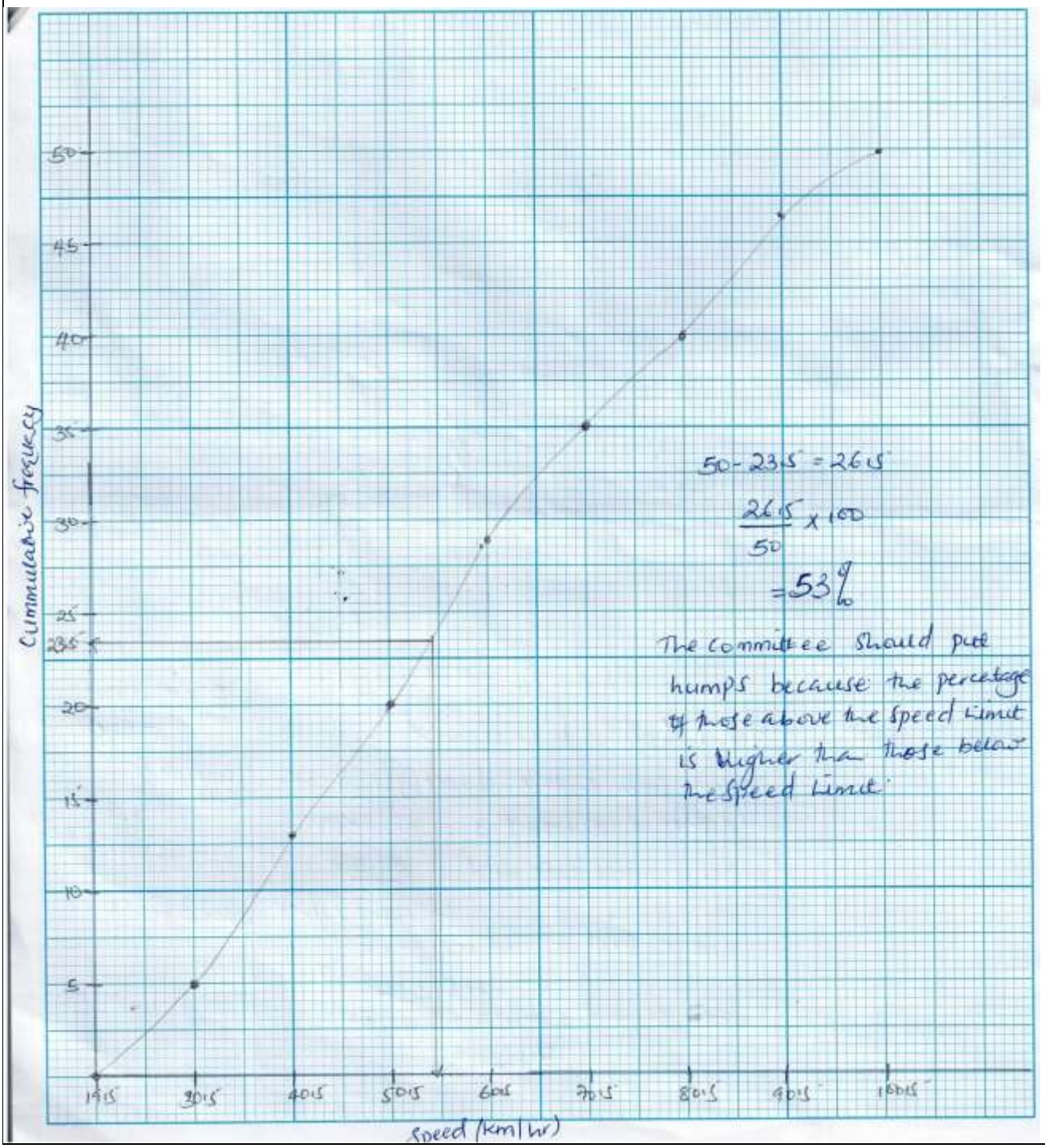
Probability $= \frac{\mathbf{13}}{\mathbf{50}}$

ITEM 14

Speed km/hr	Number of vehicles	Mid speed x	Class boundaries	cf	fx
20 – 30	5	25	19.5 – 30.5	5	125
30 – 40	8	35	30.5 – 40.5	13	280
40 – 50	7	45	40.5 – 50.5	20	315
50 -60	9	55	50.5 – 60.5	29	495
60 – 70	6	65	60.5 – 70.5	35	390

70 – 80	5	75	70.5 – 80.5	40	375
80 -90	4	85	80.5 – 90.5	44	340
90 - 100	6	95	90.5 -100.5	50	570
	Σf=50				**Σfx= 2890**

Average speed = $\frac{2890}{50}$ = 57.8 ≅ **58km/hr**



ITEM 15

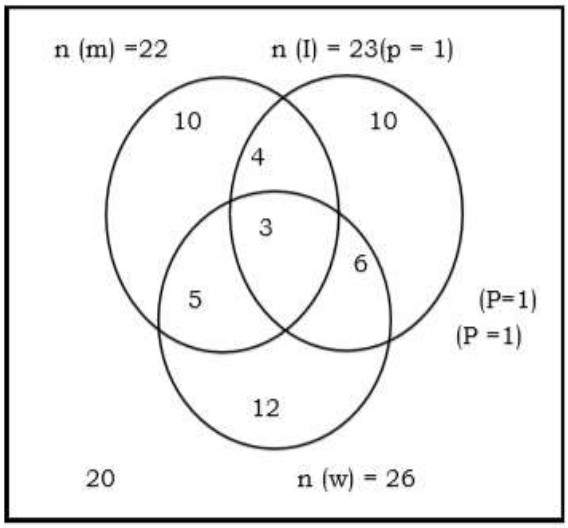
AVENN –DIAGRAM REPRESENTING THE DATA (p=1)

Let M = Teachers that attend on Monday

T = Teachers that attend on Tuesday (P =1)

W= Teachers that come on Wednesday

N= (Σ) 70 (p=1)



Teachers who attend on none of the days

70 – (10 +4 +10 +5+ 3+6+12) (A = 1)

70 -50

20 teachers.

P (some teachers will not attend 20/70 (A=1)

=0.3 (A= 1)

Conclusion: Yes the headteacher can hold a meeting on one of the days he has I mind because the probability that some teachers will not attend is < 0.5 (AP=2)

n(m) = 10 + 5 + 4 + 3 = 22

n(T)= 4 + 3+ 6 +10 = 23 (A =1)

n(w)= 5+3+6+12 = 26

The head teacher can hold the meeting on Wednesday because that is one that has the highest number of teachers. (AP=1)

MEANING OF LETTERS

P – Data presentation

A - Data Analysis

Ap - Application

ITEM 16

A FREQUENCY TABLE OF SUMMARISED DATA

Finish time (mins)	Number of people	c.f	Class boundaries
120 – 124	15	15	119.5 – 124.5
125 – 129	14	29	124.5 – 129.5
130 – 134	13	42	129.5 – 134.5
135 – 139	11	53	134.5 – 139.5
140 - 144	7	60	139.5 – 144.5
		(P=1)	(P=1)

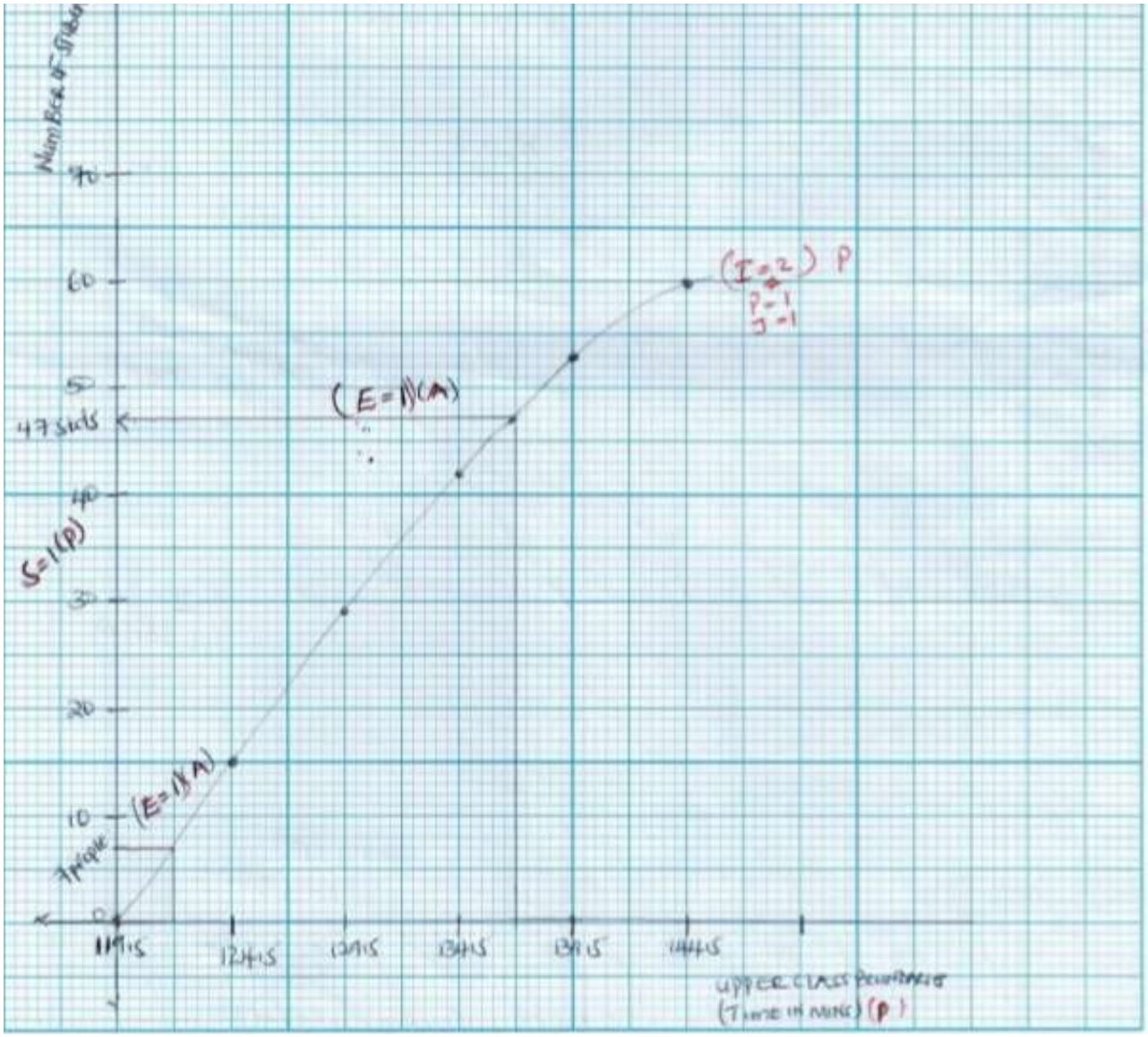
a (i)

47 people qualified for phase two (AP=1)

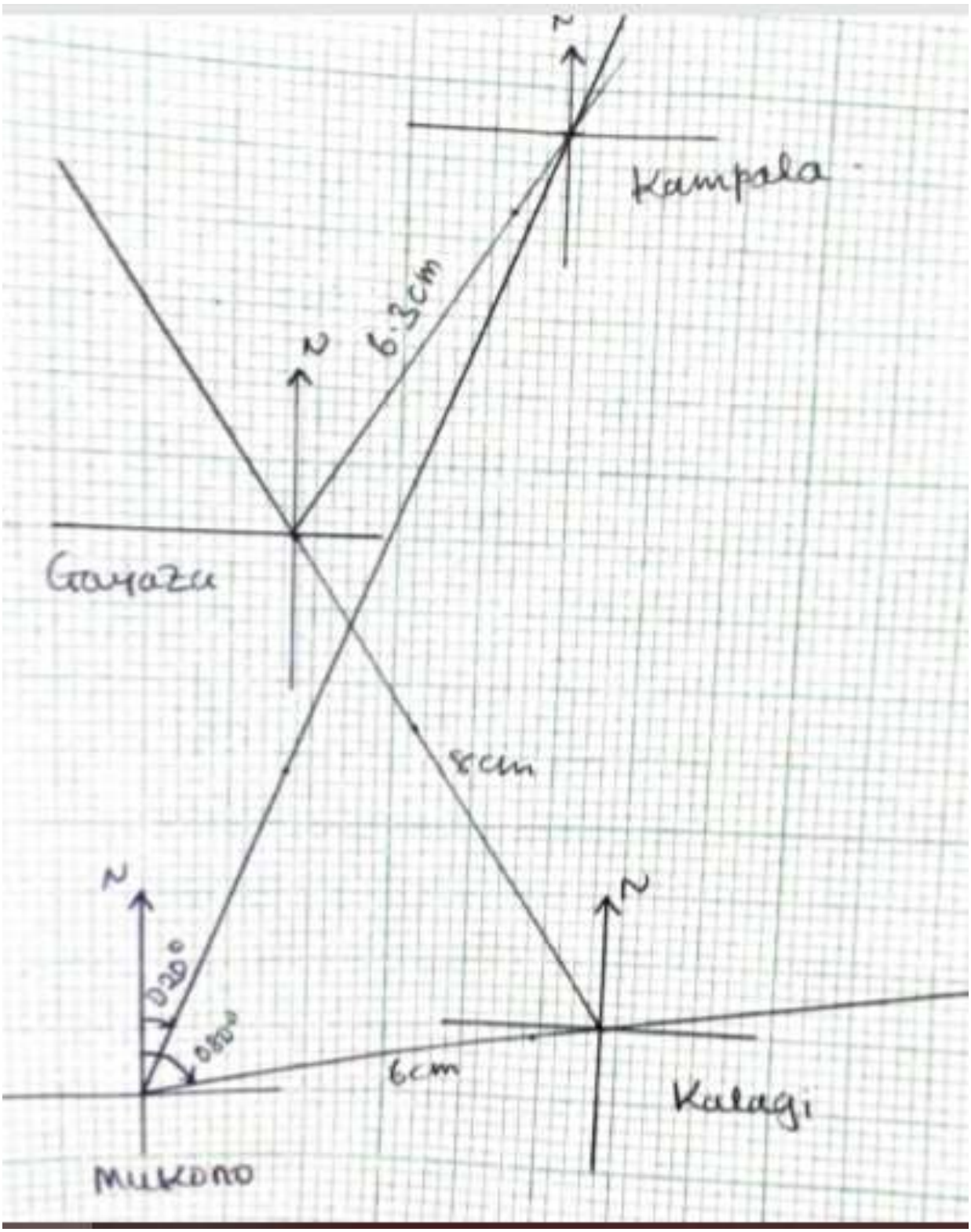
(ii) P (organization will get those who will participate) $= \frac{7}{47}$ (A=1)
(A=1)

$= 0.15$ (A=1)

(iii)Conclusion: it's very unlikely for the organization to get those who will participate from the group. (C=1) (Ap = 1)



ITEM 17

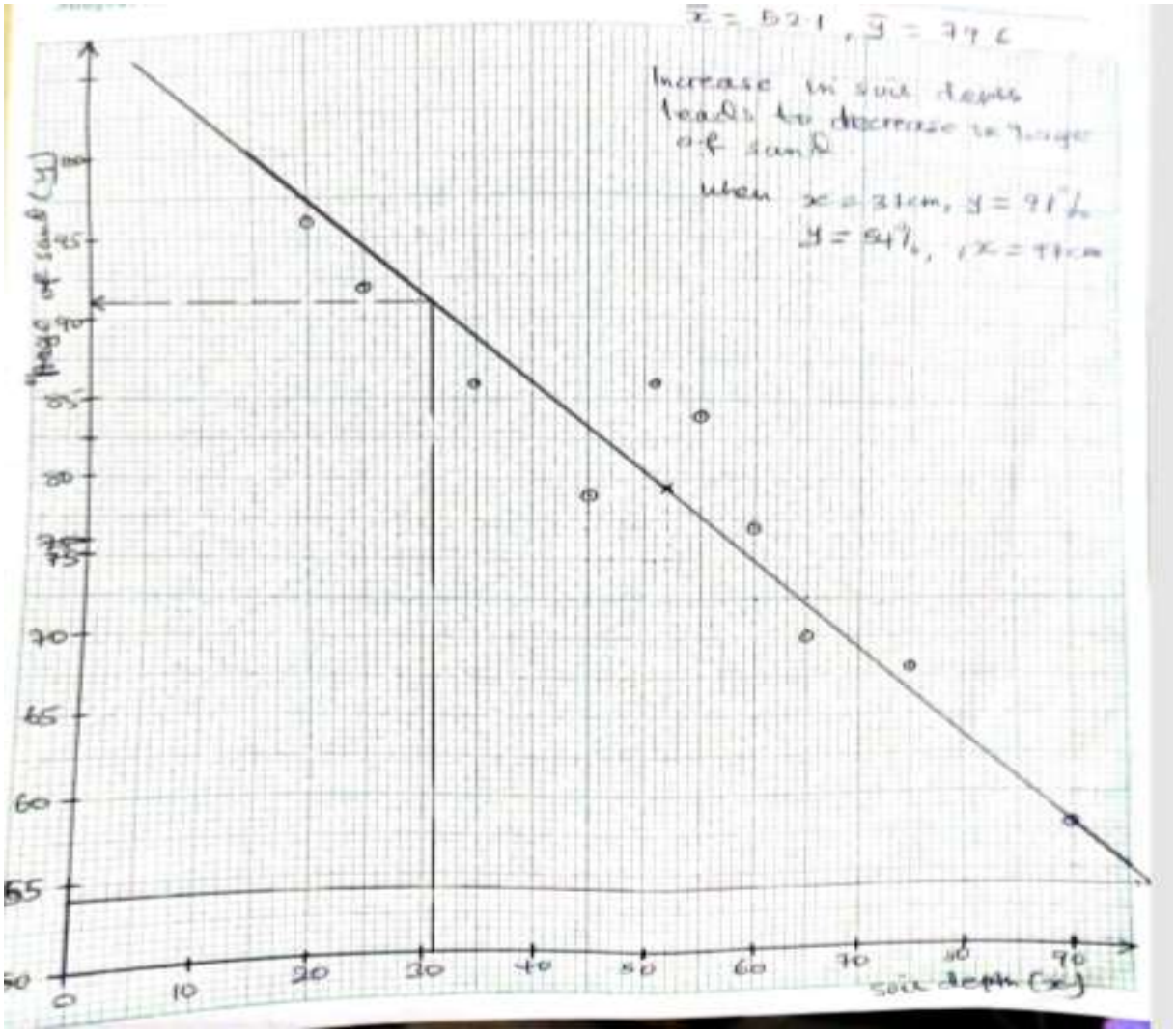


$\bar{x}$ 50.1 , $\bar{y}$ = 79.6

Increase in depths decreases the percentage of sand

When x = 31 cm, y = 91%

When y = 54%, x = 97 cm



c) Total distance = 6+ 8+ 6.3 = 20.3 cm = 20.3 x 5 = 101.5 km

Measuring tape = Shs. 10,000
Sampling tape = Shs. 20 x 5000 = Shs. 100,000
Fuel = Shs. 600x 101.5 = Shs. 60900

Total = Shs. 719, 000

SECTION B: PART II

ITEM 18

a) Number of slices that can be loaded into each container:

First, calculate the volume of a single slice:

Volume of a slice = (Area of the slice) x (Thickness of the chapatti)

Area of the slice = (Area of the chapatti) / 6

Area of the chapatti = π x (Diameter/2)^2 = (22/7) x (14/2)^2

= **approximately 153.86 cm^2**

Area of the slice = 153.86 cm^2 / 6 = approximately 25.64 cm^2

Volume of a slice = 25.64 cm^2 x 6 cm = approximately 153.84 cm^3

Container capacity = 14,784 cm^3

Number of slices per container = Container capacity / Volume of a slice

= 14,784 cm^3 / 153.84 cm^3
= **approximately 96 slices**

(ii) Number of containers needed to pack the entire batch of slices:

Total number of slices sold = 2,000 chapattis x 6 slices per chapatti

= 12,000 slices

Number of containers needed = Total number of slices / Number of slices per container

= 12,000 slices / 96 slices per container

= **approximately 125 containers**

b) (i) Amount generated from the fundrising

$each\ slice\ is\ sold\ at:\ \ Shs\ 400$

$12000\ slices\ are\ sold\ at:\ \ 400 \times 12000 = Shs.\ 4{,}800{,}000$

(ii) calculating the expenses

$$\boldsymbol{Cost\ price}\ of\ making\ each\ slice\ = Shs.\ 140$$

$$12000\ slices\ cost: \qquad 140\ \times 12000 = Shs\ 1{,}680{,}000$$

Buying price of containers
Considering a discount of 10%

Buying Price $\frac{90}{100} \times 1000 \times 125 = Shs.112{,}500$

Total expenses : $112{,}500 + 1{,}680{,}000 = Shs.1{,}792{,}500$

Profit = Total revenue - Total cost
= UGX 4,800,000 - UGX 1,792,500
= UGX 3,007,500

Recommendation:
The club made a significant profit of UGX 3,007,500 Considering the success of the event and the profit margin, it is recommended that the club continue this business venture in the future

ITEM 19

a) (i) Graph

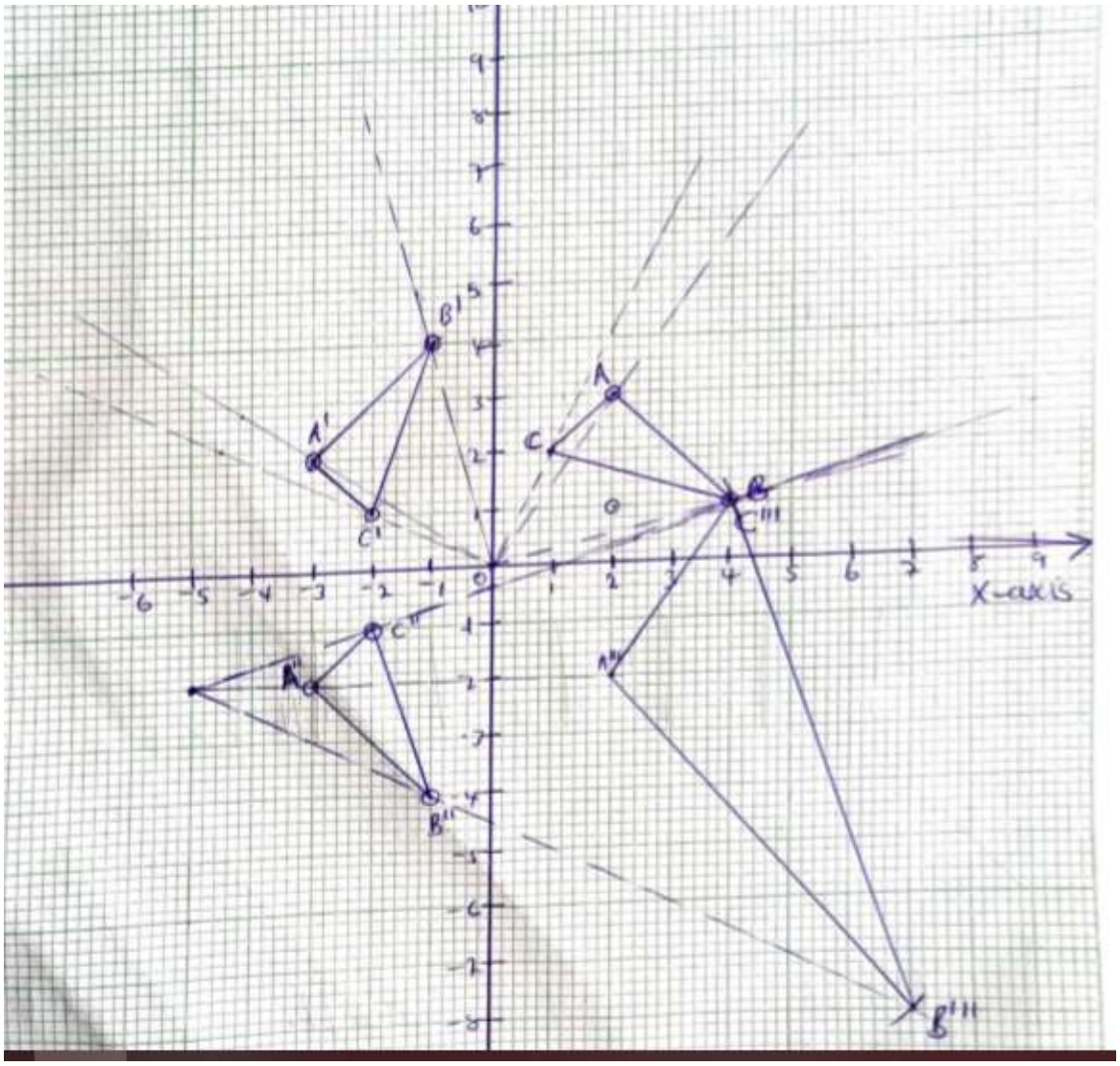
(ii) Original triangle: A(2, 3), B(4, 1), C(1, 2)

Rotate 90 degrees counterclockwise: A(-3, 2), B(-1, 4), C(-2, 1)

Mirror across the horizontal axis: A(-3, -2), B(-1, -4), C(-2, -1)

4.Scale up by a factor of 3 about the (-5, -2) ; new coordinates ae:

A(2, -2), B(7, -8), C(4, 1)



b)

Enlarged triangle area $= \frac{1}{2} ac \sin B = \frac{1}{2} \times 7.8 \times 9.5 \times \sin 21°$ = 13.2775 square units

Red area = (3/8) × 13.2775 = 4.9791 square centimeters

White area = (5/8) × 13.2775 = 8.2984 square units

Red paint cost = 4.9791sq units × UGX 20,000/sq unit = **UGX 99,582**

White paint cost = 8.2984 sq unit × UGX 15,000/sq unit = **UGX 124, 476**

Total paint cost = UGX 99,582+ UGX 124, 476 = **UGX 224,058**

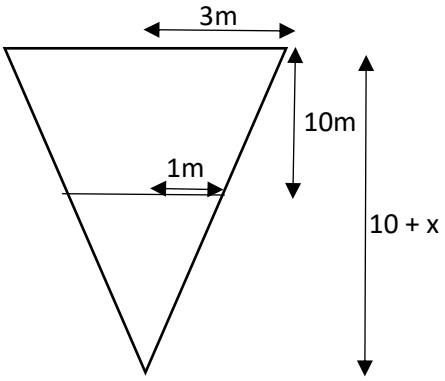
This exceeds the bank's budget limit of UGX 205,000 per logo.

Recommendation:

Based on the calculations, the bank should adjust their allocation for logo painting expenses. The current budget limit is insufficient to cover the total paint cost. Consider increasing the budget or exploring cost-effective alternatives to stay within the allocated amount.

ITEM 20

a) Volume of a tank = π × Radius² × Height
= π × (4 m)² × 15 m
= (22/7) × (4 m)² × 15 m
= 754.2857 m^3



$$V_{Small} = \frac{1}{3} \times \frac{22}{7} \times 1^2 \times 5$$

$$V_{Small} = 5.2381 m^3$$

$$Volume\ of\ bucket = V_B - V_{Small} =$$

$$= \mathbf{136.1905 m^3}$$

$$mber\ of\ required\ buckets\ to\ fill$$

$$one\ tank = \frac{\text{Volume of a tank}}{volume\ of\ a\ bucket}$$

$$= (754.2857\ m^3)/(\ 136.1905 m^3)$$

$$= \mathbf{5.5384\ buckets}$$

$$100\ tanks\ require = 5.5384 \times 100$$

$$= 553.85\ buckets$$

$$= \mathbf{554\ buckets}$$

b) cost of a metallic bucket = UGX. 8000

554 Buckets will cost = 8000× 554

$$= \mathbf{UGX\ 4,432,000}$$

$$\frac{3}{1} = \frac{(10 + x)}{x}$$

$$3x = 10 + x$$

$$x = 5\ m$$

$$Volume\ of\ the\ cone\ from\ which\ the$$

$$bucket\ is\ part = \frac{1}{3}\pi r^2 h$$

$$V_B = \frac{1}{3} \times \frac{22}{7} \times 3^2 \times 15$$

$$V_B = 141.4286\ m^3$$

c) $1\ tank = 754.2857\ m^3$

$= 754.2857\ m^3 \times 1000$

$= 754{,}285.7\ litres$

Since the deal requires 100 tanks

$100\ tanks = 754{,}285.7 \times 100$

$= 75{,}428{,}570$ liters of fertilizer

1 litre = UGX 3600

75,428,570 liters of fertilizer =

$(75{,}428{,}570 \times 3600)$

$= UGX\ 271{,}542{,}852{,}000$

$Profit = total\ revenue - expenses$

$Profit = 271{,}542{,}852{,}000 - 4{,}432{,}000$

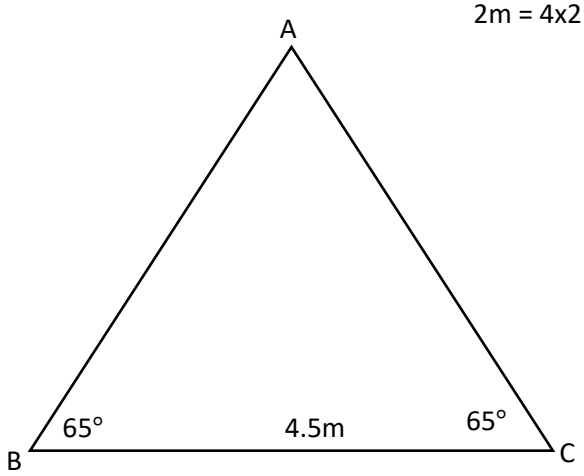
It is a profitable business

ITEM 21

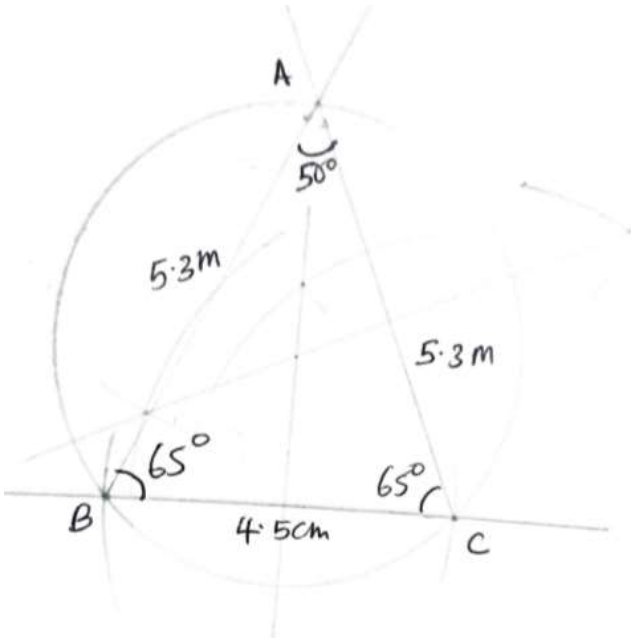
Sketch.

Let 1 metre ≡ 4 cm

2m = 4x2 = 8cm



ACCURATE DIAGRAM



b) 1 table costs $= \frac{95}{100} \times 300{,}000$

= Shs 285,000

3 tables cost = Shs 285000 × 4

= Shs. 1,140,000

c) From 7 : 30 am to 4: 00 pm = 8 hours 30 minutes

Less 30 minutes for lunch break = $8\frac{1}{2} - \frac{1}{2} = 8$ *working hours in a day*

On Monday 1 table can be made (= 5 hours) with another table (3 hours)

On Tuesday 2nd table will be completed at 9: 30 am (with the addition of 2 hrs)

On Tuesday 3rd table is to be completed at 9: 30 am + 5 : 30 =3:00 pm

On Wednesday 4th table is to be completed at **11: 30 am**

d) Minimum radius = 2.9 cm = 2.9 m

ITEM 22

a) (i)

Income (shs) per annum	taxable income	Tax rate (%)	income tax
1st Shs 80,000	1st 80,000	7.5	$\frac{7.5}{100} \times 80{,}000 = Shs\ 6{,}000$
Next Shs 80,000 (80,001 - 160,000)	Next 80,000	12.5	$\frac{12.5}{100} \times 80{,}000 = Shs\ 10{,}000$
160,001 - 240,000	Next 80,000	20	$\frac{20}{100} \times 80{,}000 = Shs\ 16{,}000$
240,001 - 320,000	Next 80,000	30	$\frac{30}{100} \times 80{,}000 = Shs\ 24{,}000$
320,001 - 400,000	Next 80,000	36.5	$\frac{36.5}{100} \times 80{,}000 = Shs\ 29{,}000$
400,001 - 480,000	(x - 400,000)	45	$\frac{7.5}{100} \times (x - 400{,}000) =$ $\boldsymbol{Shs}$**15,120**

100,320 – (6000+10,000 +16,000 +24,000 +29,200) =100,320 – 85,200

= Shs. 15,120

$$\frac{7.5}{100} \times (x - 400{,}000) = Shs 15{,}120$$

$$x - 400{,}000 = 33{,}600$$

$$x = Shs. 433{,}600$$

Taxable income = Shs. 433,600

(ii) Tax-free income $= \frac{124}{100} \times 433{,}600$

$$= Shs. 537{,}664$$

Gross income = Taxable income + Tax-free income

= 433,600 + 537,664 = Shs. 971, 264

Housing $= 14{,}000 \times 12 = \text{Shs.}\ 168{,}000$
Marriage $= y$
Medical $= \text{Shs.}\ 50{,}700$
Transport $= 10{,}000 \times 12 = \text{Shs.}\ 120{,}000$
Insurance $= \text{Shs.}\ 68{,}900$

Family allowance; $3 \times 5400 + 1 \times 4{,}200 = Shs.\,20{,}400$

Tax free income = Shs 428,000 + y = Shs 537,664

y = Shs . 109,664

marriage allowance is Shs 109,664

(iii) Annual take-home pay = Gross income – income tax
= 971,264 – 100,320
= Shs 870,944

b) Amount James should set aside $= \frac{1}{2} \times 870{,}944 \times 10$

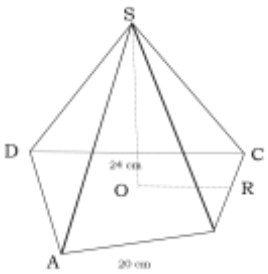
$= Shs\ 4{,}354{,}720$

$Area\ of\ plot\ of\ Land = 40 \times 22 = 880m^2$

$Cost\ of\ land = 4000 \times 880 = Shs\ 3{,}520{,}000$

Since the amount to be saved in the next 10 years exceeds the cost of the land, then he will be able to reach his set target.

ITEM 23



OR = $^1/_2$AB = 10cm

$SR^2 = 0S^2 + OR^2$

$SR^2 = 24^2 + 10^2$

= 676

SR = 26cm

Surface area of one slant side = $\frac{1}{2}$ base × height $= \frac{1}{2} \times 20 \times 26 = 260\ cm^2$

Total surface area of slant surfaces = 4x260 = 1040cm^2

Base area = L x W

= 20x20

= 400cm^2

Total surface area = 1040 + 400

= 1440cm^2

= 0.144m^2

Each pack will need 0.144m^2 of material.

b). Taxable income = Gross – Allowances

= 1,500,000 – (200,000 + 6,000x5x4) = 1,500,000 – 320,000 **= 1,180,000**

	Rate	Tax
0 – 235,000	0%	0
235,000 – 335,000	100,000 x 10%	10,000
335,000 – 410,000	75,000 x 10%	15,000
410,000 - 935,000	525,000 x 30%	157,000
	Total tax	182,500/=

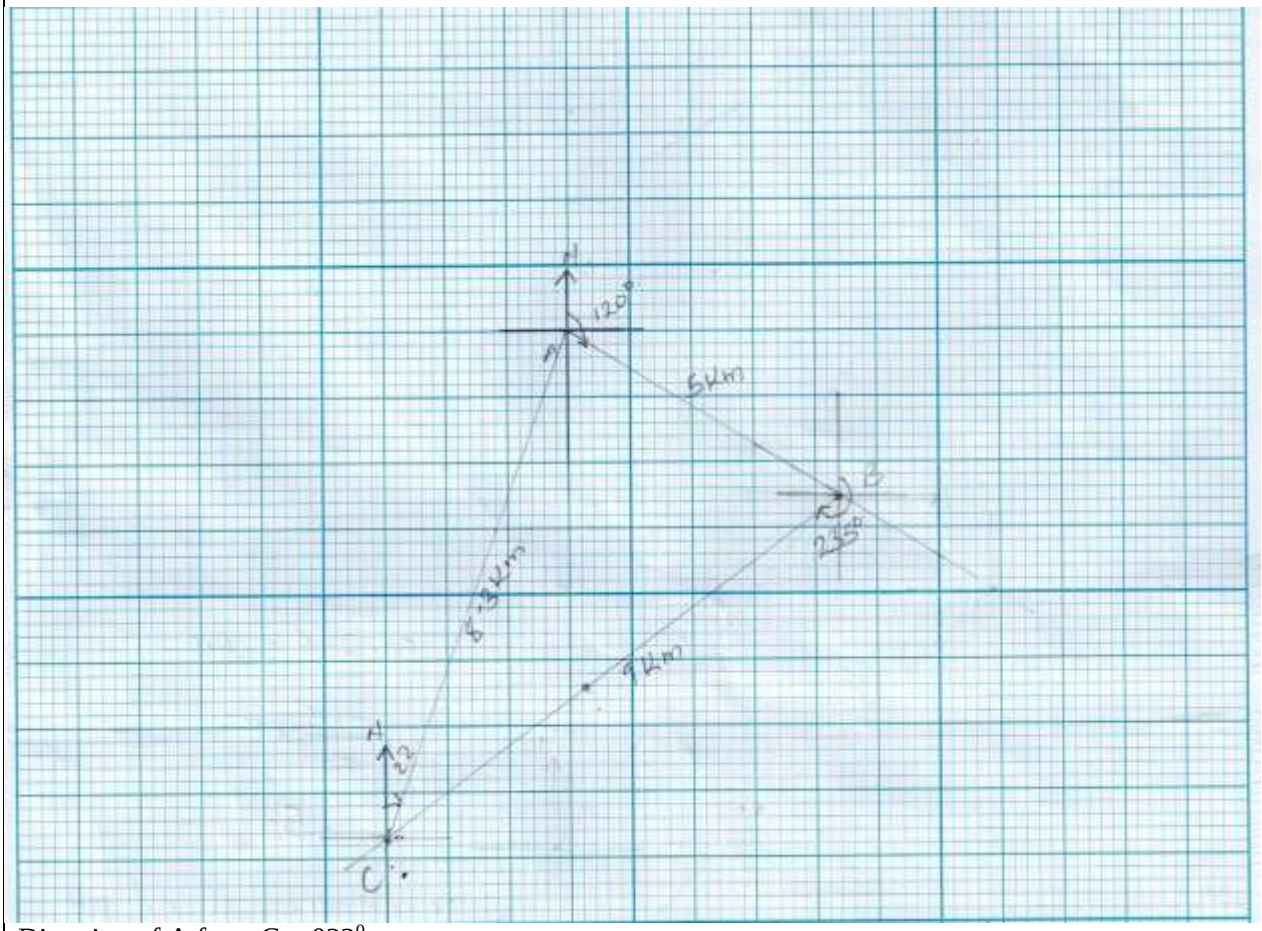
After tax 935,000 – 182,500 = 752,500

After upkeep 752,500 – 400,000

= 352,500

Yes she will be able to pay the insurance premium because the money remaining is more than the amount she wants to pay.

ITEM 24



Direction of A from C = 022^0

Total distance to be covered

Distance from C to A directly = 8.3km

Total distance = 5+9+8.3 = 22.3km

Number of litres to be used = 22.3 x 2

= 44.6litres

Cost of fuel = 44.6 x 5500

= 245,300

Total cost = 500,000 + 245,300

= 754,300

$= \frac{5}{100} \times 100{,}000 \qquad = 5000$

Total cost of fuel = 245,300 – (5000 x 2)
= ugx235,300

He will save ugx10,000 on fuel

ITEM 25

a (i) Amount = $P\left[1 + \frac{r}{100}\right]^t$ (A- 1)

= $5{,}000{,}000\left[1 + \frac{20}{100}\right]^3$ (A- 1)

= Ugx 8,640,000 (m = 1)

a (ii) Amount = Ugx 14,000,000

Customer is to pay = (100 – 10) % x 14,000,000 (A = 1)
= 12,600,000 Ugx (m = 1)

Broker's commission = $\frac{5 \times 12{,}600{,}000}{100}$ (A = 1)
= Ugx 630,000 (m = 1)

Total expenses = Broker's commission + LC 1 Amount
= 630,000 + 350,000 (A = 1)
= Ugx 980,000 (m = 1)

Amount he will remain with = amount customer is to pay – total expenses
= 12,600,000 – 980,000 (A = 1)
= 11,620,000 (A = 1)

Conclusion: yes he will be able to pay the loan amount if he sells the land because the amount he is to get is greater than the lower amount. Ap=2

(b) Time now = 16 : 45 (A = 1)
- 12 : 00
4 : 45pm (m = 1)

Time he has = 4: 60 (A = 1)
- 4: 45
15minutes (m = 1)

Distance = $\begin{pmatrix}12\\8\end{pmatrix} - \begin{pmatrix}4\\2\end{pmatrix} = \begin{pmatrix}8\\6\end{pmatrix}$ (A = 1)

= $\sqrt{8^2 + 6^2}$ (A = 1)
= 10km (m = 1)

Time = $\frac{\text{Distance}}{\text{Speed}}$ (A=1) = $\frac{10 \text{ hours}}{50}$ (A=1)
= (0.2 x 60) minutes (A=1)
= 12 minutes (m=1)

Conclusion: Yes because the time he can use to reach school is less than the time he has. (Ap=2)

ITEM 26

a (i) capacity (volume) = $2744cm^2$

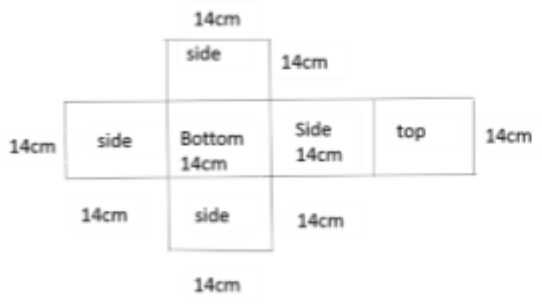
Volume = S x S x S (since it is to be made of squares) (A=1)

$S^3 = 2744$(m=1)

$\sqrt[3]{S^3}$. $\sqrt[3]{2744}$ (M = 1)

S = 14cm (m = 1)

S fetch he will follow to arrange all the faces such that the box folds and closes.



(A = 1)

(Ap = 1)

(b) Income tax: $\frac{0}{100}$ x 100,000 = Ugx 0 (A = 1)

$\frac{5}{100}$ x 100,000 = Ugx 5,000

$\frac{10}{100}$ x 100,000 = Ugx 10,000

Ugx 15,000 (m = 1)

His new salary will be: 300,000 – 15,000 (A = 1)

Ugx 285,000 (m = 1)

(c) 20m/s ⟶ km/hr (A= 1)

$\frac{20}{100} \times \frac{3600}{1}$ = 72km/hr (m = 1)

45mins ⟶ Hours

$\frac{45}{60}$ hours (A = 1)

= 0.75hours (m = 1)

D = S x T =72 x 0.75 (A = 1) = 54km (m = 1)
1km = 0.035litres
54km = 54 x 0.035 (A = 1)
= 1.89 litres (M = 1)

1 litre = UGX 5,000
1.89litres = 1.89 x 5,000 (A=1)
= UGX 9,450 (m = 1)

He will ask for Ugx 9,450 from the customer (Ap = 1)
A = Analysis
M = Manipulation
Ap = Application

END