GRADED TOPICAL APPROACH

TO

"O" LEVEL MATHEMATICS

A competence based curriculum

Revision items with solutions

S.1 – S.4

With current updates

$$c^2 = \sqrt{a^2 + b^2}$$

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SOME SAMPLE ITEMS IN THIS BOOK

SECTION A: (40 SCORES)

Answer **all** *items in this section.*

Item.1 ***(20 scores)***

Denis wants to start a cake project but he has no idea about this project. He wants to make many cakes and realise a profit. He decided to visit a friend with an idea about the project who guided him as follows:

- The cost of Oven, marketing and other expenses is shs 60,000.
- The total cost of all expenses on each cake made is shs 500 plus the number of cakes made.

He realizes that he has to ride 4km east from home and then 3km south at an average speed of $10kmh^{-1}$ to reach the market, however, the friend informed him that there was a direct route that connects Denis's home to the market. The customers in the market always need these cakes at 8:00 AM.

Task;

(a) Help Denis to find the number of cakes he should make and the amount he should sell each cake so that he does not make a loss.

(b) What distance does he have to cover by the direct route?

(c) Basing on calculations, advise Denis on the time he should set off from home in order to reach the market on time.

Item.2 **(*20 scores*)**

Twakowa tukole self– help group of civil servants has a membership of ten people. Altogether they save £ 400 per month. The group lends to the members basing on their net monthly income after the income tax deductions.
Income tax is deducted according to the schedule in the table below:

INCOME (SHS)	RATE (%)
000000 – 235000	0
235001 – 335000	10
335001 – 410000	20
Above 410000	30

An application for a loan from Akello who earns a gross income of Shs 850,000 has been approved for processing. If Twakowa tukole self–help group lends 5 times the net income of a worker which is recovered in;

Either;

12 equal monthly installments at an interest rate of 5% per annum compounded for years.

Or;

Making a deposit followed by 5 equal monthly installments of Shs 524032.5 per month.

Task;

(a) Establish Akello's net income, hence determine the amount to be approved for processing.

(b) How much money does one who pays by the;

(i) First option pay per installment?

(ii) Second option pay as deposit?

(c) Giving a reason for your answer, which option of loan repayment do you advise Akello to opt for?

SECTION: B (40 SCORES)

This section consists of **two** *parts;* **I** *and* **II**.

Part I

Answer **one** *item from each part.*

Item.3 **(*20 scores*)**

A school head teacher is thinking of how he can boost the mathematics department of your school. He can either add another teacher or buy more books or both. He has decided that he will do both if the average performance for this year's performance for the 40 students is lower than that of the previous which was **47**. He asked the department to give a test and these were the student's marks.

50	71	40	48	61	70	30	62
44	63	60	51	55	25	32	65
54	45	65	50	45	40	25	45
48	45	30	38	30	28	24	48
30	48	28	35	50	48	50	60

He also visited the library and found out that the previous candidates used three books for their revision. Longhorn, Baroque or Math Clinic. From the librarian's records it is clear that all the candidates that did not use any book failed the subject greatly.
Out of the **35** candidates this year **13** used Longhorn, **20** used Baroque and **17** used Math Clinic. **9** used Longhorn and Math Clinic, **3** used Longhorn and Baroque while **8** used Baroque and Math Clinic only. The records show that **2** used all the three books.
He observed that he should replace one book type of the three with Fountain publisher since no student read it only alone.

Task:

(a) (i) Help the head teacher group the marks to make an informed decision on the fate of the department and defend it.

(ii) Display the students' marks in groups on a simple statistics diagram.

(b) (i) Help the head teacher identify the book he should replace and explain why?

(ii) Find the probability that a student selected from the class failed.

Item.4 **(*20 scores*)**

Three schools from a Gayaza region want to participate in the National Schools Football Sports Gala to be held in Lyantonde district playground. Unfortunately, none of the schools has a school bus and they want to hire a bus for the one day for the activity. The bus charges Shs 25,000 per km moved. The three schools through there Sports master agreed to share the cost of the bus equally amongst themselves. One that day they hired a bus from your school in Gayaza and they set off at **4**: **30*am*** and increased the speed gradually to **90*km*/*hr*** reaching Mpigi at **6**: **45*am***. From there the bus driver maintained this same speed for **2¼** hours reaching Masaka.
From Masaka the he reduced slowly in speed reaching Lyantonde at **9**: **30*am***.
The games started at **10**: **00*am*** sharp and each team played six games.
School A won **3** games, drew **2** and lost **1** game. School B won **4** games and lost **2** games. School C won **2** games and drew **4** games. The organizers award three points for a win, one point for a draw and no point for a loss. They declared these schools the first three schools in order of their points they obtained from the games. They were to receive the prize money of sixteen millions five hundred thousand shillings.

Task:

(a) Find how much each school paid for the bus.
(b) Decide the cash prize for each school.

Part II;

Answer **one** *item from each part.*

Item.5 **(*20 scores*)**

Traffic Jam is a major problem along the roads leading to Kampala city centre, especially during the rash early morning hours of the day. A private hospital in the city centre has only two of the key workers in their emergency unit staying within the hospital facility.
Four stay at Mukono while another two stay at Gayaza and have to beat the traffic jam to get to work early every morning.
A chance that one is delayed due to the jam along Gayaza or Mukono road is 0.25.
The supervisor of the emergency unit is to recommend to management, a change of the accommodation policy for the emergency unit staff, if less than four of those who stay outside the facility arrive early any morning.

Task:

(a) What is the chance of a worker arriving early any morning?
(b) Help the emergency unit supervisor to make a recommendation to the management of the hospital.

Item.6 **(*20 scores*)**

You are experiencing water shortages in your area. The area Member of Parliament has been approached by the local council for help.

Below are two similar tanks the Government has decided to give to each village through the office of the member of parliament and 72 villages are to benefit from the Government program.

The smaller tank has a capacity of 20000 litres and costs shs 100,000. It is also observed that the cost is directly proportional to the capacity and the dimensions are doubled.

Task;

(a) Determine the capacity of the bigger tank.

(b) Help the area member of parliament to estimate the cost of this project.

END.

ANSWERS TO SAMPLE ITEMS

Item.1

(a) Let x = number of cakes made.

Cost per cake = 500 + number of cakes.

$500 + x$

Thus, $x(500 + x) = 60000$.

$x^2 + 500x - 60000 = 0$.

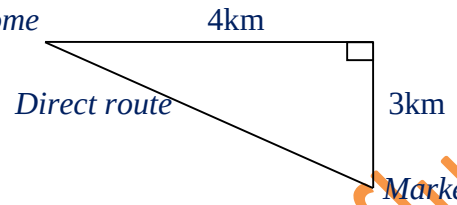
$x = 100$

or $x = -600$.(Disregard).

Take $x = 100$ cakes.

Denis should sell each cake **at least** Shs 500 + 100 = Shs 600.

(b)



Distance by direct route $= \sqrt{4^2 + 3^2}$

$= \sqrt{16 + 9}$

$= 5$km

Time taken $= \frac{distance}{speed}$

$= \frac{5}{10} \times 60$

$= 30$ minutes.

Set off time = 8:00 – 30 minutes

= **7:30AM**.

Item.2

(a) Net income = Shs 693000, Amount aproovd for processing = Shs 3465000

(b) (i) (Amount per installment = Shs 318346.875)

(ii) (Deposit = Shs 1200000)

(c) First option;

Reason: Amount per installment is easily affordable by a member of the group.

Second option:

Reason: It takes a shorter period to pay back the loan (5months).

Item 3. (a) (i)

C.I	Tallies	f	x	fx	C.B
20 – 24	*I*	1	22	22	19.5 –24.5
25 – 29	*IIII*	4	27	108	24.5 – 29.5
30 – 34	~~*HH*~~	5	32	160	29.5 – 34.5
35 – 39	*II*	2	37	74	34.5 – 39.5
40 – 44	*III*	3	42	126	39.5 – 44.5
45 – 49	~~*HH*~~ *IIII*	9	47	423	44.4 – 49.5
50 – 54	~~*HH*~~ *I*	6	52	312	49.5 –54.5
55 – 59	*I*	1	57	57	54.5 – 59.5
60 –64	~~*HH*~~	5	62	310	59.5 – 64.5
65 – 69	*II*	2	67	134	64.5 – 69.5
70 –74	*II*	2	72	144	69.5 – 74.5
		$\Sigma f = 40$		**$\Sigma fx = 1870$**	

Average performance $= \frac{\Sigma fx}{\Sigma f}$

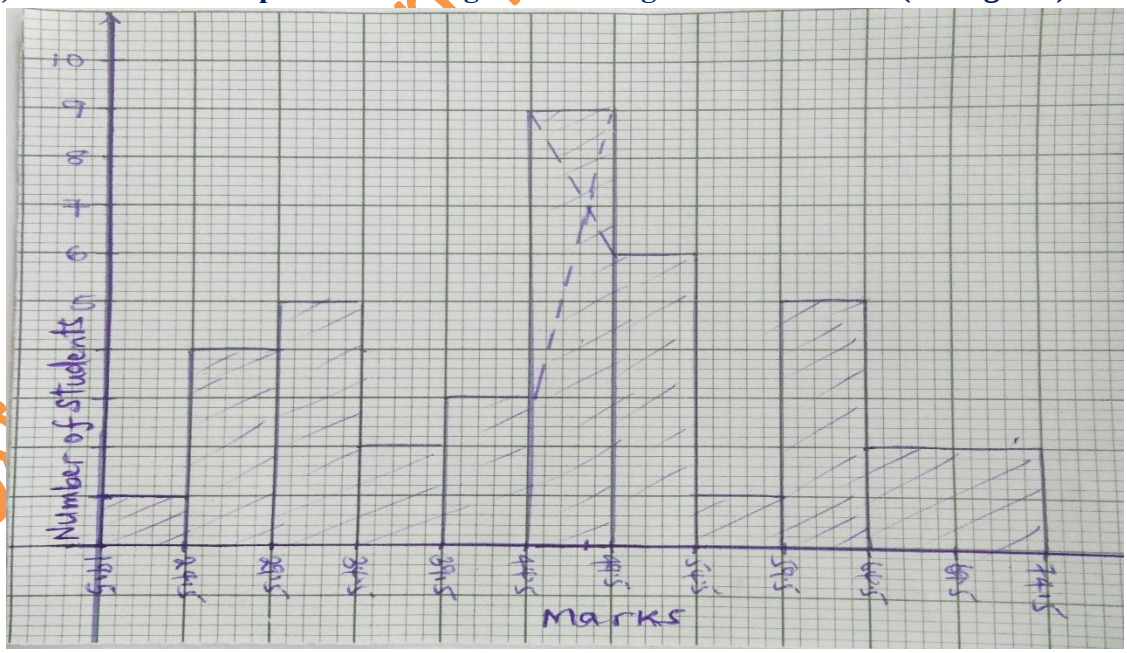
$= \frac{1870}{40}$

= 46.75

Since this years' average performance (46.75) is lower than that of last year (47), the head teacher needs to add another teacher and also buy more books.

Note: *This question requires a lot of care. The candidate's response may vary basing on the class* ***interval used****.*

(ii) **A simple statistic diagram showing students' marks. (Histogram)**



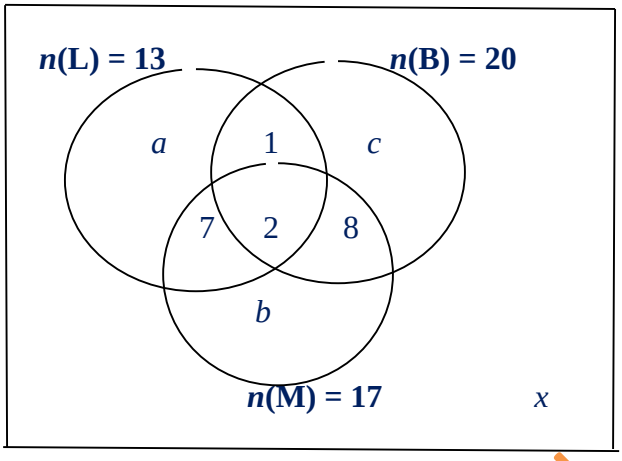
Note: *In 3(a)(ii) above, a student may either draw* ***a histogram*** *or* ***an Ogive.***

(b) (i) $n(\Sigma) = 35$, $n(L) = 13$, $n(B) = 20$, $n(M) = 17$.

n(LnM) = 9, n(LnB) = 3, n(BnMn L') = 8. n(LnBnM) = 2.

Let n(LnBnM) = x.

n(Σ) =35.



a = 13– (7+2+1)

a = 3.

b = 17 – (7+2+8)

= 0.

c = 20 – (2+8+1)

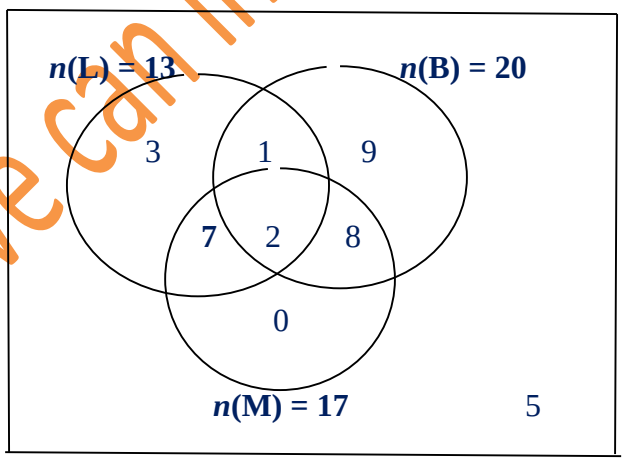
c = 9.

x = 35 – (13+0+8+9)

x = 5.

A neat Venn – diagram

n(Σ) =35.



The head teacher should replace Math clinic with Fountain publisher.

Because no student read it only alone. i.e n(MnL'nB') = 0.

(b) (ii) 5 students failed.

$$P(fail) = \frac{Number\ of\ failures}{Total\ number\ of\ sudents}$$

$$P(fail) = \frac{5}{35}$$

$$= \frac{1}{7}$$

Item 4.

(b) Performance matrix $= \begin{bmatrix} 3 & 2 & 1 \\ 4 & 0 & 2 \\ 2 & 4 & 0 \end{bmatrix}$

3 x 3.

Award matrix $= \begin{bmatrix} 3 \\ 1 \\ 0 \end{bmatrix}$

3 x 1.

$$\text{Overall performance} = \begin{bmatrix} 3 & 2 & 1 \\ 4 & 0 & 2 \\ 2 & 4 & 0 \end{bmatrix} \begin{bmatrix} 3 \\ 1 \\ 0 \end{bmatrix}$$

$$= \begin{bmatrix} 9+2+0 \\ 12+0+0 \\ 6+4+0 \end{bmatrix}$$

$$= \begin{bmatrix} 11 \\ 12 \\ 10 \end{bmatrix}$$

Teams *A*, *B* and *C* obtained 11 points, 12 points and 10 points respectively.
Team ***B*** won the Gala.
Total points = 11+12+10
= 33.

Team *A* received $\frac{11}{33}$ x 16500000 = **Shs 5500000**.

Team *B* received $\frac{12}{33}$ x 16500000 = **Shs 6000000**.

Team *C* received $\frac{10}{33}$ x 16500000 = **Shs 5000000**.

Note: *Accept any other method that leads to similar results.*

Item.5

(a) Let M = a worker stays at Mukono

G = a worker stays at Gayaza.

B = a worker beats the traffic jam.

D = a worker is delayed by the traffic jam.

$P(M) = \frac{4}{6} = \frac{2}{3}$

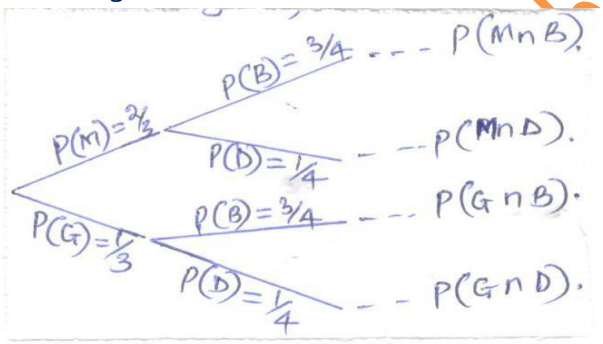
$P(G) = \frac{2}{6} = \frac{1}{4}$

$P(D) = 0.25 = \frac{1}{4}$

$P(B) + P(D) = 1.$

$P(B) = 1 - 0.25 = 0.75 = \frac{3}{4}$

A tree diagram;



If E represents a worker arriving early any morning:

Then; $P(E) = P(MnB) + P(G \cap B)$.

$= \left(\frac{2}{3} \times \frac{3}{4}\right) + \left(\frac{1}{3} \times \frac{3}{4}\right)$

$P(E) = ¾.$

(b) Let the number of people who came early morning be y,

$$\frac{y}{6} = \frac{3}{4}$$

$$4y = 18$$

$$y = \mathbf{4.5}$$

Since **4** *people are able to arrive early morning in any day, there is no need to change the accommodation policy for the emergency unit.*

Item.6

(a) L.S.F $= \frac{1}{2}$, (Because the dimensions are in the ratio 1:2)

$$\text{V.S.F} = \left[\frac{1}{2}\right]^3$$

Let the capacity bigger tank be V_B

$$\frac{20000}{V_B} = \frac{1}{8}$$

$$V_B = 20000 \times 8$$

$$\boldsymbol{V_B = 160000 \text{ litres.}}$$

(b) Cost is directly proportional to capacity.

$100000 = k \times 20000$, k is a constant of proportionality

$$\boldsymbol{k = 5.}$$

When $V_B = 160000$,

Cost of bigger tank $= 5 \times 160000$.

$= 800000$.

Cost per village $= 100000 + 800000$.

$=$ Shs 900000.

Total cost of the project $= 72 \times 900000$.

$=$ **Shs 64800000**. *END*

Together we can influence the Universe