

MERRYLAND HIGH SCHOOL – ENTEBBE
RESOURCE MATHEMATICS
456/1 (SET 2)
S.4

INSTRUCTIONS:

Answer all the questions

SECTION A

1. Solve the equation; $(2t)^3 = 8$ (4 marks)

2. If $(2x + p)(x + q) = 2x^2 - 5x - 12$ for all values of x . Find p and q . (4 marks)

3. The following table shows the distribution of number of beans in pods.

No. of beans in a pod	0	1	2	3	4	5
No. of pods	3	5	10	7	12	3

- a) State the mode of this distribution (1 mark)
b) Find the median number of beans (3 marks)

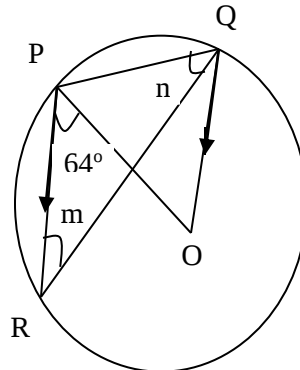
4. Given that $A = \begin{pmatrix} -2 & -1 \\ 3 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 2 \\ 5 & 4 \end{pmatrix}$, find $A^{-1}B^{-1}$. (4 marks)

5. The sum of the interior angles of a rectangular polygon is three times the sum of exterior angles. Find the size of the interior angle of the polygon. (4 marks)

6. During an exchange of gunfire with the enemy a sergeant and a private were both hit, one was shot in the leg and the other in the shoulder. Find the probability that the sergeant was shot in the right leg and that the private was shot in the left shoulder. (4 marks)

7. Solve for p ; $\frac{(p-10)}{2} + \frac{3p}{4} = \frac{1}{2}(7p - 1)$ (4 marks)

8. A straight rope is attached to the ground from the top of a flag pole. The bottom of the rope is 14m from the base of the flag pole, and the rope makes an angle of 60° with the ground. How long is the rope? (4 marks)
9. Given that $p * q = p^2 - pq + q^2$. Evaluate $-2 * (2 * 1)$. (4 marks)
10. In the diagram below, O is the centre of the circle. PR is parallel to QO. Given that $\angle RPO = 64^\circ$.



Find the values of m and n.

SECTION B:

11. The following notice appeared in a newspaper.

UMEME LIMITED

Our esteemed customers are requested to note that with effect from 1/1/06 all customers' bills will consist of

a) A fixed rental fee for the meter,
b) A charge for each unit of power consumed.

Thank you
Management

- a) In March, a customer used 325 units and his bill was shs 180,000. In April he used 225 units and paid sh 140,000. In May his bill was sh 720,000. How much power did he use in May? (7 marks)

- b) If $\log_{10} x - \log_{10} y = \log_{10} z$. Express x in terms of y and z and hence find x when $y = 2$ and $z = 3$. (3 marks)

12. The figure below show the weight, in kg of 30 people living in a street.

60	77	66	53	74
50	48	38	46	93
45	108	60	36	78
57	49	55	63	66
41	42	83	61	58
80	75	58	32	51

- a) Represent the above information in a grouped frequency table taking weight groups 20 – 39, 40 – 59 etc and use it to find mean weight. (6 marks)
- b) Draw a histogram to represent the above data and use it to estimate the modal weight. (6 marks)
13. a) Draw a graph of $y = (2 - x)(x - 3)$ for the domain $0 \leq x \leq 5$. Use 2cm to represent 1 unit on both axes. (6 marks)
- b) From your graph, find the values of x for which $-x^2 + 5x - 6 = 0$. (2 marks)
- c) By drawing an appropriate line on the graph, find the values of x for which $x^2 - 5x + 4 = 0$. (4 marks)
14. A triangle ABC with vertices A(1, 2), B(3, 4) and C(4, 1) is rotated to give triangle A'B'C' with vertices A'(-2, 1), B'(-4, 3) and C'(-1, 4).
- a) Show on the same axes, triangles ABC and A'B'C'. (3 marks)
- b) Use the drawn triangle to determine the angle and centre of rotation. (5 marks)
- c) Find and describe fully the matrix that would map A'B'C' back onto ABC. (4 marks)
15. A train leaves station P and travels to station Q, a distance of 240km. Another train, travelling 20km/hr faster, covers the same distance taking 36 minutes less. If the speed of the train is x km/hr. (6 marks)
- a) Obtain the expression in x . (6 marks)
- b) Find the time taken by the faster train to complete the journey. (6 marks)

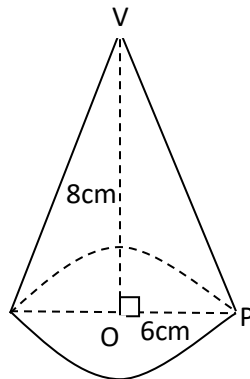
16. a) Given that $\det \begin{pmatrix} p & 2q \\ q & \frac{1}{5} \end{pmatrix} = 1$ - and $\det \begin{pmatrix} p & 20 \\ q & 2 \end{pmatrix} = 10$. Find p and q. (6 marks)
- b) If $A = \begin{pmatrix} 2 & -2 \\ -1 & 1 \end{pmatrix}$. Find;
- (i) $2A$ (2 marks)
- (ii) A^2 (4 marks)
17. At a party, the guests are to be served with beer and soda. At least twice as many crates of beer as crates of soda are needed. A crate of beer contains 25 bottles and a crate of soda contains 24 bottles. More than 200 bottles of beer and soda are required. A maximum of shs 45,000 may be spent on beer and soda. Assuming that beer costs shs 5000 a crate and soda shs 2000 a crate. If x and y are crates of soda and beer bought respectively. (4 marks)
- a) Write down the inequalities satisfying the given condition. (4 marks)
- b) On the same axes, draw the graphs of the inequalities and shade the unwanted regions. (4 marks)
- c) Find the number of crates of beer and soda that should be bought if the cost is to be as low as possible. (4 marks)

END

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RESOURCE MATHEMATICS
456/2 (SET 2)
S.4

SECTION A

1. Without using mathematical tables or calculator, find the value of;
 $2 \log_{10} 50 + \log_{10} 80 - \log_{10} 2$ (4 marks)
2. A shopkeeper bought a 100kg bag of rice at shs 300,000. He wants to make a profit of 20%.
How much should this shopkeeper sell each kilogram of rice. (4 marks)
3. Given that $\underline{a} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$, $\underline{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$, $\underline{c} = \begin{pmatrix} 1 \\ 9 \end{pmatrix}$,
find the values of k and l such that $k\underline{a} + l\underline{b} = \underline{c}$ (4 marks)
4. P and Q are two sets of objects such that $n(\varepsilon) = 15$, $n(P \cap Q) = 2$, $n(Q) = 8$ and
 $n(P \cup Q) = 4$. Find;
(i) $n(P \cup Q)$
(ii) $n(P)$ (4 marks)
5. Functions $h(x)$ and $P(x)$ are defined by $h(x) = \frac{1}{2x-1}$ and $P(x) = x^2 - 1$.
Find the values of x for which $h(x)P(x)$ is meaningless. (4 marks)
6. a) State the gradient of the line whose equation is $4x + 3y - 8 = 0$.
b) Write the coordinates of the point where the line in (a) meets the x-axis. (4 marks)
7. The figure below is a cone whose base radius is 6cm and perpendicular height OV is 8cm.



Determine the;

- (i) Slant height PV
- (ii) Area of curved surface of the cone. (4 marks)

8. Given that $2^{x+y} = 2$ and $3x = 27$, find the values of x and y . (4 marks)
9. A cylinder of radius 8cm has a capacity of 2000cm^3 . Find its height. (4 marks)
10. In a running competition, a man ran at a speed of 2m/s and completed the race in 45 minutes. How long in kilometers was the journey covered. (4 marks)

SECTION B:

11. a) Given that $\log 2 = 0.3010$ and $\log 3 = 0.4772$, and $\log 5 = 0.6990$, find $\log 2160$ without using tables or calculators. (6 marks)
- b) Given a relation $p * q = \frac{q(p-q)}{p}$; find the value of x if $-2 * x = 12$. (6 marks)
12. In a certain electricity company, the tariffs for electricity are as shown below:
- Each unit is shs 240
 - Service fee of shs 3200 per month
 - VAT is 18% (Amount due to units used plus service fee)
- a) If the meter reading in the month of April was 432264 at the beginning and 432325 at the end, how much money did the customer pay to this electricity company?
- b) How many units did the customer use in the month of May if his total bill for electricity was shs 29,264. (12 marks)
13. a) Given that $\underline{a} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$ and $\underline{b} = \begin{pmatrix} 5 \\ 2 \end{pmatrix}$; Find
- (i) Vector $\underline{c}$ where $\underline{c} = \underline{a} + \underline{b}$ (2 marks)
- (ii) By using a graph paper, show that $\underline{a} + \underline{b} = \underline{c}$. (3 marks)
- b) A, B and M are points in a straight line where A(3, -12) and B (-7, 3) while M is a point on AB such that $3AM = 2MB$, find;
- (i) BM
- (ii) Coordinates of point M. (2 marks)

14. Mutukula town is 300km away from Jinja town. A link bus left Jinja for Mutukula at 8:30 a.m. while driving at a steady speed and reached Mutukula at 11:30 a.m. A Gaga bus left Mutukula 30 minutes after the Link bus had left Jinja travelling at a steady speed of 80kmh⁻¹ for 1 hour. The Gaga bus got a mechanical breakdown which took an hour. The Gaga bus then continued steadily to Jinja at a speed of 100kmh⁻¹.

- a) Determine the average speed of the Link bus.
- b) Using a scale of 2cm to represent one hour on the horizontal axis and 4 cm to represent 50km on the vertical axis, draw on the same pair of axes, a distance – time graph for the two buses.
- c) Using your graph in (b) above, determine the;
 - (i) Time when the Gaga bus reached Jinja.
 - (ii) Time and distance from Jinja at which the two vehicles met. (12 marks)

15. In a certain secondary school, students must take at least one subject but not more than two subjects of the following; History (H), Geography (G) and Luganda (L). None of the students offer both Luganda and History, 30 take History only, 10 take Geography only, 17 take Geography, the number of students offering Luganda is six times that offering both History and Geography and the number of students offering both History and Geography is 3 more than those offering Geography and Luganda.

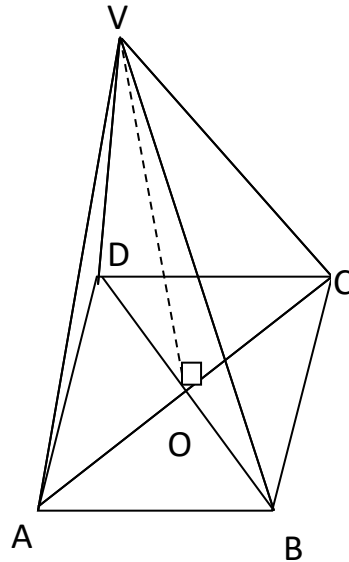
- a) Using a Venn diagram, find the number of students offering
 - (i) Luganda
 - (ii) History
 - (iii) In class.
- b) What is the probability that a student picked at random
 - (i) Takes only one subject
 - (ii) Takes at least two subjects.

16. a) Given that $g(x) = 2b + ax$, $g(0) = 4$ and $g(-1) = 3$, find the values of **a** and **b**.
(5 marks)

b) Given $h(x) = \frac{3x-6}{2x^2+7x-4}$, find the value of x for which;

- (i) $h(x) = 0$
- (ii) $h(x)$ is meaningless. (7 marks)

17. The figure below shows a rectangular based pyramid VABCD in which $\overline{AB} = 8\text{cm}$, $\overline{BC} = 6\text{m}$ and each of the slanting heights is 13m.



If VO is the height of the pyramid, calculate the;

- a) Height of the pyramid. (5 marks)
- b) Angle between;
 - (i) Line AV and the plane ABCD (2 marks)
 - (ii) Plane VBC and the base plane ABCD (2 marks)
- c) Volume of the pyramid. (3 marks)

END