BISHOP CIPRIANO KIHANGIRE SSS BBIINA
UCE PREPARATION MATHEMATICS EXTERNAL SEMINAR QUESTIONS

SECTION A QUESTIONS

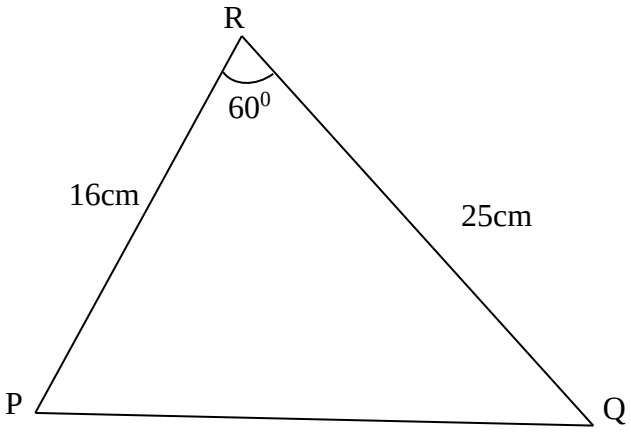
1. If a Δ b= a^2-b, evaluate
   7 Δ (4 Δ 6). (04 marks)

2. Using factorisation method, solve the quadratic equation:
   $x^2 - 18x + 77 = 0$ (04 marks)

3. If $M = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix}$

(a) Find M^2
(b) Name the matrix M^2. (04 marks)

4. Find the area of the triangle PQR shown below; correct your answer to one decimal palace.



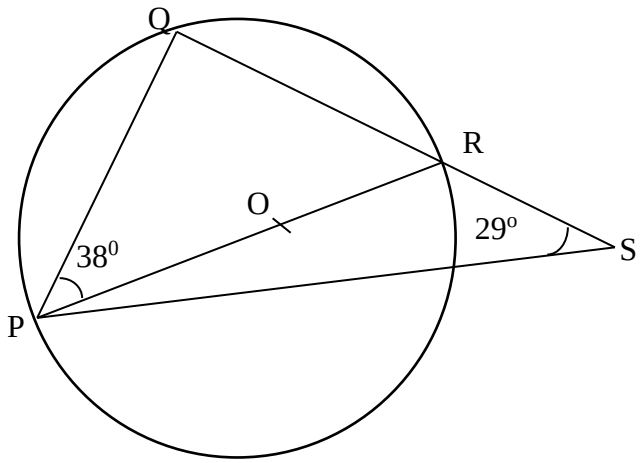
(04 marks)

5. The marks of a student in 5 subjects were 63, 87, 59, 81 and 54. The average mark in 6 subjects was 71. Determine the mark in the sixth subject.

6. Make p the subject in the equation. $\sqrt{\frac{3p-q}{p+q}} = m$ (04 marks)

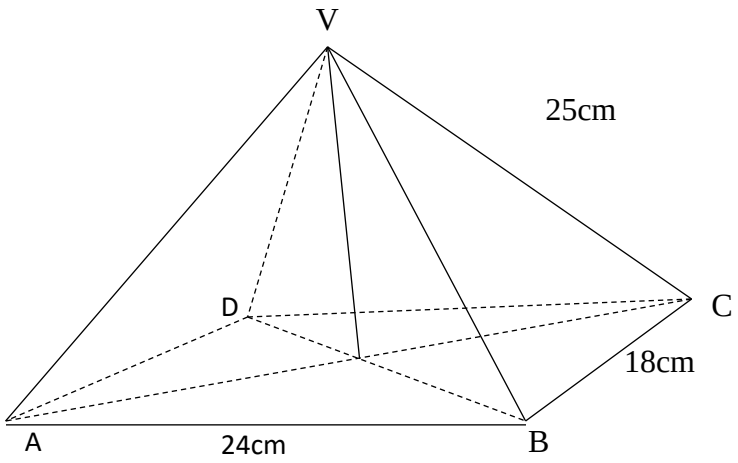
7. Solve the inequality; $\frac{x-2}{2} - \frac{3x+6}{3} > \frac{1}{2}$ (04 marks)

8. In the figure below, O is the centre of the circle. Angle OPQ = 38˚ and angle RSP = 29˚.



Find the value of angle RPS. (04 marks)

9. A translation T, maps (8, 6) on to (¯2, 2). Determine the coordinates of the image of (3, 1) under T. (04 marks)
10. A bag contains white balls and black balls. The probability of choosing a white ball is $\frac{5}{8}$. If the bag contains 40 balls, find the number of black balls in the bag.
11. Without using a calculator or logarithm tables, evaluate;
    $\log_{10} 7000 - \log_{10} 7$ (04 marks)
12. Express the decimal 1.3181818… as an improper fraction in its lowest terms. (04 marks)
13. If n(P) = 23, n(Q) = 25, $n(P^{l}nQ^{l}) = 4$ and $n(\sum) = 45$, find n(PnQ). (04 marks)
14. Find the equation of the line through the points A(4, 3) and B(10, ¯9) (04 marks)
15. Given that $\overset{OA}{\sim} = \begin{pmatrix}7\\2\end{pmatrix}$ and $\overset{OB}{\sim} = \begin{pmatrix}15\\17\end{pmatrix}$, determine the length of $\underline{AB}$ (04 marks)
16. Without using a calculator or mathematical tables, evaluate:
    $\frac{78.65^2 - 21.35^2}{5.73}$ (04 marks)
17. A saleswoman gets a basic monthly salary of 256.000/=. She also gets 0.5% commission on sales. In a certain month, her sales were 28.400.000/=. Calculate her income for that month. (04 marks)
18. Given that p varies inversely as the square of q and p = 9 when q = 4, find the value of p when q = 8. (04 marks)
19. Given that $g(x) = 9x^2 - 12x - 4$ find the value of $g(-5)$ (04 marks)
20. The diagram below shows a right pyramid on a rectangular base ABCD. $\overline{AB} = 24cm, \overline{BC} = 18cm$ *and the slanting side* $\overline{VC} = 25cm$



Find the height of the pyramid $\overline{OV}$ (04 marks)

SECTION B QUESTIONS

21. (a) Find the Highest Common Factor (HCF) and LCM of $4a^2b^4, 10a^4b^3$ and $14a^3b^2$ (06 marks)

(b) Simplify; $\frac{x}{x-2} - \frac{4}{x+2} - \frac{8}{x^2-4}$ (06 marks)

22. (a) If $A = \begin{pmatrix} 2 & 4 \\ 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 5 \\ 0 & -6 \end{pmatrix}$

Find $2A - BA$ (04 marks)

(b) Determine the inverse of matrix $M = \begin{pmatrix} 3 & 2 \\ -1 & 2 \end{pmatrix}$ (04 marks)

(c) Given that matrix, $C = (2 \quad 5)$, matrix $D = \begin{pmatrix} 4 \\ 6 \end{pmatrix}$ and matrix $E = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$, find $CD + CE$. (04 marks)

23. The table below shows the ages in years of 80 people who were allowed to enter a cinema hall.

Age (years)	15 -19	20 - 24	25 - 29	30 - 34	35 – 39	40 - 44	45 - 49
Number of people	6	5	8	12	21	18	10

(a) Calculate the mean age. (05 marks)

(b)

i. Draw a cummulative frequency curve (ogive) for the data.
ii. Use the ogive to estimate the median. (07 marks)

24. (a) Using matrix method, solve the simultaneous equations;

$$4y + 5x = 1$$
$$2y - 3x = 17$$

(05 marks)

(b) The quadratic equation $ax^2 + bx - 8 = 0$ has 4 as one of its roots. The difference between the smaller root of the equation and 4 is 5. Determine the values of a and b (07 marks)

25. The points A (1, 0), B (3, 0), C (3, 1) and D (1, 1) are vertices of a rectangle ABCD

The images A, B, C and D under a transformation $T = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$

are A', B', C' and D' respectively. the images A', B', C' and D' are then mapped on to the points A", B", C" and D" respectively, under a transformation $M = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$

(a) Determine the coordinates of the points;
i. A', B', C' and D'
ii. A", B", C" and D" (06 marks)

(b) Find a single matrix of transformation which would map rectangle A" B" C" D" back onto ABCD. (06 marks)

26. In a triangle PQR, angle QPR = 120^0, $\overline{PQ} = 5cm$ and $\overline{PR} = 4cm$

(a) Using a pair of compasses, a ruler and a pencil only,
i. Construct the triangle PQR
ii. Draw a circle passing through the vertices P, Q and R.
iii. Measure the length $\overline{RQ}$ and the radius of the circle. (10marks)

(b) Find the area of the circle. [Use π= 3.142] (02 marks)

27. A transport company has a small lorry which can carry 48 tonnes of cement per trip and a big lorry which can carry 60 tonnes of cement per trip. The maximum number of trips the small lorry can make in a day is 8. The maximum number of trips the big lorry can make in a day is 5. The company has to transport a minimum of 480 tonnes of cement on a certain day. The number of trips the two Lorries should make together on that day should not exceed 10 trips.

(a)If x and y represent the number of trips made by the small lorry and big lorry on that day respectively, use the given information to write down four inequalities. (04 marks)

(b) By shading the unwanted regions, plot the graphs of the inequalities in (a) on the same axes. (04 marks)

(c) The company charges 50, 000/= per trip made by the small lorry and 80, 000/= per trip made by the big lorry.

i. Use your graph in (b) to determine the possible number of trips each lorry can make so as to maximize the company's earnings.

ii. Find the maximum amount of money that the company would earn on that day. (04 marks)

28. (a) Three girls Betty, Diana and Mary shared 80.000/= in the ration 5:2:3 respectively. How much money did each girl get? (06 marks)

(b) Find the next two terms on each of these sequencies

i. 3, 5, 9, 17, _____, _____

ii. 3, 6, 10, 15, _____, _____ (06 marks)

29. In workshop, there are 50 teachers, 18 teach Chemistry, 16 teach Biology and 24 teach Physics. 5 teach Physics and Chemistry, 7 teach Physics and Biology, 6 teach Chemistry and Biology. 8 teachers do not teach any of the three subjects.

a) Represent the given information on a Venn diagram. (05 marks)

b) How many teachers teach all the subjects? (03 marks)

c) How many teachers teacher neither Physics nor chemistry. (02 marks)

d) Find the possibility that a teacher selected at random from the workshop teaches one subject only. (02 marks)

30. (a) The function f is such that $f(x) = 3x + 1$. Find:

i. $f(5)$

ii. $f^{-1}(x)$

iii. $f^{-1}(4)$ (06 marks)

(b) Given that $g(x) = ax^2 + 2x \text{ and } g(3) = 24$, find the value:

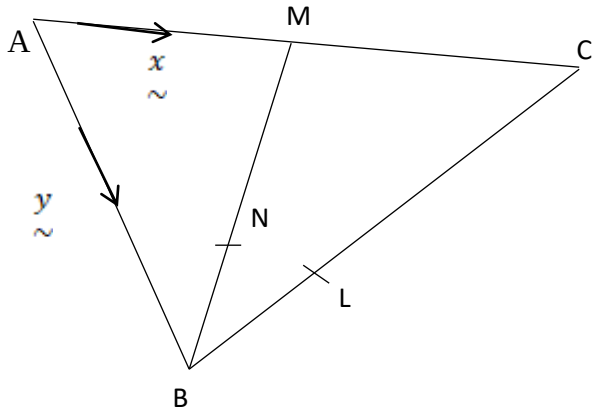
i. a

ii. $g(^-3)$ (06 marks)

31. In the diagram, M is the mid-point of $\overline{AC}$ and N is the mid-point of $\overline{MB}$.

$\overline{BL}:\overline{LC} = 1:2$.

$\underset{\sim}{AB} = y \text{ and } \underset{\sim}{\overline{AM}} = \underset{\sim}{x}$



(a) Find in terms of $\underset{\sim}{x}$ and $\underset{\sim}{y}$ the vectors:

i. $\underset{\sim}{MB}$

ii. $\underset{\sim}{AN}$

iii. $\underset{\sim}{LB}$

iv. $\underset{\sim}{AL}$ (07 marks)

(b) If $\underset{\sim}{AN} = \underset{\sim}{qAL}$, find the value of q hence find the ratio $\overline{AN}$ *to* $\overline{NL}$. (05 marks)

32. (a) On the imported goods, customs duty and Value Added Tax were levied as shown in the table below.

Customs duty	25% of the value of the goods
Value Added Tax	15% of (value of the goods + customs duty)

Find the total amount which was levied on importing a television set valued at 500.000/=. (06 marks)

(b) A man borrowed 6.000.000/= from a bank to complete a commercial building at a compound interest rate of 25% per annum. He had to repay the loan and interest within two years in equal monthly instalments. Calculate the:

i. total amount of money the man paid to the bank

ii. amount of money he paid per month

iii. interest he paid on the loan at the end of two years. (06 marks)

33. At 11.00am, a cyclist left Kampala for Masaka 120km away at an average speed of $20kmh^{-1}$. After cycling for 3 hours he rested for an hour. He then continued to Masaka at the same speed.

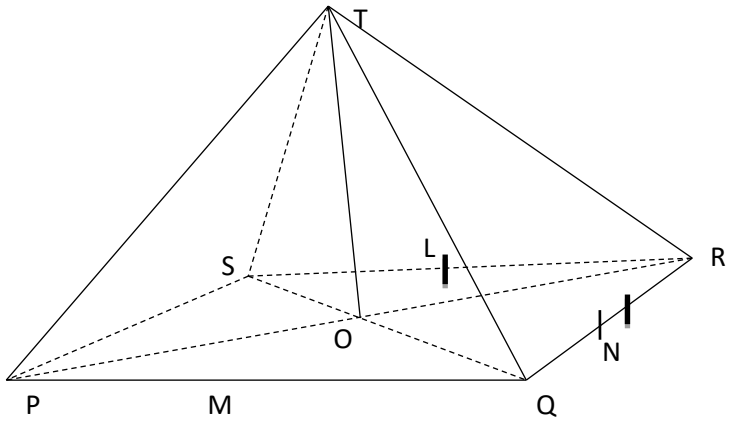
At the same time, a motorist left Masaka for Kampala at an average speed of $60kmh^{-1}$. He then stayed in Kampala for $1\frac{1}{2}$ *hours* before returning to Masaka at an average speed which took him back to Masaka in $2\frac{1}{4}$ *hours*

a) On the same axes, using a scale of 1cm to represent 5km on the vertical axis and 2cm to represent 1hour on the horizontal axis, draw a distance–time graph for the cyclist and motorist. (06 marks)

b) From your graph in (a), determine;

i. the times and distances from Kampala at which the motorist met and bypassed the cyclist on his way to and from Kampala respectively. (04 marks)

ii. How long did the motorist have to wait in Masaka before the cyclist could arrive? (02 marks)



The figure above shows a right pyramid PQRST on a rectangular base PQRS. Given that $\overline{PQ} = 64cm,\ QR = 48cm,$ *the slant lengths* $\overline{PT} = \overline{QT} = \overline{RT} = ST = 50cm.$
L, M and N are the mid-points of $\overline{SR}, \overline{PQ}$ *and* $\overline{QR}$ respectively. Calculate the;

a) Height of the pyramid OT. (05 marks)
b) Volume of the pyramid PQRST. (02 marks)
c) Angle between the slant face TQR and the base PQRS. (02 marks)
d) Angle between the two opposite slant faces PQT and SRT. (03 marks)

34. (a) Find the probability of picking a vowel from the word MATHEMATICALLY. (2 marks)

(b) A tin contains 5 blue and 6 green beads. Two beads are picked at random, one after the other without replacement. With the aid of a probability tree diagram, find the probability that both beads are of different colours. (4 marks)

(c) Two dice are thrown together once and the sum of the outcome is recorded. Find the probability that the sum is either a triangular number or an even number. (6 marks)

THE END