O'LEVEL MATHEMATICS SEMINAR

ON SATURDAY 15TH JULY 2023 ORGANISED AT

IGANGA TOWN VIEW SECONDARY SCHOOL

BY

MATHEMATICS DEPARTMENT

PAPER ONE 456/1

- ✓ Fraction
- ✓ Operations
- ✓ Construction
- ✓ Bearing
- ✓ Equation and formula
- ✓ Statistics
- ✓ Expansion & factorization
- ✓ Matrices
- ✓ Probability
- ✓ Trigonometry
- ✓ Transformation
- ✓ Linear programing
- ✓ Circles and their properties
- ✓ Quadratic equations & curves
- ✓ Inequalities

PAPER TWO 456/2

- ➢ Numerical concepts
- ➢ Sets
- ➢ Surds, Indices and logarithms
- ➢ Relations & mappings
- ➢ Geometry
- ➢ Business mathematics
- ➢ Ratios
- ➢ Scales
- ➢ Similarities
- ➢ Variations & proportions
- ➢ Functions
- ➢ Vectors
- ➢ Kinematics
- ➢ 3 – dimensional figures
- ➢ Mensuration

OPERATIONS

1. (a) if $x\nabla y = x^2 - y^2$ and $p \downarrow q = \frac{p-q}{2}$, find the value of r such that $r \downarrow (4\nabla 2) = 2$

   (b) If $a * b = \frac{a}{b} + \frac{b}{a}$. Evaluate $\frac{1}{2} * \frac{2}{3}$ correct your answer to 3dps.

EQUATIONS AND FORMULA

2. (a) Given that $f = \left(\frac{ky}{r}\right)^2 - 2x$, Express y in terms of r, f and k. Hence find the value of y when $r = 2, f = 1\ x = 4$ and $k = 8$.

   (b) Ben's age is third of his mother's age. In 18 years' time, his age will be half of his mother's age then, how old is his mother.

   (c) Solve the equation $\frac{3}{7-2x} = \sqrt[3]{\frac{64}{x^3}}$

FRACTIONS

3. (a) Without using a calculator evaluate $\frac{3\frac{1}{2} - 1\frac{5}{6} x \frac{3}{11}}{1\frac{3}{4} + 7\frac{2}{3} \div 3\frac{5}{6}}$

   (b) Express 1.6333--------- in form of a $\frac{b}{c,}$ where c $\neq$ 0 hence state the values of a, b and c.

RATIOS AND SCALES

4. The weights of two tables mats are in the ratio $(x + 1) : (2x + 1)$. Given that the smaller mat weighs 24kg and the bigger mat weighs 40kg. Determine the value of x.
5. While constructing Tropical High School, a builder discovered the following; the ratio of the lengths of the main hall to girls' dormitory is 1:3, boys' dormitory to girls' dormitory is 2:5 and girls' dormitory to the kitchen is 6:1.
   (a) Determine the ratio of the length of kitchen to boys' dormitory to girls' dormitory to main hall.
   (b) If the kitchen was 120m long, calculate how longer the girls' dormitory is by boys' dormitory.
6. A road occupying 8cm on a map of unknown scale is 104km long on the ground. What is the scale of the map?
7. The scale of a map is 1:120,000. A dam occupies an Area of 80cm^2 on the map. What is the actual Area in km^2 of the dam?
8. A forest reserve covering an Area of 807.5km^2 is represented on a map by a green Area of 32.3cm^2. Determine the scale of the map.

SURDS, INDICES AND LOGARITHMS

9. (a) Express $\sqrt{252}$ in form $\frac{a}{b\sqrt{c}}$, hence state value of a, b and c

   (b) If $a - \sqrt{6} = \frac{2\sqrt{3} - 3\sqrt{2}}{\sqrt{3}}$,find the value of a. Hence evaluate $a - \sqrt{6}$ correct to $3sfs$ given that $\sqrt{6} = -2.4495$

10. (a) Simplify $\left(\frac{64}{27}\right)^{-\frac{2}{3}} + \frac{3}{8}$

    (b) Given that $3^{2x+1} \times 4^{p-4} = 648$, find the value of *x* and *p*.

    (c) Solve $3^{x^2} = 27^{\left(4x - \frac{20}{3}\right)}$

11. (a) Simplify $\log_{10} 45^x - \log_{10} 9^x + \log_{10} 0.2^x$

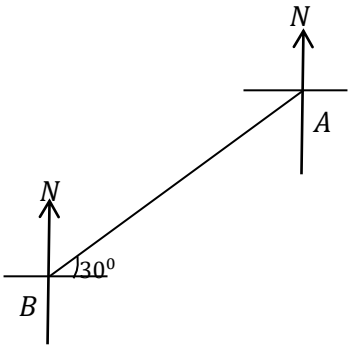
    (b) Prove that If $\log_{10} y + 3\log_{10} x = 2$, then $y = \frac{100}{x^3}$

    (c) Solve $\log_2(3m + 4) = \log_2(m - 2) + 3\log_2 2$

12. Use logarithm table to evaluate $\frac{1.28 \times 0.056}{\sqrt{1.44} \times 4.8}$ correct to 3 significant figures

GEOMETRIC CONSTRUCTION

13. In the diagram below angle $ABC = 30^0$. What is the bearing of B from A



14. Four towns P,Q,R, and S are situated such that P is 20km in a direction of N60^0E from Q, R is 24km in the direction S43^0E from P while S is 28Km in a direction of S34^0W from R.
    (a) By means of scale drawing, find the respective locations of the four towns using a scale of $1cm: 4km$.
    (b) Using your drawing, find the distance and bearing of S from Q.
15. A quadrilateral ABCD in which AB=DC= 8cm, BC=AD= 5cm, DAB= 75^0 and ABC= 105^0. Draw a perpendicular from point D such that it meets AB at point X and the same perpendicular has a point Y which is 9cm from B. Construct an inscribed circle in triangle BXY and state its radius.
16. Using a ruler and a pair of compasses,
    (a) Construct a triangle PQR with angle RPQ = 60^0, PRQ = 75^0 and PQ = 8.4cm, measure the length of PR and QR.
    (b) Construct the line ST 12.6cm long bisecting and perpendicular to QR and meeting PQ at T where S is on the side of QR. what is the size of angle STQ?.
    (c) Join S to R and Q. Draw the circle circumscribing the triangle QRS and hence state its radius

FUNCTIONS

17. (a) Given that $g(x) = ax - \frac{b}{x}$ and that $g(2) = 1\frac{1}{2}$ and $g\left(\frac{1}{2}\right) = -9$, find the value of a and b. Hence find $g^{-1}(x)$
    (b) If $f^{-1}(x) = \frac{3-px^2}{x^2}$, and $f\left(-\frac{5}{3}\right) = 3$, find the value of p
18. Two functions are such that $f(x) = \frac{x+5}{x-4}$ and $fh(x) = \frac{30-4x}{5x-24}$, find the;
    (a) expression of $h(x)$
    (b) value of x for which $h(x)$ is indeterminate
    (c) value of $hf(0)$
19. Given that $g(x) = 2x^2 - 5x + 3$, find the
    (a) expression of $g^{-1}(x)$
    (b) value of $g^{-1}(3)$

GEOMETRY

20. (a) The coordinates of points A and B are $(-4, -5)$ are (x, y) respectively. The coordinates of the midpoint of AB are $(-3,1)$. Determine the value of x and y.
    (b) Two points A and B have coordinates $(3, k)$ and $(k - 6,1)$ respectively. Given that the modulus of AB is $5\sqrt{2}\ units$, find the value(s) of k
21. Determine the equation of a straight line that passes through the midpoint of the line MN with $M(-4,1)$ and $N(0,5)$ and parallel to the line $3 - 4x - 2y = 0$
22. Three collinear points P, Q and R are such that P is $(3, t)$, Q is $(-t, 2t + 2)$ and R is $(1 - 4t, 5t)$
    (a) Calculate the value of t
    (b) Determine the equation of the bisector of PR
    (c) Find the equation of a line RT which is perpendicular to line PQ

MATRICES

23. (a) Given that matrix $P = \begin{pmatrix} 4 & 2 \\ -3 & 1 \end{pmatrix}$, show that $PP^{-1} = P^{-1}P$, hence name the matrix PP^{-1}

    (b) Given that $A = \begin{pmatrix} 2 & 4 \\ 2 & 0 \end{pmatrix}$, $B = \begin{pmatrix} 12 & 6 \\ 0 & 18 \end{pmatrix}$ and $C = \begin{pmatrix} 6 & -4 \\ 2 & 4 \end{pmatrix}$. Find

    (i) the matrix Q, Such that $Q = 2A - \frac{1}{3}B + C^2$

    (ii) Q^{-1}, the inverse of Q

24. (a) use the matrix approach to solve the following pair of simultaneous equations

    (i) $2y + x = 11$ and $3 = y - 2x$

    (ii) ii) $\frac{6}{m} - \frac{5}{n} = 2$ and $\frac{8}{m} + \frac{15}{m} = 7$

25. Four students Sarah, Babirye, Stella and Benon went to a stationary shop, Sarah bought 5 pens, 5 counter books, and 2 graph books. Babirye bought 6 pens and 3 graph books, Stella bought 4pens and 2 counter books. Benon bought 7 pens, 3 counter books and 10 graph books. The cost of a pen, a counter book and a graph book were she 600, 2000, 1000/= respectively.

    (a) (i) Write a 4 x 3 matrix for the items bought by the four students

    (ii) Write a column matrix for the cost prices

    (b) Use the matrices above to calculate the amount of money spent by each student.

    (c) If each student has to buy 6pens, 15counter books and 9graph books, how much money in total would be spent by all the four students?

EXPANSION & FACTORIZATION

26. Factorize the following completely.

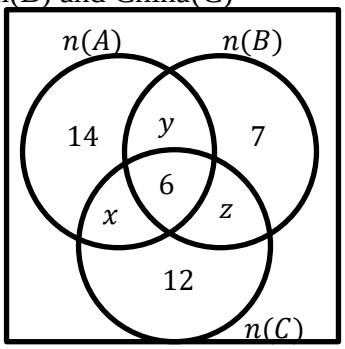
    (a) $4xy^2 - x^3 - yx^2 + 4y^3$

    (b) $p^2 - q^2$. Hence evaluate $15x\ 25$.

    (c) Without using a calculator or mathematical table evaluate $\frac{(26.6)^2 - (3.4)^2}{0.003}$

SETS

27. The diagram below shows a sample of 72 tourists who were asked if they had visited Argentina(A), Belgium(B) and China(C)



    Given that the number of tourists who visited Argentina were 5 more than those who visited Belgium, 28 tourists had visited atleast 2 of the countries and 34 tourists had visited either Argentina or China but not Belgium;

    (a) Find the value of x, y and z

    (b) Determine the number of tourists who visited atmost one country

    (c) If a tourist is selected at random, find the probability that she/he did not visit Argentina or Belgium

28. A survey was conducted on the science teaching staff of Tailan HS and it was found out that every teacher teaches atmost two subjects of Biology(B), Chemistry(C) and Physics(P). The data is summarized below

    $n(P) = 26, n(B \cap C' \cap P') = 14, n(B \cap P \cap C') = 8, n(C \cup B' \cup P') = 11$

    $n(B \cup C \cup P') = 35, n(P \cup P') = 90, n(C) - 7 = n(P)$

    (a) Represent the above information on a Venn diagram

(b) Find the number of teachers who teach;
   (i) only one subject
   (ii) atleast two subjects

(c) what is the probability that a teacher selected at random teaches either Biology or Physics

29. 60 girls were asked what they like amongst colours **Blue(B)**, **Maroon(M)** and **Red(R)**. Half of those who like **M** and **R** only like all the three colours, those who like **B** and **M** only were twice those who like **R** and **M** only. Those who like **B** and **R** only were 5 times those who like all the three colours. Those who like **M** only were half of those who like **R** only. Those who like **B** only were equal to those who like none of the colours. Those who like **M** and **R** were 6, 27 girls like only one colour and 23 girls like **B** or **M** but not **R**.
   (a) Represent the above information on a Venn diagram
   (b) Determine the number of girls who like;
      (i) All the three colours
      (ii) None of the colours
   (c) If a girl is picked at random, find the probability that she likes **M** but not **R**

PROBABILITY

30. (a) A number is chosen from the number 0 to 10 find the probability that the number chosen is a triangle number.
   (b) Two dice are thrown once and the sum of the scores on the dice is recorded.
      (i) What is the probability of getting a multiple of 3
      (ii) What is the most likely outcome?
31. Three coins are tossed together once.
   (a) Draw a possibility space showing all possible outcomes
   (b) What is the probability of obtaining atleast two heads?
32. A cupboard contains 8 white cups and 5 black cups. Two cups are randomly picked one after the other without replacement.
   (a) Draw a tree diagram to illustrate the information above.
   (b) Find the probability of getting:
      (i) Two cups of the same colours
      (ii) Two cups of different colours
      (iii) Atleast a black cup
      (iv) Atmost a white cup

VARIATIONS & PROPORTIONS

33. (a) Quantity Y is directly proportion to half the square root of X. Y is 10 when X is 16. Find X when Y is 4.
   (b) The difference between the values of y when $x = 6$ and when $x = 10$ is 16. Given that y is inversely proportion to the square of x, find the equation relating x and y.
34. (a) If T varies directly as V and inversely as A. V is 2, A is 4 when T is 7. Find A when V is 6 and T is 12.
   (b) A quantity M partly varies as t and partly as the square of t. when $t = 2, M = 22$ and when $t = 3, M = 42$.
   (i) Express M in terms of t.
   (ii) Find the value of t when M is 2.

MAPPING & RELATIONS

35. (a) Given the sets $A = \{3,4,5\}$ and $B = \{4,12,16,20\}$. Draw an arrow diagram to show the relation **"is a quarter of"** for the sets
   (b) Find the domain set that corresponds to the range $\{15,13,-11\}$ for the mapping $x \rightarrow 2x + 1$ and represent it on an arrow diagram
36. Given that $T = \{2,5,8,11\}$, illustrate on a papygram the elations;
   (a) "**Greater than by 3"**
   (b) **"factor of"**

TRIGONOMETRY

37. (a) Given that $\tan\theta = \frac{-5}{12}$ and $0^0 \leq \theta \leq 360$ find the value of $sin^2\theta + cos^2\theta$

(b) The angle of elevation of the top of a flag pole to a girl of height 2m is 45^0. If the girl is standing at a distance of 20m from the pole on a level ground, find the height of the flag pole.

38. Three points A, B and C are on the same level ground. A vertical pole NP stands in between points A and B such that AN=21m, BAC=72^0 and AC=21m. The angles of elevation of the top P of the pole from A and B are 18^0 and 57^0 respectively. Calculate;
    (a) The height of the pole NP
    (b) Length AB
    (c) Angle of elevation of P from C

STATISTICS

39. The table below shows the weights of 35 students .

Weights (kg)	Cumulative frequency
25 – 29	5
30 – 34	13
35 – 39	25
40 – 44	31
45 – 49	35

    (a) Draw an Ogive to represent the data above.
    (b) Use the Ogive above to estimate
        (i) Median weight
        (ii) 7^{th} decile

40. The following table shows the ages (years) of 40 patients treated for TB.

11	17	35	34	42	45	28	46
16	21	14	36	41	31	49	37
20	33	37	38	18	38	39	27
26	28	40	33	43	32	29	47
29	32	41	24	44	35	36	23

    (a) Construct a frequency table for the ages, starting a class of 10 – 14.
    (b) Calculate the mean age using a working mean of
    (c) Draw a histogram for the data and use it to estimate the mode.

SIMILARITIES

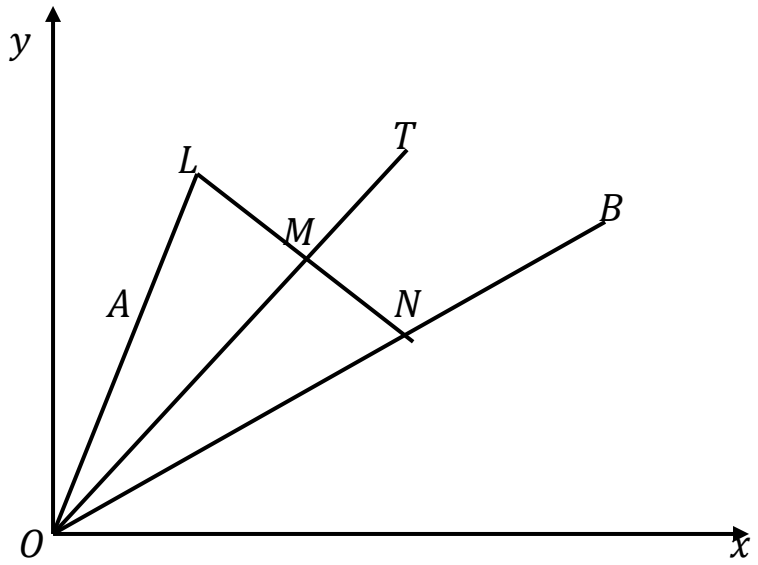
41. In a triangle ADB, E and C are points on AD and BD respectively such that $BC = 5cm,\ CD = 8cm$ and $ED = 3cm$. Find the length of AE
42. A container has a volume of 6400cm^3 and a surface Area of 800cm^2. Find the surface Area of a similar container which has a volume of 2700cm^3.
43. Two similar circles have circumferences of 7cm and 10cm respectively. Given that the Area of the bigger circle is $\frac{75}{11}cm^2$. Determine the Area of the smaller circle.

VECTORS

44. (a) The vectors a, b and c are such that $a = \begin{pmatrix}2\\t\end{pmatrix}, b = \begin{pmatrix}-t\\5\end{pmatrix}$ and $c = \begin{pmatrix}2t\\2\end{pmatrix}$. Given that $\left|2a + b - \frac{1}{2}c\right| = 2\sqrt{26}units$, find the value(s) of t

    (b) The points A(3,−1), B(−1,3) and C(−2,4)
    (i) Show that A, B and C are collinear.
    (ii) Find D such that $CD = \frac{1}{2}BD$

45. In the diagram below, the coordinates of points A and B are $(1,6)$ and $(15,6)$ respectively. Point N is on OB and that $3ON = 2OB$. Line OA is produced to L such that $3OA = OL$.



(a) Find vector LN

(b) Given that a point M is on LN such that $LM: MN = 3: 4$, find the coordinates of M

(c) (i) If the line OM is produced to T such that $OM: MT = 6: 1$, find the coordinates of T

(ii) Show that point L, T and B are collinear.

46. In a triangle $\boldsymbol{OXY}$, a point $\boldsymbol{A}$ divides line $\boldsymbol{OX}$ in the ratio of $\boldsymbol{4}: \boldsymbol{3}$. $\boldsymbol{B}$ is the midpoint of line $\boldsymbol{YX}$. Line $\boldsymbol{OY}$ is extended to a point $\boldsymbol{C}$ such $\boldsymbol{AB}$ is produced to meet $\boldsymbol{C}$. Given that $\boldsymbol{AB}: \boldsymbol{BC} = \boldsymbol{2}: \boldsymbol{1}$, $\boldsymbol{OX} = \boldsymbol{x}$ and $\boldsymbol{OY} = \boldsymbol{y}$;

(a) Express the following vectors in terms of $\boldsymbol{x}$ and $\boldsymbol{y}$

(i) $\boldsymbol{XY}$

(ii) $\boldsymbol{AC}$

(iii) $\boldsymbol{OC}$

(b) If $\boldsymbol{AC} = \boldsymbol{hOB} + \boldsymbol{kXB}$, find the value of the constants $\boldsymbol{h}$ and $\boldsymbol{k}$

TRANSFORMATION

47. (a) A rectangle, whose area is 16cm^2 is given a transformation represented by the matrix $\begin{pmatrix} 3 & 6 \\ 2 & 5 \end{pmatrix}$. Find the area of the image of the rectangle.

(b) An object of area 5cm^2 is mapped onto its image of area 20cm^2 by a transformation given by $\begin{pmatrix} 2 & 3 \\ 2 & Y \end{pmatrix}$. Find the value of Y.

(c) Triangle ABC with vertices $A\ (0, -3)$, $B\ (1, 5)$ and $C\ (1, 1)$ undergoes a translation T given by $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$, find

i) T^2

ii) The Coordinates of $A^1\ B^1\ C^1$ under T^2

48. Triangle ABC with vertices $A\ (1, 2)$ $B\ (2, 6)$ and $C\ (4, 2)$ is mapped onto triangle $A^1\ B^1\ C^1$ by a reflection in the line $y = x$. Triangle $A^1\ B^1\ C^1$ is then mapped onto triangle $A^{11}\ B^{11}\ C^{11}$ by transformation whose matrix is $\begin{pmatrix} 2 & 5 \\ -4 & -5 \end{pmatrix}$

(a) Use $I\ (1, 0)$ and $J\ (0, 1)$ to find the matrix of reflection in the $y = x$.

(b) Find the coordinates of

(i) $A^1\ B^1\ C^1$

(ii) $A^{11}\ B^{11}\ C^{11}$

(c) Determine a matrix for the single transformation which maps $A^{11}\ B^{11}\ C^{11}$ back onto ABC

49. Triangle ABC with vertices $A\ (1, 3)$ $B\ (5, 3)$ and $C(5, 0)$ is rotated through a positive quarter turn about $(0, -3)$ to triangle $A^1\ B^1\ C^1$. Triangle $A^1\ B^1\ C^1$ is then enlarged with scale factor -2 about the center $(-3, 4)$

(a) Draw on the same axis the triangles ABC , $A^1 B^1 C^1$ and $A^{11} B^{11} C^{11}$
(b) Write the coordinates of $A^1 B^1 C^1$ and $A^{11} B^{11} C^{11}$

BUSINESS MATHEMATICS

50. (a) Sharon banked shs. 1,000,000 in a bank that gives a compound interest of 18% p.a. After a certain period of time, n, she realized that she had a total of Shs. 6,028,568 on the account. Find the value of n given that she didn't make any withdraws during this period
(b) A hawker selling second hand shirts earns a commission of 9% of the total sales. Each shirt is sold at Shs. 7,500. Find the number of shirts sold if the hawker earned a commission of Shs. 297,000
(c) A sales agent dealing in bags earns a fixed basic pay of Shs. 57,000. He then earns a commission of 15% of the first 60 bags he sells and a commission of 7% on the bags he sells in excess of 60. The agent pays a tax of 7.5% of his total earnings. Given that in the month of June, the agent sold 222 bags and each bag costs Shs. 35,000, determine his net pay he received in this month.

51. (a) An FM radio commercial section charges fees for any radio announcements as follows. The first ten words shs5000 and any additional word shs100 each. Find the total charge for the announcement below;

"*Mr. Pius Ochieng, the chairman organizing committee of the wedding preparatory meetings of Mr. Jonah Mulungi and Miss Priscilla Nantongo announces the cancellation of the wedding meetings which were scheduled to begin on Friday, 21st July, 2023 at BM Rocky Hotel, Mutukula Kaliro road, Iganga. Any inconveniences caused are highly regretted. A new date and venue for the meetings will be announced later.*"

(b) Mr. Waibi bought a car at shs. 4,500,000. The car depreciates at a rate of 12% per annum. After two years, Waibi decided to sell the car to his friend at 25% less of the value of the car then, find the price at which his friend bought the car.

52. (a) The cash price of a TV set is Shs. 920,000. The TV set can also be bought on hire purchase terms by making a deposit of 60% of the cash price and then payment of equal installments for 5 months. Given that the cash price of the TV set is lower than the hire purchase value by 20%, determine the
(i) installment value per month
(ii) saving Birungi would make if she buys the TV set on cash terms other than hire purchase terms
(b) The below shows the tax structure of an organization for all its employees

Taxable income (Shs.)	Rate (%)
100,001 – 250,000	8
250,001 – 400,000	15
400,001 – 650,000	20
650,001 – 900,000	26
Above 900,000	35

Each employee is entitled to the following allowances
Transport Shs. 2000 per day
Electricity Shs. 40,000 per month
Water Shs. 258,000 every year
Lunch Shs. 10,000 per day
Insurance Shs. 28,500 per month
Child allowance for only 3 children at the following rates
0 – 5 years, Shs. 40,000 @ child
6 – 12 years Shs. 25,000 @ child

13 – 15 years Shs. 10,000 @ child

NB: A month has 30 days

Dalton is an employee in the organization with 5 children of which 2 are 17 and 18 years, the other 3 children are 21 years old and above. Given that he pays a tax of Shs. 945,600 annually, calculate Dalton's;

(i) taxable income
(ii) gross monthly income
(iii) annual net income

KINEMATICS

53. Town A and B are 100km apart. At 6:00am, Matege leaves town A for town B riding his cycle at an average speed of 40km/h and after $1\frac{1}{2}$ hours, his cycle got a flat tyre that took him 36 minutes to repair it. He then resumes his journey increasing his speed by 10km and after 24 minutes, he realized he hadn't carried his National ID and he immediately returned to town A reaching at exactly 10:00am.

    One hour after Matege leaving town A, Mukooli leaves town B for town A travelling at a steady speed of 60km/h and 30 minutes later, he changes his speed reaching town A 15 minutes earlier than Matege.

    (a) Using a scale of $2cm: 10km$ and $2cm: 30\ minutes$ on the y and $x-axis$ respectively, draw on the same graph the journeys of the two people
    (b) Determine the time and distance from town B where the two people met
    (c) Determine the speed that
        (i) Matege used for his return journey
        (ii) Mukolli's changed to in his journey

54. Lugazi and Mbale are 170km apart. A taxi leaves Lugazi at 0800 hours travelling at an average speed of 60km/h. After 2 hours, it stops in Iganga for $1\frac{1}{2}$ hours offloading and loading passengers. It then continues with the journey reaching Mbale in 2 hours and 42 minutes.

    At 0900 hours, a lorry full of bunches of bananas leaves Mbale for Lugazi travelling non – stop at a speed of 100km/h. It offloads the bananas in Lugazi for 78 minutes and then it immediately travels back to Mbale reaching 12 minutes before the taxi.

    Using a scale of $1cm: 10km$ on the vertical axis and $1cm: 30minutes$ on the horizontal axis

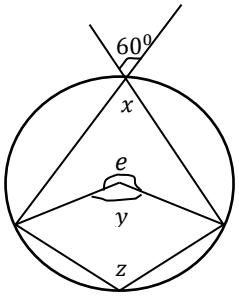
    (a) Draw on the same axes the journeys of the two vehicles
    (b) From your graph, determine the times and distances from Lugazi where the lorry overtook the taxi.
    (c) Determine to 3sfs the average speed of the;
        (i) taxi
        (ii) lorry for the whole journey

55. Town **A** and **B** are $300km$ apart. At $9:30am$, Umar was $60km$ away from **A** moving towards **B** on a motor bike when Jamali set off from **A** on a boxer motor bike moving at a non – stop speed of $50km/hr$ towards **B**. At $2:42pm$, Jamali overtook Umar and they both continued with their journeys. Calculate;

    (a) the distance from **A** when Jamali overtook Umar
    (b) Umar's average speed given to 3 significant figures
    (c) the time Umar and Jamali reached their destination
    (d) the difference in the time of arrival of the two people

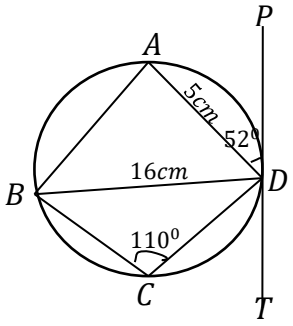
CIRCLES & THEIR PROPERTIES

56. In the figure below O is the center of the circle.



Calculate the size of angles marked x, y, z and e

57. In the figure below AB, BC, CD, AD and BD are chords of the circle. PDT is a tangent to the circle at D. $BCD = 110^0$ and $ADP = 52^0$



Determine the area of triangle ABD

58. Two equal circles of radius 7cm intersect at right angles
    (a) Find the distance between the two circles
    (b) Calculate the area of the common region of the circles

LINEAR PROGRAMMING

59. By shading the unwanted regions, show the region which satisfies the inequalities.
    $x + y \leq 3$, $y > x - 4$ and $y + 7x \geq -4$
    Find the area of the un-shaded region.
60. By shading the unwanted region, show the region satisfying the inequalities below:

$$x \geq 0, \quad y \geq 0 \quad x + y \leq 5 \quad x + 3y \leq 9$$

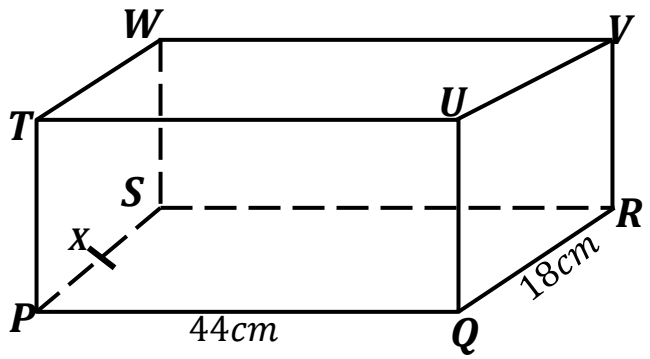
    (b) Use your graph to find the value of X and Y that will give the minimum value of $x + y$ and maximum value of $x + 3y$

61. An export company is contracted to transport 300 tonnes of pineapples. Two Cargo planes are available. A Boeing which can carry 30 tonnes of pineapples per flight and an Airbus which can carry 20 tonnes of pineapples per flight . The Airbus has to make more flights than the Boeing. The Boeing has to make at least 3 flights. The company has 150,000 US dollars for transport costs. The cost per flight is 12,000 dollars for Boeing and 9,000 dollars for Airbus.

    If x is the number of flights made by the Boeing and y the number of flights made by the Airbus;

    (a) White down four inequalities satisfying the given conditions.
    (b) Plot graphs of the inequalities you have formed on the same axes and shade the Unwanted regions.
    (c) Find the number of flights each plane should make if the cost of transport is to be minimum.

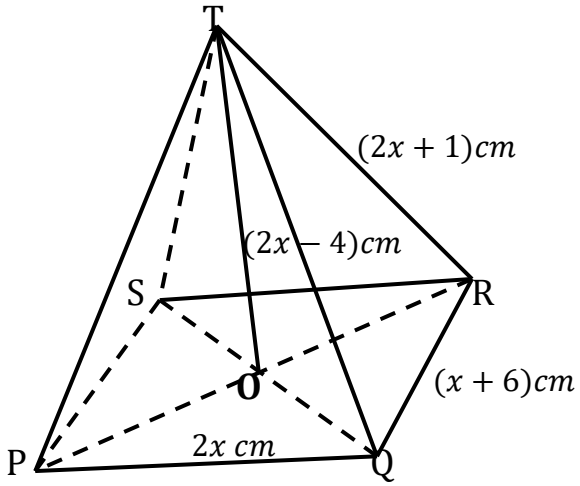
62. The figure below is a cuboid PQRSTUVW in which $PQ = 44cm$, $QR = 18cm$ and $QV = 30cm$. X is the midpoint of PS



Calculate the;

(a) length PV
(b) angle between planes UVX and $PQRS$
(c) surface area of the cuboid

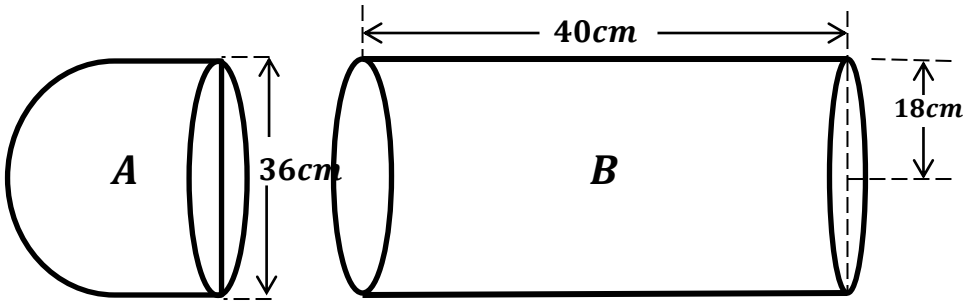
63. In the figure below, PQRST is a right pyramid with a rectangular base. $PQ = 2x\ cm$, $QR = (x + 6)cm$, the slanting edges are $(2x + 1)cm$ each and the height $TO = (2x - 4)cm$ where $x \geq 5$



Calculate the;

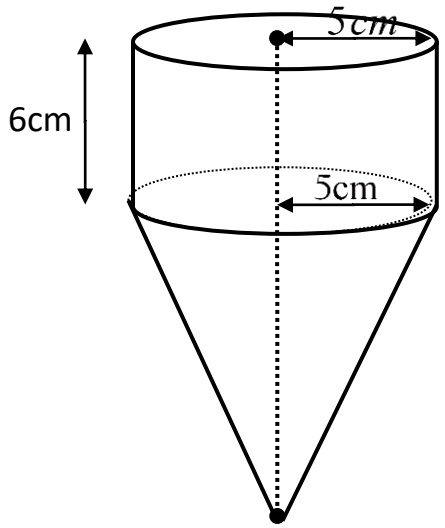
(a) value of x
(b) angle between the slanting face PQT and the base
(c) angle between triangular faces QRT and PST
(d) volume of the pyramid
(e) surface area of the pyramid

64. The figure below shows a hemisphere, A of diameter $36cm$ and a cylinder, B of height $40cm$ and radius of $18cm$.



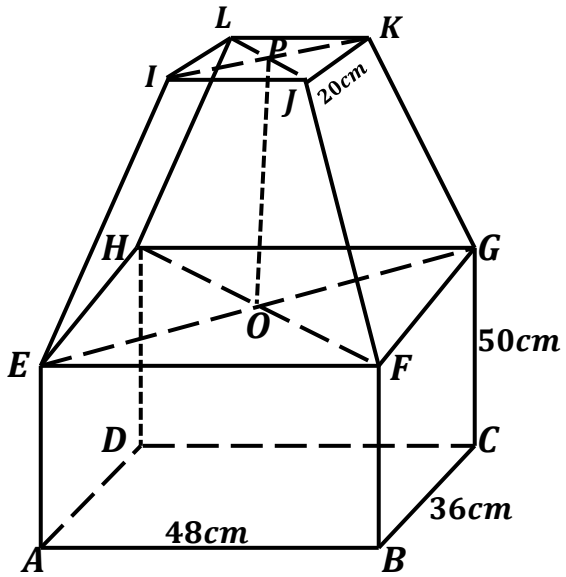
(a) Determine the volume and surface area of each of the figures above
(b) If the figures are joined together to form a water tank, find the;
    (i) volume of the tank
    (ii) surface area of the tank formed (Take π as 3.14)

65. The diagram above shows an open water container filled to its brim.



It is made up of a cone and a cylinder. The cylinder has radius 5cm and height 6 cm. The cone has radius 5 cm and slant height of 13 cm.
Calculate
(a) the height of the water container
(b) Outer surface area of the water container.
(c) Calculate the volume of the water container.

66. The figure below shows a water tank made by frustrum of a right pyramid that is mounted on cuboid $ABCDEFGH$. $AB = 48cm, BC = 36cm, CG = 50cm$ and $JK = 20cm$. The height of the pyramid from which the frustrum was removed is $72cm$



Determine the;
(a) vertical height of the tank
(b) volume of water in litres that the tank can hold when full

END

Organized by Mathematics department Iganga Town View Secondary School