

STAHIZA UCE RESOURCE MATHEMATICS SEMINER 2020

A. EQUATIONS AND INEQUALITIES

1. Solve the following equations

$$\text{a) } \frac{5x+2}{3} - \frac{7x+2}{5} = 2 \quad \text{b) } \frac{1}{8}(e+3) - \frac{1}{2}(e-10) = -4 \quad \text{c) } \frac{k+1}{2k+5} = \frac{k-1}{3}$$

2. Solve the following inequalities and represent your answer on number line and hence write the solution set.

$$\text{a) } 2\frac{1}{2} - \frac{1}{3}(9f-1) \leq 2f + \frac{1}{3} \quad \text{b) } \frac{x+2}{2} \geq \frac{x-3}{7} \quad \text{c) } t-3 < 2t+3 > 4-t$$

3. Solve the pair of simultaneous equations by elimination, substitution and matrix method.

$$\text{a) } \begin{cases} 11x - 9y + 14 = 0 \\ 9x + 12y = 66 \end{cases} \quad \text{b) } \begin{cases} 7s + 13t = 8t \\ 6s + 9t - 189 = 0 \end{cases}$$

B. TRANSFORMATIONS, ENLARGEMENT AND ROTATIONS.

4. Under a transformation matrix $T = \begin{pmatrix} k-1 & 2 \\ -k & k \end{pmatrix}$, a figure whose area is 4.5cm^2 is mapped onto a figure whose area is 54cm^2 . Write down the possible matrices of T.

5. The image of $(7, -6)$ under a translation K is $A'(5, -10)$. Find the value of K.

6. (I) A trapezium ABCD with vertices A (4, -2), B (6, -2), C (6, -6) and D (4, -4) is transformed by a reflection in the line $y + x = 0$ about the origin to $A'B'C'D'$.

a) Write down the i) matrix of reflection. ii) Vertices of $A'B'C'D'$.

b) Enlarge $A'B'C'D'$ to $A''B''C''D''$ by a scale factor -2 about the centre (3,0) and hence write down the vertices of $A''B''C''D''$.

c) Graphically obtain the vertices of $A'''B'''C'''D'''$ under a rotational transformation of a positive quarter turn about the centre (0, 6).

(II) A unit square OABC where O is the origin is mapped on to the image $OA^1B^1C^1$ by a rotation of $+270^\circ$. $OA^1B^1C^1$ then under goes a translation $\begin{bmatrix} 2 \\ 3 \end{bmatrix}$ to form $PA^{11}B^{11}C^{11}$. Find (i) the co ordinates of a unit square, $OA^1B^1C^1, OA^{11}B^{11}C^{11}$.

(ii) a single matrix that would map $OA^1B^1C^1$ directly to $OA^{11}B^{11}C^{11}$.

(iii) a single matrix that would map $OA^{11}B^{11}C^{11}$ back to $OA^1B^1C^1$.

(iv) Area of $OA^1B^1C^1$, hence area of $OA^{11}B^{11}C^{11}$.

(III) (a) A is (1, 1), B is (8, 0) and C is (5, 8). Draw lines AB and AC. Measure the angle between AC and AB. Plot triangle PQR whose vertices are P(4, -2), Q(6, -2) and R(5, 0). Triangle PQR

is reflected in AC and it's image $P'Q'R'$ is reflected in the line AB to get the final image $P''Q''R''$. Give the coordinates of

$P''Q''R''$

(b) Line L1 is the line $x = -4$ and L2 is the line $x=0$. Triangle KLM has vertices K(4, -5), L(-2, -5) and (-2, -3). Draw the mirror lines L1 and L2 and the triangle KLM. Reflect KLM in L1

followed by a reflection in L2. Describe fully a single transformation that maps KLM onto its final image.

(IV) The end points of a line AB whose coordinates are A (3,-1) and B(4, -3) undergo a rotational transformation to give the image line A'B' with A'(1,3) and B'(3,4) respectively.

(a) Plot the line AB and its image on the set of axes using a scale of 1cm to 1 unit.

(b) Determine the centre and angle of rotation of the line.

(c) Find the new image A''B'' of AB when its image A'B' further under goes a rotation of 128°. State the size of the angle formed between AB and A''B''.

C. RELATIONS MAPPINGS AND FUNCTIONS

7. Given that $T = \{2,5,6,8,9,10,12,13\}$, illustrate on papygrams the relations:

a) "Greater than by 3"

b) "A factor of".

8. A mapping is defined by $f(x) = 3x^2 - 4$ as shown in the diagram below.;

x	\longrightarrow	$3x^2 - 4$
-2	\longrightarrow	a
-1	\longrightarrow	b
0	\longrightarrow	-4
1	\longrightarrow	c
d	\longrightarrow	8
e	\longrightarrow	23

a) Find the unknowns

b) Write down domain and range for the above mapping

9. (a) If $g^{-1}(x) = 2x^2 - 1$, find $g(x)$ and hence $g(71)$

(b) $h(x) = 2ax - 3$ and $h^{-1}(x) = \frac{2}{5}x + b$. Find values of a and b.

10. The function $f(x) = \sqrt{\frac{2x-6}{3+5x}}$, find:

a) $f^{-1}(x)$

b) $f^{-1}(1)$

11. If $f(x) = x + 13$ and $g(x) = \log_{10}(x + 2)$, find :

a) The value of x when $g(x) = 0$

b) $gf(85)$

12. Given that $f(x) = x^2 - 4x + 3$. Determine the value of x when $\frac{1}{f(x)}$ is meaningless.

D. MATRICES AND THEIR APPLICATIONS

13. Given that P is an identity matrix, $R = \begin{pmatrix} 1 & -6 \\ 0 & -3 \end{pmatrix}$ and $Q = \begin{bmatrix} X + 1 & -3 \\ 2X & 6X \end{bmatrix}$ is a singular matrix where $x >$

0 Evaluate: (i) $P^2 - 3Q + PR$ (ii) $\text{Det}(QR)$ (iii) $(P + R)^2$ (iv) R^{-1}

14. Three candidates A,B and C sat for an interview in which six questions were asked from each of the categories ; oral and written.

In Oral

A got 4 questions correct, and failed the rest of the questions completely

B got 3 questions correct, tried 2 and failed one completely

C got 3 questions correct and tried the rest.

In Written

A got 3 questions correct, tried one question and failed completely the rest

B got 3 questions correct and tried none

C got 1 question correct, tried 2 and failed 3 completely.

a) Write down:

i) A 3 X 3 matrix to show the performance of each candidate in the two interviews

ii) A matrix for the overall performance of each candidate in the two interviews.

b) If three marks were awarded to a correctly answered question, one mark to a tried question and no mark to a completely failed question, by suitable matrix multiplication, determine the marks scored by the best candidate.

15. Solve the pair of simultaneous equations $2x + 4y + 6 = 0$ by:
 $-3y + 5x = 11$

a) Matrix adjunct method (b) Matrix determinant method.

E. SET THEORY AND LOGIC

16. Given that $n(A) = 9$, $n(A \cap B) = 4$, $n(A \cup B) = 12$ and $n(\epsilon) = 18$. Find the:

i) $n(A)$, $n(A' \cap B)$, $n(A \cup B)$

17. (I) A group of 40 people was to represent Uganda in three games, Rugby (R), Netball (N) and volley ball (V) in Olympics games which took place in china. 16 of them participated in volley ball, 14 participated in netball and 23 in Rugby. 2 participated in netball and volley ball only, 3 participated in rugby and netball only, while the number of those who participated in all the three games was equal to those who participated in Rugby and volleyball only. One technical person to work as a team doctor and a coach for each team were part of this group.

a) Represent the above information on a Venn diagram

b) Find the number of people who participated in;

i) All the three games

ii) At least two of the games

iii) Only one game.

c) If the best participant was to be chosen among the Ugandans, find the probability that he/she was;

i) Playing only volleyball

ii) Playing Rugby and volleyball.

(II) In a survey carried out in a bar, it was discovered that 16 women drink Tonto(T), 14 women drink Uganda Waragi(W) and 13 women drink chairman(C). The rest were summarized as follows,

$n(T \cap C \cap W) = 8$, $n(C \cap T \cap W) = 7$, $n(W \cap T \cap C) = 5$ and $n(T \cap C \cap W) = 3$ Every woman drinks at least one of the three types of alcohol.

(a) represent the above information on a venn diagram.

(b) Find the number of women who drink at least two of the mentioned alcohol

(c) Find the total number of women in the bar.

(d) Find the probability that a woman chosen at random from the bar, she drinks Tonto or Uganda Waragi but not Chairman.

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18. Given the sets: $A = \{\text{All composite numbers less than } 30\}$, $B = \{\text{All triangle numbers between } 1 \text{ and } 30\}$,

find :

a) $n(A \cap B')$

b) $n(A' \cap B)$ Where B' stands for the complement of the set

F. VECTORS

19. M1. Given that $OP = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$, $PQ = \begin{pmatrix} 4 \\ -8 \end{pmatrix}$, $OR = \frac{1}{2}OQ$ and S is a point on PQ such that

PS: SQ = 1:3, Find; OR , PR , $|PR|$, OS

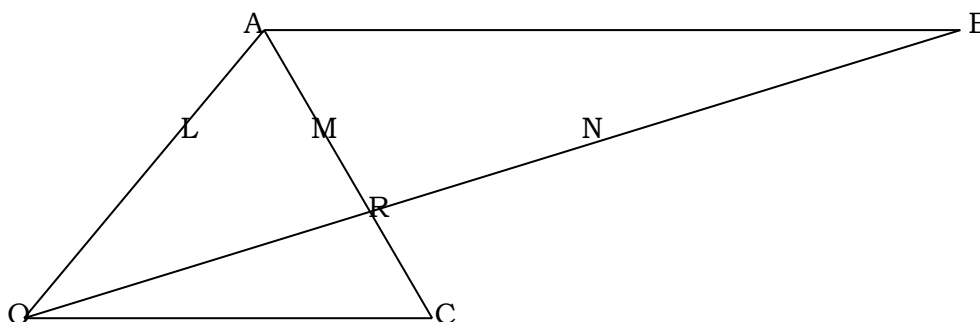
M2. In the figure given $OB = 2\mathbf{b}$, $OC = 2\mathbf{c}$, $3OR = 2ON$ and $3CR = 2CM$.

L, M and N are the mid points of OA, CA and OB respectively.

(a) Find in terms of c and b the following vectors:

(i) CR (ii) CM (iii) CA (iv) OA (v) LM and (vi) LN

(b) Show that OCNL is a parallelogram



M3. In a triangle ABC, L, M and N are the mid points of BC, CA and AB

respectively. $AM = \mathbf{m}$; $AN = \mathbf{n}$ and $3AG = 2AL$

(a) Express in terms of m and n the vectors

(i) \mathbf{AB} (ii) \mathbf{AC} (iii) \mathbf{BC} (iv) \mathbf{BG} (v) \mathbf{GM}

(b) Show that B, G, and M lie on a straight line and show that $3\mathbf{BG} = 2\mathbf{BM}$.

M4. In a triangle OAB, $\mathbf{OA} = \mathbf{a}$, $\mathbf{OB} = \mathbf{b}$. A point L is on the side AB and M on the side

OB. OL and AM meet at S. $AS = SM$ and $\mathbf{OS} = \frac{3}{4}\mathbf{OL}$. Given that $\mathbf{OM} = x\mathbf{OB}$ and $\mathbf{AL} = y$

\mathbf{AB} . Express the vectors (i) \mathbf{AM} and \mathbf{OS} in terms of \mathbf{a} , \mathbf{b} and x . (ii) \mathbf{OL} and \mathbf{OS} in terms of \mathbf{a} , \mathbf{b} and y . Hence find x and y.

20. Given that S is a point on line PQ such that $PQ:SQ = 4:1$, $SQ = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ and point P(6, -5). Determine

the; Vector \mathbf{PQ} , Coordinates of Q, Vector \mathbf{PS} and Value of $[PS + 2SQ]^{\frac{1}{3}}$

G. QUADRATIC EQUATIONS



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21. Factorise the expressions below completely; (iv) $8X^3-27$

(i) $8a^9 - 8a$ (ii) $16x^4 - 81y^4$ (iii) $\frac{4x^2 - 25}{4x^2 - 4x - 15}$ (iv) $5x^2 - 11xy - 12y^2$

22. Form a quadratic equation with integral coefficients whose roots are:

i) $-2\frac{1}{3}$ and -3 (ii) $1\frac{2}{3}$ and -2

23. A rectangle is $(x + 3)cm$ long and $y cm$ wide. The perimeter of the rectangle is 32cm and its area is $60cm^2$. Determine the possible values of x and y .

24. In a certain government – aided institution , when the fee per term was increased by sh 20,000, fifty students left the institution. However the total fee collection per term rose from shs 40,000,000 to sh 45,000,000. Find:

- (a) the original number of students in the institution.
- (b) the new fee per student per term
- (c) the percentage increase in the fee per term

25. (A) On the same axes draw graphs of $y = 2x^2 + 3x - 15$ and $y = 2x^2 + 7x - 3$ for values of x from $-5 \leq x \leq 2$, using a scale of 2cm on the x - axis and on y -axis.

Use your graph to determine the:

- i) Point of intersection of the two curves, hence find equation of the line joining the points.
- ii) Using curve $y = 2x^2 + 3x - 15$, to find the roots of $x^2 + x + 6 = 0$.

(B) On the same axes draw the graphs of $y = x^3 + 2x^2 - 5x - 8$ and $y = -(2x + 5)$ for $-4 \leq x \leq 3$. Use 1cm to represent 5units on the y – axis and 2cm : 1 unit on the x – axis. From your graph, estimate the solutions of

(a) $x^3 + 2x^2 + 5x - 8 = 0$ (b) $x^3 + 2x^2 = 0$ (c) $x^3 + 2x^2 - 3x - 3 = 0$

(C) (a) Copy and complete the table for the function $y = 2x^2 + 3x - 4$

X	-3	-2	-1	0	1	2	3
y							

(b) Draw on the same axes the graphs of $y = 2x^2 + 3x - 4$ and $y = 2 - x$, for the values of x from -3 to 3 taking 2cm to represent 5 units on the y – axis and 2 cm to represent 1 unit on the x – axis.

(b) State the range of values of x for which (i) $2x^2 + 3x - 4 \leq -3$ (ii) is $-ve$.

(D) (a) Copy and complete the table below.

$x/^\circ$	0	15	30	45	60	75	90	120	150	180
$3\text{Sin}x - 1$	-1		0.5		1.6		2			
$\text{cos}x$			0.87		0.5		0	-0.87		-1

(b) Using the same axes, draw graphs of $y = 3\text{Sin}x - 1$ and $y = \text{Cos}x$ for $0^\circ \leq x \leq 180^\circ$

(c) Use your graphs to solve the equations

(i) $3\text{Sin} x - \text{Cos} x = 1$ (ii) $3 \text{Sin} x = 1$ (iii) $\text{Sin} 80^\circ$ (iv) $\text{Cos} 130^\circ$

(Use 1cm to represent 15° on the x – axis and 2cm to represent 1unit on the y – axis)

(E) Use graphical method to solve the simultaneous equations $3x^2-3x=0$ and $10-5x=0$ for values of x from -3 to 3.

H. STATISTICS AND PROBABILITY

26. A.The data below shows the lengths of the prop roots measured to the nearest centimetre, 15, x , 17, $x+2$, 19. Given that the mean of the lengths of the roots is 333. Find the value of x hence determine the median length of the roots.

B.Find the mean of -9,-10,12,23.Hence find the mean of (i) -7,-8,14,25.(ii) -12,-13,9,20. (iii) -4.5,-5,6,11.5.

27. The table below shows marks scored by candidates in mathematics mock exams.

Marks	19 – 26	27 – 34	35 – 42	43 – 50	51 – 58	59 – 66	67 – 74
Cumulative frequency	7	15	20	32	42	48	50

a) State the:

i) Class width, Modal frequency and Median class

b) Calculate the mean score

c) Draw an O’give and use it to estimate the:

i) Median score

ii) Candidates who scored above 50.5

iii) Percentage of candidates who scored between 43.3 and 66.5.

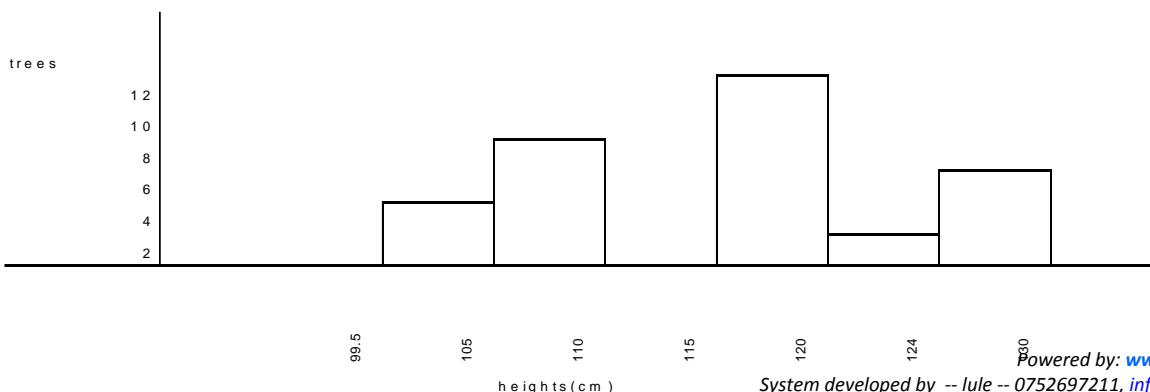
28. (I) The table below shows weights in kg of 76 students who attended a certain workshop.

Weight (kg)	Number of students
35.5 – 41.5	4
41.5 – 47.5	7
47.5 – 53.5	13
53.5 – 59.5	21
59.5 – 65.5	14
65.5 – 71.5	9

a) Using 56.5 as the assumed mean , calculate the mean weight to 2dp

b) Draw a histogram and use it to estimate the modal weight.

(II) The Histogram given below illustrates the distribution of the heights of trees in a nursery (to the nearest cm)



- (a) make a frequency distribution
- (b) how many trees were measured
- (c) Calculate the mean mark and the median mark

29. On a voting day, a family with 5 boys and 3 girls above 18 years went to cast their votes. Only two people were allowed in the gazetted area at a time to vote without repeating. Find the probability that:
 (a) A boy voted first (b) A girl voted after a boy (c) Two girls voted consecutively (d) After one voting an opposite sex would vote.

I. BUSINESS MATHEMATICS.

30. Jessica and Ibrahim both invested sh.92, 000/= in a bank which offers 10% interest per annum Jessica opted for a compound interest and Ibrahim opted for a simple interest. What amount will they have at the end of the third year?

31. Equity bank branch of Kyengera buys and sells foreign currency as follows.

Currency	Buying (shs)	Selling (shs)
1 US. Dollar (\$)	2900	3000
1 pound sterling (£)	4650	4700

A tourist arrived in Uganda with 4500 US dollars. She converted all the dollars to shillings at the equity bank branch. During her stay she spent Shs.9,900,000 and then converted the remaining shillings to Pound sterling, Calculate the amount she received in pound the pound sterling.

32. A generator is being sold in cash or hire purchase. Its cash value is Shs8940,000. On hire purchase, a deposit of 50% of the cash value is made and followed by equal monthly instalments of Shs65, 000 for 8 months. Calculate the money saved when one buys the generator in cash rather than on hire purchase.

33. A)The tax rates in a certain country for government employees are as follows:

Taxable income	Rate (%)
80,001 – 170,000	5.0
170,001 – 280,000	7.5
280,001 – 400,000	12.8
400,001 – 530,000	15.0
Above 530,000	20.5

Every employ is entitled to the following allowances;

- Medical 720,000 per annum
- Marriage 20,000 per month
- Single 10,000 per month
- Electricity 40,000 per month
- Transport 2,500 per day
- Housing 90% of his monthly medical income.

Children’s allowance for only three children according to the age distribution;

0 to 9 years shs.20,000 per child, between 9 and 16 years shs 15,000 and over 16 years shs 18,000 per child.

Given that a certain employee received Shs750,000 as June’s salary in 2015 and was married with 5 children , one child is 9 years, twins aged 12 years and the other two aged 15 and 17 years. Calculate the employees;

- i) Monthly taxable income
- ii) Monthly income tax



iii) Monthly percentage savings.

(B) Opondo owns goats and cows. The price of a goat is sh. 21500 while that of a cow is five times as much. If he sells all his goats, he gets 107500 more than he would have got by selling all his cows. If he sells all the cows and all the goats he gets forty five times the price of a goat. Calculate the number of cows and goats he owns.

NB. PLEASE DO NUMBERS ON TAXATION WHEN INCOME TAX IS GIVEN THEN THEY ASK TAXABLE INCOME, HIER PURCHASE, COMPOUND INTEREST ADDED HALF YEARLY ETC (ALL THESE CHECK YOUR NOTES)

J. NUMERICAL CONCEPTS, NUMBERS, BASES AND FRACTIONS.

34. If $5t = 4t - 2d\sqrt{\frac{d}{bc}}$, make d the subject of the formulae and hence determine the value of d when $b = 12, c = 10$, and $t = 7.2$.

35. Without using a mathematical table or calculator simply

i) $16^{-\frac{1}{4}} + 125^{\frac{1}{3}} - 256^{-\frac{1}{4}}$ (ii) $100 \times 0.009261^{\frac{1}{3}}$

36. Solve the equation $\frac{\frac{1}{243} \times 4^p \times 81}{64} = \frac{1}{12}$

37. Use logarithm table, evaluate $\frac{\sqrt{0.00256 \times 8100}}{2.56^2 \times 0.0064}$

38. Given the value $\log_{10} P = 2.778$ and $\log_{10} Q = 3.602$. Find the value of

i) $\log_{10} \left(\frac{P^2}{Q} \right)$ (ii) $\left(QP^{\frac{1}{3}} \right)$

39. (a) Simplify: $\frac{4\sqrt{243}}{13\sqrt{75} - \sqrt{363}}$ (b) Given that $\frac{8\sqrt{5}}{3 + \sqrt{5}} = x\sqrt{5} + y$. Determine x and y

(c) Given that $\frac{a + b\sqrt{2}}{c} = \frac{4 + \sqrt{2}}{4 - \sqrt{2}}$, find the values of a, b and c .

40. A lake occupies an area of 47.35 km^2 . What would be its area in cm^2 , on a map whose scale is 1:250,000?

41. Convert (i) 0.525252525..... (ii) 2.818181..... as a fraction in its simplest form.

42. (a) Given that $a * b = a + b + ab$. Find the value of n , when $7 * n = 23$

(b) Make a the subject of the expression $c = \frac{a^2}{(a-b)(a+b)}$.

43. (a) Given that $3002_{\text{six}} = 130a_{\text{ten}}$, Find the value a . (b) convert 124.234_{five} to decimal.

K. LINEAR PROGRAMMING.

44. Represent the following inequalities on the same axes and shade the unwanted regions.

$2x + 3y \geq 12, y \leq 2x + 4, 2x + y \leq 12$. Find the maximum of $2x + y$ and area of R.

45. (A) During a presidential campaign NRM party transported a maximum of 300 supporters from city square to its headquarters at kyankwanzi. The party hired Gaaga coach and Wakulanume buses which could carry 150 and 60 supporters per trip. The cost for each trip Gaaga makes is shs. 300,000 and that of Wakulanume is shs. 400,000 because they use petrol.

The party had organised shs.24 million for the transportation. The number of trips made by Wakulanume should not exceed those made by Gaaga coach. If the number of trips made by Gaaga is x and those made by Wakulanume is y .

- (i) Form all the inequalities representing the above information
- (ii) Represent all the inequalities on a graph by shading the unwanted regions and hence write down all the possible number of trips made by Wakulanume and Gaaga coach buses.
- (iii) Determine the number of trips made by the buses to keep the transport costs as low as possible.

(B) A patient recovering from illness requires to have daily at least 5 units of vitamin A and at least 9 units of vitamin E. The vitamins are available in both tablet and capsule forms. Each tablet contains 2 units of A and 1 unit of E. Each capsule contains 1 unit of A and 3 units of E. (take 1 cm on both axes) By letting x and y to be the number of tablets and capsules respectively required daily:

- (i) Write down 4 inequalities satisfied by x and y
- (ii) Illustrate the solution set of the inequalities on a graph
- (iv) if the total number of tablets and capsules combined is to be minimum, how many of each should be taken daily.
- (v) If each tablet costs sh 100 and each capsule costs shs 250, how many of each should be taken daily in order to minimize the total cost.

(C) A transporter has two types of trucks to transport sugar. Type A truck carries 2000 bags while type B carries 3000 bags per trip. The transporter has to transport not more than 120,000 bags. He has to make not more than 50 trips by the two trucks. Type B trucks are to make at most the number of trips made by type A trucks. Type B trucks make at least 10 trips.

- (i) By taking x to be the number of trips made by A trucks and y to be the number of trips made by B trucks, write down the four inequalities (other than $x \geq 0$ and $y \geq 0$)
- (ii) Present the information on a squared paper and shade the unwanted region. (take 1cm for 5 units on both axes)
- ii) If the transporter makes a profit of sh, 1000 per trip from A trucks, and sh 2000 per trip from B trucks, find the number of trips he should make with each type of trucks to maximize the profit. How much is this profit?



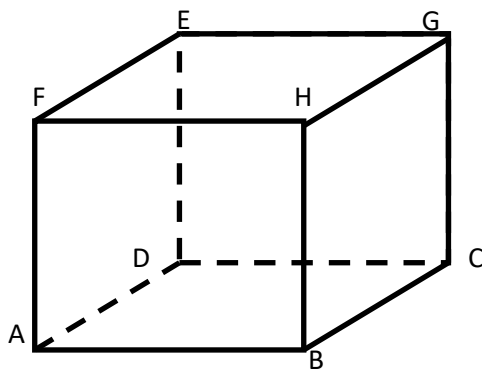
L. 2- DIMENSIONAL GEOMETRY.

46. Using a sharp pencil, a ruler and a pair of compasses only construct a parallelogram ABCD where line $AB = 6\text{cm}$, $BC = 8\text{cm}$, $\angle ABC = \angle ADC = 135^\circ$,
- Construct a perpendicular from C to meet AB being produced at F. Measure length AF.
 - Draw a circum circle on the triangle ADF and state its radius.
 - Determine the area of the;
 - Circle
 - Figure AFCD.
47. Using a ruler, a pencil and a pair of compasses only,
- Construct a triangle ABC, with $AB = 8\text{cm}$, $BC = 12\text{cm}$ and angle $BAC = 120^\circ$.
 - Draw a perpendicular line to BC from A. The perpendicular meets BC at point D. Measure the distance AD and find the area of the triangle ABC.
 - Inscribe the triangle ABC and measure the radius of the circle formed.
48. Kampala city is south of Arua town at 1200m. Kitugum town is on a bearing of 225° at a distance of 900m from Kampala and Jinja is $S60^\circ E$ at 744m from Kampala. Dokoro town is on a bearing of 100° at 960m from Kitugum. Given that $1\text{cm} = 120\text{m}$,
- Draw a sketch diagram showing the relative positions of the four towns and Kampala city
 - Draw an accurate diagram to locate the five districts
 - Use your diagram in b) above to determine the bearing of ;
 - Jinja from Dokoro
 - Kitugum from Arua
 - Arua from Jinja
 - Kampala from Dokoro
 - How long does it take a plane travelling at a speed of 500km/h to move directly from;
 - Dokoro to Jinja
 - Kitugum to Arua
49. Given that $5\sin \theta + 2 = 0$ and θ is obtuse, determine the value of;
Type equation here.
- $2\sin \theta \cos \theta$
 - $\frac{1 + \tan \theta}{1 - \tan \theta}$
50. At a certain point on the level ground the angle of elevation of the top of a tower T is 28° . At another point 100 meters away from the first point, the angle of elevation is 35° . Find the two expressions for the height of the tower hence find the height of the tower and give your answer to the nearest metre.
51. Three points A, B and C lie on the same level ground. A vertical pole NP stands between points A and B such that $AN = 21\text{m}$.
Angle $BAC = 72^\circ$ and $AC = 21\text{m}$. The angles of elevation of the top of the pole, P from A and B are 18° and 57° respectively. Calculate the (i) height of the pole NP (ii) length AB (iii) angle of elevation of P from C.
52. If $8\cos^2 x - 6 = 0$ for $0^\circ \leq x \leq 360^\circ$, find the possible values of x .

M. 3- DIMENSIONAL GEOMETRY

53. VABC is a regular tetrahedron in which the length of an edge is 10cm. Calculate the;
- Height of the tetrahedron to 3 significant figures
 - Angle between adjacent faces.
 - Volume of the tetrahedron
- Total surface area of the tetrahedron.
54. ABCDEFGH is a cube of volume 512cm^3 .



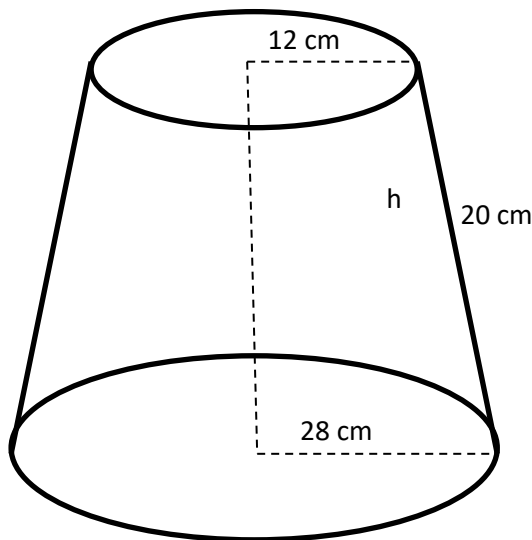


Find the: (a) Lengths AE and EB . (b) Total surface area of the cube

- (d) Angle between
- Line AG and the plane ABCD
 - Planes AEC and GEFH
 - Planes PEG and CDEG given that P is the midpoint of the line AB.

N. MENSURATION

55. (I) The diagram below shows a lampshade made out of the lower part of the cone. The base radius is 28cm, the top radius is 12cm and the slant height is 20cm.



Calculate the;

- Height h , of the lampshade
- Surface area of the lampshade. (use $\pi = 3.14$)

(II) A sector of a circle with central angle 216° and of radius of 5cm is bent to form a cone. calculate the curved surface area of the cone. ($\pi = \frac{22}{7}$)

O. KINEMATICS

56. (I) Towns P and Q are 100 km apart. A pick up starts from town P at 5:00am at a steady speed of 30 km/h for 1 hour. It increases its speed to 100km/h until it reaches town Q. At 5:30 am, a taxi starts from town Q towards P at a steady speed of 60 km/h until it breaks down $1\frac{1}{2}$ hours

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- a) On the same axes, draw a distance time graphs for the pickup and the taxi. (Use scale 2cm:30 minutes on the horizontal axis and 2cm:10 km on the vertical axes)
- b) Use your graphs to find;
 - i) The time the taxi and the pickup passed each other and how far they were from P.
 - ii) How far the taxi was from town Q when it broke down.
 - iii) The time the pickup reached town Q.

(II) Joseph and Okello wish to travel to the next trading centre which is 30km away. They both use motor cycles. When John had covered 9km traveling steadily at 4km/hr, Okello started riding at a steady speed of 7km/hr from where Joseph started. Both maintained their speeds until until Okello over took Joseph

- (a) Find the time and distance from their starting point where Okello overtook Joseph.
- (b) Given that Okello then reduced his speed, and maintained the new speed till he arrived at the trading centre thereby arriving 0.6 hours later than if he had maintained the 7km/hr speed,
 - (i) Calculate by how much he reduced his speed
 - (ii) For how long was he in the trading centre before Joseph joined him?

57. Two cars A and B start off from the rest at the same time moving in the same direction on a straight road. The speeds of the two cars in ms^{-1} are shown in the table below:

T (s)	0	2	4	6	8	10	12
Speed of A (ms^{-1})	0	4.5	9.0	13.5	18.0	22.5	27.0
Speed of B (ms^{-1})	0	2.0	5.0	10.0	23.0	27.0	28.5

Using a suitable scale, draw on the same axes the velocity – time graphs of the cars A and B. From your graph find the;

- a) Time when the two cars have equal speed and the magnitude of that speed
- b) Difference in the speed after a period of 9 seconds
- c) Distance covered by car A by way of estimating the area under the curve described by car A for the 12 seconds.

P. GENERAL QUESTIONS

58. Find the equation of a line through the point R (5, 9) and is parallel to the line joining the point S (15,-2) to the point T (-3, 4).
59. Given that $2^{2y} = \frac{1}{8}$, find the value of y .
60. Find the equation of a perpendicular bisector to a line which passes through the point (-3,5) and (6,-4).
61. If the order of digits of a two-digit number is reversed, the number increases by 27. Given that the sum of digits in number is 11. find the number.
62. The image of point A (-2,6) under enlargement linear scale factor -3 is (5,8). Find using knowledge to find the co-ordinates of the center.

63. Find the coordinates of the point of intersection between the line $y - 5x = 2$ and the curve $y = 2x^2 + 5$.
64. Express $4 - x - 5x^2$ in the form $a + b(x + c)^2$. state the values of a,b and c.,hence solve the equation $5x^2 + x - 4 = 0$.
65. The numerator of a fraction is one less than its denominator.If three is added to each of the numerator and denominator,the fraction is increased by $\frac{3}{28}$. Find the fraction.
66. Betty is 9 years younger than David. John is three times as old as Betty. The sum of all their ages is 49 years. Find David's and John's age.
67. 1000 students at STAHIZA can clear posho for 6 hours in 2 days. Find the number of days they can take to finish the food if 800 students are allowed to eat for 4 hours per day..
68. Two similar plastic containers have capacities of 2 litres and 54 litres. If the height of the bigger container is 87cm. find the height of the smaller container.
69. A right circular cylinder of radius 4cm has the same volume as the sphere of radius 3 cm.find the height of the cylinder.
70. A quantity p is partly constant and partly varies as the square of q . When $q = 2, p = 40$. When $q = 3, p = 65$.
- Form an equation relating p and q .
 - Determine the values of p when $p=100$.

WORDS OF WISDOM AND ENCOURAGEMENT

- *To the **PROBLEMS** of your life,you're the **SOLUTION** ,and to the **QUESTIONS** of your life ,you're the **ANSWER**.*
- *If you are going to achieve excellence in big things, you develop the habit in little matters.*
- *When spider webs **unite**, they can tie up a lion.*
- *Prayer and hard work go together with discipline.*
- *Things do not change; we change.*
- *Failure defeats only **LOSERS** but it inspires **WINNERS**.*
- *You may delay but **TIME** wont delay.*
- *Its yourself only who decides to obtain the best*
- *He who thinks that he can make it,makes it.*

FINALLY,

“SUCCESS COMES TO A PREPARED MIND” @stahiza

