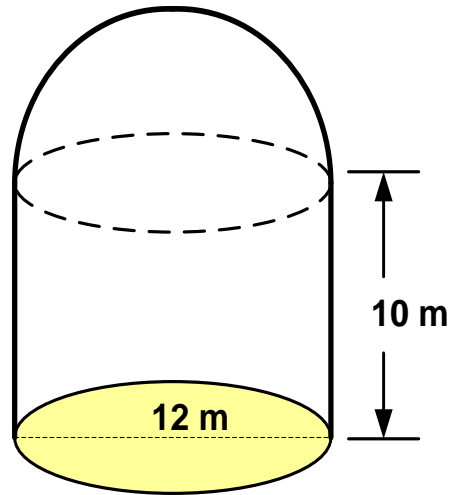


S.4 MATHEMATICS INTERNAL SEMINAR QUESTIONS 2020

SECTION A

1. Without using mathematical tables or calculator evaluate
 $32^{2/5} \times \left(\frac{16}{81}\right)^{-1/4}$
2. Given that $f^{-1}(x) = \frac{x+3}{5}$. Find the value of $f(2)$
3. Given that $x^2 - y^2 = 65$ and $x - y = 5$ determine the value of x and y
4. Point A (5, -4) and B (-1, -2) lie on a straight line. Find the equation of the perpendicular bisector of line AB. Give your answer in the form $y = mx + c$
5. Solve the equation $\log_{10}(2x - 8) - \log_{10}(x + 4) = 1$.
6. A cylindrical water tank of diameter 12m and 10m high is covered with a hemispherical top as shown in figure below.



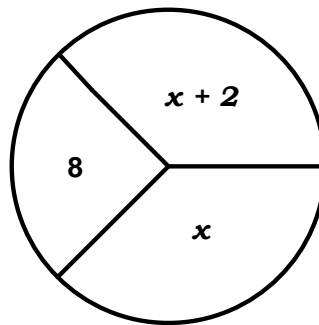
Calculate the capacity in litres of the tank including the domed path.
 (Take 1 litre = 1000 cm³).

7. The scale of a map is 1:50,000. The distance between two villages on the map is 20cm. Find the actual distance in Km between the two villages.
8. Given that vectors $\mathbf{m} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$ and $\mathbf{n} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$
 Find (i) $\mathbf{m} + \frac{1}{2} \mathbf{n}$
 (ii) $|\mathbf{m} + \frac{1}{2} \mathbf{n}|$
9. Given that two sets $A = \{x : 0 < x \leq 9\}$ and $B = \{x : 5 \leq x < 12\}$
 (i) Draw a venn- diagram to illustrate these sets.
 (ii) List the elements of $A' \cap B$.
10. Express $0.4\dot{3}$ into fraction in the lowest form.

11. Make M the subject of the formula, $Q = \sqrt{\frac{3B}{N-M}}$.

12. Matrix $P = \begin{pmatrix} 3 & -1 \\ 2 & 1 \end{pmatrix}$ and $Q = \begin{pmatrix} 2 & 3 \\ -1 & 1 \end{pmatrix}$. Find the matrix R such that $P^2 = PQ - R$.

13. In the diagram below, the angle representing $x + 2$ is 120° . Find the value of x .



14. The length of a rectangular carpet is 4 metres more than its width. If its area is 12m^2 , find the width of the carpet.

15. Find the equation of a straight line which passes through the point A $(-1, 2)$ and it is parallel to the line $x - 2y - 6 = 0$.

16. Given that $13\sin \theta + 5 = 0$ for $100^\circ \leq \theta \leq 270^\circ$, find the value of $\cos \theta + \tan \theta$.

17. Use matrix method to solve the equations; $\frac{1}{2}x + y = \frac{5}{2}$ and $x + \frac{2}{3}y = \frac{7}{3}$

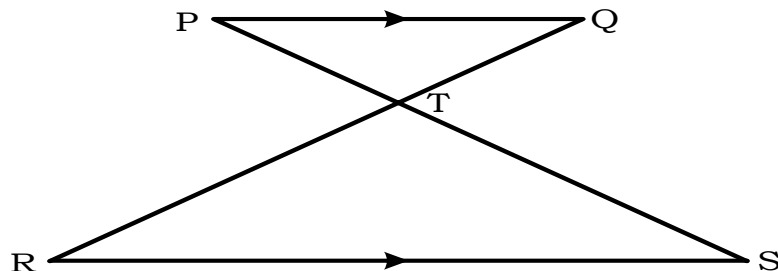
18. The mean of n , $8n+1$, 17 and 20 is 14.

Find the;

- (i) Value of n
- (ii) Mode of the data.

19. In the figure below, PQ is parallel to RS and the lines PS and RQ meet at T

Given that $PT : TS = 2 : 3$ and that $RQ = 10\text{cm}$, find the length of RT.

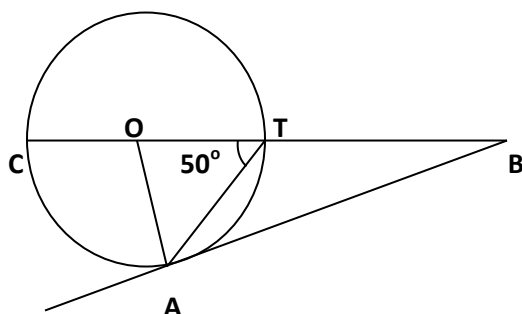


20. Given that $a * b = ab - b^2$. Find $(4 * -1) * (2 * 1)$.

21. Evaluate without using tables or calculators $\frac{8 \times 10^{11} \times (2 \times 10^{-3})^4}{3.2 \times 1.6 \times 10^8}$

22. The line $y = mx + c$ passes through the points $A(0, -2)$ and $B(-5, 4)$. Find the values of m and c .
23. Mukasa borrowed sh. 400,000 from a bank, for construction of rental houses, at 18% interest per annum. He spends sh. 4,000 every year on other expenses on the house. Determine how much he has to charge as monthly rate, if he also has to save sh. 11000 per month.
24. A map is drawn to a scale of 1:400 000. What area in km^2 , represented by a rectangle 2 cm by 4.2 cm?
25. The functions $f(x) = \frac{x}{3} - \frac{3x-7}{5}$ and $g(x) = \frac{x-2}{6}$ Find the value of x for which $f(x) = g(x)$.
26. Without using tables or calculators, solve the equation:

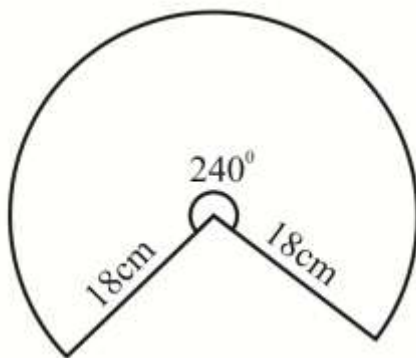
$$\log(5x - 4) = \log(x + 1) + \log 4.$$
27. In a class of 40 students, 12 enrolled for both English and German. 22 enrolled for German. If the students of the class enrolled for at least one of the two subjects, then how many students enrolled for only English and not German?
28. Given that $A(5, -3)$ and $B(11, 15)$ are two points on a plane. Determine the position vector of the point C which divides AB in the ratio 1:2 .
29. Without using tables or calculators, evaluate $21.5 \times 48.6 + 51.4 \times 21.5$
30. Solve the equation: $\frac{y+2}{3} - \frac{y-1}{4} = \frac{y+3}{2}$.
31. Below is a circle with centre **O**. \overline{AB} is a tangent at A and angle $\angle OTA = 50^\circ$



Determine value of angles;

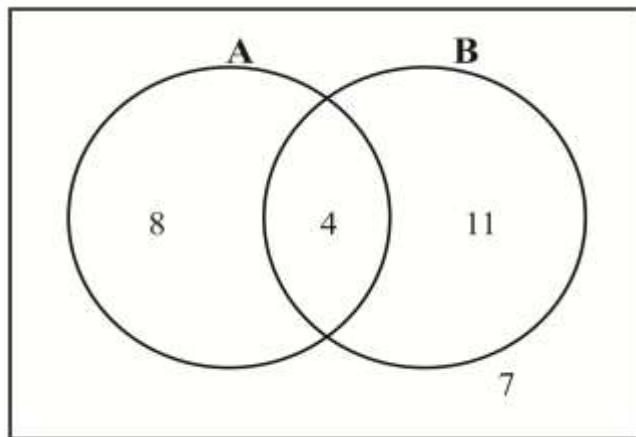
- (i) $\angle TAB$
- (ii) $\angle ABT$

32. Point **A(2,2)** is rotated through **90°** using centre **(1,0)**. Determine the coordinates of **A'**, the image of **A** after the rotation.
33. Given $P^{-1} = \begin{pmatrix} 5 & -2 \\ -7 & 3 \end{pmatrix}$ determine the matrix **P**.
34. Given that $\tan\theta = \frac{-3}{4}$ and that $0^\circ < \theta < 180^\circ$, without using a calculator, evaluate $\sin\theta - \cos\theta$
35. Solve the equation $x^2 - 2x = 15$.
36. A box has balls of the same size in colours of yellow, green and blue. The probability of picking a yellow ball is $\frac{1}{4}$ and that of a green one is $\frac{2}{3}$. What is the probability of picking a blue one.
37. Use logarithms to solve for x ; $3^{x+1} = 18.72$ (give your answer correct to 3 significant figures)
38. Given the numbers 0,6,7,3,6 and 5 determine their;
- Mean
 - Median
39. Given that $x * y = x^2 + y$ determine;
- The value of $-3 * 5$
 - The value of y when $2 * y = 7$
40. Determine the arc length of a sector of a circle, radius 13.3cm, which subtends an angle of 150° at the centre.
41. A sector with radius 18cm subtending 240° at the centre was folded to form a cone.



Find the radius and height of the cone formed.

42. A certain microfinance institution charges compound interest on money borrowed. A farmer borrowed sh. 160,000 from the microfinance institution. He paid back sh. 250,000 after 2 years. Find the interest rate per annum.
43. Express $0.8\dot{3}$ as a simplified fraction.
44. Three vectors $\mathbf{a} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -7 \\ 4 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} -1 \\ -1 \end{pmatrix}$. Find
- $\mathbf{a} - 2\mathbf{b} + \mathbf{c}$
 - length of $\mathbf{a} - 2\mathbf{b} + \mathbf{c}$
45. A function $f(x)$ varies inversely as the square of 2^x , $f(2) = 20$. Find $f\left(-\frac{1}{2}\right)$.
46. A line with gradient of $\frac{-5}{7}$, passing through a point $(21, -5)$, cuts the y – axis at A. Determine the coordinates of A.
47. The capacity of a hemisphere is 54 litres. Find the capacity in litres of a hemisphere whose radius is a third that of the given hemisphere.
48. Express $\frac{\sqrt{3}}{2-\sqrt{3}}$ in a form $p + q\sqrt{r}$ and hence evaluate $\frac{\sqrt{3}}{2-\sqrt{3}}$ correct to three significant figures if $\sqrt{3} = 1.732$.
49. If $*n = \frac{m}{n} + \frac{n}{m}$, find the value of $3 * \left(\frac{2}{3} * \frac{2}{3}\right)$.
50. Factorise completely $2x^2y^3 - xy^3 + xy - 2x^2y$.
51. Determine the solution set of the inequality $x^2 - x < 12$.
52. Solve for p in the equation $\frac{p-3}{5} - \frac{p+2}{3} = \frac{p-6}{2} + 3$.
53. The Venn diagram below represents students who visited Angola (A) or Burundi (B).



Find;

(a) $n(A'UB')$

(b) $n(AUB')$.

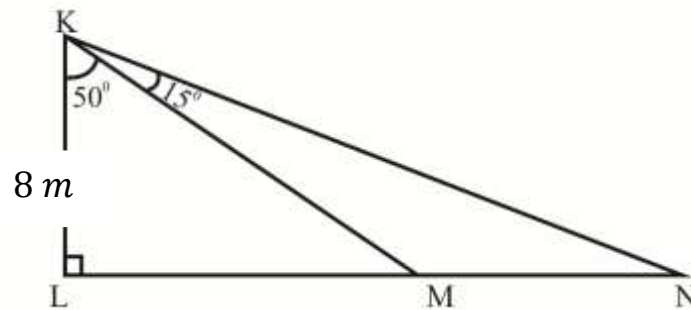
54. Use matrix method to solve the pair of simultaneous equations:

$$0.5x + 0.6y = 5$$

$$0.2y = 0.25x$$

55. Point $A(4, 3)$ was mapped onto $A'(-2, 0)$ after an enlargement of linear scale factor -2 . Find the coordinates of the centre of enlargement.

56. Find the length of MN in the diagram below. Give your answer to 3 decimal places.



57. The table below shows the number of goals scored by a team, in a series of football matches.

Number of goals	0	1	2	3	4	5	6	7
Number of matches	3	6	4	7	5	x	5	2

If the mean number of goals scored was 3.475, find the value of x .

58. The shortest distance of a chord of 16 cm length from the centre of the circle is 6 cm . Calculate the perimeter of the circle. (Use $\pi = 3.142$).

59. A fair coin having a court of arm (C) on one face and a fish (F) on the other, is tossed together with a fair die whose six faces are respectively labelled with 1, 2, 3, 4, 5 and 6. Find the probability that a fish and a triangle number will appear on top.

60. Given that the points $(-2, a)$ and $(b, -1)$ lies on the line $y = 3 - 2x$; find the values of a and b .

61. A television can be bought by paying cash of shs. 400,000 or by depositing 70% of the cash value and pay five monthly installments of shs. 50,000 each. Determine the amount;

(a) Used to buy the television under installment method.

(b) Saved by paying cash than installment method.

TRAVEL GRAPHS

62. On his journey to Masaka, Kato rides a bicycle for 45 km from Kampala to Mpigi at a speed of $22\frac{1}{2}$ to catch a staff bus. He waits for the bus for 15 minutes. The bus sets off at exactly 09:00 *am* from Mpigi and it is restricted to an average speed of 68 kmh^{-1} . A non – stop staff mini bus sets off at 08:40 *am* from Masaka to Kampala, 130km apart, where it arrives at 10:20 *am*.

- a) Determine the time Kato sets off from his home in Kampala
- b) Represent the journeys on a distance time graph and use it to determine;
 - i. The distance from Masaka where the two buses meet.
 - ii. The time at which the bus from Mpigi arrives at Masaka.

63. Two cars *P* and *Q* started off from 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 after time in seconds.

Time (s)	0	4	8	12	16	20	24
Speed of <i>P</i> (ms^{-1})	0	4.00	8.25	12.50	16.50	20.75	24.75
Speed of <i>Q</i> (ms^{-1})	0	2.50	6.50	11.00	17.75	22.75	26.50

- (a) Using a scale of 2cm representing 4 seconds, and 4cm representing 5ms^{-1} , draw on the same axes the velocity time graphs for the two cars *P* and *Q*.
- (b) Find from your graph the
 - (i) time when the two cars have equal speed and the magnitude of this speed.
 - (ii) difference in their speeds after 18 seconds.
- (c) Estimate the total distance covered by car *P* after 24 seconds.

64. Town A and Town B are 360km apart. A Prado left Town B for A at 7:00am at an average speed of 50kmh^{-1} . It then stopped for half an hour for servicing at town C after covering a distance of 200km and later continued at an average speed of 80kmh^{-1} . At 8:30am, a bus leaves Town A at an average speed of 100kmh^{-1} without stopping to town B.

- (a) Using a horizontal scale of 1cm to represent 30 minutes and a vertical scale of 2cm to represent 50km, show the two journeys on the same graph.
- (b) Determine where and when did the bus meet the Prado car?.

- (c) Find the distance from town B between the two vehicles at noon.
- (d) Calculate the average speed for the Prado car.

RELATIONS AND FUNCTIONS

65. (a) Given that $Q = \{2, 3, 5, 15, 20\}$, illustrate on papygrams the relations;
- (i) “more than by a prime number”,
 - (ii) “multiple of”
- (b) If $g^{-1}(x) = 3 - \frac{2}{x}$;
- Find;
- (i) $g(-2)$,
 - (ii) the value of x when $g(x)$ is undefined.
66. (a) Given that $f(x) = 5x + 4$ and $g(x) = \frac{x}{3-2x}$
- i. $fg(x)$
 - ii. $g^{-1}(2)$
- (b) The value of x for which $g^{-1}f(x) = 0$
- 67.(a) Given that $f(x) = px^2 - q$, $f(0) = -3$ and $f(-2) = 13$. Determine values of p and q .
- (b) The functions $h(x) = x^2 + 1$ and $g(x) = 4x$
- Find (i) $hg(x)$
- (ii) The value of x for which $hg(x) = gh(x)$.

BUSINESS MATHEMATICS

- 68.(a) Kato bought a bicycle at shs. 345,000 at the beginning of 2015. The bicycle depreciates at a rate of 15% per annum. If Kato sold the bicycle at a loss of 30% at the beginning of 2018, determine the price at which he sold the bicycle. (6marks)
- (b) A motorcycle is being sold in cash and hire purchase. The cash value is shs. 1,935,000. On hire purchase, a 45% of the cash value is made and followed by equal monthly installments of 8.5% of the cash value for 9 months. Calculate the money saved when one buys in cash rather than hire purchase.

69. An employee earns a gross monthly salary of shs 3 millions which includes the following tax free allowances;

Medical shs 50,000

Transport shs 720,000 per annum

Family and insurance shs 180,000

The rest of the employee's income is taxed as follows:

6.5% on the first shs 1,900,000

11.2% on the next shs 600,000

16% on the next shs 400,000

19.5% on the remainder

Find the employee's monthly;

(a) taxable income.

(b) income tax

(c) net income.

70.(a) Smart phone whose marked price is sh. 400,000 is sold at sh. 560,000 on hire purchase terms. Odongo bought the smart phone on hire purchase terms. He paid a deposit of 25% of the hire purchase price and cleared the balance by equal monthly instalments of sh. 26,250.

Calculate the number of instalments he made.

(b) Muhindo's monthly gross salary is shs. 3,000,000 before charging income tax, all the following allowances are deducted from his gross salary.

- Welfare allowance shs. 90,000.

- Child allowance shs. 50,000.

- Marriage allowance shs. 40,000.

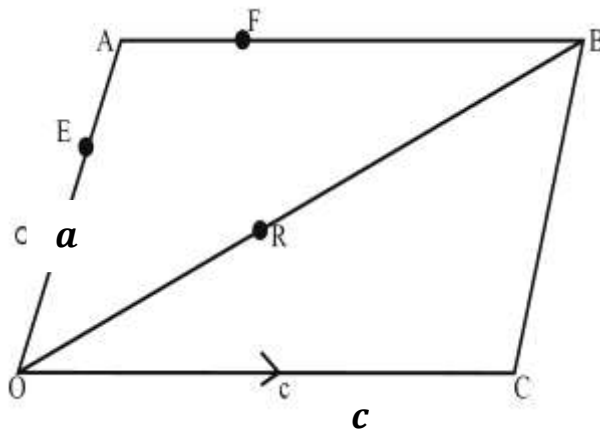
Calculate his;

(i) Monthly taxable income.

(ii) Net income, if he pays income tax of 30% of his monthly taxable income.

VECTORS

71. The diagram below represents a parallelogram $OABC$ with $\mathbf{OA} = \mathbf{a}$, $\mathbf{OC} = \mathbf{c}$, E is mid point of OA .

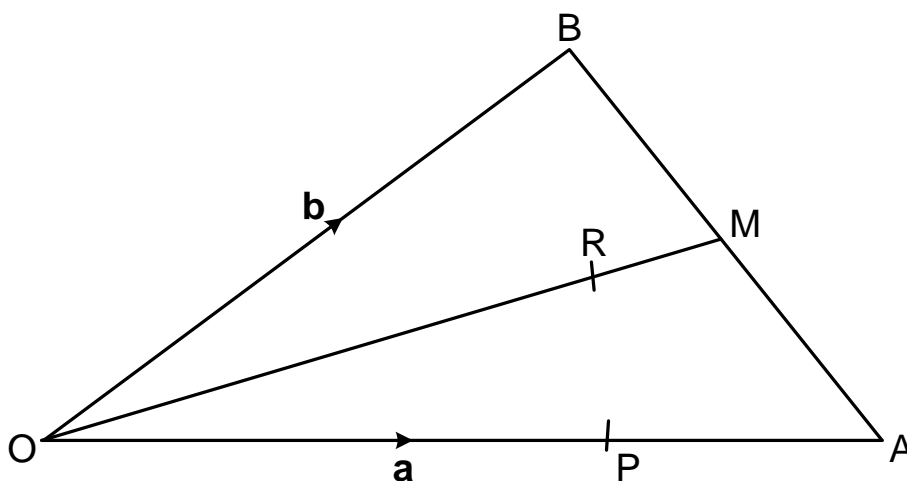


If $OR:RB = 1:2$ and $5AF = FB$

- (a) Express in terms of \mathbf{a} and \mathbf{c} the vectors;
- (i) \mathbf{FC} ,
 - (ii) \mathbf{FR} .
- (b) Show that the points E , R and C lie on a straight line and hence find the ratio $ER:RC$.
72. (a) A triangle ABC is right angled at B . Given $A(1, 3)$, $B(1, 5)$ and $C(-3, 5)$, determine vectors \mathbf{AB} and \mathbf{BC} . Hence find the area of the triangle ABC
- (b) Given vectors \mathbf{a} and \mathbf{b} , find the values of m and n such that:

$$m(2\mathbf{a} + \mathbf{b}) + n(3\mathbf{a} + \mathbf{b}) = 3\mathbf{a} + 2\mathbf{b}$$

73. In the figure below, $\mathbf{OA} = \mathbf{a}$, $\mathbf{OB} = \mathbf{b}$. M is the mid-point of AB . $OP:PA = 3:2$ and $OR:RM = 3:1$.



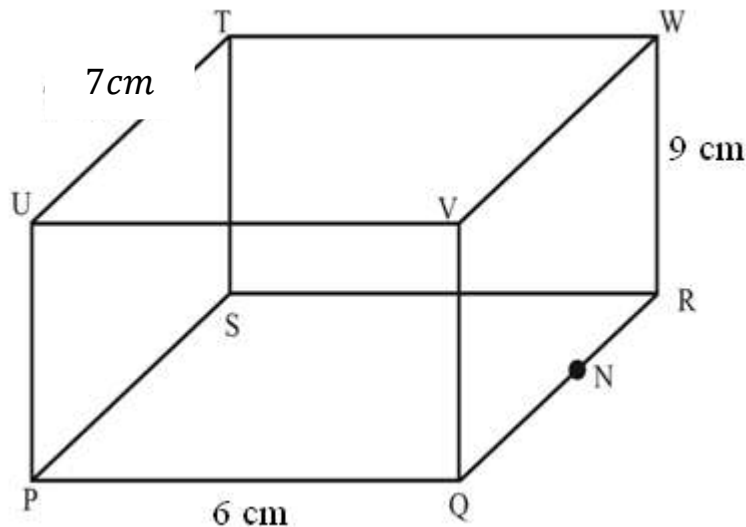
- (a) Express the following vectors in terms of \mathbf{a} and \mathbf{b}

- (i) ***OM***
- (ii) ***OR***
- (iii) ***PR***
- (iv) ***PB***

(b) Show that P, R and B lie on straight line.

THREE DIMENSION GEOMETRY

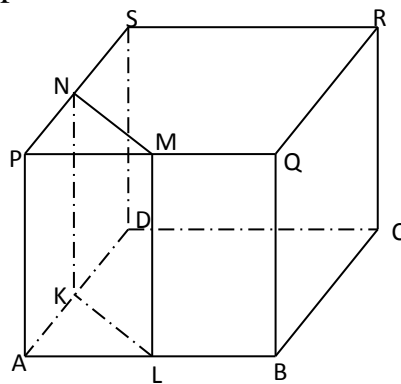
74. The figure below shows a cuboid $PQRSTU VW$ in which $PQ = 6\text{ cm}$, $UT = 7\text{ cm}$ and $RW = 9\text{ cm}$. N is the mid point of QR .



Find the;

- (a) length SV
- (b) angle between;
 - (i) line SV and the base
 - (ii) planes UTN and $UTWV$.

75. The figure below shows a cuboid with sides $AP = 10\text{ cm}$, $AB = 20\text{ cm}$ and $BC = 8\text{ cm}$. The points K , L , M and N are the midpoints of AD , AB , PQ and PS respectively.



(b) Represent the time taken by the students in the competition on a bar chart.

78. The table shows marks scored in a Mathematics test and their respective cumulative frequency.

MARKS	CF
20 – 29	2
30 – 39	7
40 – 49	15
50 – 59	27
60 – 69	33
70 – 79	38
80 – 89	40

(a) State ;

- (i) the modal frequency
- (ii) class interval

(b) Calculate the mean mark

(c) Draw a histogram and use it to estimate the modal mark.

79. The data below shows the weights in kg of fish trapped in River Kagera.

<i>Weights (kg)</i>	4.8 – 5.2	5.3 – 5.7	5.8 – 6.2	6.3 – 6.7	6.8 – 7.2
<i>Number of fish</i>	3	8	12	10	7

(a) State the;

- (i) Class width
- (ii) Median class

(b) Calculate the mean weight.

(c) Draw a histogram and hence use it to estimate the modal weight.

MATRICES AND TRANSFORMATIONS

80. (a) Given the matrices $A = \begin{pmatrix} 3 & 4 \\ 4 & -1 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 2 \\ -3 & 1 \end{pmatrix}$. Determine

(i) $A^2 + B$

(ii) $2B - A$

(b) Use matrices to solve
$$\begin{aligned} 2x + 3y &= 1 \\ x - y &= 3 \end{aligned}$$

81. Triangle ABC with vertices $A(2,2)$, $B(5,2)$ and $C(1,5)$ is given a translation $\begin{pmatrix} 2 \\ -1 \end{pmatrix}$ to triangle $A^1B^1C^1$. Then $A^1B^1C^1$ is reflected in line $y = -1$ to triangle $A^{11}B^{11}C^{11}$.

(a) Using a graph paper and on the same axes draw the triangles ABC , $A^1B^1C^1$ and $A^{11}B^{11}C^{11}$

(b) State the coordinates of;

(i) A^1, B^1 and C^1

(ii) A^{11}, B^{11} and C^{11}

82. (a) Given the matrix $A = \begin{pmatrix} 3n & n-6 \\ -6 & n+2 \end{pmatrix}$, find the values of n for which A is a singular matrix.

(b) Matrices P and Q are such that $P = \begin{pmatrix} -2 & 4 \\ -3 & 3 \end{pmatrix}$ and $PQ = \begin{pmatrix} 6 & 0 \\ 0 & 6 \end{pmatrix}$.

Find the matrix Q . Hence determine the inverse of matrix P .

83. Triangle PQR with vertices; $P(2, 1)$, $Q(4, 1)$ and $R(4, 4)$ is reflected in the line $x = 0$ to get triangle $P'Q'R'$. Triangle $P'Q'R'$ is then given a negative half turn about the origin, to get triangle $P''Q''R''$.

(a) Use $I(1, 0)$ and $J(0, 1)$ to find the matrix of ;

(i) reflection in the line $x = 0$,

(ii) rotation of negative half turn about the origin.

(b) Use the matrices in (a) above to find the coordinates of

(i) P' , Q' and R'

(ii) P'' , Q'' and R''

(a) Determine a matrix for the single transformation which maps $P''Q''R''$ back onto PQR .

84. Given the transformations represented by matrices:

$$T_1 = \begin{pmatrix} 2 & 1 \\ -1 & -2 \end{pmatrix} \text{ and } T_2 = \begin{pmatrix} 3 & 1 \\ 1 & 3 \end{pmatrix}$$

T_1 followed by T_2 can be represented by a single matrix T .

(a) Find the matrix T and its inverse.

- (b) The points $A''(7, -11)$, $B''(-7, -13)$ and $C^{11}(-8, 16)$ are images of A, B and C under T . Find the coordinates of A, B and C.
- (c) Find the coordinates of $A'B'$ and C' the image of A, B and C under the transformation T_1 .

RATIOS AND PROPORTIONS

85. The charge, C shillings per person for attending a certain workshop is partly fixed and partly inversely proportional to the total number N of people.

- (a) Write down an expression for C in terms of N.
- (b) When 50 people attend, the charge is sh. 6,000 per person while for 25 people the charge is sh. 9,000 per person.
Calculate the fixed charge.
- (c) Find the charge per person when 200 people attend.

CONSTRUCTION

86.(a) Using a pencil, ruler and a pair of compasses, construct triangle **ABC** in which **AB = 8cm**, angle **A = 60°** and angle **C = 45°**. Measure length **AC**.

(b) Construct a circle passing through A, B and C. State its radius.

(c) Calculate the area of triangle **ABC**

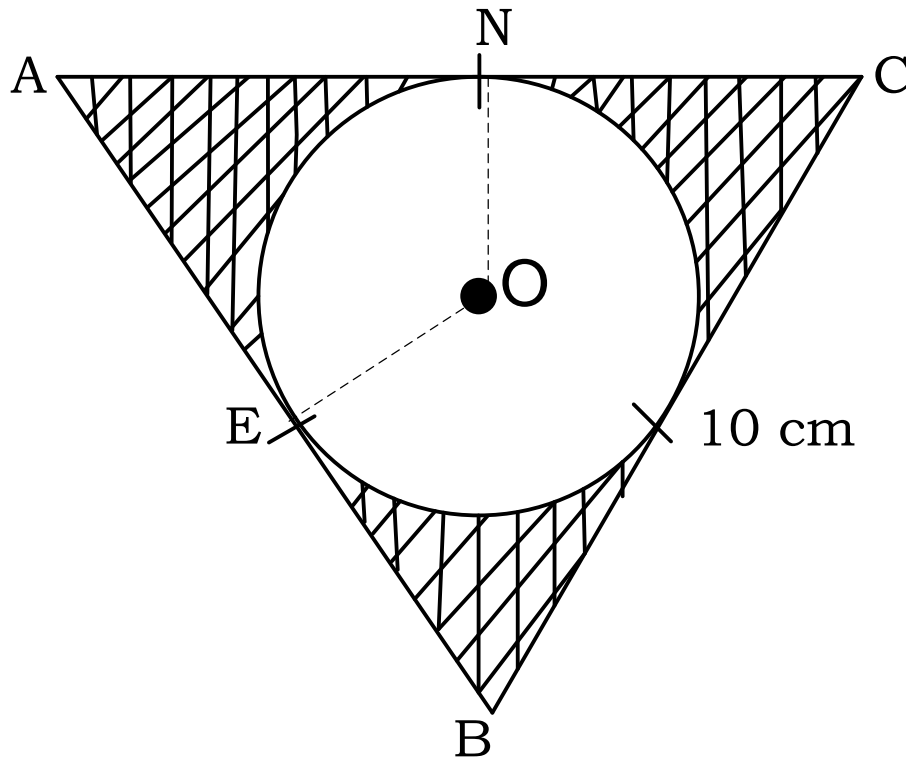
87. Using a ruler and a pair of compasses only,

- (a) Construct a parallelogram ABCD such that $AB = 6\text{cm}$, $BC = 4.8\text{cm}$ and angle $ABC = 150^\circ$.
- (b) Construct a perpendicular from D to meet AB at M. measure the length DM.
- (c) Draw a circle through the points M, A and D. Measure the radius of the circle.

CIRCLES AND CIRCLE PROPERTIES

88. The diagram below shows an inscribed circle within a triangle ABC. Given that triangle ABC is equilateral measuring 10cm and O is the centre of the circle, find:

- (i) the radius of the circle.
- (ii) the area of the sector EON
- (iii) Area of the shaded region.



INEQUALITIES AND LINEAR PROGRAMMING

89.(a) Solve the inequality $2x + 1 < 7 - x$ hence state the greatest integral value of

$$2x + 1 < 7 - x$$

(b) By shading the unwanted region, show the inequalities

$$y \leq x + 1$$

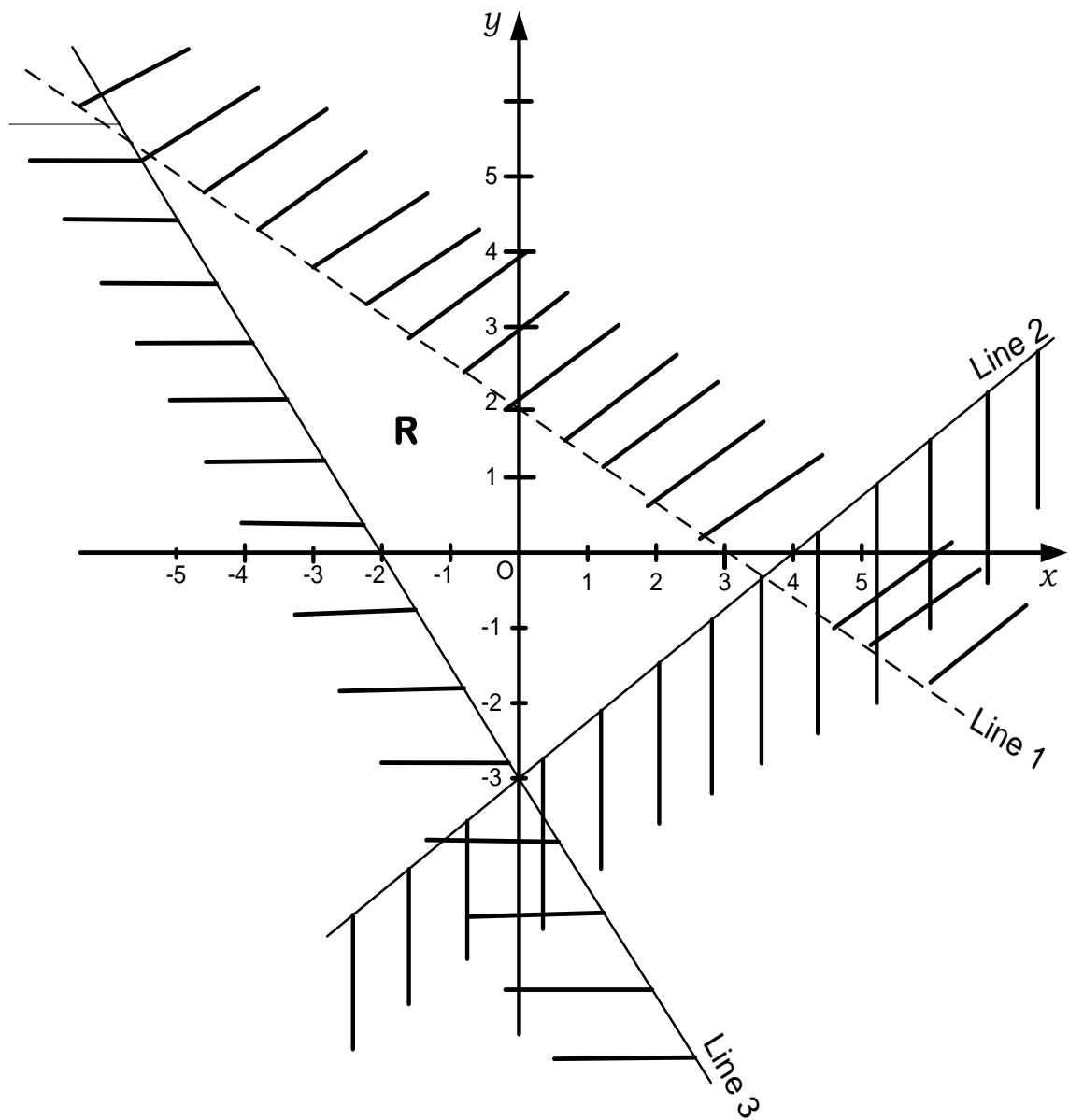
$$y > 1$$

$$2y + x \leq 8$$

90.(a) Solve and list all the integral values of x which satisfy the inequalities

$$x + 6 \leq 15 - 2x < 2x + 21$$

(b) The figure shows a graph of inequalities with shaded unwanted area. Write down all the inequalities represented by the region R.



QUADRATIC EQUATIONS AND CURVES

- 91.(a) Draw a graph of $y = 2x^2 + x - 6$ for $-3 \leq x \leq 3$
(b) state the minimum value of $2x^2 + x - 6$
(c) Use the graph to solve the equation:
(i) $2x^2 + x - 6 = 0$
(ii) $x^2 - x - 2 = 0$
- 92.(a) Draw a graph of $y = 2x^2 - x - 3$ for $-3 \leq x \leq 3$.
Use scales of 2cm to represent 1 unit on the x-axis and 1cm to represent 1 unit on the y-axis.
(b) On the same axes, draw the line $y = x + 1$.
(c) (i) Use the two graphs to solve the equation $x^2 - x - 2 = 0$
(ii) Find the minimum value of the function $y = 2x^2 - x - 3$

TWO DIMENSIONAL GEOMETRY

93. The length of a rectangle is 3cm less than twice its width, and the area is 35cm^2 .
Calculate the;
(i) width
(ii) perimeter of the rectangle
94. A garden measures 10m by 8m. A uniform path is made all round the garden. The total area of the path is 88m^2 .
(a) Find the width of the path.
(b) The path in (a) above is to be covered by a square concrete slab. Each corner of the path is covered by small slabs whose side is equal to the width of the path and rest of the path is covered by small slab of side 50cm each. Find the number of slabs required.
(c) The cost of making each corner slab is shs. 6,000 and each smaller slab is shs. 5,000. Calculate the cost of covering the path.

INDICES AND LOGARITHMS

- 95.(a) Express $\log_3 35^2 + \log_3 5^{-1} - 2\log_3 7 - 2$, as a single logarithm $\log_3 B$ and hence evaluate $\log_3 16.2B$.
(b) Use mathematical tables of logarithm to evaluate $\frac{0.0651}{\sqrt[3]{0.213 \times 68.2}}$
- 96.(a) Given that $\log_{10} 2 = 0.301$ and $\log_{10} 5 = 0.699$, use these values to find $\log_{10} 6.25$
(b) If $5^x \times 5^{4y} = 1$ and $3^x \times 3^{3y} = 3^{-2}$ calculate the value of x and y .

BEARING

97. A helicopter left Kampala at 0600 hours and flew on a bearing of 090° , at a velocity of 300 km per hour . It landed at Nairobi Airport at 0830 hours. At exactly 0900 hours, it left Nairobi Airport and flew on a bearing of 340° , at the same original velocity. It then landed at Kitgum Airstrip at 1200 hours.

Using graphical construction and a scale of $1\text{cm} : 100\text{km}$, find the:

- (a) distance of Kitgum from Kampala
- (b) bearing of Kampala from Kitgum.

SIMULTANEOUS EQUATIONS

98. Consider a two – digit number PQ in base ten, the sum of whose digits is 8. When the order of the digits is reversed, the figure QP exceeds PQ by 36.
- (b) Form two suitable equations in P and Q .
 - (c) Use the equations in (a) above to find the values of the two – digit numbers PQ and QP .

TRIGONOMETRY

99. (a) Draw a table showing the values of $\sin 2\theta$ for $0^\circ \leq \theta \leq 180^\circ$, using values of θ at intervals of 30° .
- (b) Use the table in (a) above, a horizontal scale of 2cm for 30° and a vertical scale of 2cm for 0.5 units to draw a graph of $\sin 2\theta$.
- (c) From the graph, find the values of θ for which $\sin 2\theta = -0.7$.

SET THEORY

100. A group of students in senior five was interviewed to find out those taking Economics (E), Sub mathematics (S) or Geography (G). It was found out that 32 students took Economics, 13 took Sub mathematics while 28 took Geography. 12 students took only Economics. 12 students took Economics and Geography. All students taking Sub mathematics also took Economics. The number of students not taking any of the three subjects was seven less than twice those taking all the three subjects.
- (a) Represent the above information on a Venn diagram.
 - (b) Determine the number of students;
 - (i) taking all the three subjects,
 - (ii) who did not take any of the three subjects,
 - (iii) who were interviewed.
 - (c) If a student is picked at random from this group, find the probability that

he/ she takes Economics but not Sub mathematics.

101. Thirty four first year university girls were asked to choose their favorite colour from black (B), red (R) and green (G). 20 chose Black. 16 chose Red. 22 chose Green. 2, 1 and 3 girls chose only black, red and green respectively. 6 girls chose all the three colours. The number of girls who chose red and green only was the same number that did not choose any of the three colours.

(a) Use a Venn diagram to represent the given information.

(b) Find the number of girls that chose;

- i. none of the three colours.
- ii. green and black only
- iii. black and red only

(c) What is the probability that a girl chosen at random from the group chose at most two colours?

102. A group of 120 students at Hills high school were asked to mention the football teams they support in the world cup 2018 among the three teams of England, Brazil and France. From the survey, 26 supported England only and 33 supported France only. The number of students, who supported Brazil only, exceeded those who supported England only by 2. 18 Students supported both England and France, 20 supported Brazil and England while 19 supported France and Brazil. 4 students did not support any of the three teams. Using a suitable Venn-diagram, find; the three teams.

(a) How many students supported all the three teams?

(b) How many students supported France?

(c) Find the probability that a student chosen at random supported at least two teams.

