SECTION A (60 Marks)

1. (a)Find the product of the L.C.M and G.C.F of 40, 120 and 240.

(b)Round off each of the following numbers to one decimal place.
L = 20.354, M= 40.842, N = 10.789

(c) Use the results obtained in 1(b) above to find the value of X given that $X = {}^{LM}/_{N}$

2. (a)By using the properties of exponents simplify the expression $\frac{2^{x+3} - 2^{x+1} + 7}{2^{x+1} + 1}$ (Do not use tables)

(b)Solve for x in the logarithmic equation $2\log x = \log 4 + \log (2x - 3)$

3 (a) If $(2^{x-1})(3^{y+1}) = (3^4)(2^5)$ find, (i) $x + y$ (ii) $\frac{y}{x}$

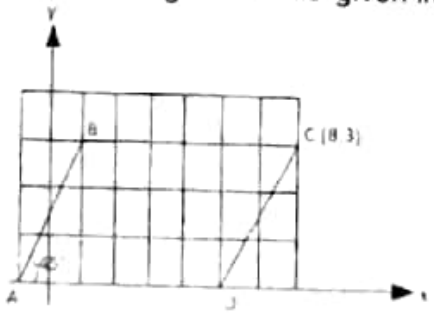
(b) Students test results on three subjects, Mathematics, Physics and Chemistry show that 20 passed Chemistry, 5 passed all the three subjects, 12 passed Mathematics and Physics and 16 passed Mathematics and Chemistry. Each student passed at least two subjects

(i)Draw a well labeled Venn diagram to represent these results.
(ii)How many students passed Physics and Chemistry?
(iii)How many students did the test?

4. (a) Solve the following Simultaneous equations. $x = 4 - {}^{3y}/_{2}$ and $-3x + {}^{y}/_{2} = 1$

(b)If $\bar{A}$ and $\bar{B}$ are two vectors such that $\bar{A} = 2i + 5j$ and $\bar{B} = -4i + j$. Find the position vector $\overline{OM}$ where M is the midpoint of $\overline{AB}$.

5. (a)Find the area and the perimeter of a parallelogram ABCD given in the figure below if <BAD = 45°



(b)The ratio of the area of two similar triangles is 1 4. Find the ratio of their corresponding sides.

6. The value V of a diamond is proportional to the square of its weight W. It is known that a diamond weighing 10 grams is worth shs. 200,000/=

(a)Write down an expression which relates V and W.
(b)Find the value of a diamond weighing 30 grams.
(c)Find the weight of a diamond worth Sh. 5,000,000/=.

7. (a)Sixty people working 8 hours a day take 4 days to Cultivate a village farm. How long will it take twenty people to cultivate the same farm if they work 15 hours a day?

(b) Neema bought a tray of eggs (containing 30 eggs) for shs. 2,000/= She boiled the eggs using a litre of kerosene costing shs 400/= and sold each egg at a price of Shs. 100/= each. Find her percentage profit

8. (a) Write down the next two terms in the sequence $\frac{1}{2}, \frac{2}{3}, \frac{3}{5}, \frac{5}{8}, \frac{8}{13}$.

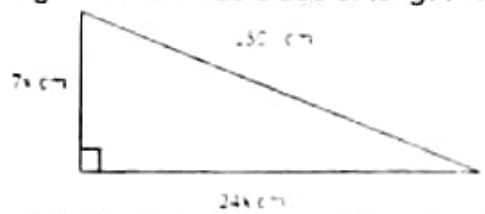
(b)(i) The n^{th} term of an A.P is $12 - 4n$, find the first term and the common difference

(ii) In an A.P the 1^{st} term is -10, the 15^{th} term is 11 and the last term is 41. Find the sum of all the terms in the progression

(c)The 5^{th} term of a G.P is 8, the third term is 4 and the sum of the first ten terms is positive. Find the first term, the common ratio and the sum of the first ten terms.

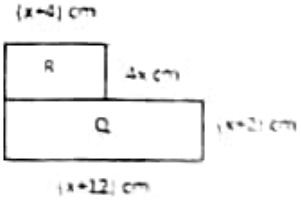
9. (a)To find the height of a tower a surveyor sets up his theodolite 100m from the base of the tower. He finds that the angle of elevation to the top of the tower is 30°. If the instrument is 1.5m above the ground, what is the height of the tower?

(b)The right angled triangle in the diagram below has sides of length 7x cm, 24x cm and 150 cm



(i)Find the value of x. (ii)Calculate the area of the triangle.

10. Study the following diagram carefully and answer the questions that follow



(a) (i)Write down an expression for the area of rectangle R.
(ii)Show that the total area of rectangles R and Q is $(5x^2 + 30x + 24)$ cm^2.

(b)If the total area of R and Q is 64cm^2, calculate the value of x correct to 1 decimal place.

SECTION B (40 Marks)

11. A shopkeeper buys two types of sugar; white sugar and brown sugar. The white sugar is sold at shs. 40,000/= per bag and the brown sugar is sold at shs. 60,000/= per bag. He has shs. 1,500,000/= available and decides to buy at least 30 bags altogether. He has also decided that at least one third of the bags should be brown sugar. He buys x bags of white sugar and y bags of brown sugar.

(a) Write down three (3) inequalities which will summarize the above information.

(b) Represent these inequalities graphically.

(c) The shopkeeper makes a profit of shs. 10,000/= from a bag of white sugar and shs 20,000/= from a bag of brown sugar. Assuming he can sell his entire stock, how many bags of each type he should buy to maximize his profit? Find that profit.

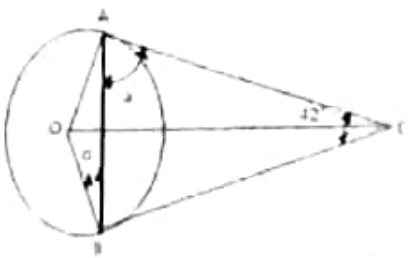
12. (a) The age at which a child first walked (to the nearest month) was recorded for eight(8) children. The results were 12, 10, 16, 19, 10, 12, 12, and 13.Calculate the Mean, Mode and Median of the data.

(b)A survey was made on the number of people attending conferences on one particular week. A random sample of 100 conference centres was taken and the results were as follows,

Number of people attending conference	Number of conference centres
150 – 154	8
155 – 159	16
160 – 164	43
165 – 169	29
170 – 174	4

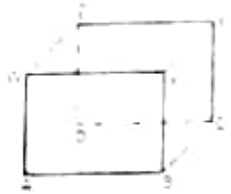
(i) Draw a histogram and a cumulative frequency curve to represent these results.
(ii) Estimate the median of this data from the cumulative frequency curve in 12.(b) (i) above.

13. (a) The two tangents AC and BC to the circle drawn below meet at C



If O is the centre of the circle, calculate the size of the angles marked **a** and **b**.

(b) A rectangular box with top WXYZ and base ABCD has AB = 6cm, BC = 8cm and WA = 3cm



Calculate the

(i) length of AC

(ii) angle between WC and AC

(c) A ship sails from port P to a distance 7km on a bearing of 306°, and then a further 11km on a bearing of 170° to arrive at X. Calculate the distance from P to X

14. At the beginning of August 2008, Nguvumpya Secondary School started up a school project shop with a capital of Tshs. 1,800,000/= The school project manager made the following transactions:

On August 6th she bought some stationeries for the shop worthTshs. 180,000/=,
On August 9th she sold goods to the students worth Tshs 270,000/=,
On August 11th she bought soft drinks for the shop from IPP Company worth Tshs 630,000/=,
On August 13th she sold foodstuffs to teachers worth Tshs 450,000/=,
On August 15th she sold foodstuffs to villagers worth Tshs. 360,000/=,
On August 17th she bought loaves of bread for the shop worthTshs 450,000/=,
On 19th paid transport charges Tshs 50,000/= and the shop management paid wages to the shop manager Tshs. 90,000/= On August 28th.

(a)Enter these transactions in a cash book

(b)Bring down the balance at the end of August 28th 2008.

15. (a) R is the point (1, 2). It is translated onto the point S by the vector $\begin{pmatrix} 3 \\ -4 \end{pmatrix}$

Write down (i) the co-ordinates of S (ii) the vectors which translate S onto R.

(b) The matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ represents a single transformation

(i) Describe fully this transformation

(ii) Find the coordinates of the image of the point (5, 3) after this transformation.

(c) If M_2 denotes a reflection in the y-axis and R_{180} a rotation about the origin through an angle of 180° for any point (x, y),

(i) Find $R_{180}M_2$ (x, y) and M_2R_{180} (x, y) (ii) Is $R_{180}M_2$ commutative? Give a reason.

16. (a) The numbers 1 to 20 are each written on a card, the 20 cards are then mixed together. One card is chosen at random from the pack. Find the probability that the number on the card is:

(i)even (ii)a factor of 24 (iii)prime

(b) The probability that Joti goes swimming on any day is 0.2. On a day when he goes swimming, the probability that he has chips for supper is 0.75. On a day when he does not go swimming the probability that he has chips for supper is x. This information is shown on the following tree diagram

The probability that Joti has chips for supper on any day is 0.5.

(i) Find x

(ii) Suppose that Joti has chips for supper, find the probability that he went swimming that day

(c)The function f is defined by$f: x \to ax + b$, for $x \in R$, where **a** and **b** are constants. It is given that $f(2) = 1$ and $f(5) = 7$ (i) Find the value of **a** and **b** (ii)Solve the equation $f \circ f(x) = 0$

SECTION A (60 Marks)

Answer all questions in this section.

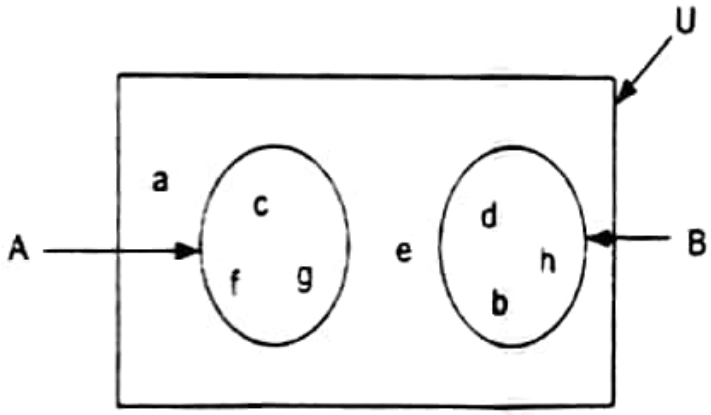
(a) Mangoes are to be exactly divided into groups of 20, 30 or 36. What is the minimum number of mangoes required?

(b) Mary was given 60,000 shillings by her mother. She spent 35 percent of the money to buy shoes and 10 percent of the remaining money to buy books. How much money remained?

(a) Find the value of x if $\sqrt{5^{2x-3}} - 9 = 116$.

(b) Find the value of the expression $\frac{3.143 \times (0.81)^2}{\sqrt{35}}$ by using mathematical tables.

(a) Use the following Venn diagram to answer the questions that follow.



(i) Find the number of subsets of set B'.

(ii) Find the elements of set $A' \cap B$.

(iii) If an element is picked at random from the universal set (U), find the probability that it is not the element of set B.

(b) The Ministry of Business and Industries has planned to employ 54 people who will work in the business sector, 36 people who will work in industries sector only, 12 people who will work in both sectors and 21 people who will neither work in business sector nor in industries sector. How many people will be employed by the Ministry? (Use a Venn diagram).

(a) Find the equation of a line which passes through the point $A(-3, 4)$ and which is parallel to the line $3x + 4y - 15 = 0$.

(b) The points P, Q and R are $(5, -3)$, $(-6, 1)$ and $(1, 8)$ respectively. Show that these points form an isosceles triangle.

(a) If $\overline{AB}$ is parallel to $\overline{CD}$ and $\overline{PQ}$ is a transversal, sketch the line segments and label on the same diagram the following pairs of angles:

(i) corresponding angles a and g,

(ii) alternate interior angles f and g,

(iii) vertically opposite angles c and d.

(b) Given that triangle ABC is similar to triangle PQR, $\overline{AB} = 4$ cm, $\overline{BC} = 5$ cm, $\overline{PQ} = 18$ cm and angle PQR is 30°, find the area of triangle PQR.

(a) Mr. Ogango from Kenya visited Tanzania. He had 5,000 Kenya shillings (Kshs) and wanted to change the money into US dollar. If 1 US dollar was equivalent to 2500 Tanzania shillings (Tshs) and Ksh 1 was equivalent to Tshs 20, how much US dollars did he get?

(b) A gardener has found that the time t to cut the grass on a square field varies directly as the square of its length (L) and inversely as the number of men (m) doing that job. If 5 men cut grass on a field of side 50 m in 3 hours, how many more men are required to cut grass on a field of side 100 m in 5 hours? Assume that the men are working on the same pace.

(a) Misumbwi, Shuma and Kiyando contributed 770,000, 560,000 and 1,050,000 shillings respectively to start a business. Find the ratio of their contribution in its simplest form.

(b) Use the following trial balance to prepare trading, profit and loss account of Mr. Rwaichi as at 31st December 2015.

TRIAL BALANCE AS AT 31ST DECEMBER, 2015

Account name	Dr	Cr
Cash	1,750,000	
Capital		2,500,000
Purchases	2,300,000	
Rent	200,000	
Furniture	550,000	
Shelves	350,000	
Sales		3,000,000
Salary	250,000	
Wages	100,000	
	5,500,000	5,500,000

(a) Given that 49, x and 81 are consecutive terms of a geometric progression. Find:

(i) the value of x.

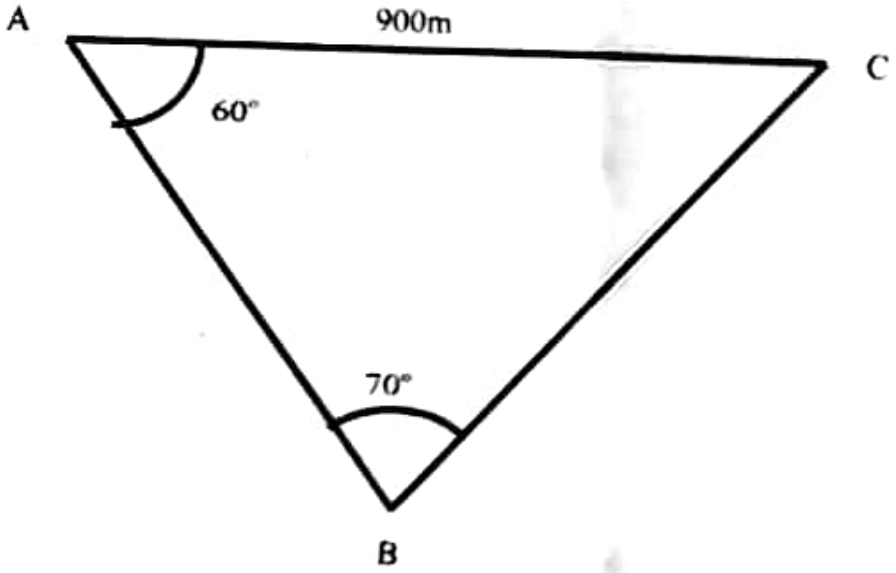
(ii) the geometric mean.

(b) A wall is in the shape of a trapezium. The first level of the wall is made up of 50 bricks where as the top level has 14 bricks. If the levels differ from each other by 4 bricks, determine the number of:

(i) levels of the bricks.

(ii) bricks used to make the wall.

(a) The following diagram shows the location of the houses A, B and C. How far is house A from house B? Give the answer to the nearest metre.



(b) A rectangular frame is made of wooden bars. The diagonal of the frame is 25 cm long and its width is 15 cm. Find the length of the frame.

(a) Factorise the quadratic expression $3x^2 - 11x - 20$ by splitting the middle term.

(b) Solve the equation $2x^2 + 3x - 5 = 0$ by completing the square.

Prisca polepole

SECTION B (40 Marks)

Answer **all** questions in this section.

1. The number of patients who attended maternity clinic daily in June 2017 in a certain village was recorded as follows:

52	61	42	27	38	44	56	36	73	22
41	48	77	30	46	43	72	63	43	76
47	53	38	55	60	51	47	58	33	37

(a) Make a frequency distribution by grouping the number of patients in the class intervals: 20 – 29, 30 – 39, 40 – 49, ...

(b) By using the frequency distribution table obtained in part (a), calculate the mean number of patients per day.

(c) Construct a pie chart for the frequency distribution obtained in part (a).

2. (a) A ship sails from Pemba (4.5°S, 39.5°E) to Dar es salaam (7.5°S, 39.5°E). If it leaves Pemba at 11:30 am and arrived in Dar es salaam at 13:30 pm, use $\pi = \frac{22}{7}$ and $R_E = 6370\,\text{km}$ to find the speed of the ship in km/h.

(b) Sketch a square pyramid whose base is PQRS, vertex is at W and centre is at N, then answer the questions that follow:

(i) State the projection of $\overline{RW}$ on PQRS.

(ii) Name the angle between $\overline{WS}$ and the plane PQRS.

(c) The volume of a square pyramid is 28.2 cm^3. If the sides of its base are 4 cm long, find the height of the pyramid correct to one decimal place.

3. (a) (i) Given the matrices $P = \begin{pmatrix} 2 & -3 \\ 5 & 4 \end{pmatrix}$ and $Q = \begin{pmatrix} 9 & 12 \\ -15 & 3 \end{pmatrix}$. Find $2P - \frac{1}{3}Q$.

(ii) If the matrix $\begin{pmatrix} 4k & 8 \\ 2 & 9k \end{pmatrix}$ is singular, find the possible values of k.

(b) Solve the following system of linear equations by using the inverse matrix method:

$$\begin{cases} 2x+3y=7 \\ y=\frac{1}{2}x \end{cases}$$

(c) By using the transformation matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$, find the image of the point $A(-2,3)$.

Hence, state the axis in which this point is reflected.

(a) Calculate the values of $f(1)$ and $f(-\pi)$ if f is defined by

$$f(x)=\begin{cases} x+2 & \text{for } x<0 \\ 2 & \text{for } 0\le x\le 2 \end{cases}.$$

(b) Using the information given in part (a), find $f^{-1}(-1)$.

(c) A trader has a space for 5 refrigerators. The trader plans to spend 2,400,000 shillings to buy refrigerators of two brands, Hitachi and Sony. Each Hitachi refrigerator costs 600,000 shillings whereas each Sony refrigerator costs 400,000 shillings. The unit profits for Hitachi and Sony refrigerators are 200,000 shillings and 150,000 shillings respectively. Denoting x and y as the number of Hitachi and Sony refrigerators respectively, determine the number of refrigerators for each brand that maximizes the profit.