

INTERNAL MOCK EXAMS

S.4 MATHEMATICS

456/2

TIME : 2 HOURS 30 MINUTES

INSTRUCTIONS

- Answer all questions in section A and only five from section B.
- All necessary calculations must be done on the same page as the rest of the answer.
- Only silent non – programmable scientific calculators may be used,.
- No paper should be given for rough work.

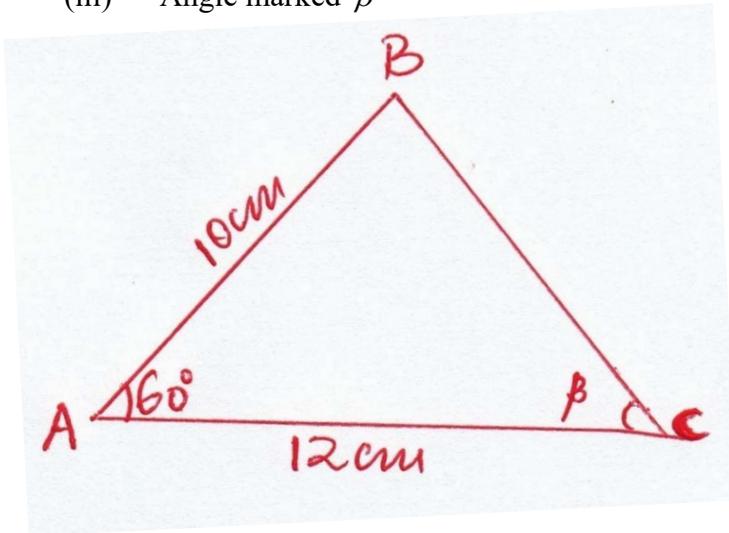
SECTION A

1. Express 0.266..... as a fraction in its lowest form.
2. Use logarithms to evaluate $\frac{24.6}{0.223 \times 132.5}$ (04 marks)
3. Solve for x if $27^{2x-5} = \frac{1}{\sqrt{9^{x+1}}}$ (04 marks)
4. A certain amount of money was shared between ratios: Tom: James and John in the ratio: 2:3:6 respectively. If John got shs. 28,000 more than tom. How much did James get? (04 marks)
5. Find the highest common factor (HCF) and the lowest common multiple (L.C.M) of 18,45 and 42. (4 marks)
6. Find the equation of a line passing through the point A(-2, 3) and parallel to the line $2x + 3y = 6$.
7. Given that $\mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} 0 \\ 7 \end{pmatrix}$, find the length of $\mathbf{a} + 2\mathbf{b} - 3\mathbf{c}$. (03 marks)
8. Amos deposited shs. 240.000 in a bank that offered a simple interest of 5%. How much did he withdraw from his account after 18 months if he wanted all his money? (04 marks)
9. It's given that y varies inversely as the square root of x and that when $y = \frac{1}{2}$ $x = 100$. Find the value of y when $x = 25$. (04 marks)
10. Given that $f(x) = x^2+1$ and $g(x) = x-1$. Find the value of x for which $fg(x) = gf(x)$. (04 marks)

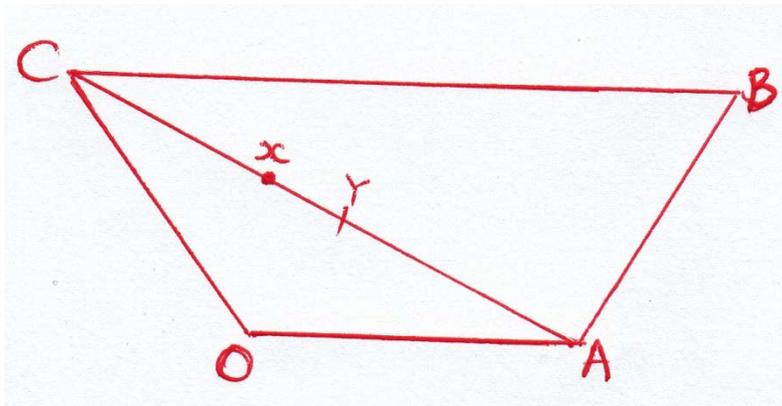
SECTION B

11. (a) Sketch the curve $y = (x + 2)(x - 4)$ for $-4 \leq x \leq 5$.
 (b) Using your curve in each, solve the equations.
 (i) $x^2 - 2x - 8 = 0$
 (ii) $x^2 + 2x - 3 = 0$ (12 marks)
 (c) Sketch the minimum value of the function (curve in each) and the value of x for which it occurs. (12 marks)

12. (a) If $\tan \theta = \frac{3}{4}$, show that $\sin^2 \theta + \cos^2 \theta = 1$.
 (b) Find the values of θ of the range $0^\circ \leq \theta \leq 360^\circ$ if $\sin \theta = -0.500$.
 (c) Use the triangle below to calculate;
 (i) length BC.
 (ii) Area of triangle ABC
 (iii) Angle marked β

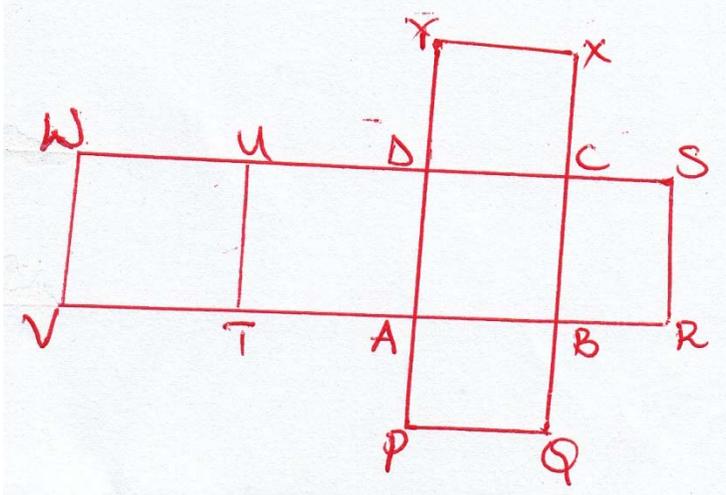


13. The figure below shows a trapezium OABC. $OA = \mathbf{a}$, $OC = \mathbf{c}$ and $CB = 3\mathbf{a}$.



- (a) X and Y are points on AC such that $Ax : xC = 1:2$ and $4AY = AC$. Find the following vectors in terms of **a** and **c**.
- AY
 - OY
 - OX
- (b) Show that O, Y and B are collinear. (12 marks)

14. The figure below shows the net which can be used to make a cube;



The net is folded such that P and T meet at F. Q, R and V meet at E, X, S and W meet at H, U and Y meet at G.

- Draw the cube formed (ABCDEFGH)
 - If $VT = TA = AB = BR$ and length $VR = 20\text{cm}$; Calculate
 - Length DE
 - Angle between the line DE and plane ABCD
 - Angle between planes ADHE and ABCD
 - Surface area of the cube
 - Volume of the cube. (12 marks)
15. A cyclist P leaves town B at 1.06pm for village A riding non stop at a steady speed of 15kmh^{-1} and arrives in village A at 3.06 pm. Another cyclist O left village A at noon for town B. From A cyclist Q ride at a steady speed of 20km for 45 minutes. It then rested for 30 minutes and then continued with a steady speed of 15km/hr and reached town B at 2.15 pm.
- Represent the motion of cyclists P and Q on a distance time graph. (Use a scale of $1\text{cm} : 15\text{minutes}$ on the X-axis, $2\text{cm} : 5\text{km}$ on the y-axis)
 - Use your graph to find;
 - When did the two cyclists pass each other and how far from B were they at this time.
 - How far apart were the two cyclists at 2:00 pm? (12 marks)

16. (a) The distance in meters of an object varies partly with time t seconds and partly with the square root of time. Given that the distance the distance $S = 14$. When $t = 4$ and $S = 27$ when $t = 9$, write the equation connecting S and t .
- (b) Find the value of S when $t = 64$ using the equation above. (12 marks)

17. A certain employee earns a gross monthly income of shs. 910,000, the allowances accruing to him include;

Housing	240,000/= per month
Head of department	300,000/= per month
Class teacher	10, 000/= per month
Water and electricity	180,000/= per month
House master	`5,000/= per month

He has also three children aged 8 years, 15 years and 18 years and the company gives child allowance for only two children according to the age brackets below.

Age (years)	Allowance per child (shs)
1 – 10	150,000
11 – 13	100,000
14 - 19	35,000

His monthly salary is subjected to taxation after deducting the allowances as shown below;

Taxable income (shs)	Tax rate (shs)
180,001 – 280,000	10
230,001 – 380,000	15
380,001 – 430,000	25
430,001 – 480,000	30
480,001 – and above	45

- (a) Help the employee to calculate his;
- (i) Monthly allowances
 - (ii) Taxable income
 - (iii) Monthly income tax
- (b) What percentage of his income goes to tax? (12 marks)

END

INTERNAL MOCK EXAMS

S.4 MATHEMATICS

456/1

TIME : 2 HOURS 30 MINUTES

INSTRUCTIONS

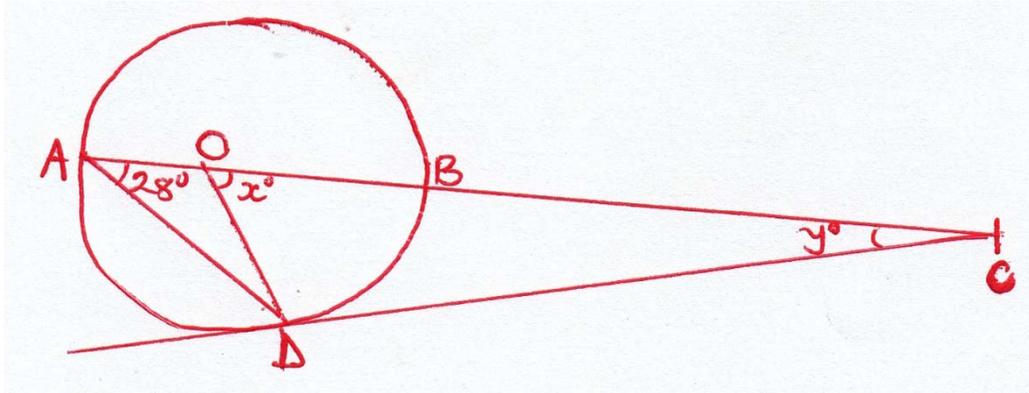
- Answer all questions in section A and any three from section B,
- Any additional questions answered will not be marked.
- All necessary calculations must be done on the same page as the rest of the answers.
- Only silent non – programmable scientific calculators may be used.

SECTION A

1. Given that $t = \sqrt{\frac{a-b}{l+ab}}$ make b the subject of the formula. (04 marks)
2. Solve the equation $\sin^2 \theta = 3 \sin \theta - 2$ for $0^\circ \leq \theta \leq 360^\circ$ (04 marks)
3. Given that $(a*b) = \text{HCF of } a \text{ and } b$, evaluate for $(9*15)*24$. (04 marks)
4. P and Q are sets of objects such that $n(\Sigma) = 12$
 $n(P \cap Q) = 5$ $n(Q) = 8$ and
 $n(P \cup Q)' = 3$ Find;
a) $n(P \cup Q)$
b) $n(P)$
5. Find the value of P if $123_P = 36_{\text{seven}}$ (04 marks)
6. The probability that a student can hit a mark in any one shot is $\frac{3}{4}$. What is the probability that he misses all the first three shots? (04 marks)
7. Given that $P = \begin{bmatrix} 2m-1 & 2 \\ -1 & m+2 \end{bmatrix}$ has no inverse. Find the two possible values of m.
8. A cliff is 8m high a ship is 12m from the foot of the cliff. What is the angle of elevation of the top of the cliff from the ship?

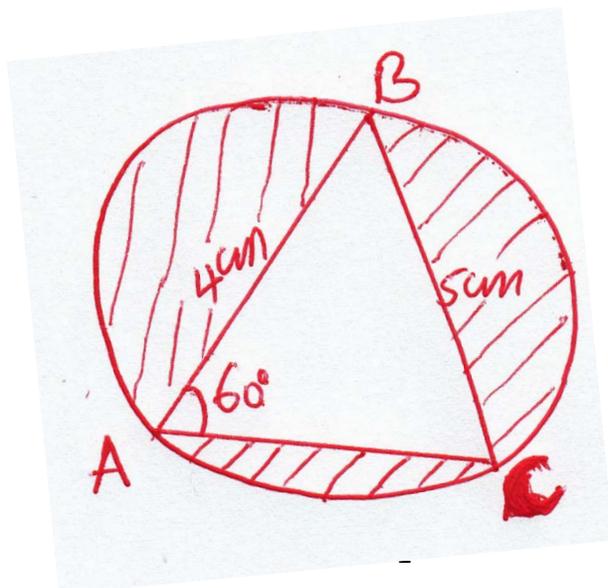
9. Factorize $6x^2 - 7x - 3 = 0$ and hence solve $6x^2 - 7x - 3 = 0$. (04 marks)

10. In the figure below, AOB is a diameter of the circle DC is a tangent. Given that $\angle DAO = 28^\circ$. Find the size of the angle marked x° and y° .



11. a) Construct a triangle PQR using a pair of compasses, a pencil and a ruler only. In which $\angle PQR = 105^\circ$, length $PQ = 6\text{cm}$ and $QR = 9\text{cm}$.
- (b) Drop a perpendicular from R to meet the line PQ produced at T. Measure RT and hence find the area of the triangle PQR.
- (c) Circumscribe triangle PQR and state the radius of the circle.

12. The figure below shows a triangle ABC circumscribed by a circle of radius R. Given that $AB = 4\text{cm}$, $BC = 5\text{cm}$ and $\angle BAC = 60^\circ$



- (a) Find the radius of the circle
- (b) Calculate the size of angle B and angle C
- (c) Find the length of AB and hence the area of the shaded area.

13. The table below shows the heights of some 60 students in S.4.

Height (cm)	100 - 104	105 - 109	110 - 114	115 - 119	120 - 124	125 - 129
No. of students	5	13	16	7	8	11

- (a) Use the data above to calculate the mean height using a working mean of 117cm.
- (b) Calculate the modal height.
- (c) Draw an ogive and use it to estimate the median.

14. In Naalya S.S there are 85 students who offer either technical drawing (T) or one or more of the subjects physics (P), Chemistry (C) and Biology (B). The number of students who offer T is 3 times the number of those who offer all the three subjects.

Given that $n(B) = 30$, $n(P) = 36$, $n(C) = 33$ and the number of students who offer Biology and Chemistry only is 4, Physics and Biology is 16 while Physics and Chemistry is 9.

- (a) Represent the above information on a venn diagram.
- (b) Find the number of students who offer;
 - (i) All the 4 subjects
 - (ii) Technical drawing
- (c) If a student is chosen at random, find the probability that the student offers only one subject.

15. (a) Use the matrix method to solve the pain of simultaneous equations below;

$$x + 3y - 13 = 0$$

$$2y + 3 = 5x$$

- (b) Given that matix $A = \begin{pmatrix} 3 & 4 \\ 2 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix}$,

show that the $\det (AB) = \det A \times \det B$.

- (c) Find the value of a for which

$$M = \begin{pmatrix} a+1 & 2 \\ 4a & 2a \end{pmatrix} \text{ is a singular matrix.}$$

16. Four points A, B, C and D lie on a horizontal level ground. A car moves from point A to B on a bearing of 075° for 240km. From there, it continues to point C in the direction $S 20^\circ E$ for a distance of 210km. From C, the car moves at an average speed of 60km/hr for $2\frac{1}{2}$ hours to point D on a bearing of 220° .
- (a) Using a scale of 1cm:30km, draw an accurate diagram to represent the positions A, B, C and D.
- (b) Use your diagram above to find;
- (i) The shortest distance of D from A
- (ii) The bearing of D from A.
17. The management of N.S.S.S has sufficient money to buy a total of 100 crates of soft drinks of type A and B. They want to buy at least twice as many crates of type A as type B. They want to buy a maximum of 80 crates of type A and at least 10 crates of type B. Taking X and Y to be the number of crates of type A and type B respectively;
- (a) Write down all the inequalities based on the above information.
- (b) Show these inequalities on a squared paper.
- (c) The profit on a crate of type A and type B is shs. 6,000 and shs. 4,000 respectively, find the number of crates of each type they should buy to make a maximum profit.
- (d) Calculate the maximum profit.

END

456/2
MATHEMATICS
PAPER 2
July 2013
2 $\frac{1}{2}$ HRS

**Uganda Certificate of Education
MOCK EXAMINATION
MATHEMATICS
PAPER 2
2hours 30minutes**

Instructions to Candidates

- *Attempt all the questions in section A and five from section B*
- *All questions carry equal marks in section B*
- *Begin each section B solution on a fresh page*
- *No papers should be provided for rough work*
- *Draw double margins on each of the pages to be used*
- *The graph papers are provided*
- *Only silent non-programmable calculators may be used*
- *For accuracy indicate TAB for use of the tables and CALC for use of a calculator*

SECTION A: (40MARKS)
Attempt all questions in this Section .

1. Without using tables or calculator simplify; $\left(\frac{64}{27}\right)^{-\frac{1}{3}}$. (3marks)

2. Without using tables or calculator simplify;
 $\frac{\sqrt{30}}{\sqrt{6}} + \frac{\sqrt{35}}{\sqrt{7}}$. (4marks)

3. Evaluate; $\frac{1\frac{1}{5} + 4\frac{1}{2} \div 1\frac{1}{2}}{3\frac{3}{5} - 2\frac{2}{5} \times 1\frac{1}{4}}$. (4marks)

4. Convert 5.272727... to a fraction in its simplest form. (4marks)

5. Given that $f(x) = 4x - 3$ find; i) $f(2)$ (2marks)
ii) $f^{-1}(x)$. (2marks)

6. If m is directly proportional to the square of n and n = 2 when m = 1, find the value of m when n = -5. (4marks)

7. A shopkeeper sells 7kg of rice at shs 12,600. If the cost of rice is then increased by 25%, how much will 3kg of rice cost? (4marks)

8. Given that the scale of a map is 1 : 250,000, find the length of a horizontal road on the map whose length on the ground is 66.25km long. (4marks)

9. Juma deposited shs. 1,600,000 in a bank which paid compound interest at the rate of 12% per annum. At the end of 5 years, he withdrew all his money. Determine how much money he withdrew. (4marks)

10. A container has a volume of 6,400cm³ and a surface area of 8,000cm². Find the surface area of a similar container which has a volume of 2700cm³. (5Marks)

SECTION B: (60marks)

Answer any five questions from this section. All questions carry equal marks.

11. a) Express $x^2 + 12x - 45$ in the form $(x + p)^2 + q$ where p and q are constants.
Hence solve the equation $x^2 + 12x - 45 = 0$. (6marks)

- b) Given that $f(x) = \frac{x+5}{2}$ and $g(x) = \frac{1-3x}{3}$, determine the values of x for
which $fg(x) = \frac{x^2 + 2x - 20}{6}$. (6marks)

12. a) Evaluate without using tables or calculators;

$$2\log_{10} 6 + 2\log_{10} 5 - 2\log_{10} 3. \quad (4\text{marks})$$

- b) Given that $\log_{10} 2 = 0.3010$ and $\log_{10} 3 = 0.4771$, evaluate without using tables
or calculators $\log_{10} 0.6$. (4marks)

- c) Use tables to evaluate; $\sqrt[3]{18.95 \times 4.2}$. (4marks)

13. A group of tourists visited Farm gate Limited, a company offering catering services. It was found out that 20 ate Rice (R), 30 ate Posho (P) and 15 ate Matooke (M). 6 ate Rice and Posho, 4 ate Posho and Matooke, and 5 ate Rice and Matooke. The number of visitors who ate Posho only is equal to twice the number of visitors who ate Rice only. All the visitors ate at least one of the foods.

- a) Represent the information on a Venn diagram. (5marks)

- b) Find the number of visitors

i) who ate all the three foods.

ii) in the group (5marks)

- c) If a visitor is chosen at random from the group, find the probability that
the visitor ate at least two foods. (2marks)

14. The speed of an object varies with time as shown in the following table;

Time(s)	0	1	2	3	4	6	8	10
Speed(Vm/s)	0	5	10	7.5	5	5	10	15

Draw the speed-time graph and find;

- a) the acceleration of the object during the last 4 seconds.

b) the total distance traveled in 10 seconds

b) the average speed of the whole journey.

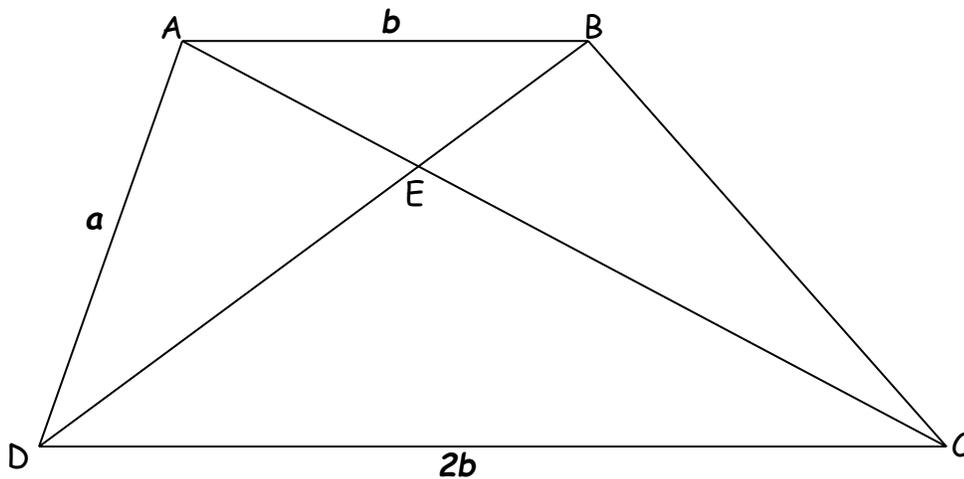
- d) the interval of time when the acceleration is zero (12marks)

15. Below is an advertisement for a brand new laptop.

LAPTOP	LAPTOT	LAPTOP	LAPTOP
HURRY WHILE STOCK LASTS!			
PRICE: SHS 1,200,000.			
CASH PAYMENT: GET A DISCOUNT OF 15%			
HIRE PURCHASE: DEPOSIT 20% OF THE PRICE AND EITHER PAY SHS . 390,000 MONTHLY FOR 3 MONTHS OR SHS. 100,000 WEEKLY FOR 13 WEEKS.			

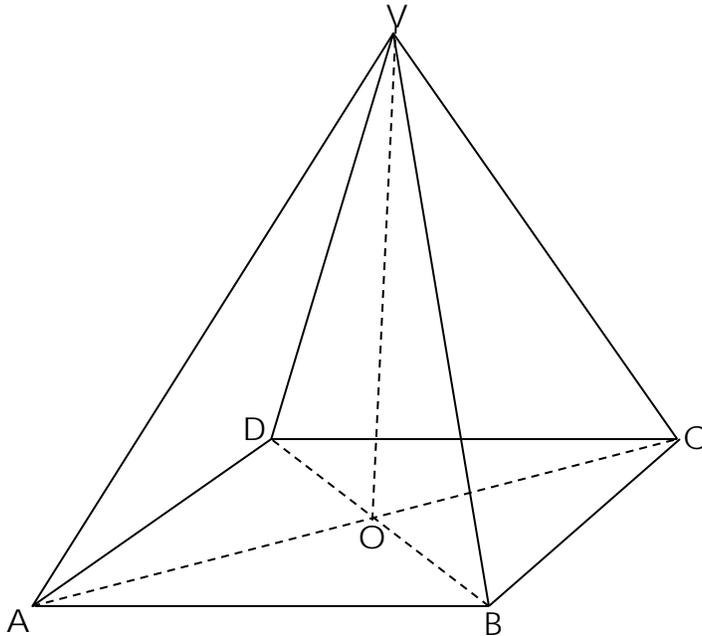
- a) Calculate the cost of purchasing a laptop using;
- i) the weekly hire purchase terms.
 - ii) the monthly hire purchase
- b) Find the savings one would make by paying cash rather than using weekly hire purchase terms. (12marks)

16. The diagram below shows a quadrilateral ABCD with $DE = 2EB$, $\vec{AB} = b$, $\vec{DC} = 2b$ and $\vec{DA} = a$.



- a) Express in terms of a and b the vectors; i) \overrightarrow{DB} (2marks)
 ii) \overrightarrow{BE} (2marks)
 iii) \overrightarrow{AE} (2marks)
 iv) \overrightarrow{AC} (2marks)
- b) Show that the points C , E and A are collinear. (4marks)

17.



The diagram above shows a right pyramid $ABCDV$ on a rectangular base. Given that $AB=DC=24\text{cm}$, $AD=BC=32\text{cm}$, the slant lengths $AV=BV=CV=DV=25\text{cm}$. M and N are mid points of AD and BC respectively. Calculate the;

- a) height of the pyramid, \overline{OV} . (5marks)
- b) volume of the pyramid (2marks)
- c) angle between the planes ADV and BCV (5marks)

*** END ***

456/1
MATHEMATICS
PAPER 1
2 ½ HOURS

**TURKISH LIGHT ACADEMY
UGANDA CERTIFICATE OF EDUCATION
MATHEMATICS**

PAPER 1

2 hours 30 minutes.

Instructions to candidates;

- Answer **all** questions in section **A** and any **five** in section **B**.
- Any addition question (s) answered will not be marked.
- All necessary calculations must be done on the same page as the rest of the answer. Therefore no paper should be given for rough work.
- Graph paper is provided.
- Silent, non – programmable scientific calculators and mathematical table with a list of formulae may be used where not prohibited.

TURN OVER

Section A (40 marks) . Answer **all** questions in this section.

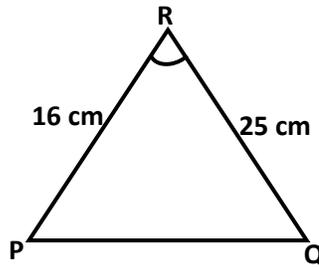
1. If $a \Delta b = a^2 - b$, evaluate $7 \Delta (4 \Delta 6)$. (04 marks).

2. Using the method of completing squares, solve the quadratic equation:

$$X^2 - 18x + 77 = 0.$$
 (04 marks)

3. If $M = \begin{pmatrix} 2 & -1 \\ 3 & -2 \end{pmatrix}$.
 (a) Find M^2 .
 (b) Name the matrix M^2 . (04 marks)

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



(04 marks)

5. The marks of a student in 5 subjects were 63,87,59,81 and 54. The average mark in 6 subjects was 71. Determine the mark in the sixth subject. (04 marks)

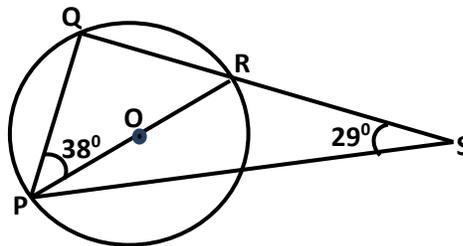
6. Make p the subject in the equation ;

$$\sqrt{\frac{3p-q}{p+q}} = m. \quad \text{(04 marks)}$$

7. Solve the inequality;

$$\frac{x-2}{2} - \frac{3x+6}{3} > \frac{1}{2}. \quad \text{(04 marks)}$$

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



Find the value of angle RPS. (04 marks)

9. A translation T, maps (8, 6) on to (-2, 2). Determine the coordinates of the image of (3, 1) under T. (04 marks)

10. A bag contains white balls and black balls. The probability of choosing a white ball is $\frac{5}{8}$, if the bag contains 40 balls; find the number of black balls in the bag. (04 marks)

SECTION B (60 marks). Answer any five questions from this section.

11. (a) Find the highest common factor (HCF) of $4a^2b^4$, $10a^4b^3$ and $14a^3b^2$. (06 marks)

(b) Simplify; $\frac{x}{x-2} - \frac{4}{x+2} - \frac{8}{x^2-4}$. (04 marks)

12. (a) If $A = \begin{pmatrix} 2 & 4 \\ 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 5 \\ 0 & -6 \end{pmatrix}$. Find $2A - BA$. (04 marks)

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

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

(04 marks)

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

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

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

(b) (i) Draw a cumulative frequency curve (Ogive) for the data.

(ii) Use the Ogive to estimate the median. (07 marks)

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

$$4y + 5x = 1$$

$$2y - 3x = 17.$$

(05 marks)

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

15. The points A(1, 0), B(3, 0), C(3, 1) and D(1, 1) are vertices of a rectangle ABCD. The images A', B', C', and D' under a transformation $T = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$ are A', B', C', and D' respectively. The images A', B', C' and D' are then mapped on to the points A'', B'', C'', and D'' respectively, under a transformation $M = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

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

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

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

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

- (i) Construct the triangle PQR .
- (ii) Draw a circle passing through the vertices P, Q , and R .
- (iii) Measure the length \overline{RQ} and the radius of the circle.
- (iv) Find the area of the circle (use $\pi = 3.142$) **(12 marks)**

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

- (a) If x and y represent the number of trips made by the small lorry and big lorry on that day respectively, use the given information to write down four inequalities.
- (b) By shading the unwanted region, plot the graph of the inequalities in (a) on the same axes.
- (c) The company charges shs 50,000 per trip made by the small lorry and shs 80,000 per trip made by the big lorry.
- (i) Use your graph in (b) to determine the possible number of trips each lorry can make so as to maximize the company's earnings.
- (ii) Find the maximum amount of money that the company would earn that day.

(12 marks)

END

456/2
MATHEMATICS
PAPER TWO
2 ½ HOURS

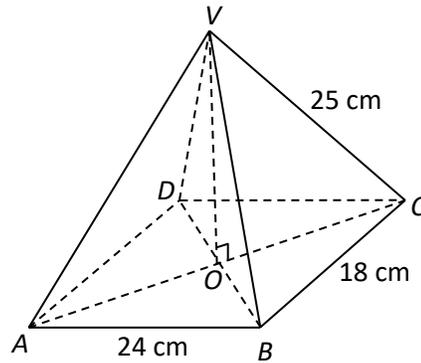
**TURKISH LIGHT ACADEMY
UGANDA CERTIFICATE OF EDUCATION
MATHEMATICS
PAPER 2
2 HOURS 30 MINUTES**

Instructions to candidates:

- Answer **all** questions in section **A** and any **five** in section **B**.
- Any additional question (s) answered will not be marked.
- All necessary calculations must be done on the same page as the rest of the answer. Therefore no paper should be given for rough work.
- Graph paper is provided.
- Silent, non – programmable scientific calculators and mathematical tables with a list of formulae may be used where not prohibited.

Section A (40 marks)

- Without using a calculator or logarithm tables, evaluate; $\log_{10} 7000 - \log_{10} 7$ (04 marks)
- Express the decimal 1.31818181..... as an improper fraction in its lowest terms. (04 marks)
- If $n(P) = 23$, $n(Q) = 25$, $n(P \cap Q) = 4$ and $n(\varepsilon) = 45$, find $n(P \cap Q)$. (04 marks)
- Find the equation of the line through the points A (4, 3) and B (10, 9). (04 marks)
- Given that $\vec{OA} = \begin{pmatrix} 7 \\ 2 \end{pmatrix}$ and $\vec{OB} = \begin{pmatrix} 15 \\ 17 \end{pmatrix}$, determine the length of \vec{AB} . (04 marks)
- Without using a calculator or tables evaluate; $\frac{78.65^2 - 21.35^2}{5.73}$ (04 marks)
- A salesman gets a basic monthly salary of shs 256,000. She also gets 0.5% commission on sales. In a certain month, her sales were shs 28,000,000; calculate her income for that month. (04 marks)
- Given that p varies inversely as the square of q and $p = 9$ when $q = 4$, find the value of p when $q = 8$. (04 marks)
- Given that $g(x) = 9x^2 - 12x - 4$, find the value of $g(-5)$. (04 marks)
- The diagram below shows a right pyramid on a rectangular base ABCD. $\overline{AB} = 24$ cm, $\overline{BC} = 18$ cm and the slant side $\overline{VC} = 25$ cm.



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

SECTION B (60 marks) . Answer any five questions from this section.

- (a) Three girls Betty, Diana and Mary shared shs 80,000 in the ratio 5: 2: 3 respectively. How much money did each girl get? (06 marks)
- (b) Find the next two terms on each of these sequences;
 - 3, 5, 9, 17, _____, _____.
 - 3, 6, 10, 15, _____, _____.(06 marks)

12. In a workshop, there are 50 teachers, 18 teach chemistry, 16 teach Biology, and 24 teach physics. 5 teach physics and chemistry, 7 teach physics and biology 6 teach chemistry and Biology. 8 teachers do not teach any of the three subjects.

- (a) Represent the given information on a Venn diagram. **(05 marks)**
 (b) How many teachers teach all the three subjects? **(03 marks)**
 (c) How many teachers teacher's neither physics nor chemistry. **(02 marks)**
 (d) Find the probability that a teacher selected at random from the workshop teaches one subject only. **(02 marks)**

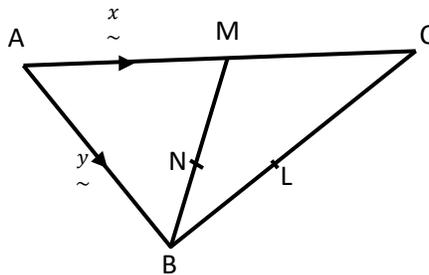
13. (a) The function f is such that $f(x) = 3x + 1$. Find;

- (i) $f(5)$.
 (ii) $f^{-1}(x)$.
 (iii) $f^{-1}(4)$. **(06 marks)**

(b) Given that $g(x) = ax^2 + 2x$ and $g(3) = 24$, find the value;

- (i) a . (ii) $g(-3)$. **(06 marks)**

14. In the diagram below, M is the midpoint of \overline{AC} and N is the midpoint of \overline{MB} . $\overline{BL} : \overline{LC} = 1 : 2$, $\overline{AB} = \underset{\sim}{y}$ and $\overline{AM} = \underset{\sim}{x}$.



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

- (i) \overline{MB} (ii) \overline{AN} (iii) \overline{LB} (iv) \overline{AL} . **(07 marks)**

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

15. (a) On the imported goods, customs duty and value added tax were levied as shown in the table below.

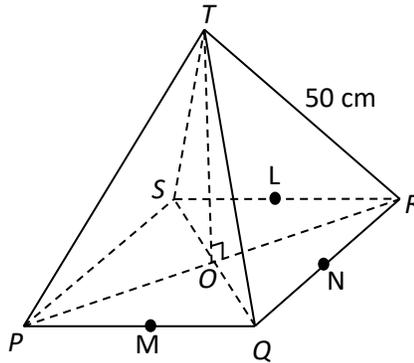
Customs duty	25% of the value of the goods.
Value added tax	15% of 9 value of the goods + customs duty.

Find the total amount which was levied on importing a television set valued at shs 500,000. **(06 marks)**

- (b) A man borrowed shs 6,000,000 from a bank to complete a commercial building at a compound interest rate of 25% per annum . He had to repay the loan and interest within two years in equal monthly installments. Calculate the;
- Total amount of money the man paid to the bank.
 - Amount of money he paid per month.
 - Interest he paid on the loan at the end of two years. **(06 marks)**

16. At 11:00 am , a cyclist left Kampala for Masaka 120 km away at an average Speed of 20 kmh^{-1} . After cycling for 3 hours, he rested for an hour. He then Continued to Masaka at the same speed.
- At the same time, a motorist left Masaka for Kampala at an average speed of 60 kmh^{-1} . He then stayed in Kampala for $1 \frac{1}{2}$ hours before returning to Masaka at an average speed which took him back to Masaka in $2 \frac{1}{4}$ hours.
- On the same axes , using a scale of 1 cm to represent 5 km on the vertical axis and 2 cm to represent 1 hour on the horizontal axis , draw a distance - time graph for the cyclist and motorist. **(06 marks)**
 - From your graph in (a) , determine ;
 - The time and distance from Kampala at which the motorist met and bypassed the cyclist on the way to and from Kampala respectively. **(04 marks)**
 - How long did the motorist have to wait in Masaka before the cyclist could arrive? **(02 marks)**

17.



- The figure above shows a right pyramid PQRST on a rectangular base PQRS. Given that $\overline{PQ} = 64 \text{ cm}$, $\overline{QR} = 48 \text{ cm}$, the slant length $\overline{PT} = \overline{QT} = \overline{RT} = \overline{ST} = 50 \text{ cm}$. L, M and N are the midpoints of \overline{SR} , \overline{PQ} and \overline{QR} respectively. Calculate the;
- Height of the pyramid \overline{OT} . **(05 marks)**
 - Volume of the pyramid PQRST. **(02 marks)**
 - Angle between the slant face TQR and the base PQRS. **(02 marks)**
 - Angle between the opposite slants faces PQT and SRT. **(03 marks)**

END

**Uganda Certificate of Education
MOCK EXAMINATION
MATHEMATICS
PAPER 2
2hours 30minutes**

Instructions to Candidates

- *Attempt all the questions in section A and five from section B*
- *All questions carry equal marks in section B*
- *Begin each section B solution on a fresh page*
- *No papers should be provided for rough work*
- *Draw double margins on each of the pages to be used*
- *The graph papers are provided*
- *Only silent non-programmable calculators may be used*
- *For accuracy indicate TAB for use of the tables and CALC for use of a calculator*

SECTION B: (60MARKS)

Attempt any five questions from this section

11. a) Given that $f(x) = ax - b$, $f(2) = 10$ and $f(1) = 7$, find the values of a and b .

b) If $f(x) = \frac{2x-1}{x^2-9}$, find the values of x for which the function $f(x)$ is undefined.

c) Given that $f(x) = x^2 + 7$ and $g(x) = x - 2$, find the values of x for which

$$fg(x) = \frac{38 - x^2}{2}. \quad (12\text{marks})$$

12. a) Using a suitable table of values, draw the curve $y = 3 + 5x - 2x^2$ for $-3 \leq x \leq 4$.

b) Use the graph to solve the equations.

i) $3 + 5x - 2x^2 = 0$

ii) $2 + 3x - 2x^2 = 0$

c) State the maximum point and the equation of line of symmetry.

(12marks)

13. At noon on Tuesday, a group of news paper vendors were asked whether they still had News papers from the Monitor(M), the New Vision(N) and the Red paper(R). All the vendors had atleast one of the three papers. 28 had the monitor, 29 had the New Vision and 30 had the Red Paper. 15 had the Monitor and the New Vision, 9 had New Vision and Red Paper, 8 had the Monitor and the Red Paper while 8 had Monitor only.

a) Represent the information above on a Venn diagram.

b) Find the number of Vendors with;

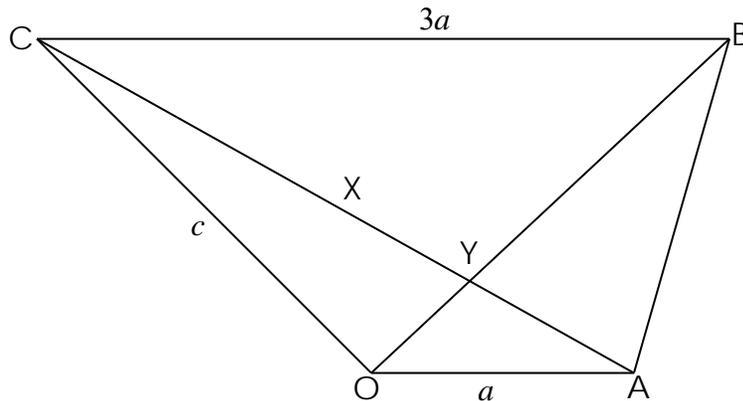
i) all the three types of papers.

ii) only two types of papers left

iii) atleast two types of papers

c) Find the probability that a vendor picked at random from the group still had the Monitor and Red Paper News papers only. (12marks)

14. The diagram below shows a trapezium OABC. $\vec{OA} = a$, $\vec{OC} = c$ and $\vec{CB} = 3a$. X and Y are points on \vec{AC} such that $AX : XC = 1:2$ and $AY : YC = 1:3$.



a) Express the following vectors in terms of a and c .

- | | |
|-----------------|----------------|
| i) \vec{AC} | ii) \vec{OY} |
| iii) \vec{OX} | iv) \vec{AB} |
| v) \vec{AY} | |

b) Hence, show that O, Y and B are collinear.

c) OX is produced and cuts CB at Z. Find the ratio $OX : XZ$

(12marks)

15. Mbale and Kampala are 165km apart. A bus leaves Mbale at 8:00am traveling at 40km/h. 45 minutes later it breaks down and stops for an hour. It resumes its journey and reaches Kampala at 11:30am. A taxi leaves Kampala at 9:30am and travels at a steady speed of 60km/h to Mbale.

a) On the same pair of axes draw both journeys described above.

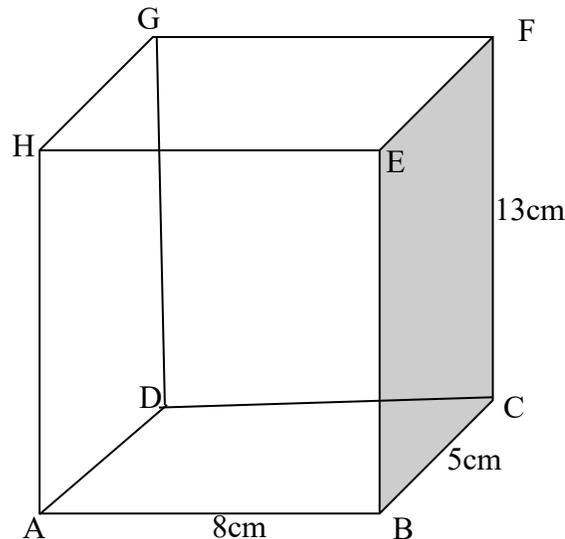
b) When did the taxi reach Mbale?

c) What was the speed of the bus on the final leg?

d) When and where did the two vehicles meet?

(12marks)

16. The figure below shows a cuboid ABCDEFGH with the dimensions as shown.



Calculate the;

i) length \overline{BF} and \overline{BG} .

ii) angle between the line \overline{BG} and the base ABCD.

iii) angle between the plane BDF and the base ABCD.

(12marks)

17. In a certain country, income tax is levied as follows.

Taxable income (shs)	Rate(%)
0 – 10,000	10
10,001 – 20,000	25
20,001 – 30,000	30
30,001 – 40,000	45
Above 40,000	50

A person's monthly gross income has certain allowances deducted from it before it is subjected to taxation (This includes family relief and insurance).

The allowances are as follows:-

Married man	Sh. 12000
Unmarried man	Sh. 8500
Each child below 11 years	Sh.9000
Above 11 but below 18 years	Sh.7500
Insurance premium	Sh. 5000

i) Sally earns sh 90,000. He is married with children aged 5,7, 12, 14 and 18 years. Given that he is insured and has claimed transport allowance of sh.1700, calculate the income tax he pays under the income tax rates above.

ii) After two years, Sally's salary is increased but the allowances remained the same. If he is found to pay a tax amounting to sh 27,650, find his gross income and the Net income.

(12marks)

*** END ***

456/1

Mathematics

Paper 1

Time: $2\frac{1}{2}$ hours

U.C.E Resourceful Mock Examinations – 2013

Instructions:

- *Attempt all questions in section A and **NOT** more than five questions from Section B.*
- *All Section B questions carry equal marks.*
- *All the necessary calculations must be done on the same sheet of paper as the rest of the answer. Therefore, no paper shall be given for rough work.*
- *Graph paper shall be provided.*
- *Silent, non-programmable calculators may be used*

Section A (40 marks)

1. Simplify: $\frac{x^2 + 3x - 10}{x - 2}$

2. Given that $K = 2\pi\sqrt{\frac{1+nx}{b-x}}$, make n the subject.

3. Find the values of x and y given that $\begin{pmatrix} 2 & x \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 3 \\ y \end{pmatrix} = \begin{pmatrix} 7 \\ 5 \end{pmatrix}$

4. Find the integral values of x which satisfy the inequality: $2x^2 - 3x < 3.5$

5. Given that the mean of the following numbers 13,8,6,0,3,12, x, 11 and 5 is 7.

Find (i) the value of x

(ii) the median

6. The transformations X and T represent a reflection in the line $x = 0$ and a translation

$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ respectively. Find the coordinates of A if $TX(A) = (-2, -5)$

7. Point A is exactly 12km West of B, while B is exactly 10km North of C. Calculate the bearing of C from A.

8. Given that $\mathbf{a} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -9 \\ 4 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$, find the scalars x and y such that $x\mathbf{a} + y\mathbf{b} = \mathbf{c}$.

9. In a class of 80 students, the average age of the 30 girls in a class is 17 years and that of the boys is 18.5 years. Find the average age for the whole class.

10. A bag contains 3 red marbles and 7 blue marbles of the same size. Two marbles are picked with replacement. Find the probability of picking marbles of the same colour.

Section B (60 marks)

11(a). Triangle ABC is rotated about point T to triangle A'B'C'. If the coordinates of A are

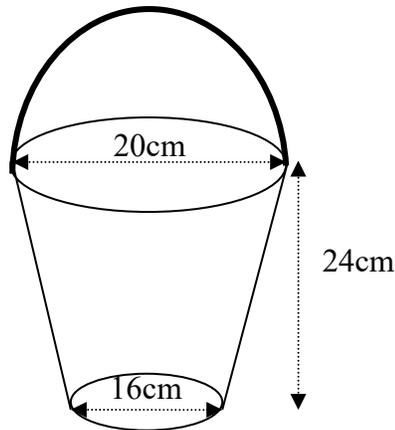
$(1,1)$, $B(1,3)$, $A'(1,1)$, $B'(1,3)$ and $C'(0,5)$. Find (i) the coordinates of T ; the centre of rotation.

(ii) the angle of rotation.

(iii) the coordinates of C.

(b) $A'B'C'$ is then enlarged by scale factor -0.5 about the origin to triangle $A''B''C''$. Find the coordinates of A'' , B'' and C'' .

12. The figure below shows a bucket with circular ends of diameters 20cm and 16 cm with a height of 24cm.



Find (i) the capacity of the bucket in litres.

(ii) the area of the wet surface if water is at a height of 12cm.

(iii) the volume of a similar bucket which is twice as big.

13. The following are heights of seedlings in a nursery bed.

4.7	2.7	2.3	4.6	3.7	2.8	2.9	3.6
4.9	3.9	4.5	3.4	4.2	3.5	1.7	1.1
2.0	3.7	3.3	3.8	3.8	1.8	3.1	3.6
4.1	1.4	1.6	2.1	2.8	2.6	3.3	4.0
3.2	4.3	3.5	2.4	4.4	4.1	2.9	3.2

(a) Draw a frequency distribution table starting with 1.0 – 1.4

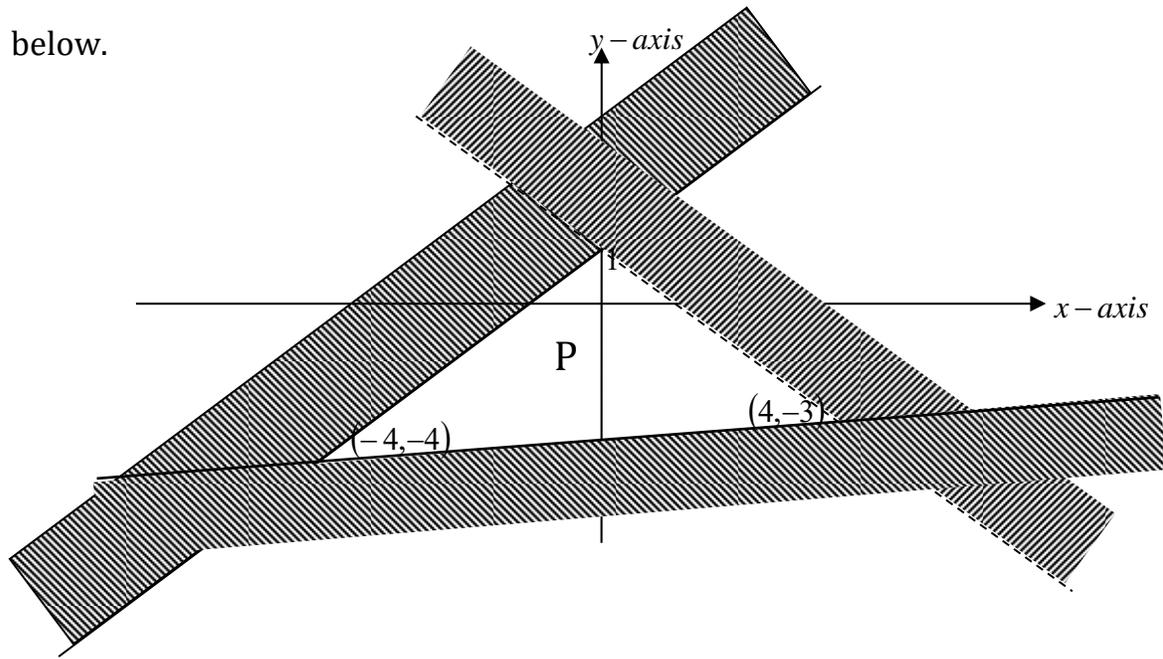
State (i) the class interval

(ii) the modal class

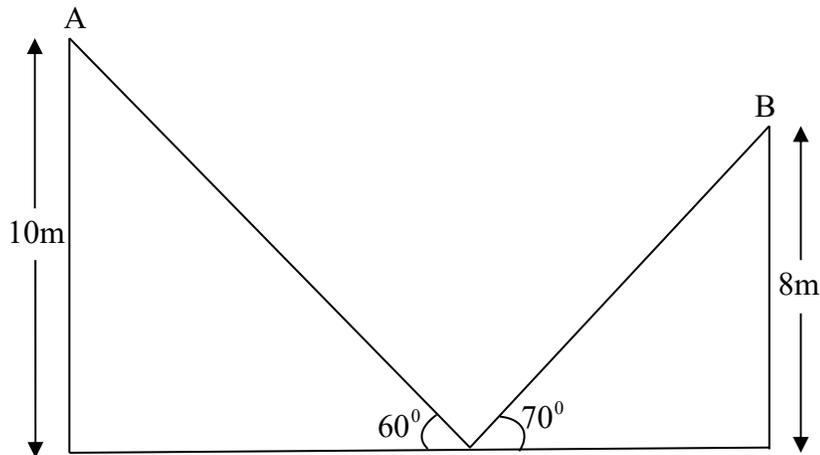
(b) Calculate (i) the mean height

(ii) the median height.

14. (a) Write down the inequalities which satisfy the unshaded region P in the diagram below.



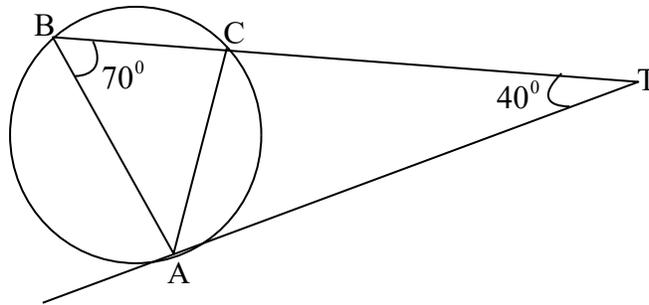
(b) Points A and B are on top of vertical poles which are 10m and 8m high respectively as shown in the figure below. From point T on the same level as the foot of the 2 poles, the angles of elevation of A and B are 60° and 70° respectively.



Find the angle of depression of B from A.

15. In the figure below TA is a tangent to the circle A, and BCT is a straight line,

$$\angle ABC = 70^\circ \text{ and } \angle ACT = 40^\circ.$$



(a) Find the angles (i) $\hat{C}AT$ (ii) $\hat{B}AC$

(b) Given that $AT = 8\text{cm}$ and $CT = 6\text{cm}$, find lengths (i) BT (ii) BA (iii) AC .

16.(a) Using an equilateral triangle of side $x\text{ cm}$, find (i) $\sin 30^\circ$ (ii) $\cos 30^\circ$ (Leave your answer in surd form or fractional form).

(b) Write down a matrix R for the rotation of 30° about the origin.

(c) Find the matrix R^2 and hence explain your answer geometrically.

17. Four hundred and eighty bags of cement are to be transported from a factory to a school where they were putting up a classroom block. A Toyota pick-up and a Isuzu Canter are the available vehicles. A pick-up can carry 50 bags at a time while a Canter can carry 80 bags. A pick-up cannot make 2 journeys more than the Canter. A pick-up should make at least one trip. The cost of each journey for a pick-up and a Canter is Sh. 60,000 and Sh, 90,000 respectively. If 0.6 million is put aside for transport and x is the number of journeys made by a pick-up and y for the number of journeys made by a Canter;

(a) Write down 4 inequalities satisfying the given information.

(b) Represent these inequalities graphically on the same axes using a scale of 1cm: 1 unit on both axes)

(c) Determine the number of trips each vehicle makes to minimize costs.