

CHAMPIONS K.C.S.E REVISION MATHEMATICS MOCKS 2016

*****Service Beyond expectation*****

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FORM 1-4 CONTENT

CHAMPIONS MATHEMATICS MOCKS-2016

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**CHAMPIONS K.C.S.E REVISION SERIES EXECUTIVE COORDINATOR/EXAMINER
HISTORY/AUTHOR CHAMPIONS K.C.S.E REVISION HISTORY AND GEOGRAPHY**

121/1
MATHEMATICS ALT A
Paper 1

July/AUGUST 2016
 2½ hours

BARINGO COUNTY EDUCATIONAL IMPROVEMENT COMMITTEE
Kenya Certificate of Secondary Education (K.C.S.E.)

Instructions to candidates

- (a) Write your name, admission number, class and index number in the spaces provided above.
- (b) This paper consists of **TWO** sections: **Section I** and **Section II**.
- (c) Answer **ALL** the questions in **Section I** and only five from **Section II**.
- (d) All answers and working must be written on the question paper in the spaces provided below each question.
- (e) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) **Non – programmable** silent electronic calculators **and** KNEC Mathematical tables may be used except where stated otherwise.
- (h) Candidates should check the question papers to ascertain that all the pages are printed as indicated and that no questions are missing.

For Examiner’s Use Only

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

**Grand
Total**

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This paper consists of fourteen (14) printed pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing

SECTION I (50 MARKS)

Answer all the questions in this section.

1. Without using mathematical tables or calculator, evaluate; (3marks)

$$\frac{-12 \div (-3) \times 4 - (-15)}{-5 \times 6 \div 2 + (-5)}$$

2. Three sirens wail at intervals of thirty minutes, fifty minutes and thirty five minutes. If they wail together at 7.18 a.m. on Monday, what time and day will they wail together again? (3 marks)

3. Simplify the following expression. (3 marks)

$$\frac{4x^2 - 81}{2ax - 6x - 9a + 27}$$

4. Without using a calculator evaluate $\frac{\frac{5}{8} - \frac{1}{3} \text{ of } \frac{27}{20} \div 2}{1 + \left(5\frac{2}{5} \div \frac{9}{25}\right)}$ leaving your answer as a mixed fraction. (3 marks)

5. Given that $1.\dot{0}\dot{5} = 1\frac{a}{b}$, Find the values of **a** and **b**. (3marks)

6. A cylindrical column of oil has radius 4.25cm and has height of 20cm. Calculate the mass of the oil if the column has density of 3.524g/cm³. (3marks)

7. A straight line passing through the point C (1, 3) and D (x, -5) is perpendicular to the line whose equation is $4y - 3x + 5 = 0$. Determine the value of x and the equation of the line CD. (3marks)

8. Solve the equation given below.

(4marks)

$$2xy - x^2 = -15$$

$$y - x = 4.$$

9. Three angles of a polygon are 125° , 140° and 160° . The remaining angles are 145° each. Calculate the sum of the interior angles of the polygon. (3 marks)

10. The exchange rate during a certain day of February was as shown below.

	Buying	Selling
1 US dollar	Ksh106.32	Kshs 107.01
100 Japanese Yen	Ksh 98.05	Kshs 98.87

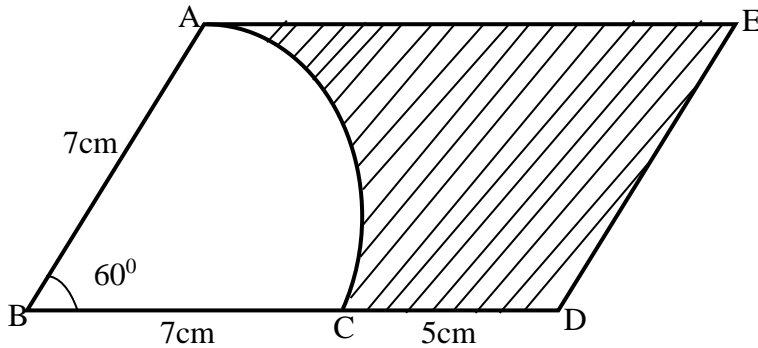
A tourist landed in Kenya and converted 5500 US dollars to Kshs. While in Kenya he spent Kshs 186,000. He then converted the money back to Japanese Yen before travelling to Japan. Calculate the amount of Japanese Yen he had to the nearest Yen. (4 marks)

11. The gradient of the curve whose equation is given by $y = ax^3 - 20x^2 + 10x$ at the point where $x=2$ is 410. Find the value of a . (3 marks)

12. In the figure below, AC is an arc of a circle centre B, angle ABD = 60° , AB = BC = 7cm and CD = 5cm.
If AE is parallel to BD and AB is parallel to ED.

Calculate the area of the shaded region.

(3 marks)



13. A bus left Nairobi and travelled towards Busia at an average speed of 90km/hr. After $2\frac{2}{9}$ hours, a car left Nairobi and travelled along the same road at an average speed of 170km/hr. If the distance between Nairobi and Busia is 800km, Determine the distance the car travelled to catch up with the bus (3 marks)
14. Two alloys Y and Z are each made up of zinc, tin and copper. In alloy Y, the ratio of zinc to tin is 2:5 and the ratio of copper to tin is 4:3. Determine the ratio, copper: zinc: tin in alloy Y. (2 marks)

15. From a point P the angle of elevation of the top of a tree is 25° . From another point Q on the same side which is 10 metres from the base of the tree, the angle of elevation of the top of the tree is 36.5° . Giving your answer to one decimal place, determine the height of the tree hence calculate the distance between P and Q. (4 marks)

16. Solve for k in the following equation:
 $125^{k+1} + 5^{3k} = 630$ (3marks)

SECTION 11 (50 MARKS)

Answer only FIVE questions from this section.

17. A trader purchases four 25kg bags of sugar and packages the sugar in 2kg, 1kg and 0.5kg packs to be sold in retail. The trader does the packaging in a ratio of 3:2:5 respectively. He makes a profit of Kshs 10 for every 2kg pack, Kshs 8 for the 1kg pack and Kshs 6 for the 0.5kg pack.

(a) Determine;

(i) The number of packets the trader made for each type of package. (3 marks)

(ii) The profit he will make if the wholesale price of a 25kg bag of sugar is Kshs 2000 (2 marks)

(iii) The selling price of each type of package. (2 marks)

(b) Determine his percentage profit. (3 marks)

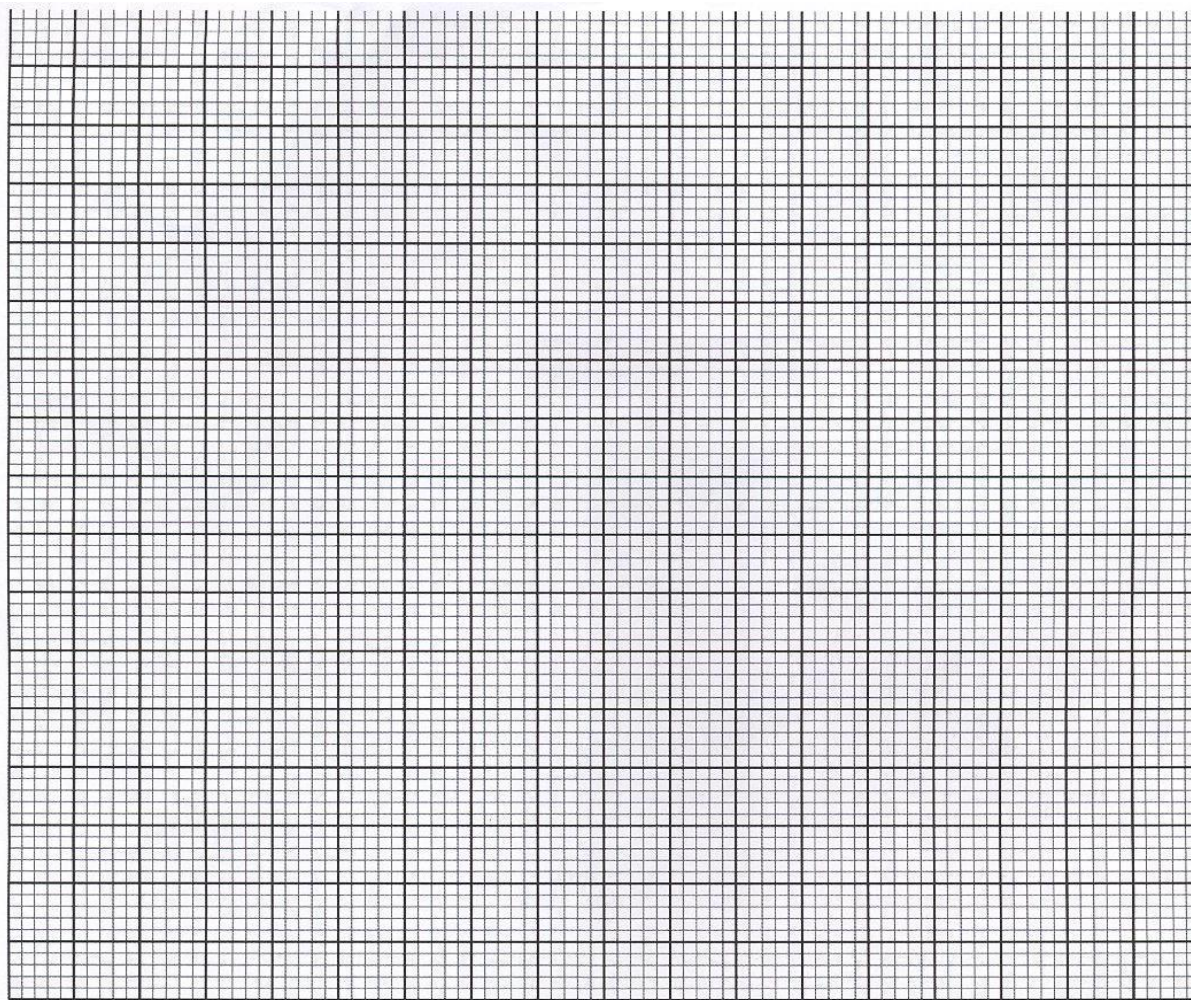
18.. (a) Complete the table below for the function $y=7 + 2x - 2x^2$ for the range $-3 \leq x \leq 4$. (2 marks)

X	-3	-2	-1	0	1	2	3	4
$-2x^2$		-8	-2	0		-8	-18	
$2x$	-6	-4		0		4	6	
7	7	7	7	7	7	7	7	7
Y		-5		7		3	-5	

(b) (i) On the grid provided draw the graph of $y=7 + 2x - 2x^2$. (3 marks)

Take the scale: 2 cm to represent 1 unit on x- axis

1 cm to represent 1 unit on y- axis



(ii) Use your graph to estimate the roots of $7 + 2x - 2x^2 = 0$. (1 mark)

(c) (i) By drawing a suitable line on the same axes in (b) above solve the equation $9 + 5x - 2x^2 = 0$ (3marks)

(ii) State the co-ordinates of the turning point. (1 mark)

19. Income rates for income earned were charged as follows.

Income in sh. per month	Rate in Ksh. per sh.20
1—8,400	2
8401—18,000	3
18001—30,000	4
30,001—36,000	5
36,001—48,000	6
48,001 and above	7

A civil servant earns a monthly salary of ksh.19, 200. His house allowance is ksh.12, 000 per month. Other allowances per month are transport ksh.13, 000 and medical allowance ksh.2, 300. He is entitled to a personal relief of ksh.1,240 per month. Determine

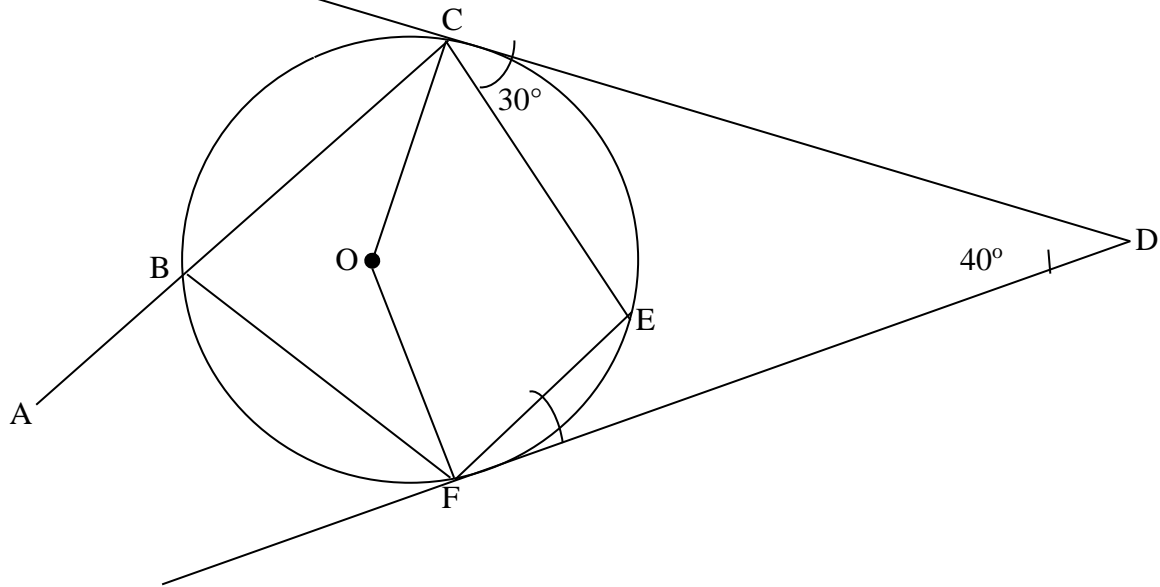
(a) (i) His taxable income per month (2 marks)

(ii) Net tax (5marks)

(b) In addition, the following deductions were made.
NHIF sh.230, Service charge ksh.100, Loan repayment ksh.4, 000, Cooperative shares of ksh.1,200. Calculate his net salary per month (3 marks)

20. Three warships P, Q and R leave port X at 9:00am, ship P sails at a steady speed on a bearing of 070° , 100km from port X, while ship Q sails on a bearing of 320° , 80km from X. Ship R is on a bearing of 150° from port X and due south of ship P.
- a) Using a ruler and compasses only construct a scale drawing to show the position of P,Q,R and X (4marks)
- b) Use the scale drawing to determine
- i) the distance and bearing of ship P from ship Q (2marks)
- ii) the distance of ship R from port X (2marks)
- iii) the distance of ship R from ship P (2marks)

21. In the figure below, O is the centre of the circle. CD and FD are tangents to the circle at C and F respectively. Angle DCE = 30° and angle CDF = 40°. ABC is a straight line and BC=BF.



Find giving reasons the angles

- (a) FCE. (2 marks)

- (b) CBF. (2 marks)

- (c) EFD. (2 marks)

- (d) BCO. (2 marks)

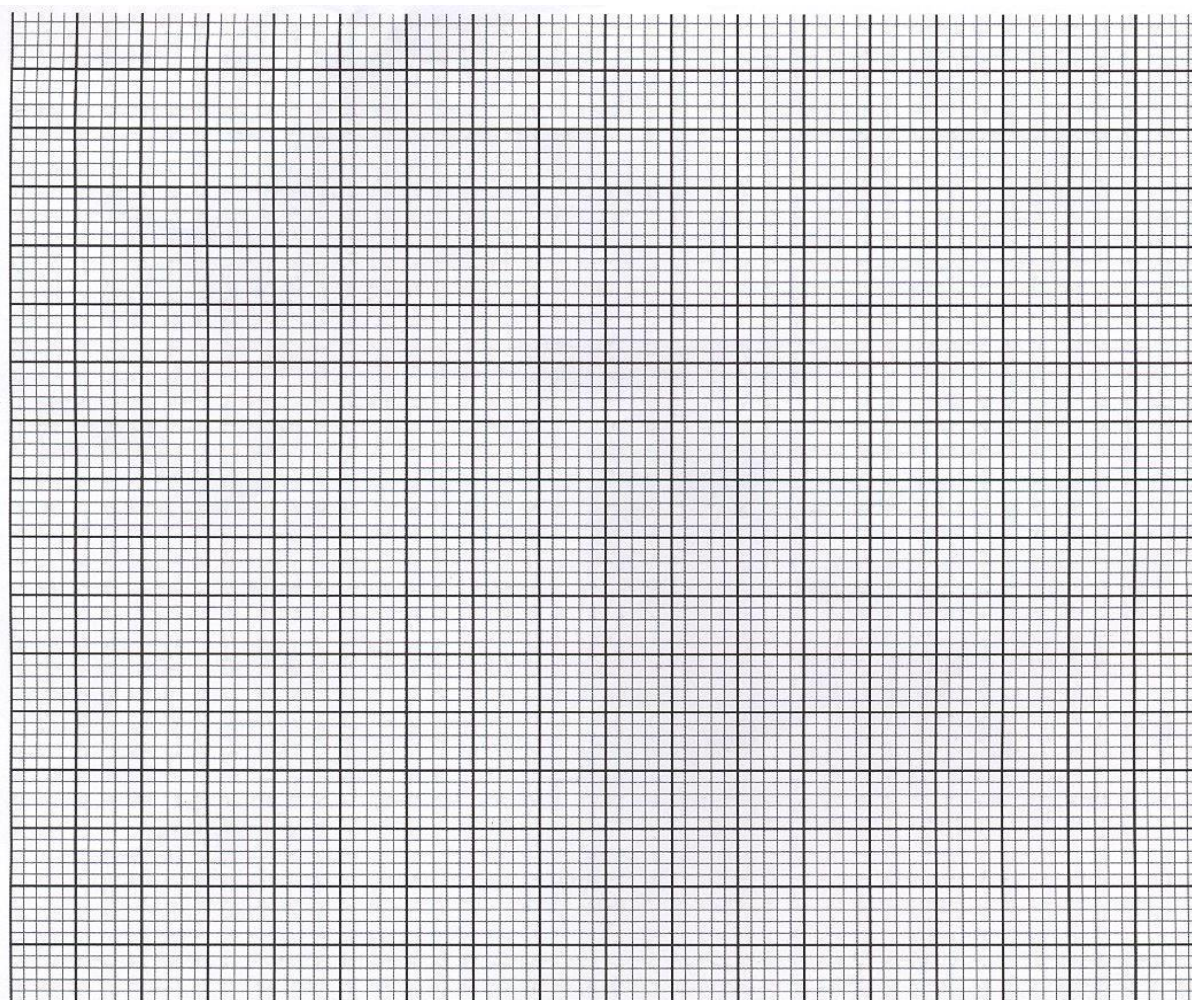
- (e) Reflex FOC. (2 marks)

22. A rectangular tank whose internal dimensions are 2.04m by 1.68m by 26.4 m is seven – eighth full of milk
- a) If the tank is made of metal of thickness 3mm. Calculate the external volume of the tank in m^3 when closed. (3 marks)
- b) Calculate the volume of milk in the tank in cubic metres. (2 marks)
- c) The milk is to be packed in small packets. Each packet is in the shape of a right - Pyramid on an equilateral triangular base of side 19.2cm. The height of each packet is 13.6 cm. Full packets obtained are sold at kshs. 35 per packet. Calculate;
- i) The volume of milk, in cubic centimeters contained in each packet to 4 significance figures. Hence find the number of full packets. (3 marks)
- ii) The exact amount that will be realized from the sale of all the packets of milk. (2 marks)

23. Two variables A and B are connected by the equation.
 $A = kB^n$ where k and n are constants.
 The table below gives values of A and B.

A	1.5	1.95	2.51	3.20	4.50
B	1.59	2.51	3.98	6.31	11.5

- (a) Find a linear equation connecting A and B (2 marks)
 (b) On square paper draw a suitable straight line graph to represent the relation in (a) above. Use (scale 1cm to represent 0.1 units on both axis) (5 marks)



- (c) Use your graph to estimate the values of k and n in to one decimal place. (3 marks)

24. A particle moves with a speed $v = -5 + 3t^2$ m/s through a point O, $S = 10$ m when $t = 0$ s.

Determine;

a) An expression for its displacement S after t seconds. (3 marks)

b) Its displacement after 2s from point O. (2 marks)

c) An expression for its acceleration a after t seconds. (2 marks)

d) Its acceleration after 10s. (1 mark)

e) Time t when its speed $v = 0$ to 3 decimal places. (2 marks)

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MATHEMATICS ALT A
Paper 2

July/AUGUST 2016
 2½ hours

BARINGO COUNTY EDUCATION IMPROVEMENT COMMITTEE 2016

Kenya Certificate of Secondary Education (KCSE)
MATHEMATICS
PAPER 2
TIME: 2½ HOURS

INSTRUCTIONS TO CANDIDATES

- a) Write your Name and Index Number in the spaces provided at the top of this page.
- b) Sign and write the date of examination in the spaces provided above.
- c) This paper contains TWO sections: section I and section II
- d) Answer all the questions in Section I and strictly any FIVE questions in section II.
- e) All answers and working must be written on the question paper in the spaces provided below each question.
- f) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- g) Marks may be given for correct working even if the answer is wrong.
- h) Non-programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.

FOR EXAMINER'S USE ONLY:

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

Section II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

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SECTION 1: (50 MARKS)

Answer ALL the Questions in this section in the spaces provided.

1. Evaluate using logarithms.
(4 marks)

$$\sqrt[4]{\frac{723.9 \times \log 8.765}{3400 + 23.4}}$$

(4)

2. Given the expression $9.7 \div 3.7$, find to four significant figures the percentage error in its quotient.
(3 marks)

3. Solve for θ given that $2\sin\theta = \tan\theta$ for $0^\circ \leq \theta \leq 360^\circ$.
(3 marks)

(3)

4. Simplify $\frac{3\sqrt{2}}{\sqrt{5} - \sqrt{2}}$, leaving the answer in the form $a + b\sqrt{c}$, where a, b and c are rational numbers
(3 marks)

5. (i) Find the inverse of the matrix $\begin{pmatrix} -3 & 4 \\ 2 & 5 \end{pmatrix}$ (2 marks)

- (ii) Hence solve the simultaneous equations; (2 marks)

$$4y - 3x = 6$$

$$2x + 5y = 19$$

6. The cost of maize flour and millet flour is Kshs 44 and Kshs 56 respectively. Calculate the ratio in which they were mixed if a profit of 20% was made by selling the mixture at Kshs. 54. (3marks)

7. The equation of a circle is given by $4x^2 + 4y^2 + 12x - 16y - 11 = 0$. Determine the radius and the co-ordinates of the centre of the circle. (3 marks)

8. Solve the following linear inequalities and list the integral values of x. (3 marks)

$$\frac{1}{3}x + 7 \geq -2x$$

$$0.5x + 4 > 1.5x$$

9. The cash price of a music system is kshs. 30,000. It can be bought under hire purchase terms by paying a deposit of kshs. 10,000 and twelve monthly installments of Kshs. 3,200 per month. Determine the percentage rate of interest per month.
(3 marks)

10. Evaluate $\int_0^1 (3x^2 - 6x + 3)dx$ (3 marks)

11. Make h the subject of the formula $n = \sqrt[3]{\frac{yx^2h}{m-h}}$ (3 marks)

12. Solve for x in $\log(2x + 4) - \log(x - 1) = 3\log 2$. (3 marks)

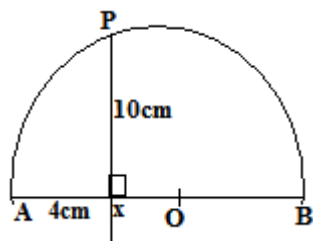
13. The average of the first and fourth terms of a GP is 185. Given that the first term is 27, find the common ratio.
(3 marks)

14. The equation $3x^2 - 8px + 12 = 0$ has real roots. Find the value of P. (3 marks)

15. (a) Expand $(2 - x)^7$ up to the fifth term. (2 marks)

(b) Use your expansion in (a) above to evaluate 1.98^7 to four significant figures. (2 marks)

16. In the figure below O is the centre of the circle diameter AB. $\angle AXP = 90^\circ$, AX = 4cm and PX = 10cm. Calculate the radius of the semi-circle. (3 marks)



SECTION II (50 MARKS)

(Answer any five questions in this section)

17. The table below shows the distribution of ages in years of 50 adults who attended a clinic:-

Age	21-30	31-40	41-50	51-60	61-70	71-80
Frequency	15	11	17	4	2	1

(a) State the median class (1 mark)

(b) Using a working mean of 45.5, calculate:-

(i) The mean age (3 marks)

(ii) The standard deviation (3 marks)

(iii) Calculate the 6th decile. (3 marks)

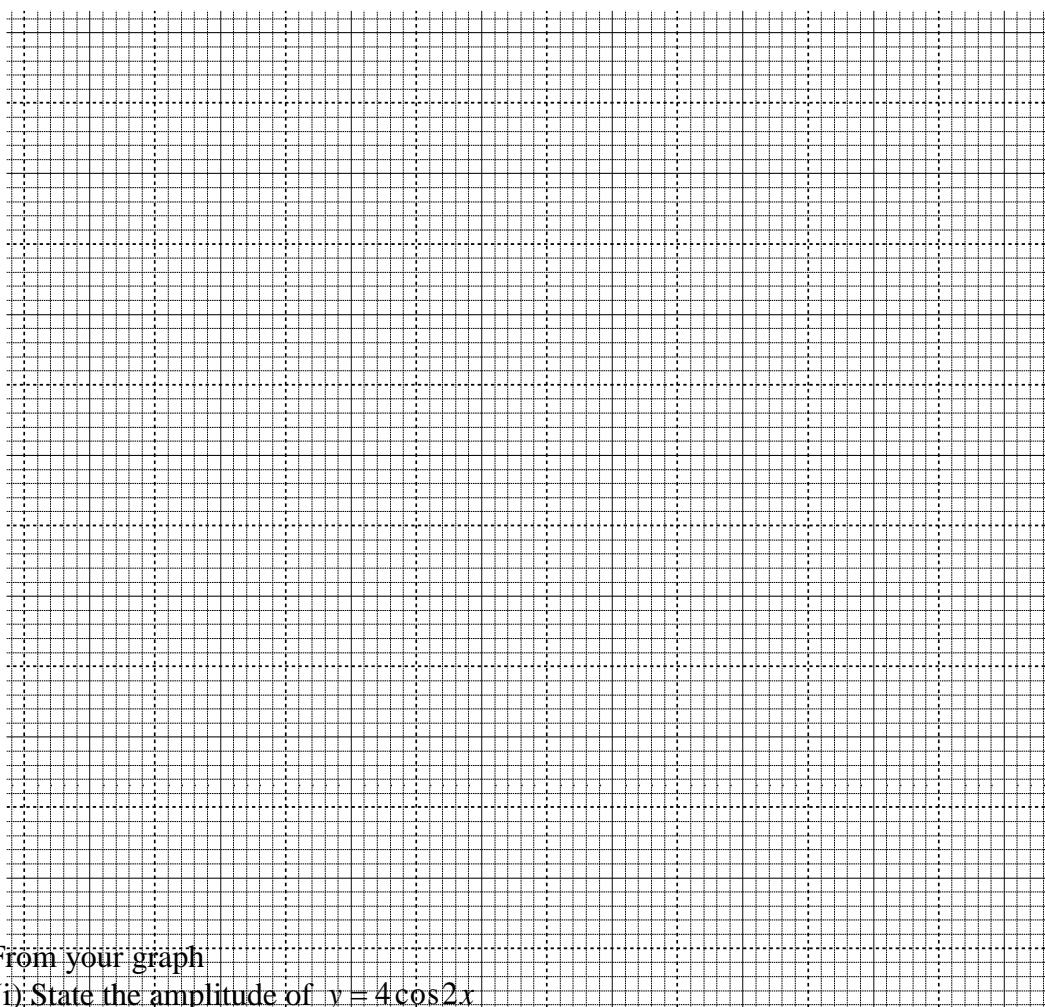
18. (a) Complete the table given below by filling the blank spaces.
marks)

(2

x	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
$2\sin(2x+30)^\circ$	1.00	1.73	2.00	1.73		0	-1.00	-1.73				0	1.00
$4\cos 2x$	4.00		2.00	0	-2.00		-4.00	-3.46		0	2.00		4.00

(b) On the grid provided draw on the same axes, the graph of $y = 4\cos 2x$ and $y = 2\sin(2x + 30^\circ)$ for $0^\circ \leq x \leq 180^\circ$.

(5 marks)



(c) From your graph

(i) State the amplitude of $y = 4\cos 2x$ (1 mark)

(ii) Find the period of $y = 2\sin(2x + 30^\circ)$ (1 mark)

(d) Use your graph to solve $4\cos 2x - 2\sin(2x + 30^\circ) = 0$ (1 mark)

19. OPQ is a triangle in which $OP = p$ and $OQ = q$. X is a point on OP such that $OP:XP = 5:2$ and Y is another point on PQ such that $PY:YQ = 1:2$. Lines OY and XQ intersect at T.

(a) Express the following vectors in terms of \vec{p} and \vec{q} .

(i) PQ
mark) (1

(ii) OY
mark) (1

(iii) QX
mark) (1

(b) If $OT = k OY$ and $QT = h QX$ express \vec{OT} in two different ways. Hence or otherwise find the values of h and k.
marks) (6

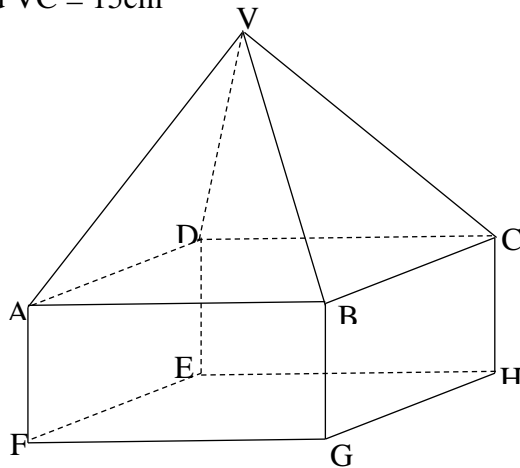
(c) Determine the ratio OT: TY.
mark) (1

20. Using a ruler and a pair of compass only;

a) Construct a triangle PQR such that $PR=7.5\text{cm}$, $PQ=3.0\text{cm}$ and $\angle QPR=60^\circ$
marks) (3

- b) Construct the locus T of points which are equidistant from a point L and passes through the vertices P, Q and R. (2 marks)
- c) Locate the locus S on T such that it is equidistant from sides PQ and QR of the triangle. (2 marks)
- d) Locate the locus of points G enclosed by PQ and QS such that $QG < 2\text{cm}$. (2marks)
- e) Measure SL. (1 mark)

21. The figure shows a right pyramid mounted onto a rectangular block. The length $AB=8\text{cm}$, $BC = 6\text{cm}$, $CH = 3\text{cm}$ and $VC = 15\text{cm}$



Given that M is the centre of the plane ABCD and P is a point on MV such that $MP = \frac{1}{5} MV$, Calculate:-

- (a) The length of EG. (1 mark)
- (b) The height MV of the pyramidal section to 2 decimal places. (2 marks)

(c) The angle between the plane BPC and the pyramidal base ABCD. (3 marks)

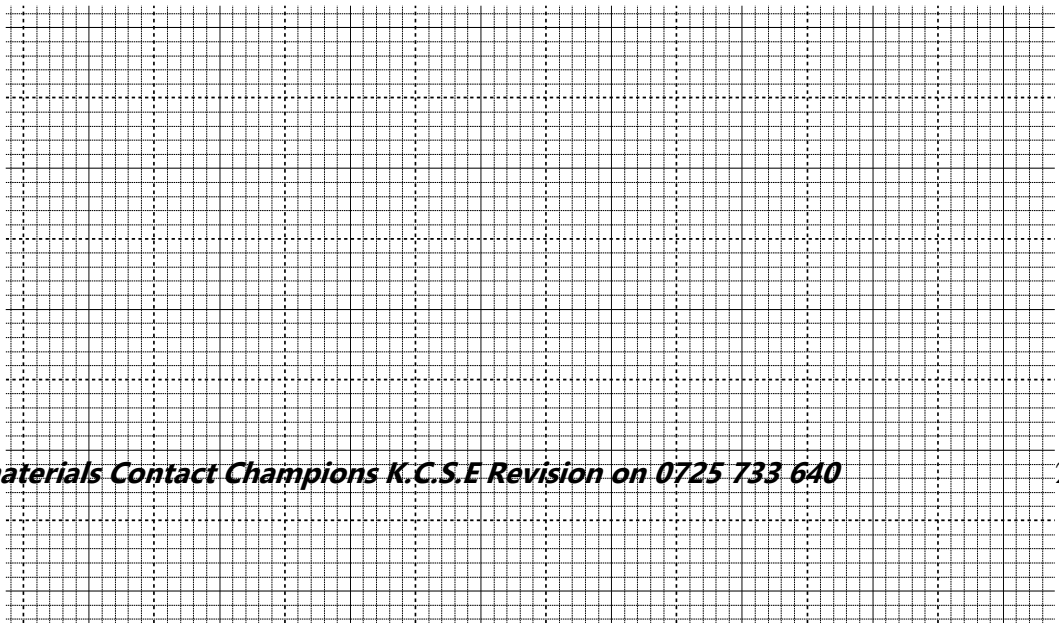
(d) The angle between the line GV and the plane EFGH. (2 marks)

(e) The volume of the solid to four significant figures. (2 marks)

22. Triangle ABC is such that A(-5, 1), B(-1, 1) and C(-3, 4). Triangle A'B'C'.is the image of ΔABC under transformation $T = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$

a) Determine the co-ordinates of $\Delta A'B'C'$. (2 marks)

b) On the grid provided draw ΔABC and $\Delta A'B'C'$. (2 marks)



- c) Describe the transformation T fully. (1 mark)
- d) $\Delta A''B''C''$ is a reflection of the $\Delta A'B'C'$ on the line $y = -x$. Construct $\Delta A''B''C''$. (3 marks)
- e) Determine a single matrix that maps $\Delta A''B''C''$ onto ΔABC . (2 marks)

23. Every evening before the end of preps, Eunice either reads a novel or solves a mathematical problem. The probability that she reads a novel is $\frac{4}{5}$. If she read a novel, there is a probability of $\frac{3}{4}$ that she will fall asleep. If he solves a mathematical problem, there is a probability of $\frac{1}{4}$ that she will fall asleep. Sometimes the teacher on duty enters Eunice's classroom. When Eunice is asked whether she had been asleep, there is a probability of only $\frac{1}{5}$ that she will admit that she had been asleep and a probability of $\frac{3}{5}$ that she will claim to have been asleep when she had not been asleep.

- a) Draw a tree diagram to represent this information. (2 marks)

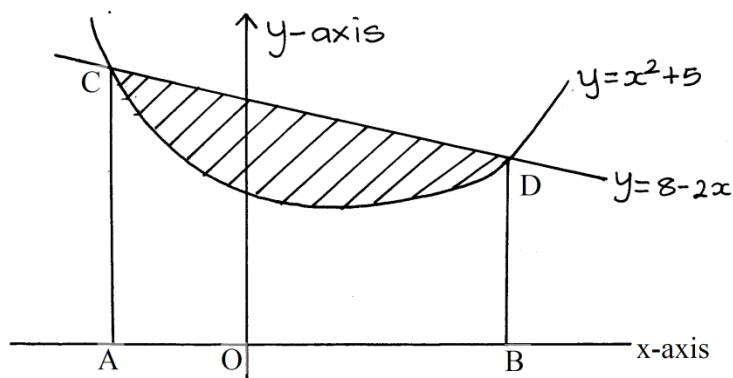
- b) Use the tree diagram to find the probability that;
- I. She sleeps and admits marks) (2)

 - II. She sleeps and does not admit marks) (2)

 - III. She does not sleep and says that she has not been asleep marks) (2)

 - IV. She does not sleep but claims that she had been asleep marks) (2)

24. The diagram below, not drawn to scale shows part of the curve $y = x^2 + 5$ and the line $y = 8 - 2x$. The line intersects the curve at points C and D. Lines AC and BD are parallel to the y-axis.



(a) Determine the coordinates of C and D.

(4

marks)

(b) Use integration to calculate the area bounded by the curve and the x-axis between the points C and D.

(3 marks)

(c) Calculate the area enclosed by the lines CD, CA, BD and the x-axis.

(3

marks)

(d) Hence determine the area of the shaded region.

(1

mark)

Name.....Index No:.....

School.....Candidate's Signature

121/1

MATHEMATICS

PAPER 1

MAY/JUNE 2016

Time: 2 ½ Hours

EKSIKA JOINT EVALUATION TEST

Kenya Certificate of Secondary Education (K.C.S.E.)

Mathematics

PAPER 1

Time: 2 ½ Hours

INSTRUCTIONS TO CANDIDATES

- Write your **name** and **index number** in the spaces provided at the top of the page.

For more materials Contact Champions K.C.S.E Revision on 0725 733 640

- The paper contains two sections; section I and II.
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For Examiners Use Only

SECTION I

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Marks																

SECTION II

Question	19	18	19	20	21	22	23	24
Marks								

GRAND TOTAL

This paper consists of 16 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

1. Use mathematical table to evaluate (4mks)

$$\sqrt{\frac{2.935 \times 0.0765}{32.74}}$$

2. The interior angle of a regular polygon is 4 times the exterior angle. How many sides does the polygon have? (3mks)

3. Mr. Makasembo has a triangular plot that measure 170m, 190m and 210m. find the area of this plot in hectares (3mks)

4. Simplify completely the expression

3mks

$$\frac{15x^2+xy-6y^2}{5x^2-8xy+3y^2}$$

5. In Abwao mixed secondary school, $\frac{3}{10}$ of the students are boys. On a certain day, $\frac{1}{6}$ of the boys were absent and $\frac{2}{5}$ of the girls were absent, find the number of students in the school 3mks

6. Use tables of reciprocals only to work out

3mks

$$\frac{3}{0.6735} + \frac{13}{0.156}$$

7. Express $\frac{1}{x-2} - \frac{2}{x+5} = \frac{3}{x+1}$ in the form of $ax^2 + bx + c = 0$. Where a, b and c are constants hence solve for x 4mks

8. Two similar solids have masses of 80 kg and 270 kg respectively. Find the surface area of the larger solid if the smaller solid has a surface area of 48cm^2 3mks

$$\frac{3}{0.6735} + \frac{13}{0.156}$$

9. A Kenyan bank buys and sells foreign currencies using the rates shown below;

Buying (ksh)	selling (ksh)
1Euro 86.25	86.97
100 Japanese yen 66.51	67.26

A Japanese travelling from France arrives in Kenya with 5000 Euros, which he converts to Kenyan shillings at the bank .while in Kenya he spent a total of ksh 289,850 and then converted the remaining Kenyan shillings to Japanese Yen at the bank. Calculate the amount of Japanese Yen that he received
3mks

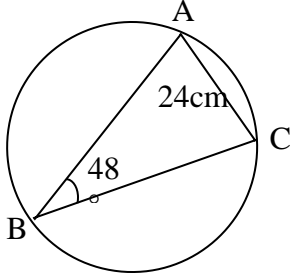
10. Three liters of water (density 1g/cm^3) is added to twelve liters of alcohol (density 0.8g/cm^3)..
what is the density of the mixture
3mks

11. The angle of elevation of the top of a cliff from point P is 45° . From a point Q which is 10m from P towards the foot of the cliff, the angle of elevation is 48° . Calculate the height of the cliff.
4mks

12. Given that $P=3^r$, express the equation $3^{2r-1}+2 \times 3^{r-1}=1$ in terms of P. hence find the value of r in the equation
 $3^{2r-1}+2 \times 3^{r-1}=1$ 4mks

13. A trader sells a bag of beans for ksh 2,100 and that of maize at ksh.1,200. He mixed maize and beans in the ratio of 3:2. Find how much the trader should sell a bag of the mixture to realize the same profit 3mks

14. Find the area of the circle in the diagram below 4mks



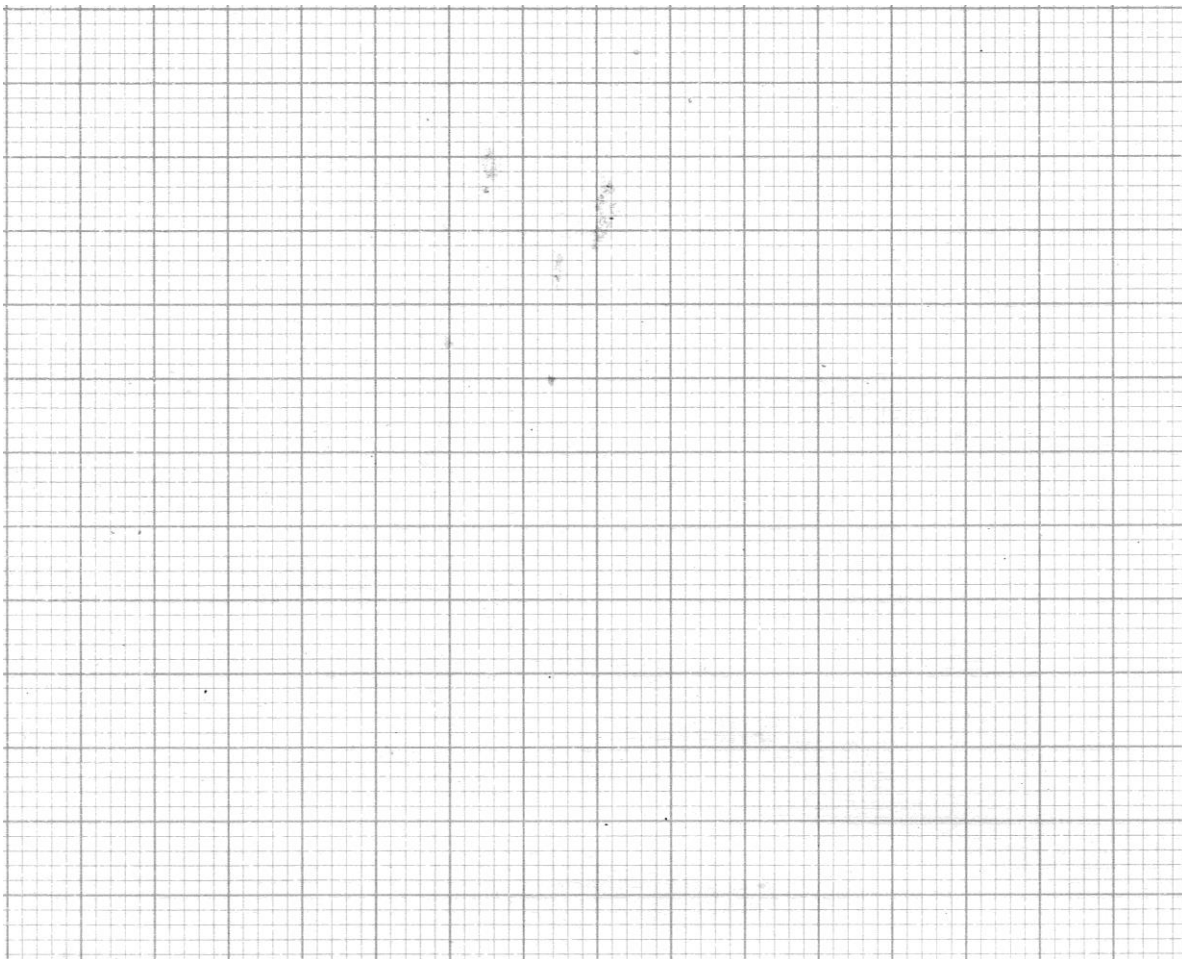
15. Draw a line AB of length 9cm. on one side of the line AB construct the Locus of a point P such that the area of triangle APB is 13.5 cm^2 . On this Locus locate two positions of P, P_1 and P_2 such that angle $AP_1B =$ angle $AP_2B = 90^\circ$ 4mks

16. The frequency distribution table below shows the weekly salary (k£) paid to workers in a factory

Salary	$50 \leq X < 100$	$100 \leq X < 150$	$150 \leq x < 250$	$250 \leq x < 350$	$350 \leq x < 500$
No. of workers	13	16	38	24	9

On the grid provided draw a histogram to represent the information shown above

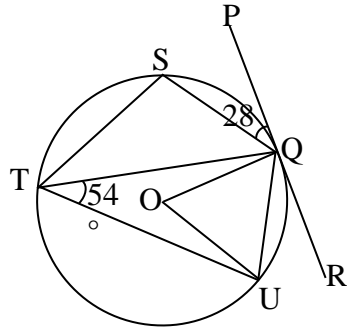
4mks



SECTION II (50 MARKS)

Answer any five questions in this section

17. In the figure below PQR is tangent to the circle at Q and the angle $PQS=28^\circ$ and angle $UTQ=54^\circ$ and $UT=TQ$



Stating reasons, determine the values of angles named below

a) $\angle STQ$ 2mks

b) $\angle TQU$ 2mks

c) $\angle TQS$ 2mks

d) Reflect angle UOQ 2mks

e) $\angle TQR$ 2mks

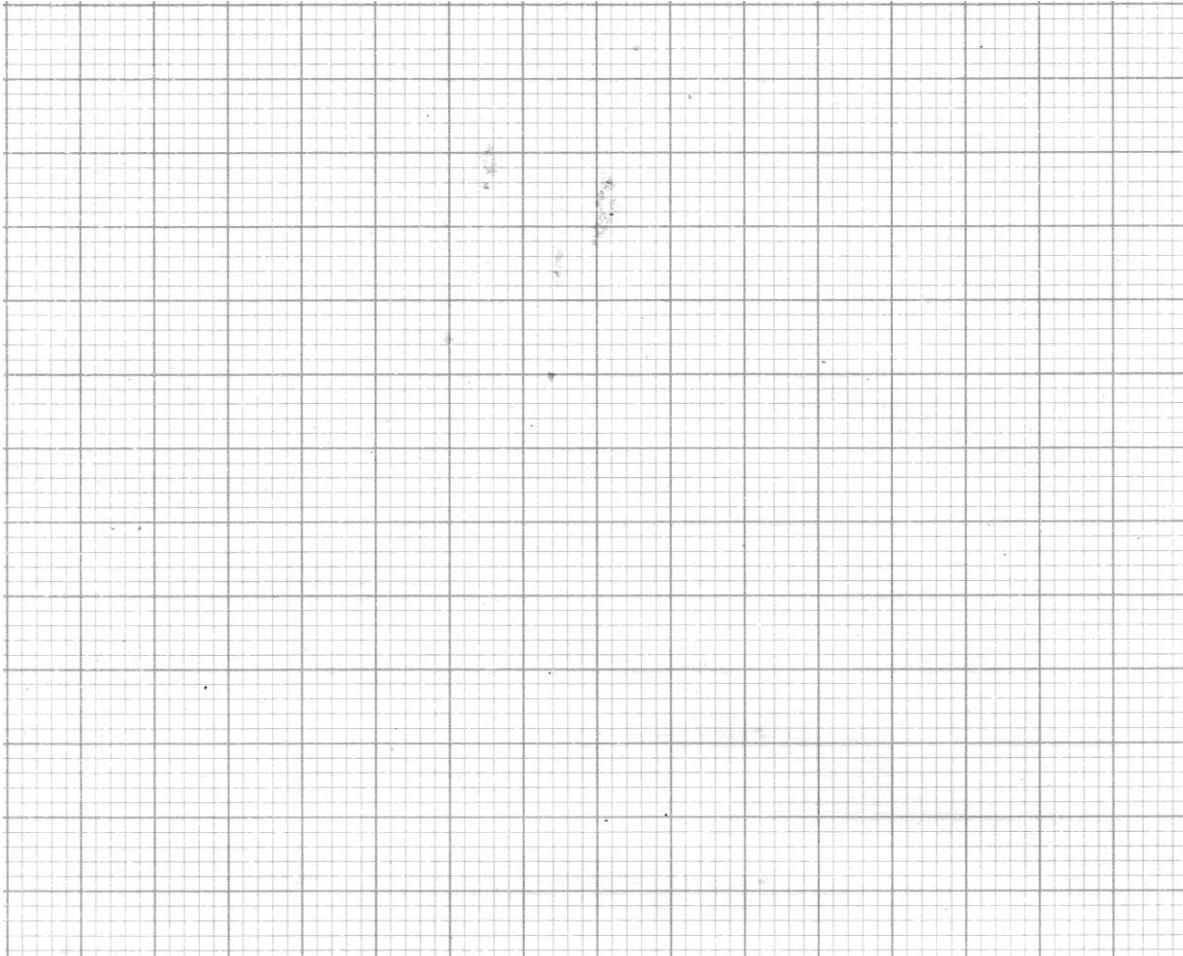
18. A car accelerates from rest for 10 seconds until it reaches a velocity of 12ms^{-1} . It then continues at this velocity for the next 40 seconds after which it brakes and comes to rest at a constant retardation of 1.5ms^{-2} . Determine

i) The acceleration over the first 10 seconds 2mks

ii) The time taken during retardation 2mks

b) draw the velocity time graph for the journey

2mks



c) Use the graph above to

determine;

i) The total distance covered by the car

2mks

ii) The percentage of the total distance which was covered during the first 15 seconds

2mks

19. Given the simultaneous equations

$$5x+y=19$$

$$-x+3y=9$$

a) Write the equations in matrix form. Hence solve the simultaneous equations by matrix method

5mks

b) Find the distance of the point of intersection of a line $5x+y=19$ and $-x+3=9$ from the point $(11,-2)$
2mks

c) Determine the values of x for which the matrix below has no inverse 3mks

$$\begin{pmatrix} 2x & x^2 \\ 2 & 1 \end{pmatrix}$$

20. a) Three points A $(0,4)$ B $(2,3)$ and C $(-2,-1)$ are vertices of a triangle. Find;

i) The gradient of AC 1mk

ii) The gradient of the perpendicular bisector of line AC 1mk

iii) The coordinates of the mid-point of line AC 1mk

b. i) The gradient of AB 1mk

ii) The gradient of the perpendicular bisector of lines AB 1mk

iii) The coordinates of the mid-point of AB 1mk

c) i. find the equation of the perpendicular bisector of AC 1mk

ii) The equation of perpendicular bisector of AB 1mk

iii) Hence find the coordinates of the circumcentre of the triangle 2mks.

21. The position vectors of points A and B with respect to the origin O, are $\begin{pmatrix} -8 \\ 5 \end{pmatrix}$ and $\begin{pmatrix} 12 \\ -5 \end{pmatrix}$

Respectively. Points M and N are the mid points of AB and OA respectively.

a) find

i) The coordinates of N and M 3mks

ii) The magnitude of NM 3mks

b) Express vector \vec{NM} in terms of \vec{OB} 1mk

c) Point P maps onto P^1 by a translation $\begin{pmatrix} -5 \\ 8 \end{pmatrix}$ Given that $OP = OM + 2MN$, find the coordinates of P^1 3mks

22. A particle moves in a straight line such that after t seconds, its displacement s metres from a fixed point O is given by $S=(-4t-2t^2+5t^3)m$

a) Find the velocity at $t=3$ seconds 3mks

b) Find the instant at which the particle was momentarily at rest 2mks

c) Find the acceleration at time $t=2$ seconds 3mks

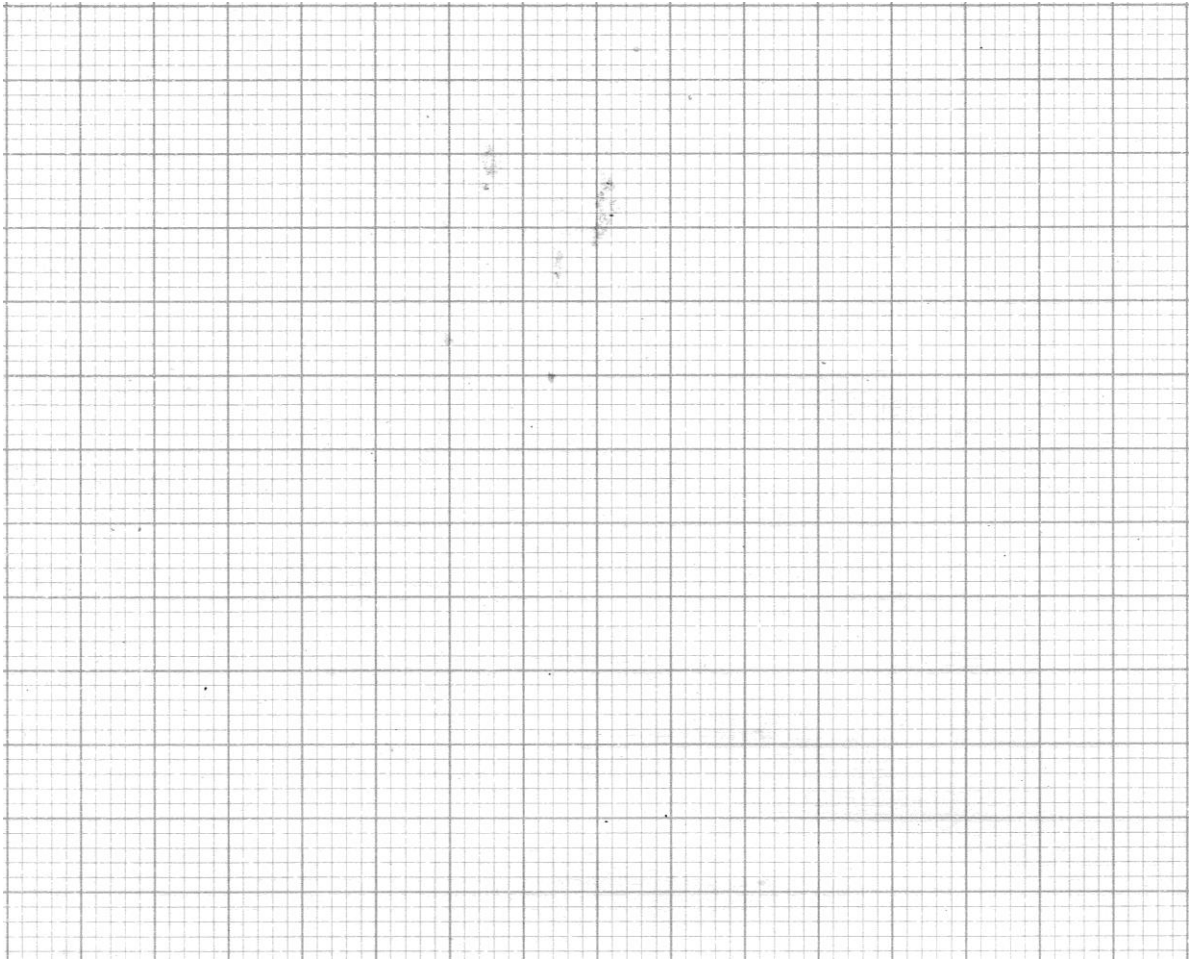
d) Find the displacement of the particle when $t= 2$ seconds 2mks

23. a) Complete the table below for the equation $y=x^3-2x^2-4x+7$ 2mks

X	-3	-2	-1	0	1	2	3	4
Y	-26	-1		7				23

b) Using the scale 1cm to represent 2units on the x-axis and 1 cm to represent 5 units on the y-axis, draw the graph of $y=x^3-2x^2-4x+7$ 3mks

Use



c) your

graph to estimate the roots of the equation $x^3 - 2x^2 - 4x + 7 = 0$

1mk

d) By drawing appropriate straight lines, use your graph to solve the equations

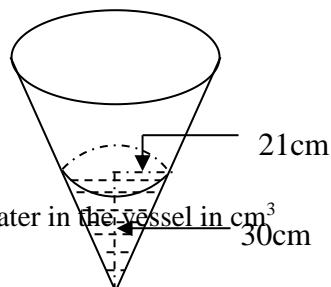
i) $x^3 - 2x^2 - 4x + 2 = 0$

2mks

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

2mks

24. The diagram below represents a conical vessel which stands vertically. The vessel contains water to a depth of 30 cm. the radius of the water surface in the vessel is 21 cm (take $\pi = \frac{22}{7}$)



a) calculate the volume of the water in the vessel in cm^3

2mks

b) when a metal sphere is completely submerged in the water, the level of the water in the vessel rises by 6cm. calculate

i) the radius of the new water surface in the vessel 2mks

ii) the volume of the metal sphere in cm^3 3mks

iii) the radius of the sphere 3mks

121/2

MATHEMATICS
PAPER 2
MAY/JUNE 2016
Time: 2 ½ Hours

EKSIKA JOINT EVALUATION TEST
Kenya Certificate of Secondary Education (K.C.S.E.)

Mathematics
PAPER 2
Time: 2 ½ Hours

INSTRUCTIONS TO CANDIDATES

- Write your **name** and **index number** in the spaces provided at the top of the page.
- The paper contains two sections; section I and II.
- Answer **all** the questions in section I and only five questions from section II.
- All answers and working **must** be written on the question paper in the spaces provided below each question.
- Non- programmable silent electronic calculators and **KNEC** mathematical tables may be used **except** where stated otherwise.
- Marks may be given for correct working even if the answer is wrong.

For Examiners Use Only

SECTION I

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Marks																

SECTION II

Question	19	18	19	20	21	22	23	24
Marks								

GRAND TOTAL

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This paper consists of 16 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION I(50 MARKS)

Answer all the questions in this section in the spaces provided

1. Point A(1,4), B(3,1), C(5,1) and D(7,4) have images A¹(-4,1), B¹(-1,3) C¹(-1,5) and D¹(-4,7) under a transformation. Find the matrix of transformation 3mks
2. Three pegs R, S, and T are on the vertices of a triangular plain field. R is 300m from S on a bearing of 300° and T is 450m directly south of R
- a) Using a scale of 1cm to represent 60m, draw a diagram to show the positions of the pegs 2mks
- b) Use the scale drawing to determine
- i) The distance between T and S in metres 1mk
- ii) The bearing of T from S 1mk
3. Find in radians the value of x in the interval $0^\circ \leq x \leq 2\pi^\circ$ for which $2\cos^2x - \sin x = 1$ (leave your answer in terms of π) 4mks

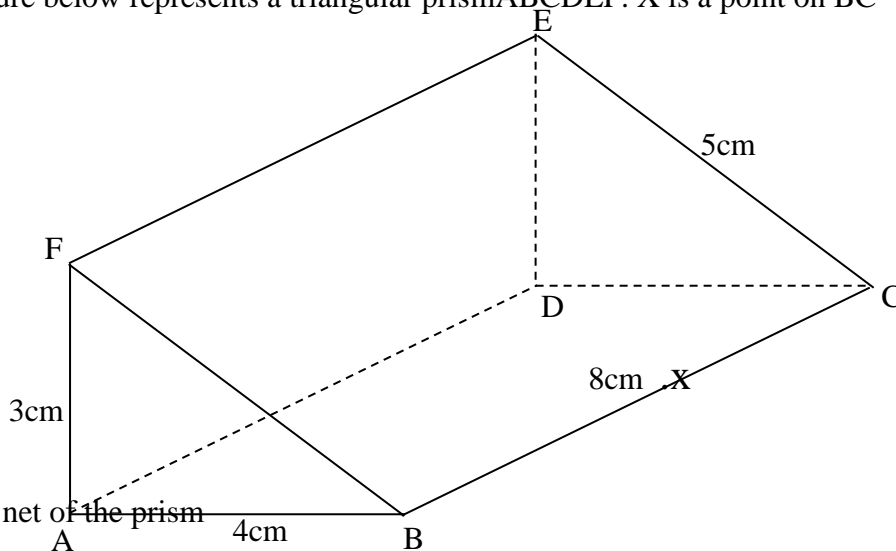
4. a) Expand $(1-x)^5$

1mk

b) Use the expansion in (a) up to the term in x^3 to approximate the value of $(0.98)^5$ 2mks

5. Make P the subject of the formula in $Q = \sqrt{\frac{T^2}{T^2 - P^2}}$ 3mks

6. The figure below represents a triangular prism ABCDEF. X is a point on BC



a) Draw a net of the prism

2mks

b) Find the surface area of the prism

2mks

7. Given that the circle whose equation is $x^2+y^2-7x+2y+c=0$ passes point A (7,1)

a) If AB is the diameter of the circle, find the value of C

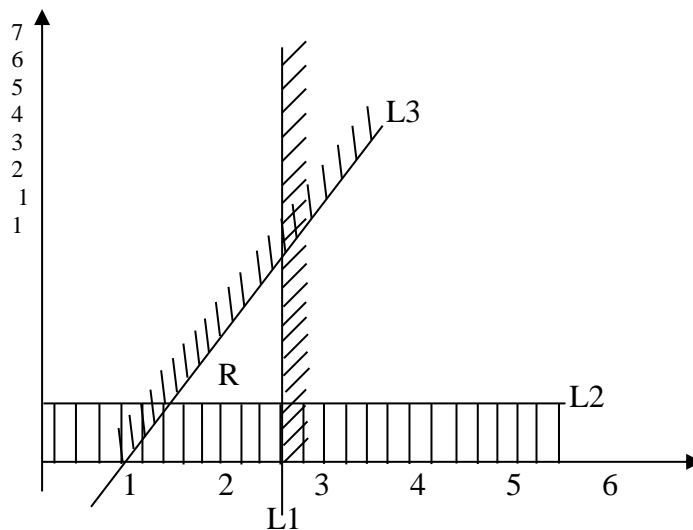
1mk

b) State the coordinates of the center of the circle and the radius of the circle

3mks

8. Find the inequalities representing the region R shown below

3mks



9. Four bells ring at interval 24 seconds, 27 seconds, 30 seconds and 36 seconds. If four bells rang simultaneously at 7:00 am at what time will they ring together again 2mks

10. X and Y are two places on the earth's surface. if X is ($8^{\circ}\text{S}, 31^{\circ}\text{E}$) and Y is ($23^{\circ}\text{N}, 31^{\circ}\text{E}$), find the distance between the two places in kilometers . Take radius of the earth as 6370km 3mks

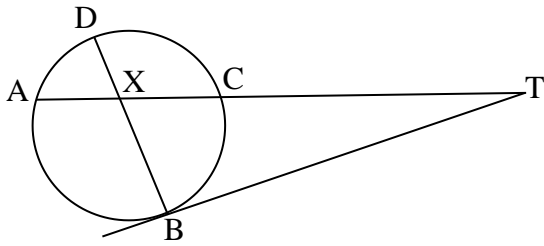
11. Given that $\log 3 = 0.4771$ and $\log 8 = 0.9085$, evaluate $\log 72$ without using a calculator or a mathematical tables 3mks

12. a) simplify $(1 + \sqrt{5})(1 - \sqrt{5})$ 1mk

b) Hence evaluate $\frac{1}{1 + \sqrt{5}}$ correct to 3 significant figure given that $\sqrt{5} = 2.236$ 2mks

13. Given that the equation of a curve is $y = 2x^3 - 3x + 2$ find the equation of the tangent at point P(1,1) 3mks

14. The figure below BT is a tangent to the circle at point B. AXT and BXD are straight lines
 $AX=6\text{cm}$, $CT=8\text{cm}$, $BX=4.8\text{ cm}$ and $XD=5\text{cm}$. find XC 2mks



15. a) By correcting each number to one significant figure approximate the value of
 566×0.004 1mk

b) Hence calculate the percentage error arising from this approximation 2mks

16. Find the compound interest on ksh 24321 for $1\frac{1}{2}$ year at 7% per annum interest being added half yearly to four significant figures 3mks

SECTION II (50 MARKS)

Answer any FIVE questions in this section in the spaces provided

17. Bag A contains 4 red balls and 3 white balls. Another bag contains 3 red balls and 5 white balls. A bag is picked at random and a ball is picked from it at random, its colour is noted and the ball is not returned. Then another ball is picked at random and its colour noted. If the probability of picking bag A is $\frac{2}{3}$ and that of picking bag B is $\frac{1}{3}$

a) draw a possibility space for the possible outcome 2mks

b) Find the probability of picking balls of the same colour 3mks

c) Find the probability that the first ball picked is red and the second ball is white 2mks

d) Find the probability that two balls picked are of different colours 3mks

18. A tank has two inlet taps P and Q and an outlet tap R. when empty the tank can be filled by tap P alone in 4 hours or by tap Q alone in 3 hours. When the full tank can be emptied in 2 hours by tap R

a) The tank is initially empty. Find how long it would take to fill up the tank

i) If tap R is closed and taps P and Q are opened at the same time 2mks

ii) If all the three taps are opened at the same time 2mks

b) The tank is initially empty and three taps are opened as follows

P, at 8:00 am, Q, at 8:45 am and R at 9:00 am

i) Find the fraction of the tank that would be filled by 9:00 am 3mks

ii) Find the time the tank would be fully filled up 3mks

19. Three quantities R,S and T are such that R varies directly as S and inversely as the square root of T

a) Given that $R=480$, when $S=150$ and $T=25$. Write an equation connecting R,S and T 4mks

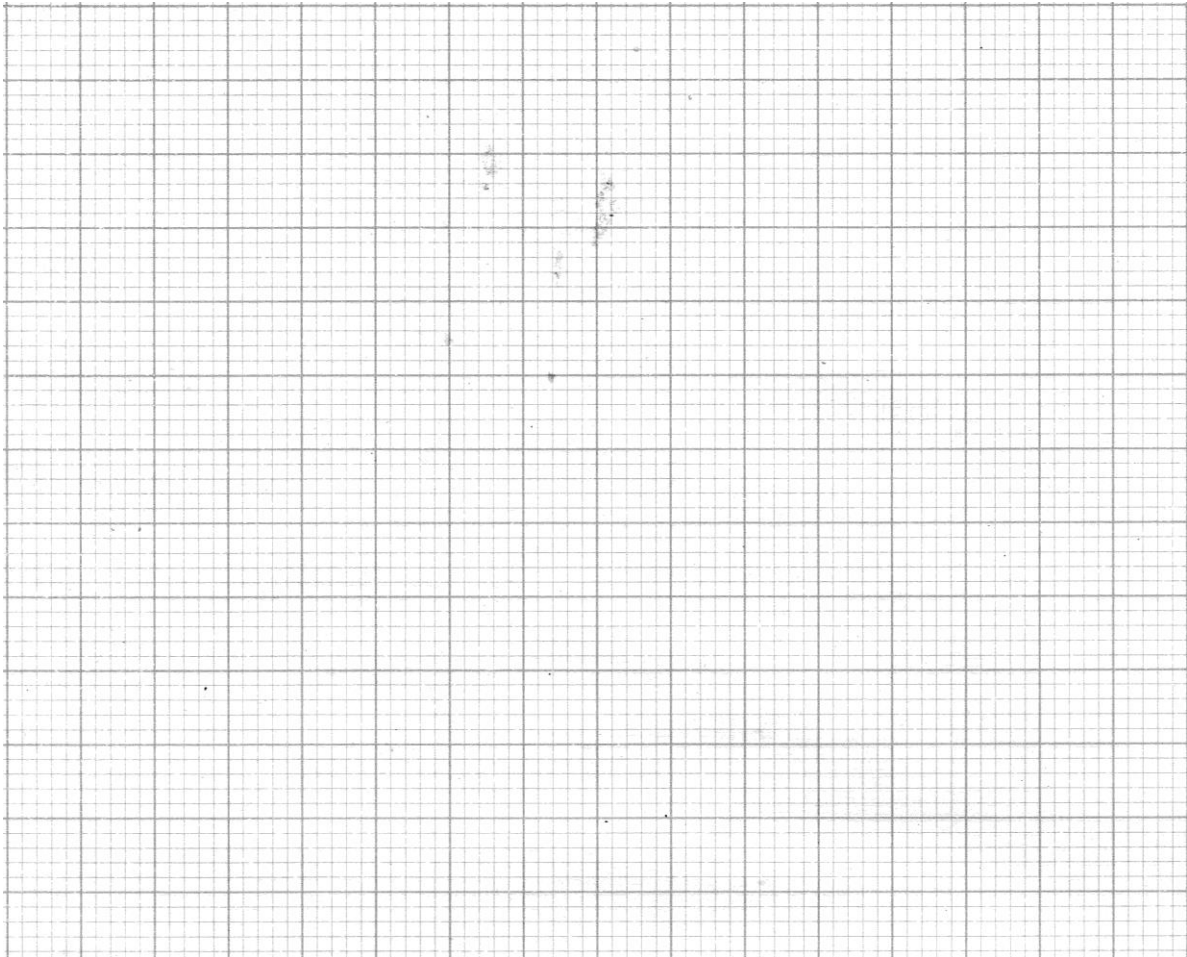
b) i) Find the value of R when $S=360$ and $T=2.25$ 2mks

ii) Find the percentage change in R if S increases by 5% and T decrease by 20% 4mks

20. The table below shows the distribution of marks scored by 70 students in a test

marks	16-20	21-25	26-30	31-35	36-40	41-45	46-50
Frequently	2	10	12	17	15	9	5

On the grid provided draw an ogive curve that represents the above information (scale 1cm for 5 unit on both axes) 4mks



b) Use the curve to estimate
 i) The median 1mk

ii) The quartile deviation 3mks

iii) In order to pass the test a student has to score 35 marks. Calculate the percentage of students who failed 2mks

21. The n^{th} term of a sequence is given by $2n+5$

a) Write down the first terms of the sequence

2mks

b) Find the sum of the first 20 terms of the sequence

2mks

c) If the third, the fifth and the eighth terms of another sequence which is an A.P forms the first three consecutive terms of a geometric sequence. If the common difference of the A.P is 3, find

i) The first three terms of the GP

4mks

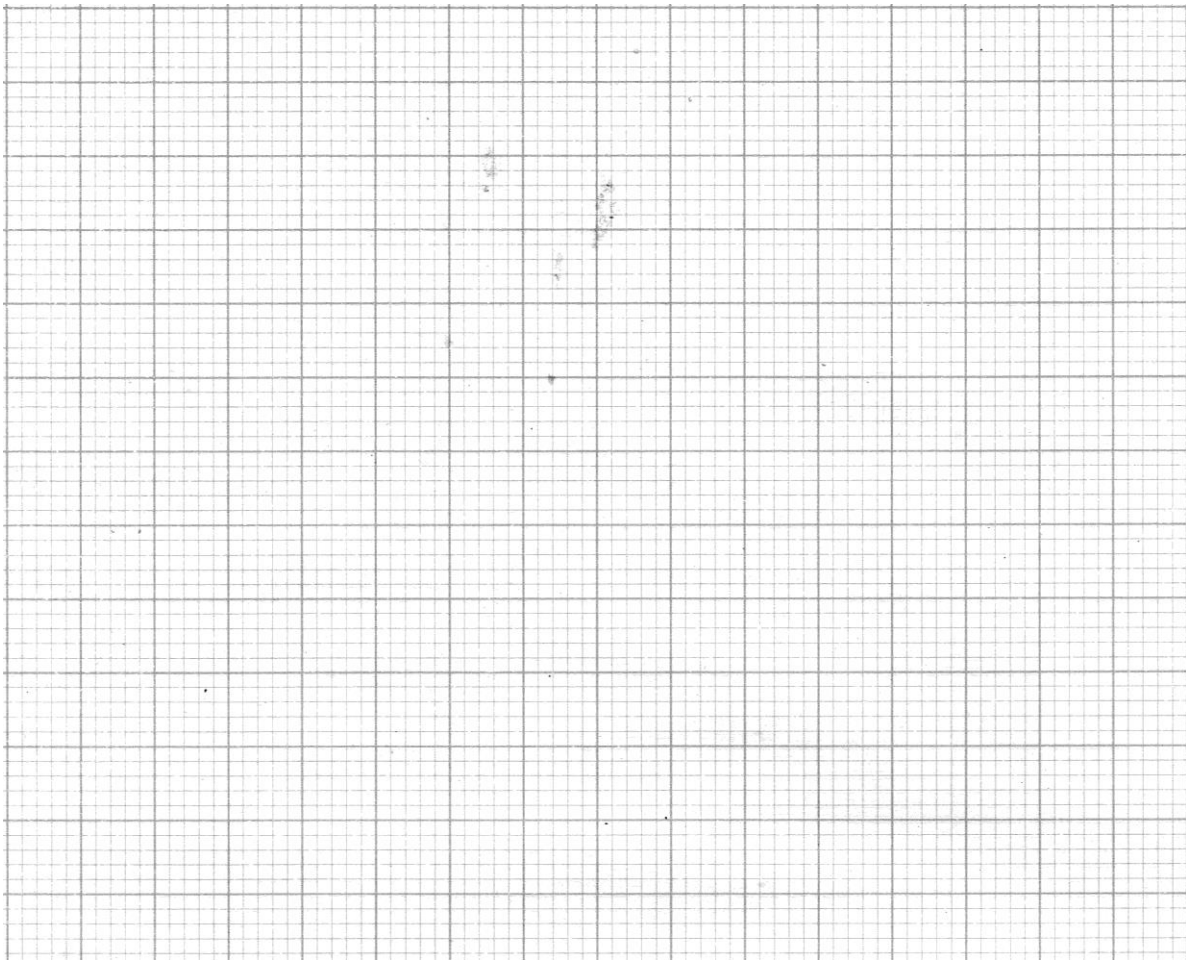
ii) The sum of the first 8 terms of the G.P to four decimal places

2mks

22. a) complete the table below for the function $y=3\cos 2x$

X	0	30	60	90	120	150	180	210	240	270	300	330	360
$y=\sin^{1/2}x$	0.00	0.78	1.50		2.60		3.00	2.90		2.12			0.00
$Y=3\cos 2x$	3.00	1.50		-3.00		1.50	3.00		-1.50	-3.00	-1.50		3.00

Using a scale of 1cm represents 30° on the horizontal axis and 2cm represents 1 unit on the vertical axis.
 Draw the graph of $y=3\sin^{1/2}x$ and $y=3\cos 2x$ on the same set of axes 5mks



b) Use your graph to

i) Solve $3\sin^{1/2}x - 3\cos 2x = 0$

2mks

ii) State the period for $3\sin^{1/2}x$

1mk

iii) State the amplitude of $y=3\cos 2x$

1mk

23. Using a pair of compasses and a ruler only

a) Construct triangle ABC where $AB=8.5\text{cm}$, $BC=8.5$ and angle $ABC=75^\circ$

b) Locate the position of P which satisfy the following conditions

i) P is nearer to BC than AC

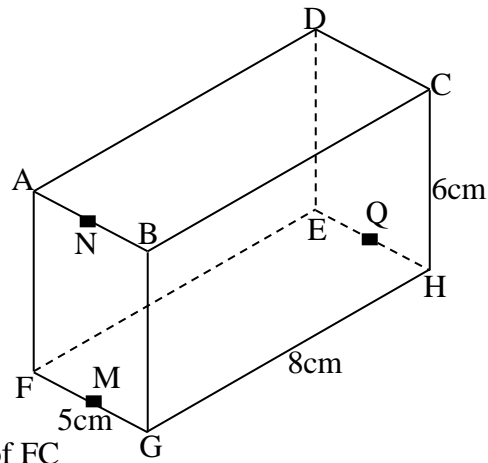
ii) $BP \leq CP$

iii) $PC \geq 6\text{CM}$

in each case shade out the unwanted regions

10mks

24. the diagram below represents a cuboid ABCDEFGH in which $FG=5\text{cm}$ $GF=8\text{cm}$ and $HC=6\text{cm}$



Calculate

a) The length of FC

3mks

b) i) the size of the angle between lines FC and FH

2mks

ii) The size of the angles between the AB and FH

2mks

c) The size of the angles between the planes ABHE and the plane FGHE

3mks

121/1
 Mathematics
 Paper 1
 2 ½ Hours
 JULY/AUGUST- 2016

KAKAMEGA SOUTH SUB-COUNTY JOINT EVALUATION TEST-2016
 Kenya Certificate of Secondary Examination (KCSE)

121/1
 Mathematics
 Paper 1

INSTRUCTIONS TO CANDIDATES

- a) Write your name, school and index number in the spaces provided above.
- b) Sign and write the date of the examination in the spaces provided above.
- c) This paper consists of **two** sections: **Section I** and **Section II**
- d) Answer **ALL** the questions in **section I** and only **FIVE** questions from **section II**.
- e) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
- f) Marks may be given for correct working even if the answer is wrong.
- g) **Non – programmable**, silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.
- h) Candidates should answer the questions in English

For Examiner’s use Only

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND

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This paper consists of 15 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION 1 (50 MARKS)

Answer all questions in this section in the spaces provided

1. Simplify without using mathematical tables or a calculator (3mks)

$$1\frac{3}{4} - \frac{7}{16} \text{ of } 1\frac{11}{49} \div \left(\frac{13}{21} + \frac{11}{28}\right)$$

2. The diagonal of a square is 15cm. Calculate its perimeter (3mks)

3. (a) The point B(3,2) maps onto B'(7,1) under a translation T_1 . Find T_1 (1mk)

- (b) If B^1 is mapped onto B^{11} under translation T_2 given by $\begin{pmatrix} -3 \\ 5 \end{pmatrix}$. Find T_3 , given that ;-
 $T_3(B) = B^{11}$ (2mks)

4. Determine the value of x in the equation below

$$\log 5 + \log (2x+10) - 2 = \log (x-4) \quad (3mks)$$

5. The ratio of the exterior angle to interior angle of a regular polygon is 1:9. Determine the number of sides of the polygon (3mks)

6. Find the integral values of x that satisfy the inequalities below (3mks)

$$3x + 1 \leq 4 + 7x < 3x + 11$$

7. An American tourist on holiday in Kenya has US \$ 6,000 in traveler's cheque which she changed into Kenya shillings. At the end of her stay in Kenya, she was left with Ksh.124,934.60. Which she changed into dollars before leaving Kenya.

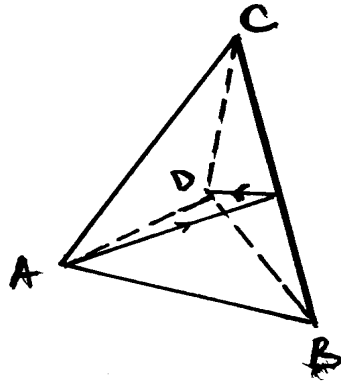
(i) What amount of money in Ksh. did she spend in Kenya (2mks)

(ii) How many US dollars did she have before leaving Kenya (1mk)

Use the exchange rate table below

	Buying	Selling
1 US dollar	76.50	76.60

8. The figure shown below is a regular tetrahedron ABCD of edges 4cm, draw its net in the spaces provided, hence, measure the length of the straight path of AD over edge BC.
(3mks)



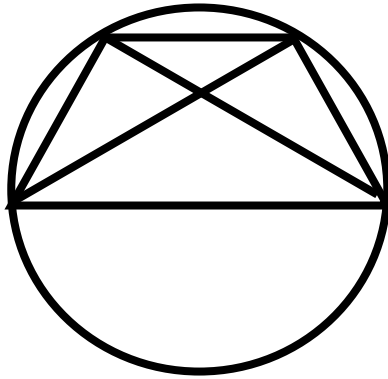
9. Determine the equation of a line perpendicular to the line $3y-2x=4$ passing through the point $(-2,0)$ and express your result in the form;
(2mks)

$$\frac{x}{a} + \frac{y}{b} = 1$$

Hence state the value of a and b

(1mk)

10. Given that O is the centre of the circle shown below and angle $NMK = 34^\circ$, and angle $MKL = 20^\circ$. Find the value of the following angles.



(a) Angle NKM

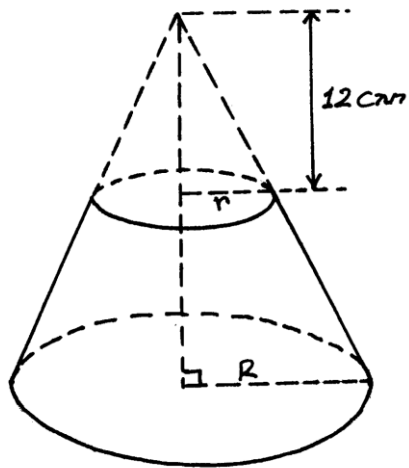
(1mk)

(b) Angle marked J

(2mks)

11. Juma drove a distance of 240km from Eldoret to Naivasha at an average speed of X km/hr. Jamlek drove the same distance at 20km/hr faster and took 2 hours less. Find the value of x (3mks)

12. 12cm of a cone is chopped off to form a frustrum as shown below, given that the radius $r = 8\text{cm}$ and $R = 14\text{cm}$



Calculate the height of the frustum

(3mks)

13. Three years ago, Juma was three times old as Ali. In two years time, the sum of their ages will be 62. Determine their current ages (3mks)

14.

(i) Express 98 and 72 as product of their prime factors

(2mks)

(ii) A rectangle of sides 98cm by 72cm is sub-divided into small squares each of side x (cm). Find the values of X (2mks)

15. Evaluate;-

(3mks)

$$\left[\frac{81}{16}\right]^{-3/4} \times \left[\frac{9}{40}\right]^{1/2} \times (27)^{2/3}$$

16. (a) Use mathematical tables of squares and reciprocals to find;-

(1mk)

(i) 4.978^2

(ii) $\frac{1}{31.65}$

(1mk)

(b) Hence evaluate to 4 significant figures, the value of

(2mks)

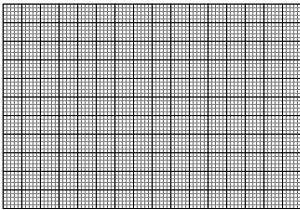
$$4.978^2 - \frac{1}{31.65}$$

SECTION II (50 MARKS)

Answer any FIVE questions in this section.

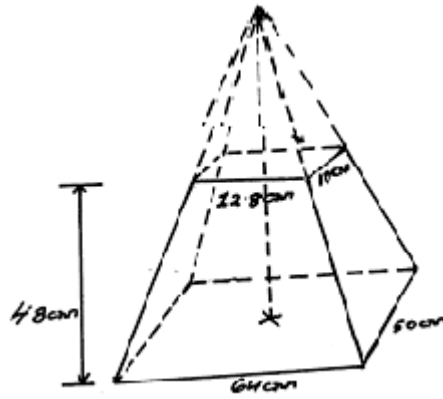
17. The vertices of triangle PQR are $P(1,1)$, $Q(4,1)$ and $R(5,4)$. A transformation represented by matrix $T = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ maps triangle PQR onto triangle $P^1Q^1R^1$. A second transformation represented by $U = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ maps triangle $P^1Q^1R^1$ onto triangle $P^{11}Q^{11}R^{11}$

- (a) On the same axes, draw the three triangles PQR, $P^1Q^1R^1$ and $P^{11}Q^{11}R^{11}$ (6mks)



- (b) Describe a single transformation which maps triangle PQR onto triangle $P^{11}Q^{11}R^{11}$ and find its matrix (4mks)

18. The figure below shows the frustum of a right pyramid with a rectangular ends measuring 64 cm by 50cm and 12.8cm by 10cm respectively. The height of the frustum is 48cm.



- (a) Calculate the
(4mks)

volume of the frustum

- (b) Calculate the surface area of the frustum if it is closed at both ends (6mks)

19. Three war ships P,Q and R are at sea such that ship Q is 400km on bearing of 030 from ship P. Ship R is 750km from Q and on a bearing of 120 from Q, an enemy warship S is sighted 1000km due south of ship Q.

(a) Taking a scale of 1cm to represent 100km, locate the position of ships P, Q R and S
(4mks)

(b) Using the scale drawing;
Find the compass bearing of

(i) Ship P from ship S

(ii) Ship S from ship R

(2mks)

(c) Use the scale drawing to determine

(i) The distance of S from P

(ii) The distance of R from S

(2mks)

(d) From the scale drawing:

Find the bearing of

(i) Q from R

(ii) P from R

(2mks)

20. Two friends Jane and Tom live 40km apart .One day Jane left her house at 9.00a.m and cycled towards Tom's house at an average speed of 15km/h.Tom left his house at 10.30 am on the same day and cycled towards Jane's at an average speed of 25km/h

(a)Determine

(i) The distance from Jane's house, where the two friends met (4mks)

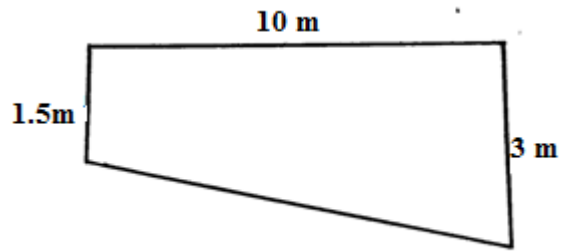
(ii)The time they met. (2mks)

(iii)How far Jane was from Toms house when they met (2mks)

(b)The two friends took 10minutes at the meeting point and then cycled to Toms house at an average speed of 12km/h .Find the time they arrived at Tom's house

(2mks)

21. The figure below shows a uniform cross-section of a swimming pool which is 4 meters wide. The depth of the pool increases gently from 1.5 meters to 3 meters.



- (a) How much water in litres does it hold when full? (3mks)
- (b) Calculate the total internal surface area of the pool (5mks)
- (c) Find the angle at which the bottom of the pool inclines to the horizontal (2mks)

22. Complete the table below for the function $y=x^2-4x+5$

X	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8
y	2	1.25	1		2		5		10		17		26		

(1mk)

(c) Using the mid-ordinate rule with seven strips to estimate the area enclosed by the curve $y=x^2-4x+5$, the x axis and the lines $x=1$ and $x=8$ (2mks)

(c) Find the exact area of the region in (b) above. Hence calculate the percentage error introduced by using the mid-ordinate rule in (b) above. (5mks)

(d) Estimate the area enclosed by the curve $y=x^2-4x+5$ using the trapezoidal rule with 5 trapezia between $x=2$ and $x=7$ (2mks)

23. A group of people agreed to raise Ksh.7200,000 to start a business.They were to share the amount equally.However,20 members were unable to contribute and withdrew from the group.The remaining members had therefore to contribute Ksh.6000 more each in order to raise the greed target.

(a) Write an expression of the amount each member would contribute originally(1mk)

(b) Write an expression of the amount each member would contribute after the withdrawal of some members (1mk)

(c) Calculate the original number of members of the group (6mks)

(d) Calculate the percentage increase in the amount of contribution for each member (2mks)

24. The acceleration of a particle moving from a fixed point 0 after t seconds is $a = 6 - 24t \text{ m/s}^2$.

(a) Calculate the velocity of the particle after 1 second given that initial velocity is 36 m/s
(3mks)

(b) Calculate the displacement of the particle during the 2nd (2mks)

(c) Calculate the maximum velocity (2mks)

(d) Find the displacement when the particle is momentarily at rest. (2mks)

121/2
Mathematics
Paper 2
2 ½ Hours
JULY/AUGUST- 2016

KAKAMEGA SOUTH SUB-COUNTY JOINT EVALUATION TEST-2016
Kenya Certificate of Secondary Examination (KCSE)

121/2
Mathematics
Paper 2

INSTRUCTIONS TO CANDIDATES

1. Write your name , index number and school in spaces provided above.
2. Sign and write the date of the examination in spaces provided.
3. This paper contains two sections; section I and section II.
4. Answer ALL questions in section I and any FIVE questions in section II.
5. All answers and working MUST be shown on the question paper in the spaces provided below each question.
6. Show ALL steps in your calculations, giving your answer at each stage in the space provided.
7. Marks may be awarded for correct working even if the answer is wrong.
8. Non-programmable , silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.
9. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no question is missing.

FOR EXAMINERS USE ONLY

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

SECTION 1

1. Use logarithms to evaluate;

(3mks)

$$\sqrt[3]{\frac{4.68 \times 0.1324^2}{5 \log 7}}$$

2. Make x subject of the formular

(3mks)

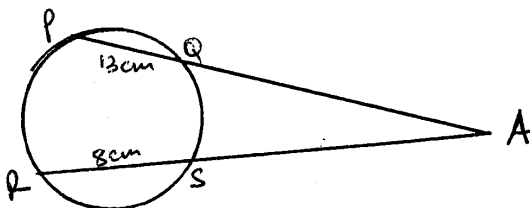
$$H = \sqrt[n]{\frac{t+kx}{T-kx}}$$

3. Solve the following equation by completing the square method.

(3mks)

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

4. In the figure below two chords PQ and RS intersect externally at A. PQ = 13cm, RS = 8cm. If AQ is 1cm shorter than AS. Find the length of AS.



For m

on on 0725 733 640

71

5. Find the percentage error in rounding off $0.7\dot{3}$ to the nearest two decimal places (3mks)
6. The base length of a squared pyramid is 24cm. The slant edges are 20cm long. Calculate the angle between a sloping face and the base. (3mks)
7. The sum of the first four terms of an arithmetic progression is 14. If the sum of the first eight terms is 108, find the sixth term of this progression. (3mks)
8. (a) Expand $(3 + a)^5$ (2mks)
- (b) Hence evaluate $(2.97)^5$ correct to 4 significant figures (2mks)

9. Grade A tea costs Ksh. 100 per kg while grade B costs Ksh. 150 per kg. Find the ratio in which the two grades should be mixed to get a mixture worth Ksh. 140 per kg. (3mks)
10. Three friends Aloice, Kennedy and Chore went out for shopping. Aloice bought 2 cards , 2kg of sugar and $\frac{1}{2}$ kg of beans, Kennedy bought 1 card, 3kg of sugar and $1\frac{1}{2}$ kg of beans while Charo bought 5 cards, 4kg of sugar and 2 kg of beans.
- a) Write this information in the form of a matrix (1mk)
- b) The cost of a card is sh.100, a kg of sugar at sh.90 and a kg of beans at sh.180. Use matrix multiplication to find the amount of money spent by the three boys. (2mks)
11. Find the centre and radius of a circle whose equation is; (3mks)
- $$2x^2 + 2y^2 + 8x - 5y + 10 = 0$$
12. Simplify without using calculators or mathematical table (3mks)
- $$\frac{\sin 60^\circ - 1}{\cos 30^\circ + 1}$$

13. Simplify;

(3mks)

$$\frac{12x^2 - 16x}{20 - 11x - 3x}$$

14. P varies directly as R squared and inversely as the square root of Q. Find the percentage change in R if P increases in the ratio 5:2 and Q decreases by 10% (3mks)

15. A ship cruises 60km on a bearing of 230° it then changes course and heads due west for 80km. calculate its direct distance from the starting point. (3mks)

16. Under a transformation whose matrix $X = \begin{pmatrix} a-2 & -2 \\ a & a \end{pmatrix}$ a triangle whose area is 12.5cm^2 is mapped onto a triangle whose area is 50cm^2 . Find two possible values of a. (3mks)

SECTION II 50 MARKS

(Answer any Five questions in this section)

17. An aircraft leaves town P($30^{\circ}S, 17^{\circ}E$) and moves directly to Q ($60^{\circ}N, 17^{\circ}E$). It then moved at an average speed of 300 knots for 8 hours westwards to town R. Determine;

- a) The distance PQ in nautical miles (3mks)
- b) The position of town R (3mks)
- c) The local time at R if the local time at Q is 3.15p.m (2mks)
- d) The total distance moved from P to R in km. Take $1\text{nm} = 1.853\text{km}$ (2mks)

18. The table below shows monthly income tax rates for a certain year.

Income, k£ p.m	Rate of tax, shs per £
1 – 342	2
343 – 684	3
685 – 1026	4
1027 – 1368	5
1369 – 1710	6
Over 1710	7

A civil servant earns a salary of Ksh.42,000 and is provided with a house at a normal rent of Ksh.1500 per month.

a) Taxable income is the employee's salary plus 15% of the salary less nominal rent. Calculate the civil servants taxable income in k£ p.m (2mks)

b) If the employee is entitled to a personal relief of Ksh.900p.m, what is his PAYE (5mks)

c) The following deductions are also made from his monthly pay; NHIF Ksh.630; WCPS – Ksh. 540, union dues Ksh. 330; SACCO loan recovery – Ksh. 7,000, co-operatives shares – Ksh.2500. Calculate his net pay (3mks)

19. (a) Using a ruler and a pair of compasses only, construct triangle ABC in which $AB = 6$, $BC = 5.5\text{cm}$ and angle $ABC = 60^\circ$. Measure AC (3mks)

(b) On the same side of AB as C,

i. Determine the locus of a point P such that angle $APB = 60^\circ$ (3mks)

ii. Construct the locus of R such that $AR = 3\text{cm}$ (1mk)

iii. Identify the region T such that $AR \geq 3\text{cm}$ and $\angle APB \geq 60^\circ$ by shading the unwanted parts (3mks)

20. Mukumbeti flying company has two types of aeroplanes. The smaller one uses 180 litres of fuel per hour while the bigger one uses 300 litres per hour. The fuel available per week is 18000 litres. The company is allowed 80 flying hours per week. To keep the aeroplane in good condition, the bigger plane must be flown for x hours a week while the smaller aeroplane must be flown y hours per week.
- a) Write down all the inequalities in x and y , representing the above information. (3mks)
- b) On the grid provided, draw all the inequalities in (a) above by shading the unwanted regions (4mks)
- c) The profit on the smaller aeroplane is Ksh.4000 per hour while that on the bigger one is Ksh. 6000 per hour. Use the graph drawn in (b) above to estimate the maximum profit that the company made per week. (3mks)

21. A box contains red and green apples. There are 8 red and 28 green apples. One apple is picked from the box at random without replacement then a second apple also picked at random.
- a) Draw a tree diagram to represent the information up to when the second apple is picked. List down all the possible outcomes. (3mks)
- b) Find the probability that;
- i. The first apple picked is red (1mk)
 - ii. The second apple picked is green (2mks)
 - iii. Both apples are of same colour (2mks)
 - iv. The apples picked are of different colours (2mks)

22. In an agricultural centre, the length of a sample of 50 maize cobs were measured and recorded as shown on the table below;

Length (cm)	8 – 10	11 – 13	14 – 16	17 – 19	20 – 22	23 – 25
No. of cobs	4	7	11	15	8	5

Use the data above to estimate;

a) The median (3mks)

b) The mean (2mks)

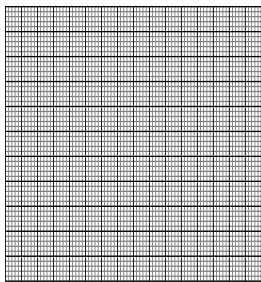
c) The variance (3mks)

d) The standard deviation (2mks)

23. (a) Complete the table given below by filling in the blank boxes

X°	0	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
$3\cos X^\circ$	3.0		2.60		1.50		0	-0.75					-3.0
$4\sin(2x - 10^\circ)$	0.69	1.37		3.94	3.76		0.69				-3.76		-0.69

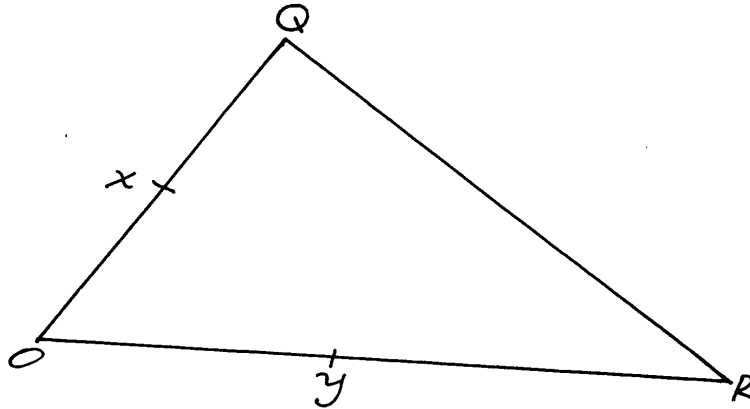
(b) Using a scale of 1cm rep. 15° on the x-axis and 2cm to represent 1 unit on the vertical axis, draw the graphs of $y = 3\cos X^\circ$ and $y = 4\sin(2x - 10^\circ)$ using the same axes on the grid provided (5mks)



(c) Use the graph to find the values of x for which $3\cos X^\circ - 4\sin(2x - 10^\circ) = 0$ (1mk)

(d) State the period and amplitude for the two graphs (2mks)

24. In the figure below, $OQ = q$ and $OR = r$. point x divides OQ in the ratio 3:4. Lines XR and YQ intersect at E .



a) Express in terms of

i. \mathbf{OR}

(1mk)

ii. \mathbf{OQ}

(1mk)

b) If $\mathbf{XE} = m\mathbf{XR}$ and $\mathbf{YE} = n\mathbf{YQ}$ express \mathbf{OE} in terms of;

i. \mathbf{r} , \mathbf{q} and \mathbf{m}

1mk)

ii. \mathbf{r} , \mathbf{q} and \mathbf{n}

(1mk)

c) Using the results in (b) above, find the values of m and n

(6mks)

KASSU JET EXAMINATION

Kenya Certificate of Secondary Education

121/1

MATHEMATICS

PAPER I

JUNE 2016

2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

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SECTION I

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SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

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SECTION A 50 MARKS

1. Evaluate $\frac{\frac{3}{4} + 1\frac{5}{7} \div \frac{4}{7} \text{ of } 2\frac{1}{3}}{\left(1\frac{3}{7} - \frac{5}{8}\right) \times \frac{2}{3}}$ (3marks)

2. Solve for x in $\sin(x-15) - \cos(x+5) = 0$ (2marks)

3. The LCM of two numbers is 328,600 and the GCD is 20. If one of the numbers is 1240, use prime factorization method, find the other number. (3 marks)

4. A spherical solid lead of diameter 12cm weighs 6.4kg. How much would a similar solid of a diameter 10cm weigh? (3marks)

5. Without using a calculator or mathematical tables evaluate,

$$\frac{\left(\frac{1}{81}\right)^{\frac{1}{4}} \times (256)^{\frac{1}{2}} \times 3^5}{(729)^{\frac{1}{3}} \times 72^2} \quad (3\text{marks})$$

6. On arrival to Kenya a Canadian tourist exchanged his Canadian dollars for Ksh 199 690. Given that the currency exchange rate was 1 Canadian dollar = Ksh 52.55 and that the bank charged him 5% commission, find the number of dollars he exchanged. (3 marks)

7. By using completing square method, solve for x in $4x^2 - 3x - 6 = 0$ (3marks)

8. Simplify the following. (3 Marks)

$$\frac{2x-4}{12-3x^2} - \frac{1}{3x+6}$$

9. The matrix $\begin{bmatrix} x & 1 \\ x+5 & x+5 \end{bmatrix}$ maps a triangle ABC onto a straight line. Determine the possible values of x . (3 marks)

10. Using the tables of squares, square roots and reciprocal $3.0452 \times \frac{6}{\sqrt{49.24}}$ (4marks)

11. Find the percentage error in the quotient in $9.16\text{cm} \div 2.0\text{cm}$ (4marks)

12. The position vectors $\mathbf{a} = \begin{pmatrix} -1 \\ 5 \\ 2 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} 2 \\ 1 \\ -3 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} -8 \\ 7 \\ 13 \end{pmatrix}$. Find the scalars S and T such that $S\mathbf{a} + T\mathbf{b} = \mathbf{c}$ (3 marks)

13. The following data represents the enrolment of students in 12 colleges

564	553	566	554	563	563
657	556	553	554	651	559

- Calculate the quartile deviation (3 marks)

14. The density of a sphere of diameter p cm is 2.68 g/cm^3 and that of another sphere is diameter Q cm is 14.23 g/cm^3 . Determine the volume of sphere Q that would have the same mass as 80 cm^3 . (3marks)

15. Solve and represent the integral values of the linear inequalities given below on a number line.

$$\frac{4}{3} - \frac{x-2}{x} \geq 1 \quad , \quad -2 - \frac{2}{3}x < x + 8 \quad (3\text{marks})$$

16. Find the equation of the normal to the curve $y = x^3 - 2x^2 + 3x - 1$ at the point (2,5) (3marks)

SECTION B (50 MARKS)

17. A straight line L_1 has its x-intercept and y-intercept as -6 and 4 respectively.

a) Write its equation in the form $ax + by + c = 0$ where a, b, and c are integers (3marks)

b) Another line L_2 which is parallel to L_1 in (a) above passes through $(2, 3k)$ and $(-k, 8)$. Find the value of k. (2marks)

c) Find the equation of the perpendicular bisector to the line L_1 (3marks)

d) Calculate the angle which L_1 makes with the x-axis (2marks)

18. A man spent $\frac{1}{9}$ of his salary on food and $\frac{1}{4}$ of the remainder on electricity and water bills. He paid fees with 20% of his salary and invested 16% of what was left into a business. After taking a game drive on which he spent Ksh 2000, he saved Ksh 5350. Calculate:

(a) His total monthly earnings. (4 marks)

(b) How much he spent on fees. (2 marks)

(c) How much he invested. (2 marks)

(d) The percentage of the salary saved. (2 marks)

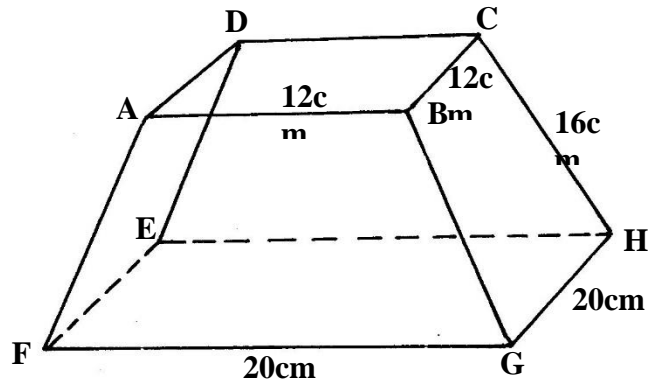
19. Every Sunday Alex drives a distance of 80km on a bearing of 074° to pick up his brother John to go to church. The church is 75km from John's house on a bearing of $S50^{\circ}E$. After church they drive a distance of 100km on a bearing of 260° to check on their father before Alex drives to John's home to drop him off then proceeds to his house.

- (a) Using a scale of 1cm to represent 10km, show the relative positions of these places. (4 marks)

(b) Use your diagram to determine:

- (i) the true bearing of Alex's home from their father's house. (1 mark)
- (ii) the compass bearing of the father's home from John's home. (1 mark)
- (iii) the distance between John's home and the father's home. (2 marks)
- (iv) the total distance Alex travels every Sunday. (2 marks)

20. The figure below shows solid frustum of a pyramid with a square top of side 12cm and a square base of side 20cm. The slant edge of the frustum is 16cm.



a) Calculate the total surface area of the frustum. (4marks)

b) Calculate the volume of the solid frustum. (4marks)

c) Calculate the angle between the planes **BCHG** and the base **EFGH**. (2marks)

21. (a) A radio station tower was built in two sections. From a point 870m from the base of the tower, the angle of elevation of the top of the first section is 25° and the angle of elevation of the top of the second section is 40° . What is the height of the top section of the tower? (5marks)

(b) Two vertical poles on horizontal ground are 60m apart. The shorter pole is 3m high. The angle of depression of the top of the shorter pole from the top of the longer pole is 20° . Using scale drawing, find the length of the longer pole. (5 marks)

22. Coast bus left Nairobi at 8.00a.m. and traveled towards Mombasa at an average speed of 80km/hr. at 8.30am, Lamu bus left Mombasa towards Nairobi at an average speed of 120km/h. Given that the distance between Nairobi and Mombasa is 400km; determine:

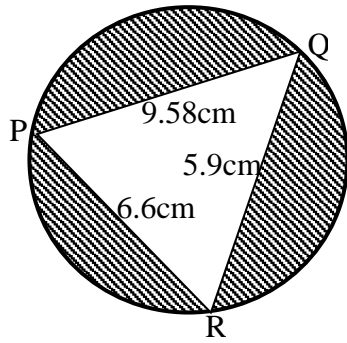
(i) The time Lamu Bus arrived in Nairobi. (2marks)

(ii) The time the two buses met. (4marks)

(iii) The distance from Nairobi to the point where the buses met. (2marks)

(iv) How far Coast Bus is from Mombasa when Lamu bus arrives in Nairobi. (2marks)

23. Triangle PQR is inscribed in the circle. $PQ = 7.8\text{cm}$, $PR = 6.6\text{cm}$ and $QR = 5.9\text{cm}$.



Find;

(a) size of angle QPR

(3 Marks)

(b) the radius of the circle.

(3 Marks)

(c) the area of the shaded region.

(4 Marks)

24. (a) Find the stationary points of the curve to (1 d.p) (6 marks)

$$y = \frac{(x+2)(x-1)}{(x-4)^{-1}}$$

(b) Find the x and y intercepts of the curve above. (2 marks)

(c) Sketch the curve. (2 marks)

121/2
MATHEMATICS
PAPER 2
2 ½ HOURS
JUNE 2016

KASSU JOINT EVALUATION TEST (J.E.T)
Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES

1. Write your name, Admission Number, Class and Index Number.
2. The paper contains two sections: Section I and II
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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

GRAND TOTAL

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SECTION II

17	18	19	20	21	22	23	24	TOTAL

SECTION A 50 MARKS

1. Use logarithm tables to evaluate; $\sqrt[3]{\frac{648 \times 0.0079}{(968 - 94) \div 0.0046}}$ (3mks)

2. The middle digit of a number between 100 and 1000 is zero, and the sum of the other digits is 11. If the digits are reversed the number so formed exceeds the original by 495. Find the number. (3 mks)

3. Without using mathematical tables or a calculator evaluate

$$\sqrt{\frac{0.3 - 0.098 \div (0.84 - 0.14)}{(0.28 + 0.12) \div 0.8 \times 0.5}}$$

Leaving the answer as a decimal (3 marks)

4. Expand $(0.07)^5$ using binomial theorem giving your answer to four significant figures (3marks)

5. Solve for θ in the equation $\sin(3\theta + 120^\circ) = \frac{\sqrt{3}}{2}$ in the range $0 \leq \theta \leq 180^\circ$. (3 mks)

6. Rationalize the denominator leaving your answer in the form $a + b\sqrt{c}$ where a , b and c are constants

$$\frac{5 - 2\sqrt{3}}{2 + 3\sqrt{3}}$$

(3marks)

7. A farmer bought a machine at a current price of Ksh 224,000. If the depreciation rate is 5% in every 3 months. Calculate the sum of its value in 3 years ago and 3 years' time. (3mks)

8. Without using logarithm table or calculators, find the value of p in the equation.

$$\log n^3 + \log 4n = 10 \log 2 - \log \left(\frac{2}{8}\right)$$

(3mks)

9. Using mid-ordinates rules, estimate the area under the curve $y = \frac{1}{2}x^2 - 2$, using six strips between $x=2$ and $x=8$ and x -axis (3mks)

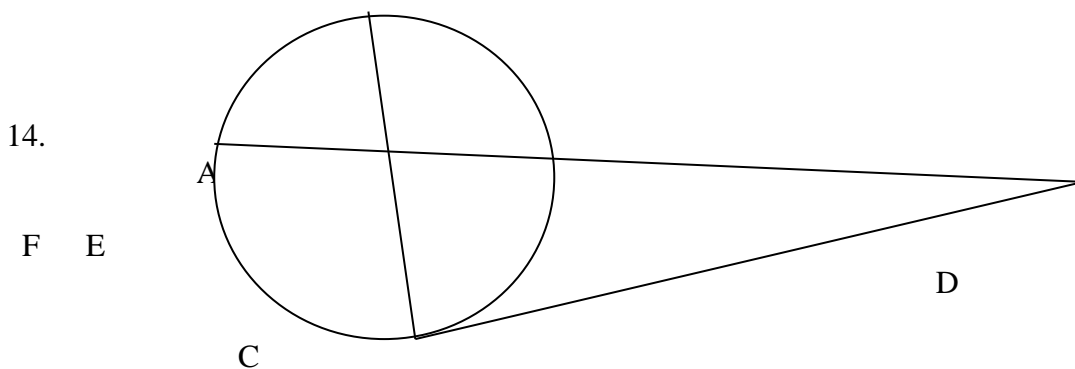
10. (a) Using a pair of compass and a ruler only Construct a triangle PQR in which $PQ=QR=4\text{cm}$ and angle $QPR = 30^\circ$. (2mks)

(b) A point T is always on the same side of PQ as R and angle $PRQ = \text{angle } PTQ$. Construct the locus of T and describe it. (2mks)

11. R is partly constant and partly varies as the square of q. when $R = 5$, $q = 3$ and $R = 21$, when $q = 5$.
Find the value of R when $q = 5$. (3mks)

12. The first, the third and the seventh term of an increasing arithmetic progression are three consecutive terms of a geometric progression. If the first term of the arithmetic progression is 10, find the common difference of the arithmetic progression (3mks)

13. The equation of a circle is $x^2 - 8x + y^2 + 12y + 16 = 0$
Determine the coordinates of the Centre of the circle and its radius. (3 Marks)



In the diagram above CD is a tangent to the circle at C. AC and FD intersect at B. FED is a straight line. Given that $CD = 10$ cm, $AB = 2$ cm $AC = 8$ cm, $FB = 3$ cm. Find the length ED. (4mks)

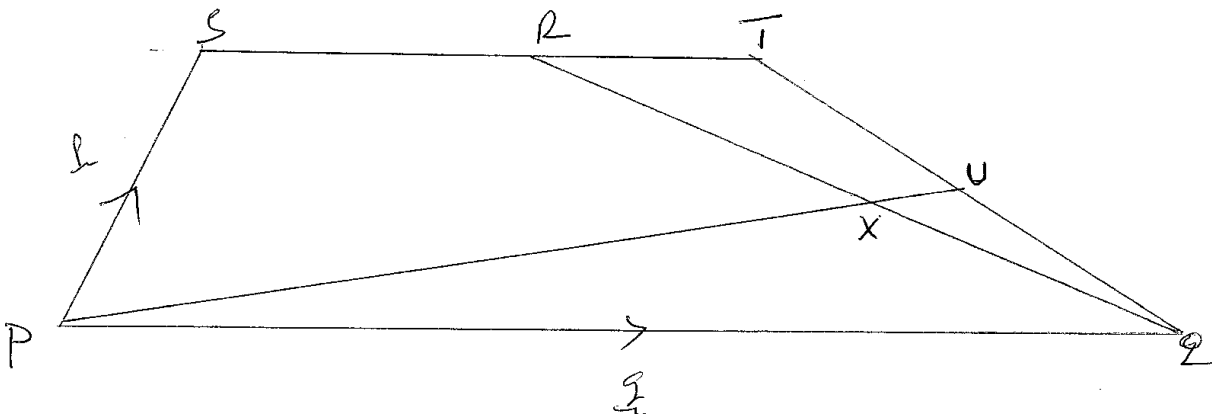
15. The cost of 2 brands of coffee A and B per kilogram are 59.40 and Sh.72 respectively. The two brands are mixed in the ratio $x:y$ and sold at a profit of 20% above the cost. If the selling price per kilogram mixture is Ksh.72. find the value of x and y (3mks)

16. Evaluate $\int_{-1}^3 \frac{2x^3 - 3x^2 - 8x + 12}{x^2 - 4} dx$

(3mks)

SECTION B 50 MARKS

17. In the trapezium shown below $\overrightarrow{PQ} = 3\overrightarrow{ST}$. T divides SR in the ratio 4 : 1 and U is the midpoint of QT. PU and QR intersect at X. $PX = hPU$ and $QX = kQR$.



Given that $PQ = \mathbf{q}$ and $PS = \mathbf{p}$

- (a) Express QR in terms of \mathbf{P} and \mathbf{q} (1mk)
- (b) Express PX in terms of \mathbf{P} , \mathbf{q} and h . (2mks)
- (c) Express PX in terms of \mathbf{P} , \mathbf{q} and k . (3mks)
- (d) Hence; obtains the values of h and k . (3mks)
- (e) Determine the ratio in which X divides QR. (1mk)

18. The table below shows the distribution of marks of 40 candidates in a test

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Frequency	2	2	3	x	12	5	2	3	1	1

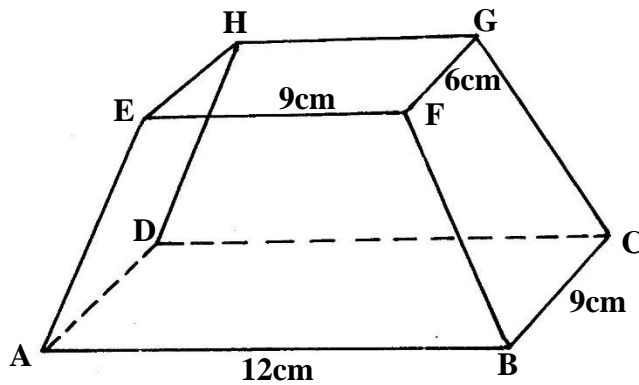
(a)(i) Find the value of x (1mk)

(ii) State the modal class (1mk)

(iii) Calculate the median (4mks)

(iv) Calculate the mean. (4marks)

19. The figure below is a frustum of a rectangular pyramid with $AB=12\text{CM}$, $EF=8\text{CM}$, $BC=9\text{CM}$ and height of 6 CM



Calculate:

- | | | |
|---|---------|--------|
| a) the full height of the pyramid | 2 marks | |
| b) angle that the plane ABFE makes with the base ABCD | | 2marks |
| c) angle that AG makes with the base ABCD | | 3marks |
| d) angle that AC makes with line AE | | 1mark |
| e) angle that plane BCGF makes with the base ABCD | | 2marks |

20. (a) A point a (35° N, 40° W) and b (40° S, 40° W), Calculate the distance between A and B in Kilometers. Take earth radius o be 6370 km. answer to 1 d.p. (3mks)

(b) A and B are points on latitude 70° C. Their longitudes are 62° W and 118° E respectively. Find the distance from A to B along a parallel of latitude. (4mks)

(c) Peter was in Mombasa 39° E and Mary was in Banju 17° W. Calculate the time difference between the two. (3mks)

21. ABCD is a quadrilateral with vertices as follows: **A** (3, 1), **B** (2, 4) **C** (4, 3) and **D** (5, 1)

(a) (i) On the grid provided draw the quadrilateral **ABCD** and the image **A'B'C'D'** under a transformation

With matrix $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$. Find the co-ordinates of **A'B'C'D'** (3mks)

Describe the transformation that maps **ABCD** onto **A'B'C'D'** fully (1mk)

(b) A transformation represented by the matrix $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ maps **A'B'C'D'** onto **A''B''C''D''** find the co-ordinates of **A''B''C''D''**. Plot **A''B''C''D''** on the same grid. (3mks)

(c) Determine a single transformation that maps **A''B''C''D''** onto **ABCD**. Describe this transformation fully. (3mks)

22. The table below shows the income tax rates in Kenya.

Income in K£ per month	Rate in Ksh / K£
1 - 325	2
326 - 975	3
976 - 1300	5
1301 - 1625	6
Over 1625	7.5

(a) Mr. Sigei is a public servant who lives in a government house and pays a nominal rent of Ksh. 1220 per month. He earns a basic salary of Ksh. 24,800 and taxable allowances of Ksh. 13,380 per month. He is entitled to a monthly tax relief of Ksh. 1120. Calculate his monthly

i) Taxable income in K£. (2mks)

ii) Gross tax. (3mks)

iii) Tax due (2mks)

(b) Apart from income tax, the following monthly deductions are made from his salary.

i) HELB loan repayment Ksh. 2400

ii) NHIF Ksh 320

iii) 2% basic salary as union dues.

Calculate Mr. Sigei's monthly net salary. (3mks)

23. An airline has to fly 1000 passengers and 35000 kg of luggage from Nairobi to Kampala. Two types of aircrafts are available. Type A takes 100 passengers and 2000 kg of luggage. Type B takes 60 passengers and 3000 kg of luggage. The airline must not use more than 16 aircrafts altogether.
- (a) if the airline hires x type A aircrafts and y type B aircrafts, write down 3 inequalities to represent the information above. (3mks)
- (b) Draw the inequalities on a grid. (3mks)
- (c) Find the minimum number of aircrafts the airline could use. (1mk)
- (d) If the cost of hiring charges for each aircraft is sh 100,000 and sh 120,000 for type A and b respectively, find:
- (i) The number of planes of each type that should minimize the cost (2mks)
- (ii) Minimum cost (1mk)

24. In a mathematics test, the probability of 3 students, Kamau, Otieno and Mwala passing are $\frac{2}{3}$, $\frac{3}{4}$ and $\frac{5}{6}$ respectively

(a) Draw a tree diagram to represent this information (3 marks)

(b) Use the tree diagram to find the probability that:

(i) All the three students will fail (2 marks)

(ii) At least two students will pass. (3 marks)

(iii) Only one student will pass (2 marks)

**KIRINYAGA CENTRAL SUB-COUNTY EFFECTIVE FORTY
JOINT EXAMINATION – 2016**

**Kenya Certificate of Secondary Education
MATHEMATICS
PAPER 1
TIME: 2½ HOURS**

INSTRUCTION TO CANDIDATE’S:

1. Write your **name**, **index number** and **school** in the spaces provided at the top of this page.
2. **Sign** and write the **date** of examination in spaces provided above.
3. This paper consists of **two** Sections; Section **I** and Section **II**.
4. Answer all the questions in Section **I** and any **FIVE** questions from Section **II**.
5. All answers and working must be written on the question paper in the spaces provided **below** each question.
6. Show all the steps in your calculation, giving your answer at each stage in the spaces provided **below** each question.
7. Marks may be given for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and **KNEC** Mathematical tables **may be** used, except where stated otherwise.
9. Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

FOR EXAMINER’S USE ONLY:

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

SECTION I: (50 MARKS)

Answer all the questions in the section.

1. Evaluate: $\frac{28 - (-18)}{-2} - \frac{15 - (-2)(-6)}{-3}$. (3mks)

2. John spent $\frac{2}{3}$ of his salary on food $\frac{1}{3}$ of the remainder on rent and saved the rest. What fraction of his salary did he save? If he spent Sh.1200 on food, how much did he spend on rent. (3mks)

3. Given that $\sin \theta = \frac{1}{\sqrt{5}}$ where θ is an acute angle, find without using Mathematical tables or 'a calculator'.

(a) Cos θ in the form $a\sqrt{b}$. (2mks)

(b) Tan $(90 - \theta)$. (1mk)

4. Use tables 1 and table 2 below to find the average speed that the Nairobi-Mombasa passenger train uses to travel between Konza and Masongaleni. (3mks)

Table 1: Shows the rail distance in km between selected stations from Mombasa to Nairobi.

Table 2: Shows the departure and arrival time between selected stations from Mombasa to Nairobi.

Table 1 – is a travel table for a passenger train from Nairobi to Mombasa

<i>w.e.f. 15/10/2001</i>	<i>Passenger train</i>	
<i>Station</i>	<i>ARR</i>	<i>DEP</i>

<i>Nairobi Yard</i>		<i>1900</i>
<i>Athi River</i>	<i>1952</i>	<i>1954</i>
<i>Konza</i>	<i>2055</i>	<i>2057</i>
<i>Sultan Hamad</i>	<i>2234</i>	<i>2236</i>
<i>Makindu</i>	<i>2354</i>	<i>2356</i>
<i>Kibwezi</i>	<i>0025</i>	<i>0027</i>
<i>Masongaleni</i>	<i>0057</i>	<i>0059</i>
<i>Mtito Andei</i>	<i>0158</i>	<i>0213</i>
<i>Voi</i>	<i>0423</i>	<i>0438</i>
<i>Mariakani</i>	<i>0718</i>	<i>0720</i>
<i>Mazeras</i>	<i>0740</i>	<i>0742</i>
<i>Mombasa</i>	<i>0825</i>	

ARR – Arrival time at station

DEP – Departure time from station

Table 1

Nairobi																						
29.6																						
73.7	Athi River																					
130	44.1																					
193.4	100.4	Konza																				
215.3	163.8	56.3	Sultan Hamud																			
233.1	185.7	119.7	63.4	Makindu																		
266.6	203.5	141.6	85.3	21.9	Kibwezi																	
365.9	237	159.4	103.1	39.7	17.8	Masongaleni																
492	237	192.9	136.6	73.2	51.3	33.5	Mtito Andei															
506.4	336.3	292.2	235.9	172.5	150.6	132.8	99.3	Voi														
530.3	462.4	418.3	362	298.6	276.7	258.9	225.4	126.7	Mariakani													
	476.8	432.7	376.4	313	291.1	273.3	239.8	140.5	14.4	Mazeras												
	500.7	456.6	400.3	336.9	315	297.2	263.7	164.4	38.3	23.9	Mombasa											

Table 2

5. Solve the following simultaneous equations.

(3mks)

$$x^2 + y^2 = 26$$

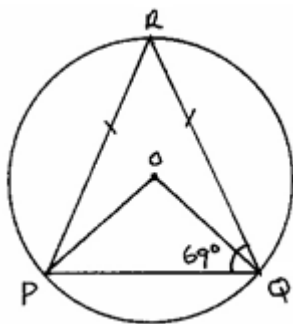
$$x + y = 4$$

6. A Kenyan company received US Dollars 100,000. The money were converted into Kenya shillings in a bank which buys and sells foreign currencies as follows.

	Buying (Ksh)	Selling (Ksh)
1 US Dollar	77.24	77.44
1 Sterling Pound	121.93	122.27

- (a) Calculate the amount of money, in Kenya shillings, the company received. (2mks)
- (b) The company exchanged the Kenya shillings calculated in (a) above, into sterling pounds to buy a car from Britain. Calculate the cost of the car to the nearest sterling pond. (2mks)

7.



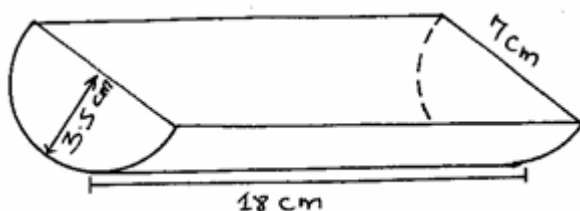
- In the figure above O is the centre of the circle. Given that $PR = QR$ and $\angle PQR = 69^\circ$. Find $\angle RQO$.

8. Find the smallest number which leaves a remainder of 4 when divided by either 8 or 12 or 14. (2mks)
9. Find the integral value of χ which satisfy the inequality.
 $3 + 2\chi < 3\chi - 1 \leq 2\chi + 7$ (3mks)
10. A line L is perpendicular to $2\chi + y = 3$ and passes through point (4, -1). Determine
(i) the equation of line L. (2 marks)
- (ii) the acute angle that line L makes with the χ -axis. (1 mark)
11. The angle of elevation of the top of a storey building from point P is 23.61° . From another point Q six metres nearer to the base of the building, the angle of depression from the top of the building is 35° . Calculate to 1 decimal place the height of the building. (4mks)

12. State the amplitude and the period of the function $y = \frac{3}{2} \cos(2x + 30^\circ)$. (2mks)

13. In a fund raising committee of 45 people, the ratio of men to women is 7: 2. Find the number of women required to join the existing committee so that the ratio of men to women is changed to 5: 4. (3mks)

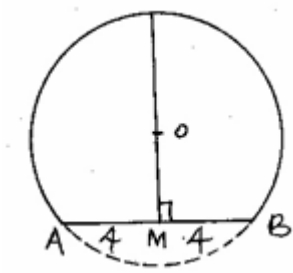
14. The figure below is a semi-cylindrical solid of length 18cm and radius 3.5cm are shown.



Draw a labelled net of the solid. (3mks)

15. Find the radius of the circle whose major segment is given below if $CM = AB = 8\text{cm}$.

(3mks)



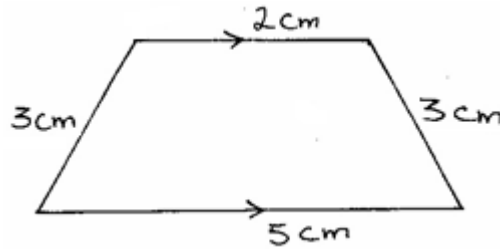
16. Given that $P = 3^y$ express the equation $3^{2y-1} + 2 \times 3^{y-1}$ in terms of P.
Hence or otherwise find the value of y in the equation $3^{2y-1} + 2 \times 3^{y-1} = 1$. (3mks)

SECTION II: (50 MARKS)

Answer only ANY FIVE questions in this section.

17. Mutwapa Primary School is 30km on a bearing of 015° from a tourist hotel. The nearest town is 45km from the school on a bearing of 120° .
- (a) Using a scale of 1cm to represent 15km, make a scale drawing of the positions
of the school the tourist hotel and the town. (4mks)
- (b) How far is the tourist hotel from the town? (2mks)
- (c) What is the bearing of
(i) the town from the tourist hotel? (2mks)
- (ii) the school from the town? (2mks)

18. The diagram below (not drawn to scale) represents the cross-section of a solid prism to 8.0cm.

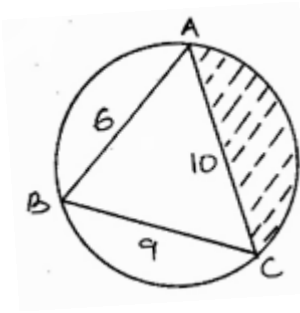


- (a) Calculate the volume of the prism. (3mks)
- (b) Given that the density of the prism is 5.75g/cm^3 , calculate its mass in grams. (2mks)
- (c) A second prism is similar to the first one but is made of a different material. The volume of the second prism is 246.24cm^3 .
- (i) Calculate the area of the cross-section of the second prism. (3mks)
- (ii) Given that the ratio of the mass of the first prism to that of the second is 2: 5, find the density of the second prism. (2mks)

19. The distance between two towns A and B is 760km. A minibus left town A at 8:15am and traveled towards B at an average speed of 90km/h. A matatu left B at 10:35am and on the same day and travelled towards A at an average speed of 110km/h.
- (a) (i) How far from A did they meet? (4mks)
- (ii) At what time did they meet? (2mks)
- (b) A motorist starts from his home at 10:30am on the same day and travelled at an average speed of 100km/h. He arrived at B at the same time as the minibus. Calculate the distance from B to his home. (4mks)

20. A jet flies from town Q (60°S , 24°E) to town R (60°S , 10°W) and then due north for 1200 nautical miles to town S.
- (a) Obtain the latitude of S. (3mks)
- (b) Calculate the distance between Q and R in
- (i) Nautical miles. (3mks)
- (ii) km (2mks)
- (c) Find the total flight time if the jet flies at an average speed of 800 knots. (2mks)

21. The figure below shows a triangle inscribed in a circle. $AB = 6\text{cm}$, $BC = 9\text{cm}$ and $AC = 10\text{cm}$.



Calculate

- (a) the interior angles of $\triangle ABC$. (5mks)

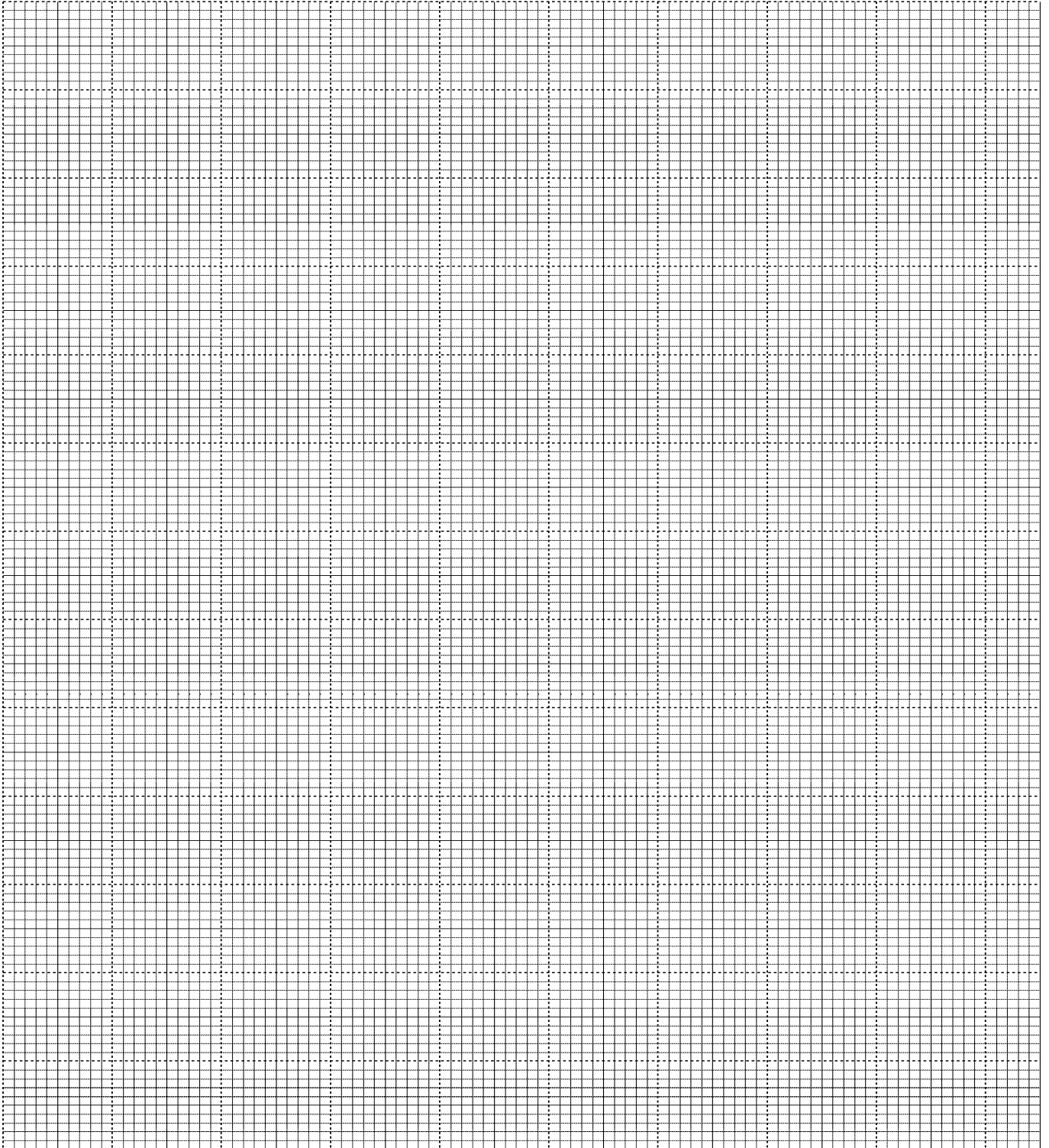
- (b) the radius of the circle. (2mks)

- (c) the area of the shaded part. (3mks)

22. A triangle has vertices A (1, 2), B (4, 4) and C (6, 2).

(a) Draw triangle ABC on the grid provided.

(1mk)



(b) Construct the image triangle $A^1B^1C^1$ image of triangle ABC under a rotation of 90° clockwise about the origin.

(2mks)

- (c) Draw triangle $A^{11}B^{11}C^{11}$ the image of triangle $A^1B^1C^1$ under a reflection in line $y = \chi$, state the coordinates of $A^{11}B^{11}C^{11}$ (3mks)
- (d) Draw triangle $A^{111}B^{111}C^{111}$ the image of triangle $A^{11}B^{11}C^{11}$ under a reflection in the line $y = 0$ and state the coordinates of its vertices. (2mks)
- (e) Describe a single transformation that maps triangle $A^{11}B^{11}C^{11}$ onto triangle ABC . (2mks)

23. In triangle OAB, $\underline{OA} = \underline{a}$ and $\underline{OB} = \underline{b}$. Points P and T divide OB and AB in the ratio

2:3 and 1:3 respectively. Lines OT and AP intersect at Q.

(a) Draw the diagram to represent the above information. (1mk)

(b) Express \underline{OP} and \underline{AP} in term of \underline{a} and \underline{b} . (2mks)

(c) Express \underline{OT} in terms of \underline{a} and \underline{b} . (1mk)

(d) Given further that $\underline{OQ} = t\underline{OT}$ and $\underline{AQ} = s\underline{AP}$, express \underline{OQ} in two ways and hence find the values of s and t. (6mks)

24. The velocity of a particle, V m/s, moving in a straight line after t seconds is given by

$$V = 3t^2 - 3t - 6$$

Find:-

(i) The acceleration of the particle after 2 seconds. (2mks)

(ii) The distance covered by the particle between $t = 1$ and $t = 4$ seconds. (3mks)

(iii) The time when the particle is momentarily at rest. (2mks)

(iv) The minimum velocity attained by the particle. (3mks)

121/1
 MATHEMATICS
 PAPER 1
 JULY/AUGUST 2016
 TIME: 2 ½ HOURS

KIRINYAGA EAST SUB – COUNTY CENTRAL ZONE STRATEGIC ALLIANCE EXAMINATION - 2016
Kenya Certificate of Secondary Education(K.C.S.E)

MATHEMATICS
PAPER 1
TIME: 2 ½ HOURS

INSTRUCTIONS TO CANDIDATES:

- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the space provided above.
- The paper contain two sections: Section I and section II
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FOR EXAMINERS USE ONLY

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

Grand Total

This paper consists of 15 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.

SECTION I

1. Make h the subject of the formula. (2mks)

$$q = \frac{1+rh}{1-hr}$$

2. Find x if $3^{2x+3} + 1 = 28$ (2mks)

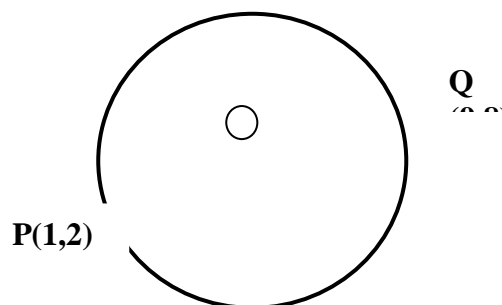
3. Simplify $\frac{5}{\sqrt{7}-3} + \frac{4}{\sqrt{7}+3}$ leaving your answer in the form $a = \frac{b}{\sqrt{c}}$ where a,b and c are rational numbers. (3mks)

4. Given that $\sin(x + 60)^\circ = \cos(2x)^\circ$, find $\tan(x + 60)^\circ$ (3mks)

5. The gradient function of a given curve is $12x^2 - 6x + 2$.
If this curve passes through (1,4) find its equation (3mks)

6. Find the value of x that satisfies the equation (3mks)
 $\log_2(2x - 11) - 3 = \log_2 3 + \log_2 x$

7. P and Q are the points on the ends of the diameter of the circle below.



Write down in terms of x and y the equation of the circle in the form:
 $ax^2 + by^2 + x + y + c = 0$ (3mks)

8. The angle of elevation of the top of a tree from a point A on the horizontal ground is 33.5° . From another point B three metres nearer to the base of the tree, the angle of elevation of the top of the tree is 48.6°

Calculate the height of the tree.

(3mks)

9. The difference between the eighth term and the fourth term of an arithmetic progression is 24. The first term exceeds the common difference by 2. Find the sum of the first ten terms of the series.

(3mks)

10. A motorist took 2 hours to travel from Nairobi to Kutus and 1 hour 40 minutes to travel back. Calculate the percentage change in the speed of the motorist.

(3mks)

11. Given that a rectangle has a length and width of 4.2cm and 2.2cm respectively, find the percentage error in its area.

(3mks)

12. Two planes start from an airport at the same time. One plane flies due West at 400km/hr while the other flies at 500km per hour. On bearing of 040° what is the shortest distance between the two planes after 15 minutes. (4mks)

13. The matrix $\begin{bmatrix} K & -3 \\ 2 & 1 \end{bmatrix}$ has its determinant as 2. Find the value of K , hence determine the inverse of the matrix. (3mks)

14. Two companies sell similar cylindrical tanks. Kentainer sells a tank whose radius is 10 metres in diameter and holds 12000 litres liquid. What is the radius of a similar tank from Roto if it holds 1500 litres of water. (3mks)

15. Find the value of x if $\det \begin{bmatrix} 1 & 3 \\ -2 & x \end{bmatrix} = \det \begin{bmatrix} x^2 & 4 \\ 1 & 3 \end{bmatrix}$ Hence write two possible matrices that satisfy these values. (4mks)

16. Given that $Y = \frac{1}{0.1748} + (1.523)^3$. Find the value of $\frac{2}{y}$. Using reciprocal tables and cubes. (4mks)

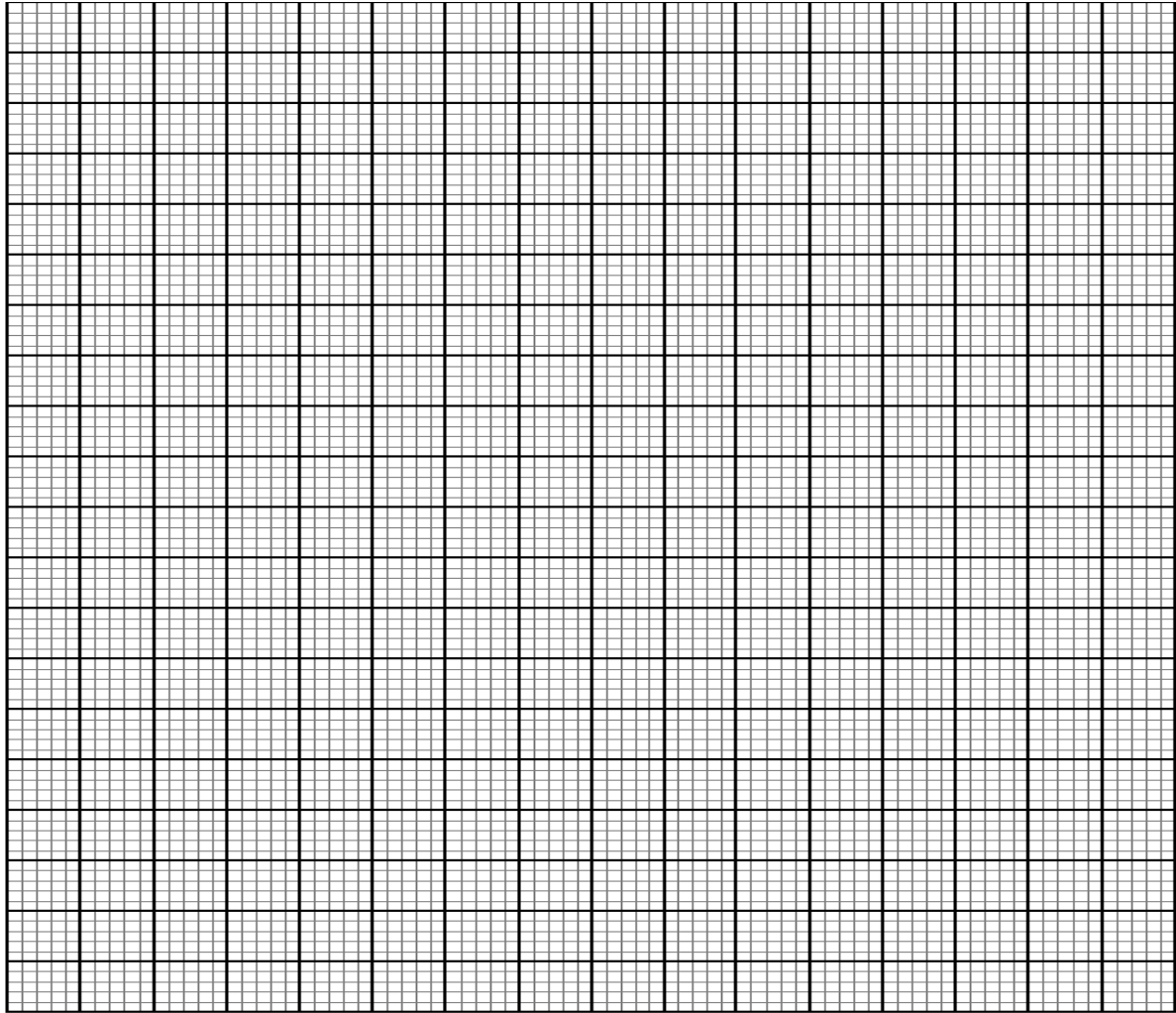
SECTION II (Answer any five questions in this section)

17. The displacement, s metres of a moving particle after t seconds is given by:

$$S = 2t^3 - 5t^2 + 4t + 2$$

Determine :

- a) The velocity of the particle when $t = 3$ seconds (3mks)
- b) The value of t when the particle is momentarily at rest (3mks)
- c) The acceleration of the particle when $t = 3$ seconds (2mks)
- d) The acceleration of the particle when $t = 3$ seconds (2mks)
18. i) Draw the graph of the function $y = 2x^2 + 5x - 3$ on the grid provided below (3mks)



ii)
State
the

equation of the line of symmetry

(1mk)

iii) Using the graph solve the equations:

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

(1mk)

b) $2x^2 + 5x + 2 = 0$

(2mks)

iv) State the range of values for x in which

(1mk)

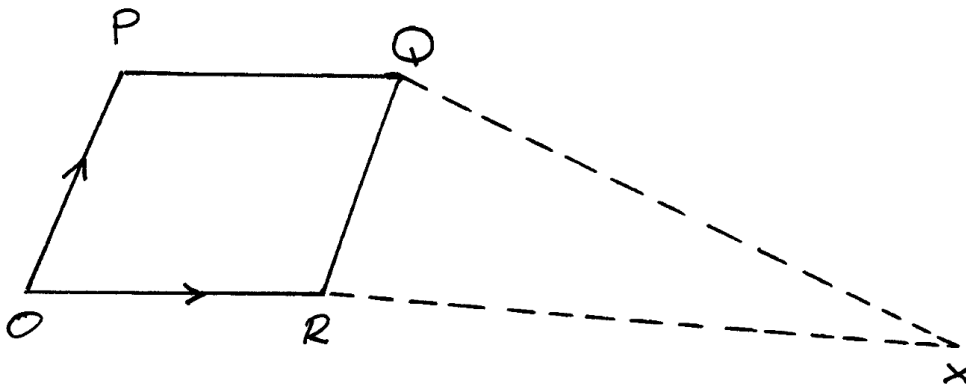
$$2x^2 + 5x < 3$$

19. a) Given that $\vec{OR} = 5a$ $\vec{OP} = 5b$ and $PQ = 2a - b$. Express as simply as possible in terms of a and b

i. \vec{OQ} (2mks)

ii. \vec{RQ} (2mks)

b) Given that line PQ produced meet at X and that $Px = \frac{\vec{OR}}{k} = \frac{\vec{Ox}}{m} = \frac{\vec{OR}}{m}$. Form an equation connecting k , m , a and b . Hence deduce the values of k and m . (6mks)



20. Two dice are thrown and the results on the top faces recorded.

a) Draw a table to show all the expected out comes (2mks)

b) Use the table to find the probability of:

i. Getting the same score on both dice (2mks)

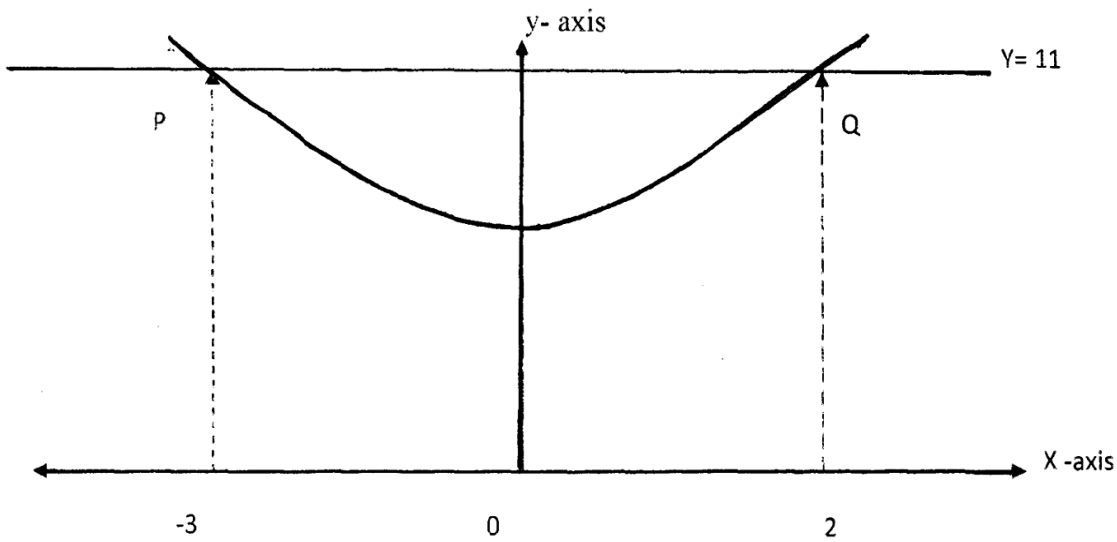
ii. Scoring a total 9 or more on both dice (2mks)

c) The probability that it will rain is $\frac{2}{5}$. The probability that Jane carries an umbrella and it rains is $\frac{2}{7}$. The probability that Jane carries an umbrella and it does not rain is $\frac{3}{7}$ find the probability that;

i. Jane does not carry an umbrella and it rains (2mks)

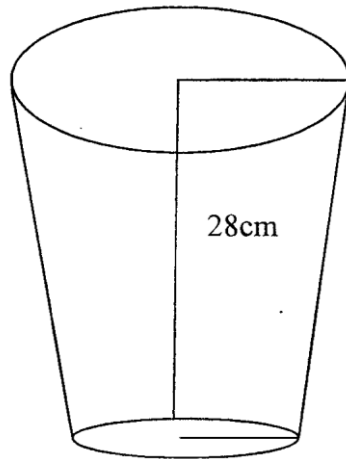
ii. Jane carries an umbrella (2mks)

21. The figure below is a sketch of the curve whose equation is $y = x^2 + x + 5$. It cuts the line $y = 11$ at points P and Q



- a) Find the area bounded by the curve $y = x^2 + x + 5$ and the line $y = 11$. Using the trapezium rule with 5 strips. (5mks)
- b) Calculate the difference in the area if the mid-ordinate rule with 5 ordinates was used instead of the trapezium rule. (5mks)

22. The diagram below shows a bucket with top diameter 30m and bottom diameter 20cm. the height of the bucket is 28cm.



Find ;

a) The capacity of the

bucket in litres

(5mks)

b) The area of the metal sheet required to make 100 such buckets, taking 10% extra overlapping and wastage (5mks)

23. Matrix P is given by $\begin{bmatrix} 4 & 7 \\ 5 & 8 \end{bmatrix}$

a) Find P^{-1}

(2mks)

b) Two school, Utaati Secondary and Ngosini secondary school purchased beans at Ksh. B per bag and maize at Ksh. M per bag. Utaati purchased 8 bags of beans and 14 bags of maize for Ksh. 99,600. Ngosini purchases 10 bags of beans and 16 bags of maize at Ksh. 12,000.

i. From a matrix equation to represent the above information.

(2mks)

- ii. Using P^{-1} in (a) above, determine the cost of a bag of beans and a bag of maize (3mks)
- c) The price of beans later went up by 5% and that of maize remained constant. Utaati bought the same quantity of beans but spent the same total amount of money as before on the two items. State the new ratio of beans to maize. (3mks)

24. The table below shows income tax rates

Monthly taxable pay K£	Rate of tax Ksh in K£
1 – 435	2
436 – 870	3
871 – 1305	4
1306 – 1740	5
Excess over 1740	6

4 company employees earns a monthly basic salary of Ksh.30,000 and is also given taxable allowances amounting to Ksh. 10,480

a) Calculate the total income tax (5mks)

b) The employee is entitled to a personal tax relief of Ksh. 800 per month. Determine the net tax (2mks)

c) If the employee received a 50% increase in his total income, calculate the corresponding percentage increase on the income tax. (3mks)

121/2
MATHEMATICS
PAPER 2
JULY/AUGUST 2016
TIME: 2 ½ HOURS

**KIRINYAGA EAST SUB – COUNTY CENTRAL ZONE STRATEGIC
 ALLIANCE EXAMINATION - 2016**
Kenya Certificate of Secondary Education(K.C.S.E)

MATHEMATICS
PAPER 2
TIME: 2 ½ HOURS

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FOR EXAMINERS USE ONLY

SECTION 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

Grand Total

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This paper consists of 16 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.

1. Use logarithms correct to 4 decimal places. (4mks)

Evaluate: $\frac{(0.528)^{\frac{2}{3}}}{3.25 \times \log 4.8}$

2. Factorise $2x^2y^2 - 5xy - 12$ (2mks)

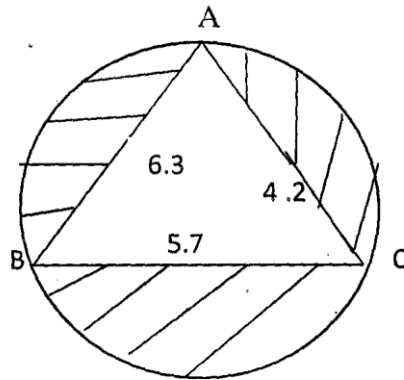
3. a) Expand and simplify the expression (2mks)

$$\left[10 + \frac{2}{x}\right]^5$$

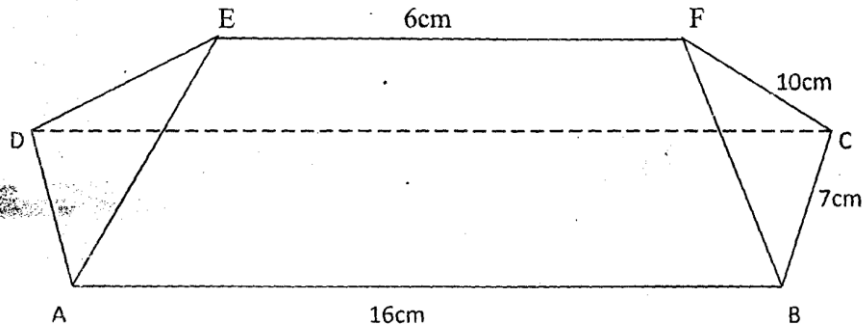
- b) Use the expansion in (a) above to find the value 14^5 (2mks)

4. The straight line through the points D (6,3) and E (3, -2) meets the Y-axis at point F. find the co-ordinates of F. (3mks)

5. The circle below whose area is 18.05cm^2 circumscribes a triangle ABC where $AB = 6.3\text{cm}$, $BC = 5.7\text{cm}$ and $AC = 4.8\text{cm}$. Find the area of the shaded region. (4mks)



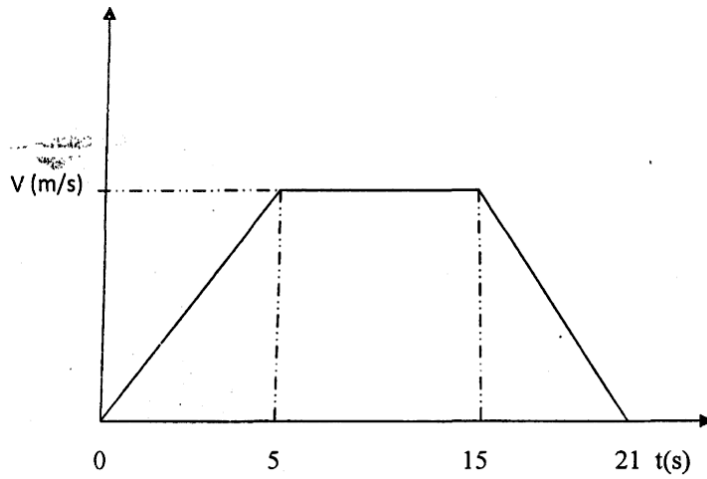
6. Using a pair of compasses and ruler only construct a quadrilateral ABCD in which $AB = 4\text{cm}$, $BC = 6\text{cm}$, $AD = 3\text{cm}$ and angle $ABC = 135^\circ$ and angle $DAB = 60^\circ$. Measure the size of angle BCD (4mks)
7. Find the interquartile range of the following numbers 2,4,3,1,2,4,14,6,9,6,1. (2mks)
8. The figure below shows a model of the roof with a rectangular base ABCD. $AB = 16\text{cm}$, $BC = 7\text{cm}$ and $EF = 6\text{cm}$. The ridge EF is parallel to the base and centrally placed. The edges AE, BF and CF and DE are each 10cm long. Calculate the angles between the planes ABFE and ABCD. Give your answer to 1 d.p.



9. Type A of tea costing sh.36 per satchel is mixed with type B of tea costing sh.44 per satchel. In what ratio should the two brands be mixed so as to cost sh.42 per satchel. (3mks)

10. Tap A can fill a tank with water in 2 hours. Tap B can fill it in 5 hours and tap C can fill it in 4 hours. Tap D can empty the tank in 10 hours and Tap E can empty it in 3 hours. All taps are opened and the tank is filled. How many hours are used to fill the tank when all pipes are working. (3mks)

11. The velocity time graph drawn below shows the distance travelled by a particle is 620m. Calculate ;
- The velocity V .
 - The deceleration of the particle.



12. When A is obtuse, $\sin A = \frac{4}{5}$ find the value of $\cos A - \tan A$ (4mks)
13. If $a = i - 2j + 3k$, $b = -2i + 3j - k$, $c = 3i - j - 4k$ and $p = 3a - 2b + c$
Find to one decimal place the length of vector p (3mks)
14. Without using calculator evaluate: (3mks)
- $$\frac{2\frac{1}{5} + \frac{2}{5} \text{ of } 3\frac{3}{4} - 4\frac{1}{6}}{1\frac{1}{4} - 2\frac{2}{5} \div 1\frac{1}{3} + 3\frac{3}{4}}$$
15. The diagonal of a rectangular garden measures $11\frac{1}{4}$ while its width measures $6\frac{3}{4}$. Calculate the perimeter of the garden.

16. An aeroplane flies at an average speed of 500 knots due East from a point P($53.4^{\circ}N, 40^{\circ}E$) To another point Q. It takes $2\frac{1}{4}$ hours to reach point Q.

Calculate;

- i. The distance in nautical miles it travelled (1mk)

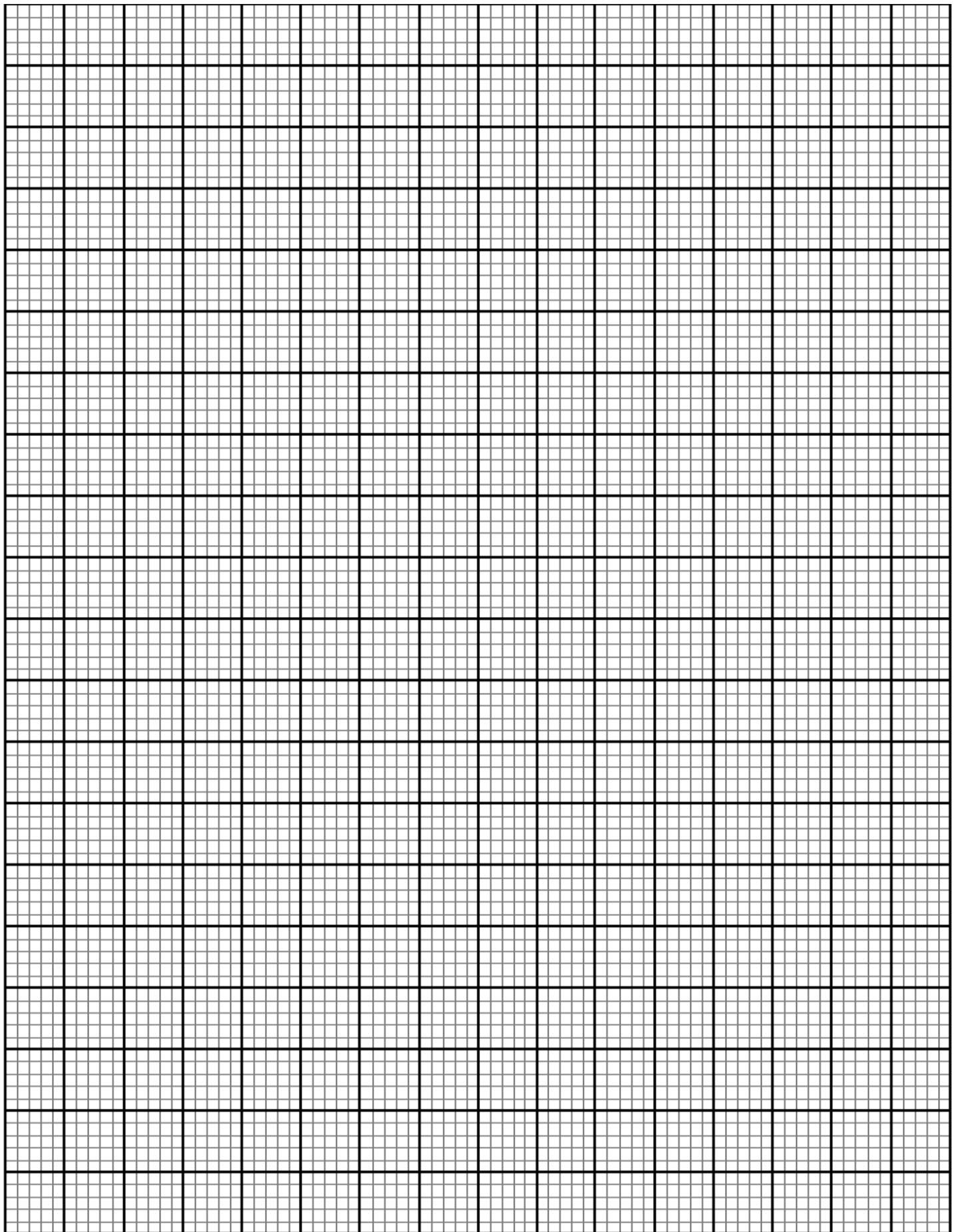
- ii. The longitude of point Q to 2 d.p

SECTION B

17. Two variables X and Y are related by the formula $Y = Ka^x$ where a and k are constants. The values x and y are given in the table below.

X	0	2	4	5	7	9	12
y	256	286	316	339	385	437	525
Log y		2.46			2.59		

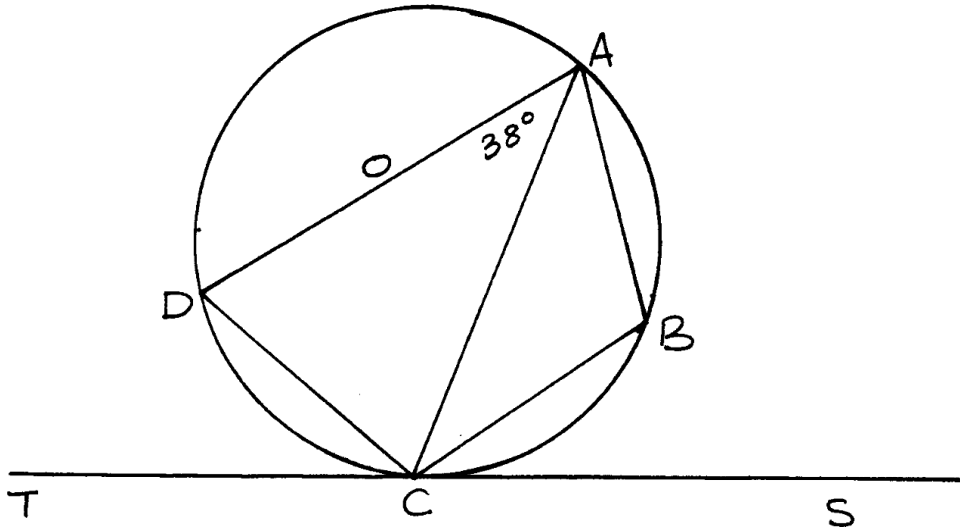
- a) Compare the table above for all values of y correcting each value to 2 d.p (2mks)
- b) Given that the relation between values of x and log y approximate to a linear form $\text{Log } y = x \log a + \log k$ where a and k are constants.
 - i) Use the axis on the grid provided to draw the line of best fit for the graph of log y against x (4mks)



ii) Use the graph to estimate the values of a and k .

iii) Write down the relationship between x and y

18. In the figure below OA is a diameter of the circle ABCD centre O, radius 10cm. TCS is a tangent to the circle at C. AB = BC and angle DAC = 38°



- a) Find the size of the angle (2mks)
- i. ACS
 - ii. BCA (2mks)
- b) Calculate the length of (i) AC
- ii) AB

19. Complete the table below giving the values correct to 2 d.p (2mks)

X	0	30	60	90	120	150	180	210	240	270	300	330	360
Sin 2x	0		0.87		-0.87		0	0.87	0.87				0
$3 \cos x - 2$	1	0.60		-2	-3.5			-4.6			-0.5		1

- b) On the grid provided draw the graphs of $Y = \sin 2X$ and $Y = 3 \cos x - 2$ for $0^\circ \leq x \leq 360^\circ$
 On the same axes. Use a scale of 1cm to represent 30° on the X- axis and 2cm to represent 1 unit on the Y axis.

c) Use the graph in (6) above to solve the equation $3 \cos x - \sin 2x = 2$

20. Three quantities R,S and T are such that R varies directly as S and inversely as the square of T.
a) Given that $R = 480$ when $S = 150$ and $T = 5$, write down an equation connecting R, S and T
(4mks)

b) Find the value of R when $s = 360$ and $T = 1.5$ (2mks)

Find the % change in R if S increases by 5% and T decreases by 20% (4mks)

21. The triangle ABC has vertices A(1,2) B (2,1) and C (2,3). A₁B₁C₁ is the image of ABC under the transformation given by the matrix $\begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$

a) What are the co-ordinates of A₁ B₁ C₁? Plot ABC and A₁ B₁ C₁ on the same axis

(3mks)

b) State the ratio of the areas of the two triangles and use the area of ABC to calculate the area of A₁B₁C₁

c) If A₂ B₂ C₂ is the image ABC under the transformation given by the matrix $\begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix}$

Find the co-ordinates of A₂ B₂ C₂. Plot A₂ B₂ C₂ and describe the transformation fully.

22. The following shows the distribution of marks in a C.A.T in a form four class.

Marks	31-40	41-50	51-60	61-70	71-80	81-90
No of students	2	5	14	12	6	1

a) i) On the grid provide draw a cumulative frequency curve for this data. (3mks)

ii) Using the graph, estimate the median mark (1mk)

b) Taking 55.5 as the assumed mean, calculate

i. The mean mark (3mks)

ii. The standard deviation (3mks)

23. Four towns P,Q,R and S are such that Q is 1500km due East of town P. Town R is 1080km due North of town Q. Town S is on a bearing of 300° from R

a) Use a ruler a pair of compasses and show the positions of town P,Q,R and S. (Take a scale of 1cm = 3000km) (5mks)

b) i) Determine the distance of PS in km (2mks)

ii) Determine the distance RS in km (2mks)

iii) Determine the bearing of town S and Q (1mk)

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 MATHEMATICS
 PAPER 1
 JULY/AUGUST-2016
 TIME 2 ½ HOURS.

LUGARI SUB-COUNTY JOINT EVALUATION TEST-2016
Kenya Certificate of Secondary Education.(K.C.S.E)

121/1
 MATHEMATICS
 PAPER 1
 JULY/AUGUST-2016
 TIME 2 ½ HOURS.

INSTRUCTIONS TO CANDIDATE'S

- ❖ Write your name and index number in the spaces provided at the top of this page.
- ❖ This paper consists of two sections: Section I and Section II.
- ❖ Show all the steps in your calculations, giving your answers at each stage in the spaces below each question. may be given for correct working even if the answer is wrong.
- ❖ Answer **ALL** questions in section **1** and any **five** questions from section **II**
- ❖ Show all the steps in your Calculations, giving your answers at each stage in the spaces below each question.
- ❖ Marks may be given for correct working even if the answer is wrong.
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- ❖ *This paper consists of 16 printed pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.*

For Examiner's Use Only

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

SECTION II

17	18	19	20	21	22	23	24	Total

**GRAND
 TOTAL**

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SECTION I (50marks)

Attempt all the questions in this section.

1. Evaluate without using calculators and give your answer in its simplest form.

$$\frac{\frac{1}{7} \text{ of } 49 + 4 - \frac{1}{5}(15 - 20)}{8x - 5 \div 3} \quad (3\text{mks})$$

2. Simplify.

$$\frac{2x^2 + x - 3}{4x^2 - 9} \quad (3\text{mks})$$

3. On a certain day in October 2014, a Kenyan Commercial Bank exchanged currency at the rates shown below.

	Buying (shs)	Selling (shs)
1 US Dollar	8.50	86.00

Mr. Yosi visited the bank and exchanged shs. 926,700 for US Dollars. How much money in US Dollars did he get? (2mks)

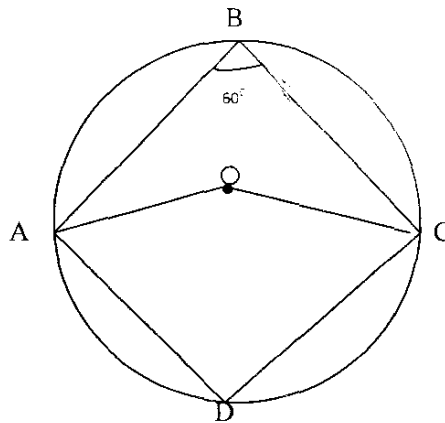
4. A line L passes through points A(2X, 4) and B (-1,X) and its gradient is $\frac{1}{7}$ Find the equation of a line perpendicular to L and passing through point B. (4mks)

5. A cylinder of diameter 28cm contains water. A metal solid sphere of radius 63cm is submerged into the water in the cylinder. Find the change in height of the water in the cylinder giving your answer to 2 decimal places. (3mks)
6. The size of each Interior angle of a regular polygon is seven times the size of the exterior angle. Find the number of sides of the polygon. (3mks)
7. Given that x is an acute angle and $\cos x = \frac{2\sqrt{5}}{5}$, find without using mathematical tables or calculator, $\tan (90-x)^\circ$ (2mks)
8. Solve the simultaneous equations
- $$\begin{aligned}xy &= 4 \\x + y &= 5\end{aligned}$$
- (4mks)

9. Use tables of square root, square and reciprocal to evaluate:

$$\frac{1}{x} = \frac{1}{\sqrt{4.296}} + \frac{1}{1.872^2} \quad (2\text{mks})$$

10. In the following figure, O is the centre of the circle. Given that Angle ABC 60° , find the value of the angle ADC.



11. Two similar containers have capacities 256litres and 108 litres respectively. If the surface of the smaller container has an area of 810cm^2 , what is the area of the corresponding surface on the larger container? (4mks)

12. The lengths in centimetres, of 10 leaves from a certain tree were recorded as follows:

7, 9, 8, 10, 6, 8, 4, 2, 5, 3.

Determine

(a) The mode (1 mk)

(b) The median (2mks)

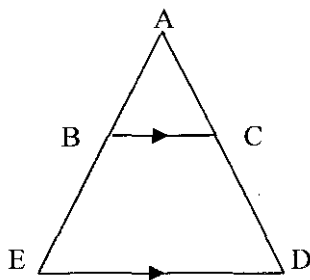
13. Find the integral values that satisfy the simultaneous inequalities below.

$$2x - 3 \geq \frac{x}{2} - 6$$

$$4 - \frac{3}{2}x > x - \frac{7}{2}$$

(3mks)

14. In the diagram below, BC is parallel to DE and AC: CD 1: 2. If the triangle ABC has an area of 5cm², find the area of the trapezium BCED. (4mks)



15. The L.C.M of two numbers is 180 and their GCD is 12. If the no numbers are 36 and Y, find the value of y.

(2mks)

16. (a) Using a ruler and a pair of compasses only construct triangle ABC such that AB 5.9cm, AC 9.2cm and angle ABC 105° .

(2mks)

(b) By construction, locate a point T on AB such that AT: TB 2:1

(2mks)

SECTION II (50 marks)

Answer only FIVE QUESTIONS IN THIS SECTION

17. The cash price of a camera is shs. 42,200. Tony bought the camera on hire purchase by paying a deposit of shs. 7,200 and cleared the balance in 24 equal monthly instalments of shs, 2,250.
- (a) Find the amount of interest paid under the hire purchase plan. (3mks)
- (b) Hillary took a loan from a bank and bought the camera in cash. He repaid the loan in two years at 18% p.a. Interest compounded semi annually.
Find the total interest he paid. (3mks)
- (c) The cash price is taken as the true value of the camera. If the camera depreciated at a rate of 15% in the first year after buying, and at $p\%$ p.a for the rest of the time, calculate the value of p if the value of the camera was shs. 23, 534 after 5 years. (4mks)

18. The table below shows the marks obtained by 40 candidates in an examination.

Marks	5-14	15-29	30-44	35-44	45-49
Frequency	2	2	7	15	X

(a) Find the value of x (2mks)

(b) On a grid, draw a histogram to represent the data. (5mks)

(c) By drawing a straight line on the graph above determine the median mark. (3mks)

19. A triangle whose vertices are $A(-1,2)$, $B(-1,4)$ and $C(1,6)$ mapped onto triangle $A'B'C'$ whose vertices are $A'(2,-1)$, $B'(4,-1)$ and $C'(6,-3)$
- (a) Draw the triangles on the grid provided (2mks)
- (b) Find the centre of rotation (4mks)
- (c) Find the angle of rotation (1mk)
- (d) If a point $Q(4,2)$ is rotated using the same angle and same centre of rotation, find the coordinates of Q . (3mks)

20. Using a ruler and a pair of compasses only.

(a) Construct triangle ABC in which Angle ABC = 67.5° , AB 6cm and BC 8cm (5mks)

(b) Drop a perpendicular from A to meet BC at T. measure AT (3mks)

(c) Using the length AT, calculate the area of the triangle ABC (2mks)

21. The displacement s metres of a particle moving in a straight line after t seconds is given

$$S = 3t + 1.5t^2 - 2t^3$$

(a) Find the initial acceleration of the particle (4mks)

(b) Calculate

i) The time when the particle was momentarily at rest. (2mks)

ii) Its displacement by the time it comes to rest momentarily. (2mks)

iii) The maximum speed attained (2mks)

22. Two towns P and Q are 160km apart. Koech started driving from P towards Q at 8:00am and drove at an average speed of 60km/h, Otieno started his journey from Q towards P at 9:00am and drove at 70km/h.

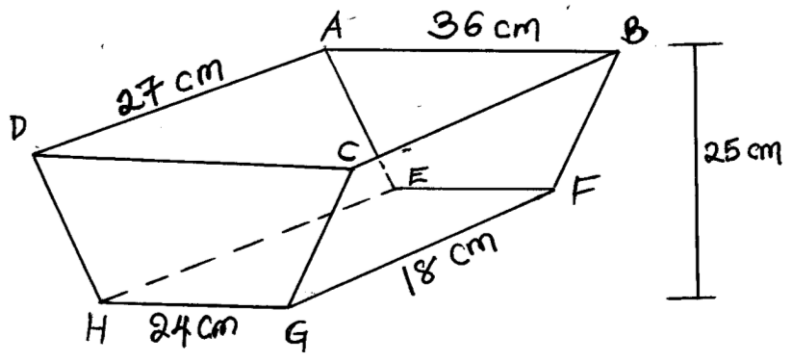
Calculate:

- (a) (i) the distance from P when Koech and Otieno met. (4mks)

- (ii) the time of the day when they met (2mks)

- (b) Amin started his journey from Q at 9:30am and met Koech at the same time as Otieno did. Determine Amin' s average speed. (4mks)

23. The figure below shows a 25cm deep frustrum shaped container. End ABCD is open, $AB = 36\text{cm}$, $AD = 27\text{cm}$, $HG = 24\text{cm}$ and $GF = 18\text{cm}$.



Wafula used it to fill an empty cylindrical tank of radius 1.2 m and height 1.5m. Taking $\pi = 3.142$

- (a) Find the capacity of:
- (i) the tank in litre (2mrks)
- (ii) the container in litres (6mrks)
- (b) Calculate the number of full containers that Wafula used to fill the tank. (2mrks)

24. Complete the table below for $y = \sin(x + 60^\circ)$ and $y = \sin x$ (2mks)

X°	0	60	120	180	240	300	360
$(x+60)^\circ$	60		180	240	-0.87		420
$\sin(x + 60)^\circ$			0.00				0.87
$\sin x^\circ$	0			0.00			0.00

(a) Using scale of 1cm to represent 30° on the x-axis and 4cm to represent 1 unit on the y-axis draw on the same axes the graphs of $y = \sin(x+60)^\circ$ and $y = \sin x$ for $0^\circ \leq x \leq 360^\circ$ (4mks)

(b) From the graph, find:

i) The amplitude of the waves (1 mk)

ii) The period of each wave (1mk)

iii) The transformation that maps $y = \sin x$ onto $y = \sin(x+60)^\circ$ (1mk)

(c) Use your graph to solve the equation $\sin(x+60)^\circ - \sin x = 0$ (1mk)

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 MATHEMATICS
 PAPER 2
 JULY/AUGUST-2016
 TIME 2 ½ HOURS.

LUGARI SUB-COUNTY JOINT EVALUATION TEST-2016
Kenya Certificate of Secondary Education.(K.C.S.E)

121/2
 MATHEMATICS
 PAPER 2
 JULY/AUGUST-2016
 TIME 2 ½ HOURS.

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SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

SECTION II

17	18	19	20	21	22	23	24	Total

**GRAND
 TOTAL**

SECTION 1 (50 MARK)

Answer all the questions in this section in the spaces provided.

1. Use the tables of logarithms to evaluate

$$\sqrt{\frac{80.26 \log 7.25}{(9.367 + 1.98)^2}} \quad (4\text{mks})$$

2. Make b the subject of the formula (3mks)

$$\frac{bd}{\sqrt{b^2 + d}} = \frac{l}{r}$$

3. The sides of a rectangle were measured and recorded as 7cm and 13.5 mi. Calculate the percentage error in the area correct to 2 decimal places (3mks)

4. The first four terms of a sequence are 81, p , q , 3. Find the values of p and q . (3mks)

5. By using completing square method, solve for x in

$$4x^2 - 3x - 6 = 0 \quad (3\text{mks})$$

6. Use binomial expansion to simplify

$$(\sqrt{2} + \sqrt{3})^4 - (\sqrt{2} - \sqrt{3})^4$$

(3mks)

7. The equation of a circle is $x^2 + y^2 + 6x - 10y - 2 = 0$. Determine the coordinates of the centre of the circle and its radius.

(3mks)

8. A quantity Z varies directly as the square of X and inversely as the square root of MY . If X increases by 20%, Y decreases by 36% and M increases by 44%, find the percentage change in Z .

(3mks).

9. Solve the equation $3\cos 2(x - 20) - 1 = 0$

$$\text{for } 0^\circ \leq x \leq 360^\circ$$

(3mks)

10. Without using mathematical table or a calculator, evaluate

$$\frac{\cos 30^\circ}{\tan 60^\circ - \sin 45^\circ} \quad (3\text{mks})$$

11. Given that $\log 3 = r$, express the following expression in terms of r .

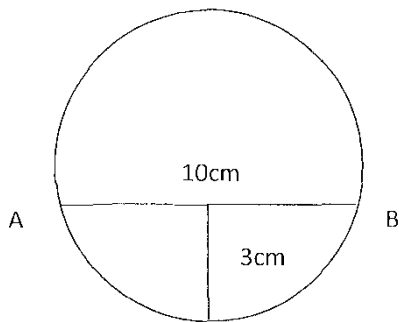
$$\log \left(\frac{10}{3} \right) - \log \left(\frac{1}{27} \right) + \log 81. \quad (3 \text{ mks})$$

12. A trader mixes grade A rice costing shs. 600 per kg, with grade B rice costing shs. 280 per kg in the ratio 3 : 5. Find the price at which he must sell 1 kg of the mixture to make a profit of 20%. (3mks)

14. Chord AR is of length 10cm and the maximum distance between the chord and the lower part of circle is 3cm. determine the radius of the circle.

13. The points P, Q and R lie on a straight line. The position vectors of P and R are $2\mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$ and $5\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$, respectively.
Q divides PR internally in the ratio 2:1. Find the position vector of Q and its magnitude. (3 mks)

14. Chord AR is of length 10cm and the maximum distance between the chord and the lower part of circle is 3cm. determine the radius of the circle. (3mks)



15. The displacement, s metres of a particle moving along a straight line after t seconds is $s = 3t + t^2 - 4t^3$. Find its initial acceleration. (3mks)

16. On average, the rate of depreciation of a generator is 12% per annum. After four years its value was shs. 450,000. Find its value at the start of the four year period. (3mks)

SECTION II: (50 MARKS)

Answer only five questions iii this section in the spaces provided.

17. The table below shows the tax rates for 2014.

Taxable monthly income (shs)	Rates (%)
0- 9,860	10
9861 18800	15
18801 27920	20
27,921 - 37,040	25
37,04 and above	30

John's monthly earning are as follows:

Basic salary - shs. 40,000

House allowance - shs. 20.000

Medical allowance - shs. 3,000

Commuter allowance - shs. 2,000

If John is allowed a tax relief of Shs. 1,162 per month, calculate:

(a) His monthly taxable income (2mks)

(b) The tax he pays (6mks)

(c) John is awarded a 5% increment in his basic salary. Find the percentage increase in the tax paid if his allowance remains constant.

18. (a) A triangle ABC with coordinates

A(4,-2), (-2,-2) and C (-2,-4) is transformed by $M = \begin{bmatrix} -1.5 & 0 \\ 0 & -1.5 \end{bmatrix}$

(i) Find the coordinates of A'B'C' and plot it on the same grid. (3mks)

(ii) Describe this transformation fully (1mk)

(b) Triangle A'B'C' is rotated through +90° about the origin to A''B''C''. draw it (2mks)

(c) Triangle A''B''C'' is reflected along the X-axis to give A'''B'''C'''.

(i) Draw triangle A'''B'''C''' and state the coordinates (3mks)

(ii) Give the transformation Matrix for reflection in the X-axis. (1mk)

19. The table below shows the marks obtained by 80 students in a physics test.

Marks	20 -24	25- 29	30 -34	35 -39	40 -44	45-49	50- 54
No. of student	3	10	26	22	12	5	2

(a) State the modal class (1 mk)

(b) Using a working mean of 37,

Calculate:

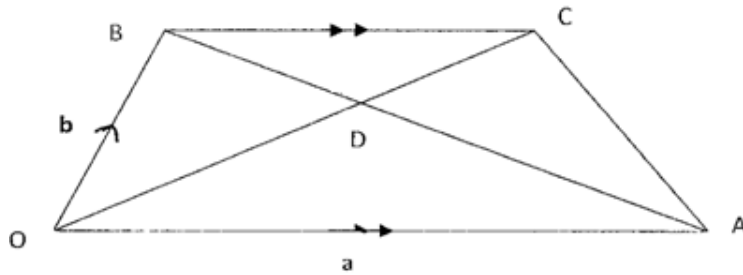
(i) The mean mark (3mks)

(ii) The standard deviation (3mks)

(iii) The range of marks obtained by the middle 50% of the students. (3mks)

20. Given points x (30°N , 70°E) and y (30°N , 20°W) taking $\pi = \frac{22}{7}$ and radius of the earth $R = 6370\text{km}$, Calculate:
- (a) The distance between X and Y along the parallel of latitude.
- (i) In km (2mks)
- (ii) In nm (1mk)
- (b) The local time at x if the local time at y is 2030 hours. (2 mks)
- (c) The position of z if z is 5,700nm south of y. (2mks)
- (d) The shortest distance between Z and K in nm given the position of K(65°S , 20°E). (3mks)

21. In the figure below shows a trapezium in which OA is parallel to BC . $OA = a$ and $OB = b$ and $BC:OA = 3:4$.



- (a) Express the following vectors in terms of a and b . (1mk)

(i) BA (1mk)

(ii) OC (1mk)

- (b) If $BD = m BA$ and $OD = n OC$, express OD in terms of:

(i) a, b and m (2mks)

(ii) a, b and n (1mk)

Find the values of m and n hence find the ratio $OD:DC$. (5mrks)

22. Alex commutes to work by either a bus or a taxi. If he commutes by bus on any one day the probability that he will commute by taxi the following day is $\frac{1}{4}$. If he commutes by taxi on any one day, the probability that he will commute by bus the following day is $\frac{5}{6}$. The probability that he will commute by bus on Tuesday is $\frac{2}{3}$

Find the probability that he will commute by:

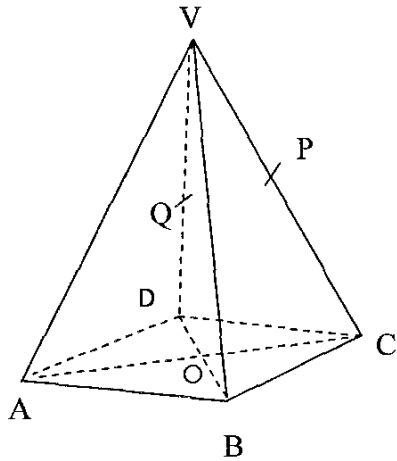
(a) Bus on Wednesday (2mks)

(b) Taxi on Wednesday (2mks)

(c) Bus on Thursday (3mks)

(d) Taxi on Thursday (3mks)

23. The diagram below shows a right pyramid VABCD with V as the vertex. The base of the pyramid is rectangle ABCD, with $AB = 4\text{CM}$ and $BC = 3\text{CM}$. The height of the pyramid is 6cm,



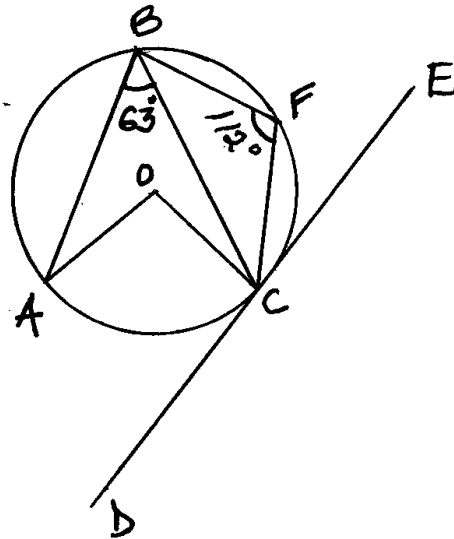
(a) Calculate;

i. The length of the projection of VA on the base (2mks)

ii. The angle between the face VAB and the base (3mks)

- (b) P is the mid point of VC and Q is the midpoint of VD. Find the angle between the planes VAB and the plane ABPQ. (5mks)

24. In the figure below O is the centre of the circle. DCE is a tangent at point C. angle ABC 63° and angle BFC = 112°



Stating reasons find

- | | | |
|-------|------------------|--------|
| (i) | Angle ACD | (2mks) |
| (ii) | Obtuse angle AOC | (2mks) |
| (iii) | Angle BAC | (2mks) |
| (iv) | Angle BCE | (2mks) |
| (v) | Angle OCB | (2mks) |

KAHURO/MURANG'A EAST JOINT EXAMINATION – 2016

Kenya Certificate of Secondary Education
MATHEMATICS ALT A
PAPER 1
TIME: 2½ HOURS

INSTRUCTION TO CANDIDATE'S:

- (a) Write your name, index number and school in the spaces provided above.
- (b) Sign and write the date of examination in spaces provided above.
- (c) This paper consists of **TWO** sections: **Section I** and **Section II**.
- (d) Answer **ALL** the questions in **Section I** and any **five** questions from **Section II**.
- (e) All answers and working must be written in the spaces provided below each question.
- (f) Electronic calculators may be used and KNEC Mathematical tables except where stated otherwise.

FOR EXAMINER'S USE ONLY:

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

Grand
Total

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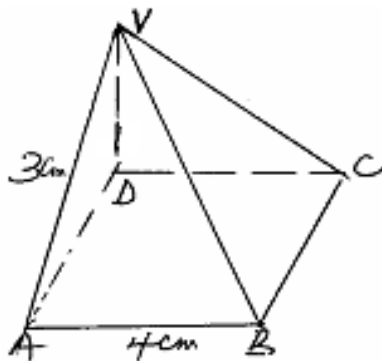
Mathematics Paper 1
Turnover

SECTION I: (50 MARKS)

Answer all the questions in this section in the spaces provided.

1. Find the greatest number which when divided into 167, 260 and 389 leaves remainders of 11, 8 and 5 respectively. (2 marks)

2. The figure below shows a right pyramid with a square base of 4cm and a slant height of 3cm. Draw the net of the pyramid. (3 marks)



3. A tourist arrived in Kenya with 10000 US dollar which he converted to Kshs on arrival. He spent Kshs.428,500 and converted the remaining amount to sterling pounds. How much did he receive in sterling pounds. The currency exchange rates of the day were as follows:-

Currency	Buying	Selling
1 Sterling pound	135.50	135.97
1 US dollar	72.23	72.65

(3 marks)

4. Without using calculators evaluate:

$$\frac{\frac{1}{2} + 2\frac{4}{5} \text{ of } 8 \div 6(2 \times 4\frac{2}{5})}{\frac{1}{2} \text{ of } 6(8 \div 3\frac{1}{3})}$$

(3 marks)

5. A man on top of a tower 300m sees two cars P and Q on a straight level road. The angle of depression of P was 48° and that of Q was 28° . Calculate the distance between the two cars. (Give your answer to 2d.p.). (3 marks)

6. Solve for χ and y in the simultaneous equation.

$$3^{2\chi} \times 3^y = 27$$

$$2^{\chi-y} \times 2^\chi = 32$$

(3 marks)

7. Use tables of squares, square roots and reciprocals to evaluate

$$\sqrt{\frac{1}{0.2365} + \frac{20}{2.6228^2}}$$

(4 marks)

8. Given $\cos \chi = \frac{5}{13}$, find the values of the following without using tables or calculators.

(a) $\sin \chi$

(1 mark)

(b) $\tan^2 (90 - \chi)$.

(2 marks)

9. Line L_1 passes through the points A (2, -4) and B (6, -8). Find the equation of the line L_2 , the perpendicular bisector of AB leaving your answer in the form $a\chi + by + c = 0$.

(3 marks)

10. A point P has co-ordinates (2, 4, 6).
If $\vec{PQ} = 10\vec{i} + 2\vec{j} + 4\vec{k}$, find

(i) the co-ordinates of Q.

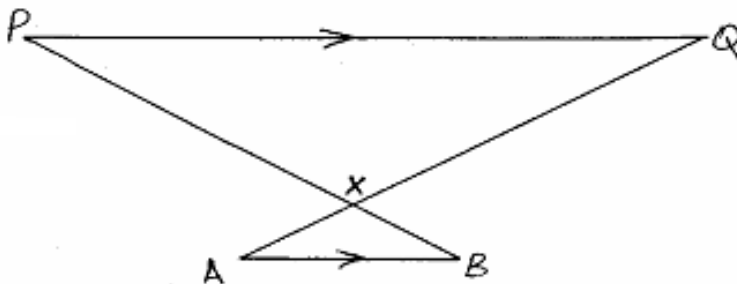
(2 marks)

(ii) the length of PQ. (1 mark)

11. The volume of a cube is 1728cm^3 . Calculate to 1 decimal place, the length of the diagonal of a face of the cube. (3 marks)

12. Find all the integral values of χ which satisfy the inequality $3(1 + \chi) \leq 5\chi - 11 \leq \chi + 45$. (3 marks)

13. In the figure below $AB \parallel PQ$. PB and AQ meet at X. Given that $PQ = 15$, $AB = 2.5$ and $AQ = 10.5\text{cm}$, find AX. (3 marks)



14. Simplify the expression:

$$\frac{(\chi + 1)(4y^2 - \chi y)}{\chi^2 + \chi - 4\chi y - 4y}$$

(3 marks)

15. A circle centre O has the equation $\chi^2 + y^2 = 4$. The area of the circle in the first quadrant is divided into 5 vertical strips each of width 0.4cm.

(a) Use the equation of the circle to complete the table below for values of y correct to 2d.p..

χ	0	0.4	0.8	1.2	1.6	2.0
y	2.00			1.60		0

(1 mark)

(b) Use the trapezoidal rule to estimate the area of the circle. (3 marks)

16. Find the area in hectares of a coffee field whose measurements are entered in a field book as shown below. Take XY = 200m as the baseline. (4 marks)

	Y	
	180	40 to Q
To R 80	140	
To S 160	100	
	40	100 to P
	X	

SECTION B: (50 MARKS)

Answer any FIVE questions from this section.

17. A transport company wishes to transport 288 tonnes of stones to sites P and Q. The company pays Shs.48,000 to transport 48 tonnes for every 28km. James transported 96 tonnes to site P, 49km away.
- (a) Find how much he was paid. (3 marks)
- (b) James spends Shs.6000 to transport every 8 tonnes of stones to site P. Calculate her total profit. (3 marks)
- (c) Kimani transported the remaining stones to site Q, 84km away. If he made 44% profit, find his transport cost. (4 marks)

18. A trailer left town P at 11.45am and travelled towards town Q at an average speed of 60km/hr. A car left town P at 2.15pm on the same day and travelled along the same road at an average speed of 100km/hr. The distance between towns P and Q is 500km.

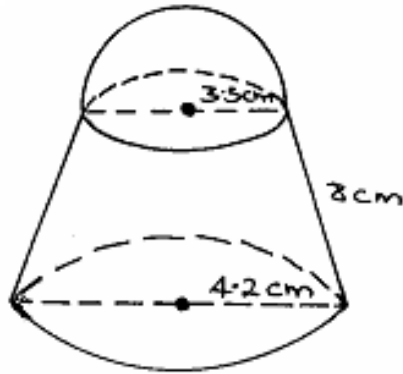
(a) Calculate the time of the day when the car overtook the trailer. (4 marks)

(b) The distance from P when the car overtook the trailer. (3 marks)

(c) After overtaking the trailer both vehicles continued towards Q at their original speeds. Find how long the car had to wait at town Q before the trailer arrived.

(3 marks)

19. The figure below represents a solid made up of a conical frustrum and a hemispherical top. The slant height of the frustrum is 8cm and its base radius is 4.2cm.



If the radius of the hemispherical top is 3.5cm.

(a) Find the area of:

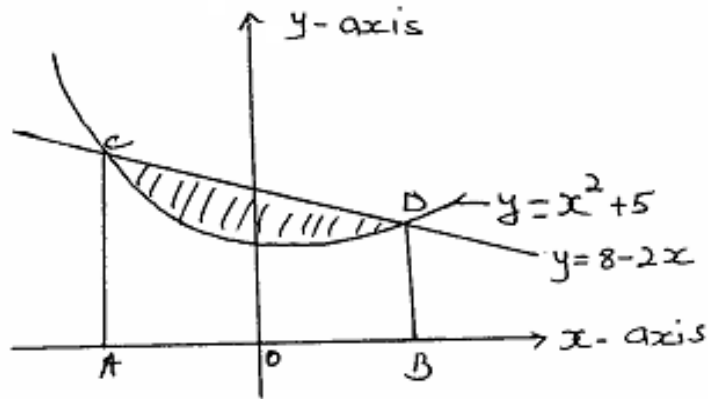
(i) the circular base. (2 marks)

(ii) the curved surface area of the frustrum. (4 marks)

(iii) the hemispherical surface. (2 marks)

(b) A similar solid has a total surface area of 81.51cm^2 . Determine the radius of its base. (2 marks)

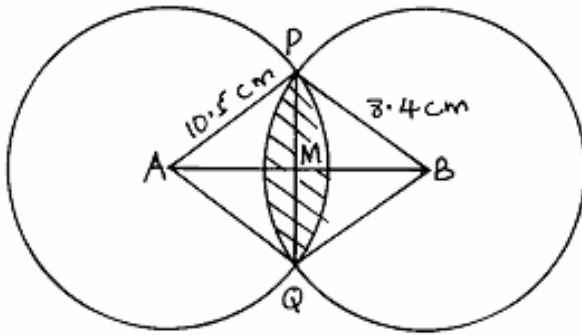
20. The diagram below, not drawn to scale, shows part of the curve $y = x^2 + 5$ and the line $y = 8 - 2x$. The line intersects the curve at points C and D. Lines AC and BD are parallel to the y-axis.



- (a) Determine the coordinates of C and D. (4 marks)
- (b) Use integration to calculate the area bounded by the curve and the x -axis between points C and D. (3 marks)
- (c) Calculate the area enclosed by the lines CD, CA BD and the x -axis. (2 marks)
- (d) Determine the area of the shaded region. (1 mark)

21. Three people Kariuki, Juma and Mwangi are having their homes situated within the same town. Mwangi's home is 10km away from Juma's home on a bearing of 150° . Kariuki's home is $N30^\circ E$ from Mwangi's home and on a bearing of 135° from Juma's home.
- (a) Using a scale 1cm represent 2km, show the relative position of the three homes. (4 marks)
- (b) Using your diagram, determine;
- (i) bearing of Juma's home from Kariuki's home. (1 mark)
- (ii) distance of Mwangi's home from Kariuki's home. (2 marks)
- (c) Calculate the distance of Kariuki's home from Juma's home. (3 marks)

22. The figure below shows two circles of radii 10.5cm and 8.4cm and with centres A and B respectively. The common cord PQ is 9cm.



- (a) Calculate angle PAQ. (2 marks)

- (b) Calculate angle PBQ. (2 marks)

- (c) Calculate the area of the shaded part. (6 marks)

23. Using a ruler and a pair of compasses only.
- (i) Construct line $AB = 6\text{cm}$. (1 mark)
 - (ii) Construct triangle DAB where angle $DAB = 75^\circ$ and $AB = BD$. (2 marks)
 - (iii) Complete the parallelogram $ABCD$. (1 mark)
 - (iv) Drop a perpendicular from A to BD and hence find the area of the parallelogram. (3 marks)
 - (v) Construct a circle to touch line BC , AB produced and DC produced. Measure its radius. (3 marks)

24. Two towns X and Y lie on the same latitude in the southern hemisphere. When it is 9,00am at X, the time at Y is 11.00am.

(a) Given that the longitude of X is 12°E , find the longitude of Y. (3 marks)

(b) A plane leave X for Y and takes 2 hours to arrive at Y travelling at 600km/hr along a parallel of latitude. Find.

(i) the radius of circle of latitude on which towns X and Y lies.(3 marks)

(ii) The positions of the two towns.

(4 marks)

121/2
MATHEMATICS ALT A
PAPER 2
JULY/AUGUST, 2016
TIME: 2½ HOURS

KAHURO/MURANG’A EAST JOINT EXAMINATION – 2016

Kenya Certificate of Secondary Education
MATHEMATICS ALT A
PAPER 2
TIME: 2½ HOURS

INSTRUCTION TO CANDIDATE’S:

- (a) Write your name, index number and school in the spaces provided above.
- (b) Sign and write the date of examination in spaces provided above.
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FOR EXAMINER’S USE ONLY:

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

**Grand
Total**

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Mathematics Paper 2

Turnover

SECTION I: (50 MARKS)

Answer all the questions in this section in the spaces provided.

1. Use logarithms to evaluate, correct to 4 decimal places.

$$\sqrt{\frac{7.24 + 3.072}{23.2 \cos 70^\circ}} \quad (4 \text{ marks})$$

2. Make R the subject of the formula

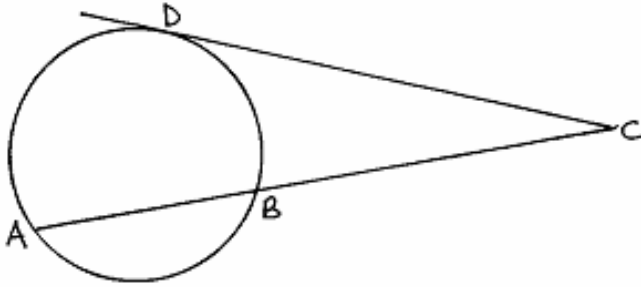
$$A = \Pi (R + r) (R - r) \quad (3 \text{ marks})$$

3. The seventh term of an arithmetic sequence is 17, three times the third term is 3. Calculate the first term and the common difference of the sequence. (3 marks)

4. Find the value of χ given that

$$\begin{pmatrix} \chi & 6 \\ 4 & \chi - 2 \end{pmatrix} \text{ is a singular matrix.} \quad (2 \text{ marks})$$

5. In the figure below DC is a tangent to the circle at point D. Given that ABC is straight line where AB 9.45cm and BC = 5cm. Find the length of DC. (3 marks)



6. Tap A can fill a bath in 4min. Tap B can fill the same bath in 6min and tap C can empty the bath in 8min.
- (a) Calculate how long it would take to fill the bath if all the taps were left running. (2 marks)
- (b) Calculate how long it would take to fill the bath if all taps were left running for 3min after which tap C is closed. (2 marks)
7. Rose cocoa beans cost Sh.60 per kg while Wairimu beans cost Sh.90 per kg. In what ratio should they be mixed such that by selling the mixture at Sh.84 per kg, a profit of 20% is made. (3 marks)

8. A point Q divides a line PR internally in the ratio 2: 1 and a point T divides the line internally in the ratio 3: 1. In what ratio does T divide PQ? (3 marks)
9. Given that $y = \frac{\chi(\chi^2 - 1)}{\chi + 1}$ is the equation of a curve, find the gradient of the tangent to the curve at the point (2, 4). (3 marks)
10. Find the quartile deviation of the data below 2, 4, 6, 8, 10, 5, 6, 9, 4, 6. (3 marks)
11. Under a shear with χ -axis invariant a square with vertices A (1, 0), B (3, 0), C (3, 2) and D (1, 2) is mapped onto a parallelogram with vertices A¹ (1, 0), B¹ (3, 0), C¹ (7, 2) and D¹ (5, 2). Find the shear matrix. (3 marks)
12. Find the value of χ given that $\log(15 - 5\chi) - 1 = \log(3\chi - 4)$. (3 marks)

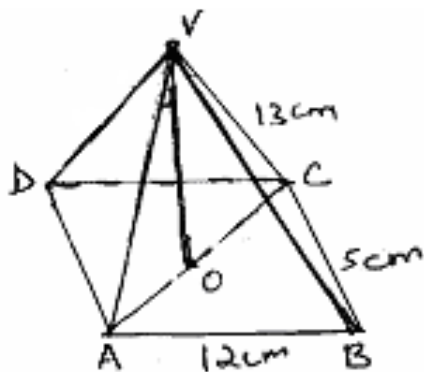
13. Simplify, without using tables or calculators

$\frac{1 - \cos 60^\circ \sin 60^\circ}{1 + \cos 30^\circ \sin 30^\circ}$ leaving your answer in the form $a + b\sqrt{c}$. (4 marks)

14. A triangle ABC is such that AB = 9cm, BC = 7cm and AC = 11cm. Find the radius of a circle which passes through A, B and C correct to 2d.p. (3 marks)

15. Find the percentage error in using 0.67 as an estimate of $\frac{2}{3}$. (3 marks)

16. In the figure below, $VABCD$ is a right pyramid on a rectangular base. Point O is vertically below the vertex V . $AB = 12\text{cm}$, $BC = 5\text{cm}$ and $CV = 13\text{cm}$.



Calculate the angle between the edge CV and the base $ABCD$. (3 marks)

SECTION B: (50 MARKS)

Answer any FIVE questions from this section.

17. Mobile dealer sells phones of two types Nokia and Motorola. The price of one Nokia and one Motorola phone is Ksh.2000 and Ksh.1600 respectively. The dealer wishes to have at least fifty mobile phones. The number of Nokia phones should be at least the same as those of Motorola phone. He has Ksh.120000 to spend on phones. If he purchases x Nokia phones and y Motorola phones:
- (a) Write down all the inequalities to represent the above information. (4 marks)
 - (b) Represent the inequalities in part (a) above on the grid provided. (4 marks)
 - (c) The profit on a Nokia phone is Ksh.200 and that on a Motorola phone is Ksh.300. Find the number of phones of each type he should stock. (3 marks)



18. Given that $-2\chi^2 - 3\chi + 11 = y$

(a) Complete the table below.

χ	-4	-3	-2	-1	0	1	2	3
y	-9		9		11		-3	

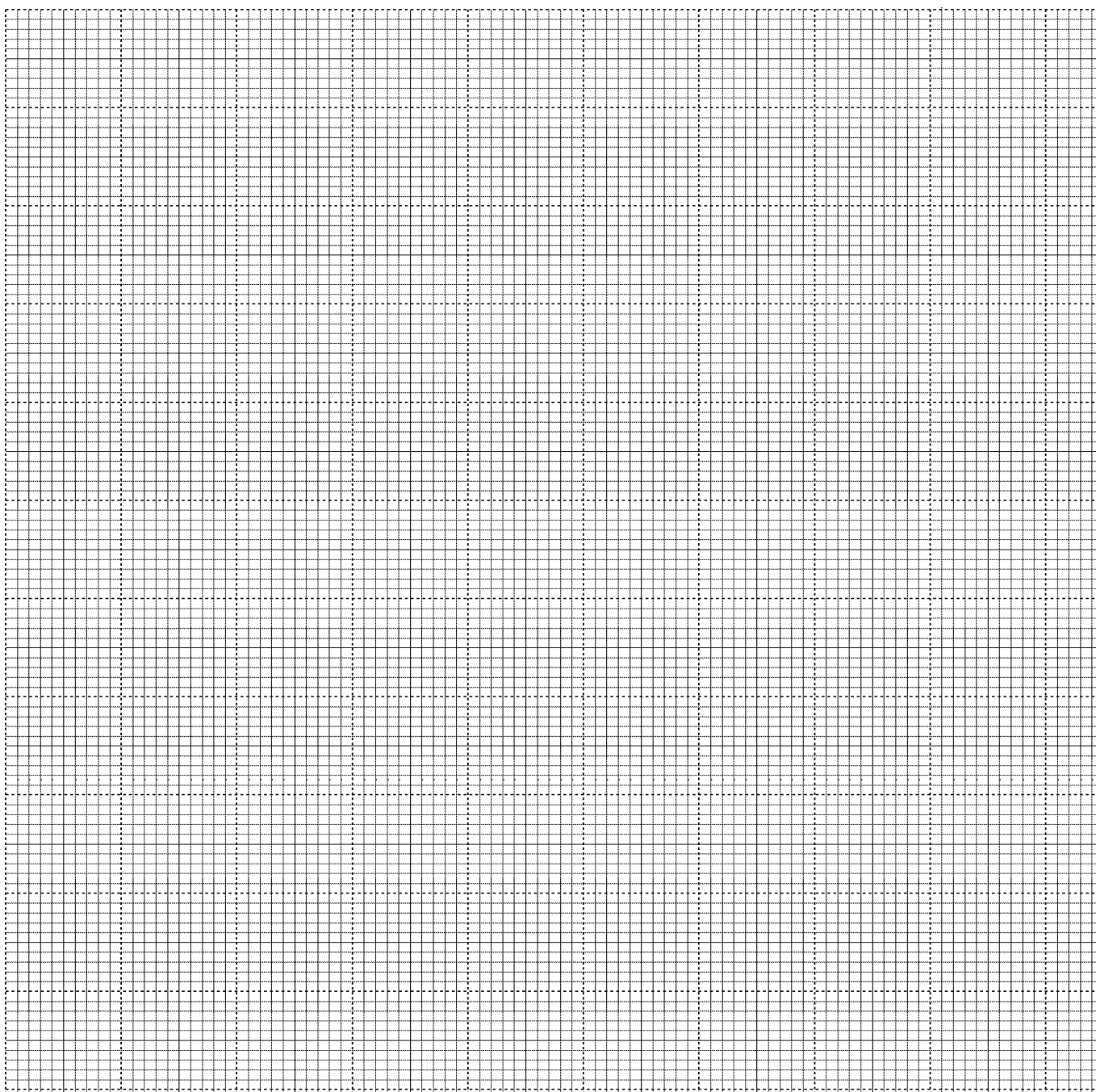
(2 marks)

(b) On the grid provided draw the graph of $y = -2\chi^2 - 3\chi + 11$ for values of χ from -4 to 3. (3 marks)

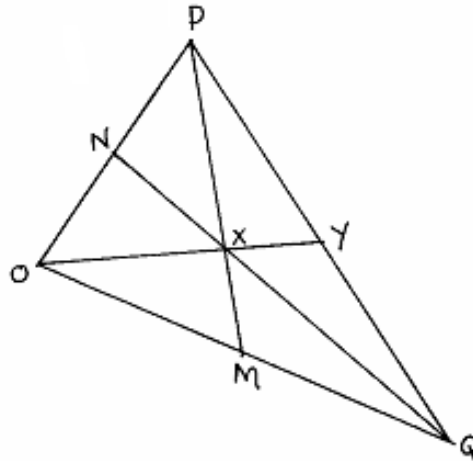
(c) Use the graph to solve.

$-2\chi^2 - 3\chi + 11 = 0$ (2 marks)

$-2\chi^2 - 5\chi + 10 = 0$ (3 marks)



19. The figure below triangle OPQ in which $\vec{OP} = \underline{p}$ and $\vec{OQ} = \underline{q}$. M and N are points on OQ and OP respectively such that $ON = NP = 1:3$ and $OM:MQ = 2:1$.



- (a) Express the following vectors in terms of \underline{p} and \underline{q} .
- (i) \vec{PM} .
 - (ii) \vec{QN} .
 - (iii) \vec{PQ} .
- (b) Lines PN and QM intersect at X such that $PX = hPM$ and $QX = kQM$. Express OX in two different ways and find the value of h and k. (6 marks)
- (c) OX produced meets PQ at Y such that $PY:YQ = 3:2$. Using the ratio theorem or otherwise, find OY in terms of p and q. (1 mark)

20. Income tax is charged on annual income at the rate shown below.

Taxable income K£ p.a.	Rate Ksh. Per £
1 – 2300	2
2301 – 6900	3
6901 – 9200	5
9201 - 11500	7
11501 and over	9

Mr. Njoroge earn a basic salary of Ksh.15000 per month and lives in a company house for which he pays a nominal-rent of Ksh.1250 per month. He enjoys personal relief of Ksh.1056 per month and insurance relief of Sh.270 per month. Calculate.

(a) Taxable pay is the employee's salary + 15% of salary less his taxable income nominal rent. Calculate Njoroge's taxable income in K£ p.a. (3 marks)

(b) The amount of tax he pays per month in Kenya shillings. (5 marks)

(c) His net monthly salary in shillings. (2 marks)

21. Use ruler and compasses only for all constructions in this question.
- (a) Construct triangle ABC given that $AC = 6\text{cm}$, $AB = 5.6\text{cm}$ and angle $BAC = 75^\circ$. Measure BC. (3 marks)
 - (b) L_1 is the locus of points equidistant from BA and BC. Construct L_1 . (2 marks)
 - (c) Construct L_2 , the perpendicular from C to AB. (2 marks)
 - (d) L_1 and L_2 meet at P. Locate P. (1 mark)
 - (e) Find the point inside the triangle which is furthest from point P. What is the distance of that point from P? (2 marks)

22. The table below shows marks scored by 40 candidates in an examination.

Marks	Frequency
11 – 20	1
21 – 30	5
31 – 40	8
41 – 50	9
51 – 60	8
61 – 70	4
71 – 80	2
81 - 90	3

Using an assumed mean of 45.5 estimate:

(i) Mean. (3 marks)

(ii) Standard deviation. (3 marks)

(iii) Calculate the quartile deviation. (4 marks)

23. Two bags X and Y contains ten and eight balls respectively. Bag X has 6 green and 4 red balls while bag Y has 3 and 5 red balls. A bag is selected at random and 2 balls selected without replacement.
- (a) Draw a tree diagram to represent the above information. (4 marks)
- (b) Find the probability of selecting a green ball the first time. (2 marks)
- (c) What is the probability of selecting at most one red ball? (2 marks)
- (d) Find the probability of selecting two green balls. (2 marks)

24. The length and the width of a rectangular are $(6\chi - 1)$ and $(\chi - 2)$ respectively. If the length and the width are increased by 4cm the new area is thrice that of the initial rectangle.

(a) Find the dimension of the initial rectangle. (6 marks)

(b) By what percentage does the area of the rectangle increase after the change? (2 marks)

(c) What is the difference in size between the length and the width of the initial length? (2 marks)

121/1
 MATHEMATICS ALT A.
 PAPER 1
 JUNE / JULY 2016
 2 ½ HOURS

Nakuru Sub County Trial Examination 2016
Kenya Certificate of Secondary Education

MATHEMATICS ALT. A.
 PAPER 1
 2½ HOURS

INSTRUCTIONS TO CANDIDATES

- a) Write your name and index number in the spaces provided above.
- b) Sign and write the date of examination in the spaces provided
- c) This paper consists of two sections: **Section I and Section II.**
- d) Answer all the questions in Section I and only five from section II
- e) All answers and working must be written on the question paper in the spaces provided below each question.
- f) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- g) Marks may be given for correct working even if the answer is wrong.
- h) Non- programmable silent electronic calculators **and** KNEC Mathematical tables may be used except where stated otherwise.
- i) Candidates should check the question paper to ascertain that all the 24 questions are printed.

For Examiner's Use Only

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

SECTION II

17	18	19	20	21	22	23	24	Total

**Grand
Total**

- This paper consist of 14 printed papers

SECTION 1(50marks)

Answer all questions in this section in the spaces provided

1. Evaluate, to 3 significant figures (3marks)

$$\frac{-87.12 \div 2.42 + 5.73 \times 2.1}{3.9 \times 11.16 \div 4.8}$$

2. Given that the ratio of $m:n=5:2$, find the ratio $(2m+3n):(4m-3n)$ (3marks)

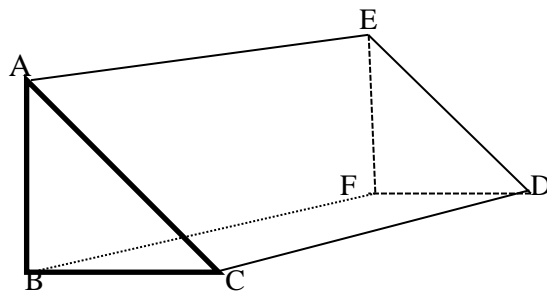
3. The capacity of a cone is 0.35 litres. Determine the radius of the cone in centimetres (3marks)

4. Otieno is six times as old as his son Omondi. In five years time, the difference between their ages will be 30 years. Find the age of Otieno three years ago. (3marks)

5. Given that $\sin 2x = \cos(2x-30^\circ)$. Find the value of $\tan x$ (3marks)

6. The bell at St Mary's primary rings after every 25 minutes. The bell at St Mary's secondary school rings after every 40 minutes. If they both ring at 8.20 am, find the time they will ring again at the same time. (3marks)

7. The figure below represents a right angled triangular prism **ABCDEF** with sides **FB=8cm**, **AB=3cm** and **AC=5cm**



- a) Determine the length of **BC**

(1mark)

- b) Draw the net of the prism

(2marks)

8. A tourist visited Kenya from Denmark. On arrival she exchanged half of her 5400 Euro into Dollars. If the exchange rate at that particular time was :

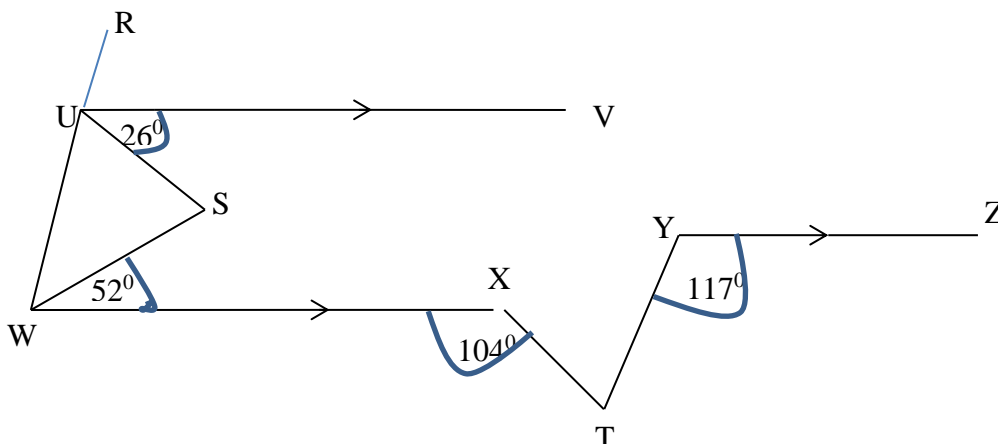
1 Euro (€) =Ksh 97.65

1 Us Dollar (\$) =Ksh 78.50

Calculate, to 2 decimal places the amount of Dollars she received. (3marks)

9. Find the equation of a perpendicular line drawn from the point $(-2, 5)$ to the line $x-6y+24=0$ leaving the answer in the form $y=mx+c$ (3marks)

10. In the figure below **UV**, **WX** and **YZ** are parallel. Angles **SUV**= 26° , **SWX**= 52° , **TYZ**= 117° , **WXT**= 104° and **RUS** is a right angle.



Find the size of:

a) $\angle RWS$ (1mark)

b) $\angle XTY$ (1mark)

c) reflex <USW

(1mark)

11. Simplify

$$\frac{15x^2 + xy - 2y^2}{18x^2 - 2y^2}$$

(3marks)

12. Without using mathematical tables or a calculator, evaluate

$$\left(\frac{256}{81}\right)^{-\frac{1}{4}} \times (343)^{\frac{2}{3}}$$

(3marks)

13. The marks obtained by 12 students in a mathematics test were as follows:

25,24,22,23,23,22,26,21,25,23,22 and 27

Determine the

a) Mode

(1mark)

b) Median mark

(2marks)

14. The third and tenth term of an arithmetic progression are 11 and 39 respectively. Find
a) the first term and the common difference of the progression (2marks)

b) The sum of the first 20 terms of the progression (2marks)

15. Given that $\mathbf{P} = \begin{pmatrix} 1 & 2 \\ 3 & x \end{pmatrix}$ and $\mathbf{Q} = \begin{pmatrix} 3 & x \\ -1 & 1 \end{pmatrix}$ and \mathbf{PQ} is singular matrix, determine the value of x .
(4marks)

16. A building and a flag post are on the same level ground. The height of the building is 19m and the flag post is 5m from the building. The angle of elevation of the top of the building from the top of the flagpost is 63° . Calculate the height of the flagpost (3 marks)

SECTION II (50 marks)

Answer only five questions in this section in the spaces provided

17. Three brothers Felix, William and Chris decided to buy a petrol tanker for transport. The dealer allowed them to pay 70% of the cost and clear the remaining in twelve equal monthly instalments. The marked price of the petrol tanker is Ksh 7.2million. The brothers raised the Ksh. 705,000 in the ratio 5:4:3 respectively.

a) Determine

i) The monthly instalment (2marks)

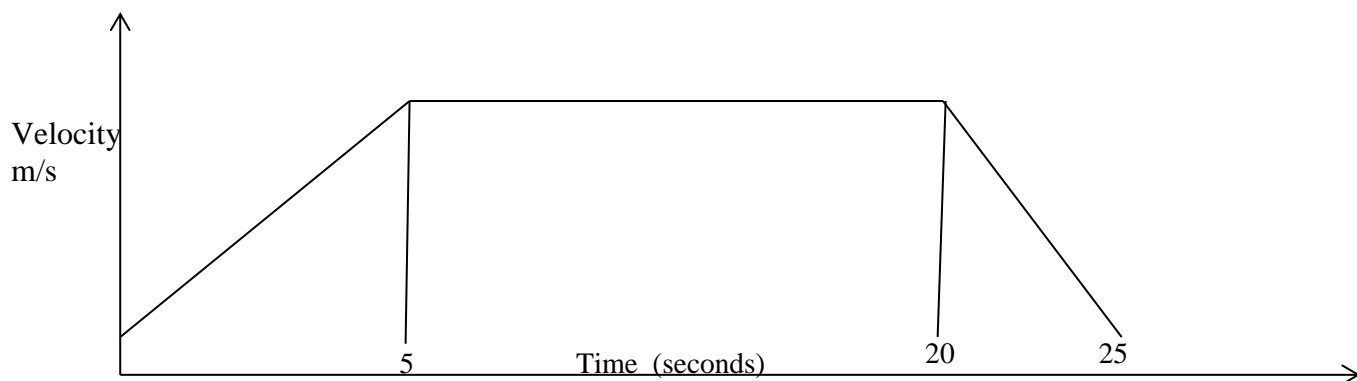
ii) Williams contribution in the initial payment (2marks)

b) The brothers made a profit of Ksh 4,320,000 from the business in one year. Their expenses were total monthly instalments and business expenses of ksh. 1,200, 000: Find

i) Their net profit (3marks)

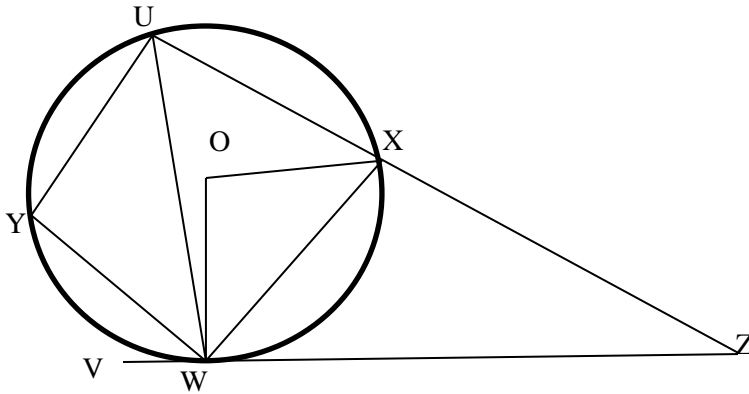
ii) The difference between Felix and Chris's share of the profit (3marks)

18. The figure below is a velocity-time graph for a car.



- a) Find the maximum speed attained if the distance travelled is 1600 metres (3marks)
- c) Calculate the distance travelled in the last 5 seconds (3marks)
- d) Determine the retardation in the last 5 seconds (2marks)
- e) Find the average speed for the whole journey (2marks)

19. In the figure below $\angle XWZ = 50^\circ$ and $\angle UWY = 40^\circ$. O is the centre of the circle and $UW = UX$. VWZ is a tangent to the circle at W.



a) Determine the size of
i) $\angle UWY$

(2marks)

ii) $\angle UVW$

(2marks)

iii) $\angle XOW$

(2marks)

b) Given that $WZ = 9\text{cm}$ and $XZ = 7.6\text{cm}$, calculate to 1 decimal point

i) the length of UX

(2marks)

ii) the radius of the circle

(2marks)

20. The ages, in years of local tourists who visited Lake Nakuru National park in a certain period was recorded as follows:

12 23 26 17 31 21 14 19 22 18 21 15 20 16 27 18 17 25 28 14
 23 19 11 38 15 19 24 20 17 32 19 24 21 33 10 36 21 13 18 16

The table below shows the age of local tourists who visited Lake Nakuru national park on a certain a day.

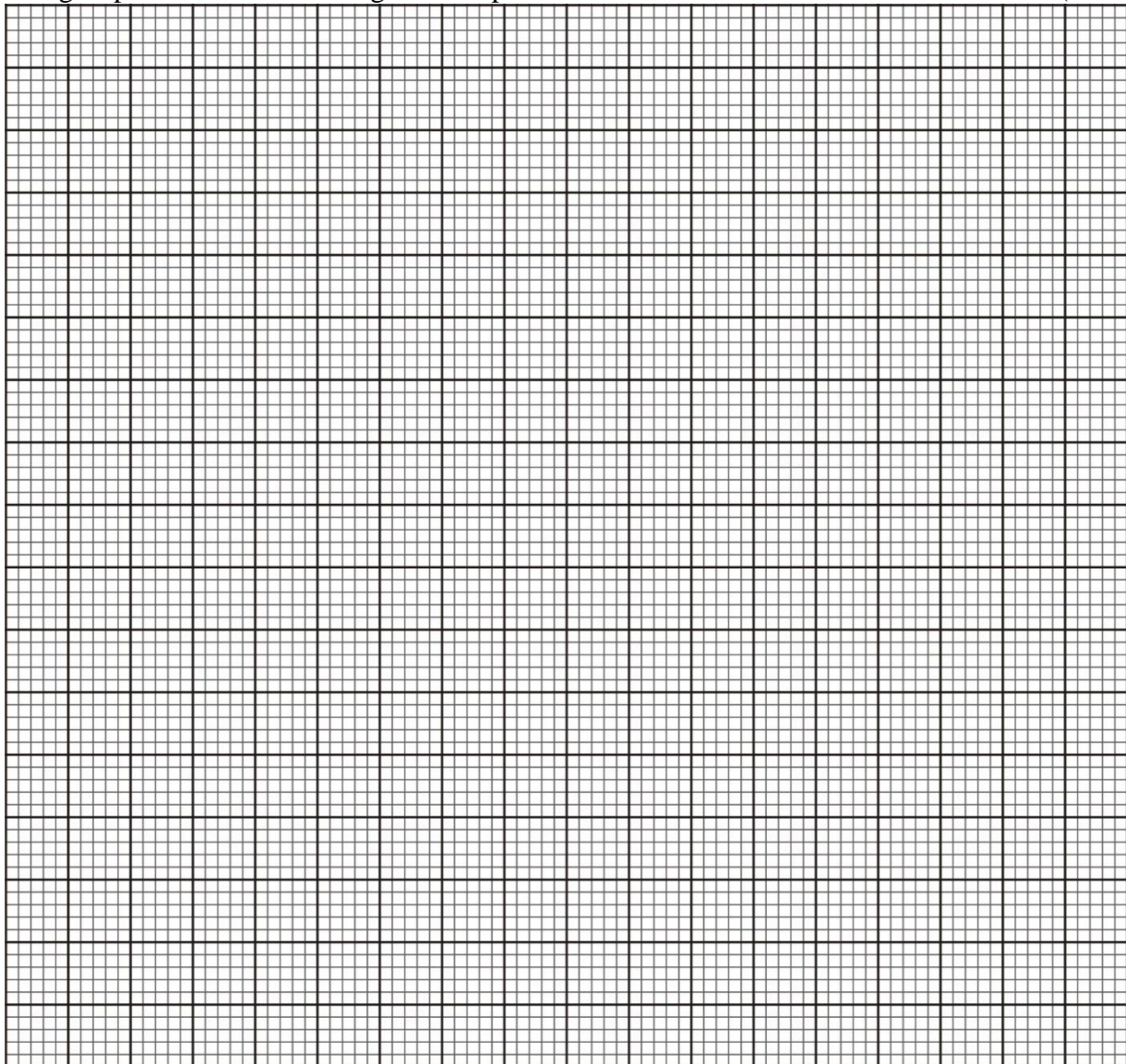
Age(years)	10-14	15-17	18-21	22-29	30-34	35-39
Frequency	6				3	

a) Complete the table (2marks)

b) Using the table in (a) above:

i) State the modal age (1mark)

b) On the grid provided draw a histogram to represent the above data. (5marks)



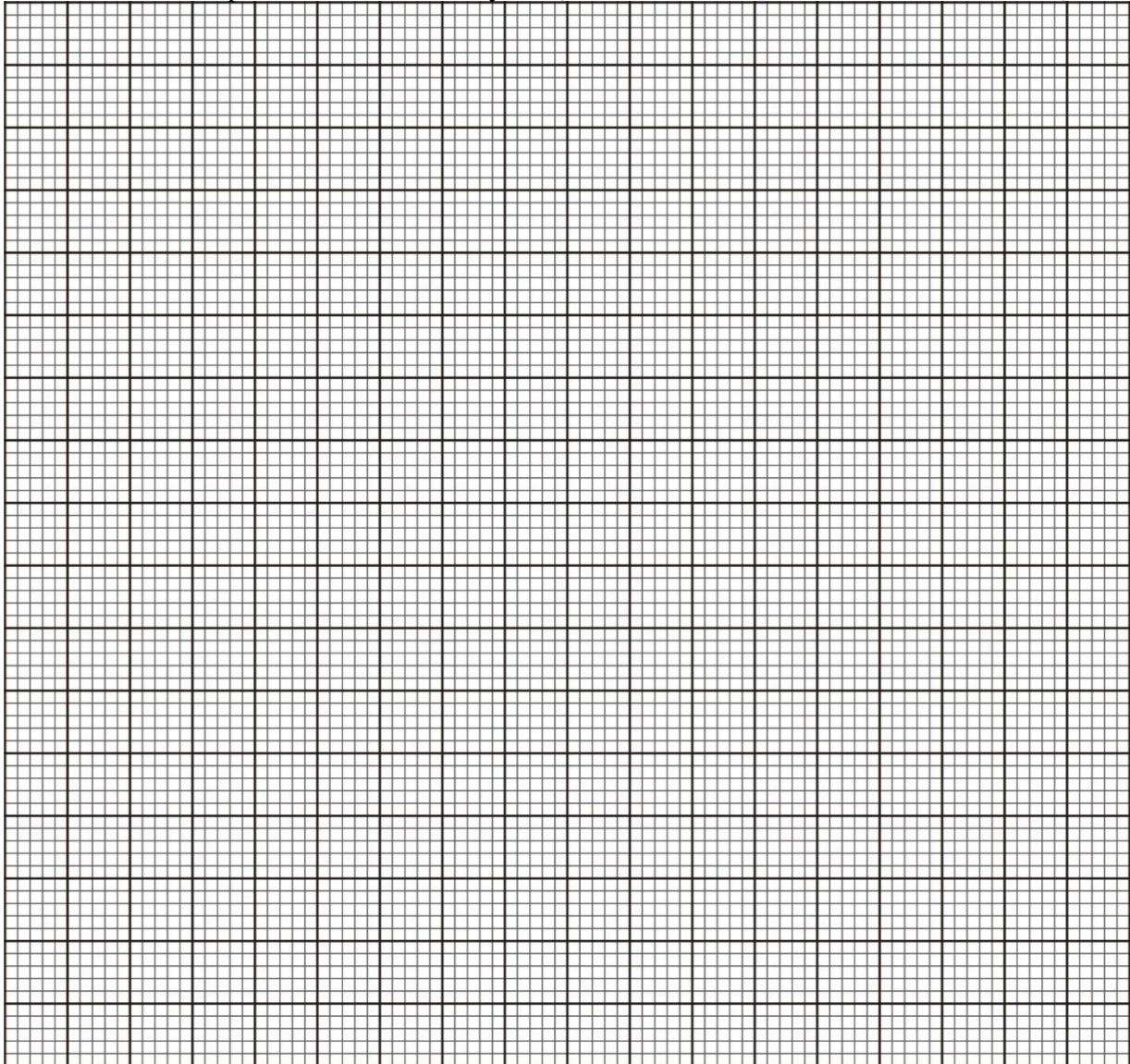
c) use the histogram in (b) above to estimate to 1 decimal place;

i) the median age (1marks)

ii) the 80th percentile age

(1marks)

21. a) Draw the graph of $y = 2x^2 - 4x + 7$ on the grid provided (use the scale 2cm to represent 1 unit on the x-axis and 1cm to represent 5 units on the y-axis) for $-2 \leq x \leq 6$ (5marks)



b) Using the trapezium rule, estimate the area bounded by the curve, the x axis and the lines $x = -1$ and $x = 5$ using 7 ordinates. (2marks)

c) Find

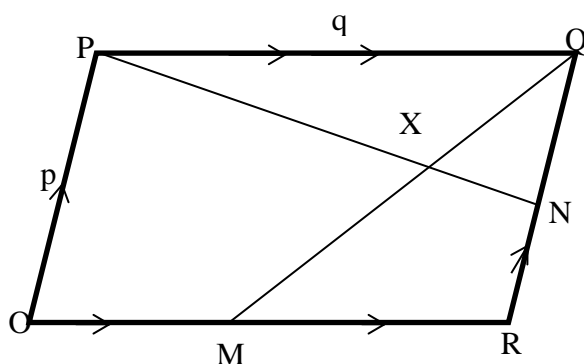
i) the exact area of (b) above

(2mark)

ii) Calculate the percentage error in using the trapezium rule

(1 marks)

22. OPQR is a parallelogram. $\mathbf{OP}=\mathbf{p}$ and $\mathbf{PQ}=\mathbf{q}$, $\mathbf{OM}=\frac{1}{2}\mathbf{OR}$ and N divides \mathbf{RQ} in the ratio 2:3. X is the point of intersection of \mathbf{PN} and \mathbf{QM} .



a) Express in terms of \mathbf{p} and \mathbf{q}

i) \mathbf{QR}

(1mark)

ii) \mathbf{QM}

(1mark)

iii) \mathbf{PN}

(1mark)

b) Given that $\mathbf{PX}=\mathbf{sPN}$ $\mathbf{OX}=\mathbf{tQM}$ find the values of \mathbf{s} and \mathbf{t}

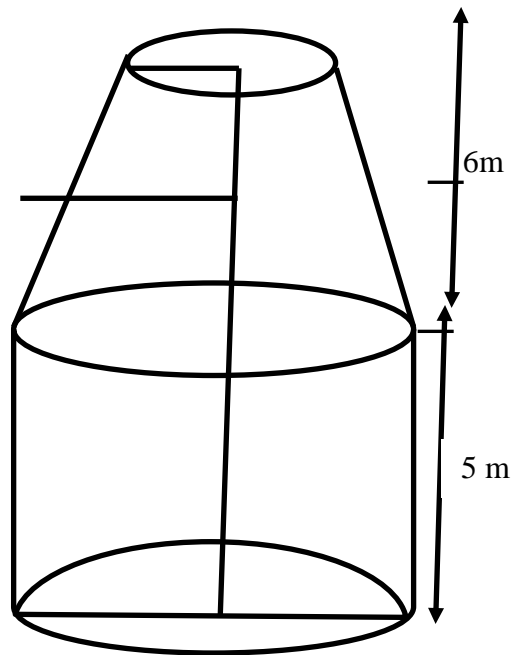
(5 marks)

c) Show that \mathbf{Q},\mathbf{X} and \mathbf{M} are collinear

(2marks)

23. A cereal vendor deals with two grades of maize, Grade **A** and grade **B**. Grade **A** costs ksh.2500 per 90 kg bag while grade **B** costs shs.1500per 90kg bag respectively.
- a) The vendor mixes grade **A** maize with grade **B** maize in the ratio $x: y$ and sells the mixture at shs 2016 per 90 kg bag making a profit of 12%. Determine the ratio $x: y$ in its simplest form. (4 marks)
- b) Had the vendor packaged and sold the mixture in 2kg tins, he would have made a profit of sh.10 per tin. Calculate the selling price per 2kg tin. (3marks)
- c)To increase his sales the vendor mixed one bag of grade A maize with one bag of the mixture in (a) above. Calculate the ratio of Grade **A** to Grade **B** maize in the new mixture. (3 marks)

24. A right conical frustum of top radius 3.5m and a height of 6m is fixed onto a cylinder of base radius 7m and a height of 5m to form a closed solid as shown below.



Find

a) The volume of the solid (5marks)

b) Cost of painting the solid if 0.5m^2 requires shs.50 (5marks)
(take $\pi = \frac{22}{7}$)

121/2
 MATHEMATICS ALT A.
 PAPER 2
 JUNE / JULY 2016
 2 ½ HOURS

Nakuru Sub County Trial Examination 2016 Kenya Certificate of Secondary Education

MATHEMATICS ALT. A.
 PAPER 2
 2½ HOURS

INSTRUCTIONS TO CANDIDATES

- j) Write your name and index number in the spaces provided above.
- k) Sign and write the date of examination in the spaces provided
- l) This paper consists of two sections: **Section I and Section II.**
- m) Answer all the questions in Section I and only five from section II
- n) All answers and working must be written on the question paper in the spaces provided below each question.
- o) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- p) Marks may be given for correct working even if the answer is wrong.
- q) Non- programmable silent electronic calculators **and** KNEC Mathematical tables may be used except where stated otherwise.
- r) Candidates should check the question paper to ascertain that all the 24 questions are printed.

For Examiner's Use Only

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

SECTION II

17	18	19	20	21	22	23	24	Total

**Grand
Total**

- This paper consist of 15 printed papers

SECTION I (50MARKS)

Answer all questions in this section in the spaces provided

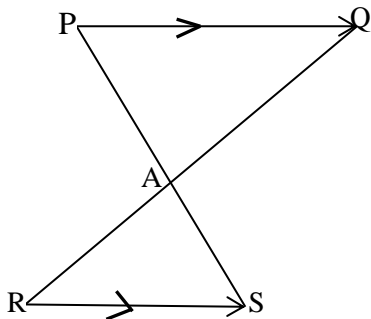
1. Use logarithm, correct to 4 decimal places to evaluate

$$\sqrt[3]{\frac{7.071}{456.3 \sin 45^\circ}} \quad (4\text{marks})$$

2. Make **V** the subject of the formula

$$Mgh - \frac{1}{2}mV^2 = 1 \quad (3\text{marks})$$

3. In the figure below **PQ** is parallel to **RS**. **PS** and **QR** intersect at **A**. Given that **PQ**=9cm, **RS**=3cm and **AS**=4cm, calculate the length of **PS** .(3marks)



4. During the 1998 Safari rally, our local driver Patrick Njiru covered 550km in 2hours. Find the percentage error in his speed. (3marks)

5. Without using tables or calculator evaluate

$$\frac{\text{Log}729 - \log 81}{\text{Log}3}$$

(3marks)

6. The area of a sector of a circle of radius 15cm is 270cm^2 . If the area of the sector subtends an angle θ at the centre of the circle, calculate:

a) The size of angle θ in radians

(2marks)

b) The length of the arc subtended by the angle θ

(1mark)

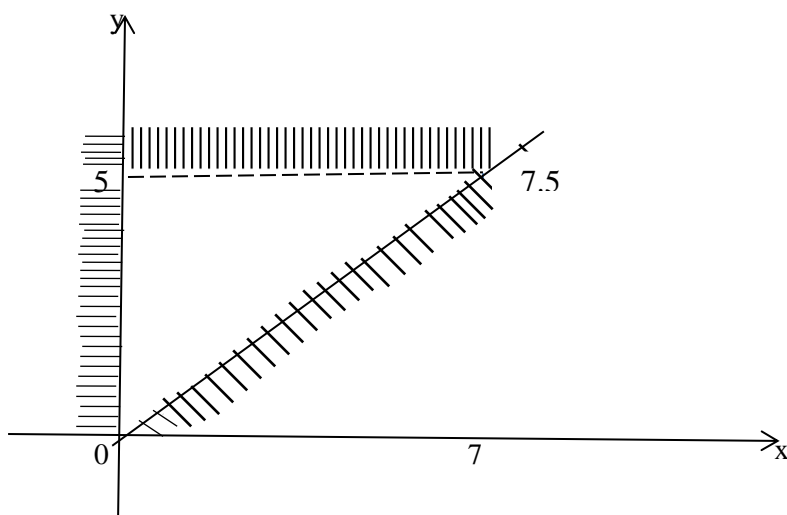
7. Two taps **P** and **Q** can fill a cistern in 68 minutes and 4 minutes respectively. Another tap **R** can drain the same cistern in 8 minutes. Tap **Q** and **R** are opened for 2 minutes and then tap **P** is opened. Find the time taken to fill the cistern.

(3marks)

8. If $\frac{\sqrt{3}}{2-\sqrt{5}} = a\sqrt{b} + c\sqrt{d}$, find the values of **a**, **b**, and **d** where they are rational numbers.

(3marks)

9. Write down the inequalities that defines the unshaded region



10. A two digit number is such that the product of its tens and ones is 56. When the digits are reversed the number formed exceeds the original number by 9. Find the number. (3marks)

11. The shopping centres Mwanzo and Mwisho are 17km apart. Nanjala walks towards Mwisho at an average speed of 9km/h. Forty five minutes later Cheron cycles from Mwanzo towards Mwisho at an average speed of 30km/h. Calculate the distance from Mwisho when Cheron catches up with Nanjala. (3marks)

12. Solve the equation

$$4\sin^2(x-10) = 3 \quad \text{for } 0 \leq x \leq 180 \quad (3\text{marks})$$

13.a) Expand and simplify the expression $(1+2x)^6$ (2 marks)

b) Use the first four terms of the expression in (a) above to find the approximate value of $(1.02)^6$
(2marks)

14. The mass of a cylinder varies jointly as the square of the radius and its height. If the radius is increased by 20% and the height is decreased by 10%, find the percentage change in mass.
(3marks)

15. Evaluate $\int_{-2}^3 (x^3 - 2x^2 + 5)dx$ (3marks)

16. The equation of a circle is given by $x^2 + y^2 + 6x - y + 7 = 0$. Find the centre and radius of the circle
(3marks)

SECTION II (50marks)

Answer only five question from this section in the spaces provided

17. The table below shows the income tax rates in a certain year.

Total income in k£per annum	Rate in shs per pound
1-3900	2
3901-7800	3
7801-11,700	4
11701-15600	5
15601-19500	7
Over 19500	7.5

Mrs.Masau earned a basic salary of ksh18600 per month and allowances amounting to ksh 7800 per month. She claimed a personal relief of ksh 1080 per month.

Calculate:

a) Total taxable income in k£ p.a (2 marks)

b) i) the tax payable in ksh per month without relief (4marks)

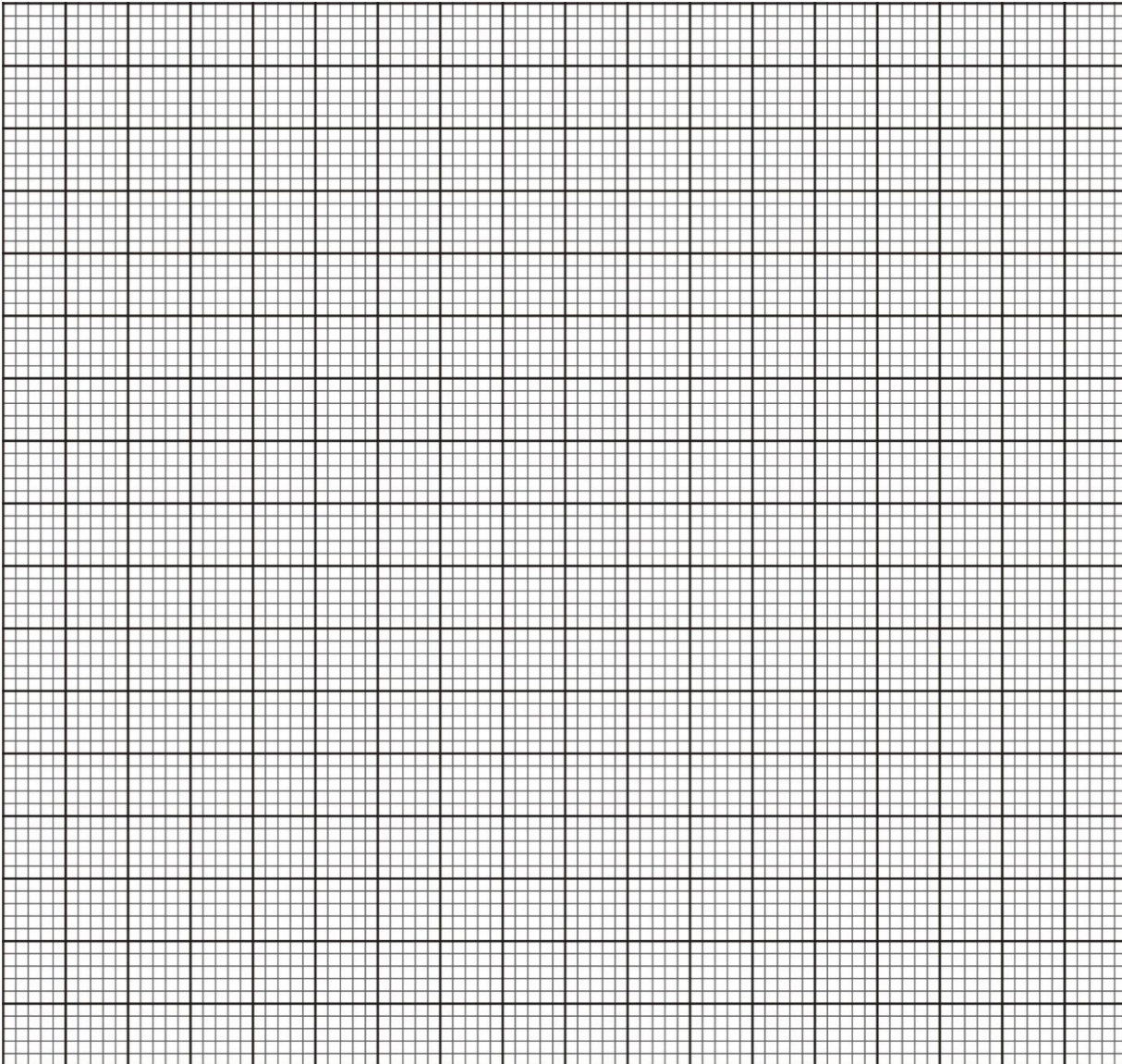
ii)the tax payable in ksh per month after relief (2marks)

c) Mrs. Musau's net monthly income (2marks)

18.a) Complete the table below for $y = x^3 + 2x^2 - 5x - 4$ (2marks)

x	-4	-3	-2	-1	0	1	2	3
$Y = x^3 + 2x^2 - 5x - 4$	-16		6		-4			26

b) On the grid provided, draw the graph of $y = x^3 + 2x^2 - 5x - 4$ for $-4 \leq x \leq 3$. Use 2cm to represent 1 unit on the x axis and 2cm to represent 5 units on the y axis (3marks)



c) i) Use the equation to solve the equation $x^3 + 2x^2 - 5x - 4 = 0$ (2marks)

ii) By drawing a suitable straight line on the graph, solve the equation $x^3 + 2x^2 - 2x - 10 = 0$ (3marks)

19. In a second year class of a certain college, $\frac{2}{3}$ are boys and the rest are girls. $\frac{4}{5}$ of the boys and $\frac{9}{10}$ of the girls are right handed, the rest are left handed. The probability that a right handed student will answer a question correctly is $\frac{1}{10}$ and the corresponding probability for a left handed student is $\frac{3}{10}$ irrespective of the sex.

(a) Draw a tree diagram to represent the above information (2marks)

(b) Determine:

i) The probability that a student chosen at random from the class is left hand (3 marks)

ii) The student is a girl and answers the questions incorrectly (1mark)

iii) The probability that a question is answered correctly (4marks)

20. The table below shows marks obtained by 60 form four students in an English test.

Marks	No. of students
40-44	5
45-49	10
50-54	20
55-59	15
60-64	5
65-69	3
70-74	2

(a) State the modal class (1mark)

(b) Using an assumed mean of 52,
Calculate:

(i) The actual mean (3marks)

(ii) The standard deviation (3marks)

(c) Estimate the median mark (3marks)

21. The table below shows data collected from an experiment involving two variables **P** and **T**

P	6.0	5.3	4.5	3.9	3.1	2.4	1.4
T	1.33	0.48	0.40	0.28	0.23	0.18	0.14

The variables are believed to satisfy an equation of the form $p = \frac{k}{T} + m$ where **k** and **m** are constants.

a) For each of the value of **T** in the table above, write down the value of $\frac{1}{T}$ (1mark)

b) (i) Using the scale 2cm to represent 1 unit on both axes draw a suitable straight line graph on the grid provided. (3marks)

ii) Use the graph to estimate the value of **k** and **m** (3marks)

iii) Write down the equation connecting **P** and **T** (1mark)

c) using the equation of (b)(iii) above, determine to 2 decimal places the value of **p** when **T**=8 (1mark)

22. a) A plane flew due East to a town **Q** from a town **P**(60°N, 16°W). The plane covered a distance of 5400km.

Find;

i) Find the position of **Q** (4marks)

ii) The time at **P** when the time at **Q** is 0140hrs on a Wednesday. (3marks)

b) Another plane flew **P** to **Q** through the North Pole at a speed of $667\frac{1}{3}$ km, determine the time taken by the plane (take $\pi = \frac{22}{7}$, $R = 6370$ km) (3marks)

23. Four schools, Flamingo, Central, Afraha and Christ the King are such that Central is 2000m on a bearing 120° from Flamingo, Afraha is 4000m on a bearing of 240° from Central and Christ the King is 1200m on a bearing 020° from Afraha

a) Using a scale of 1cm to represent 500m draw a diagram to show the relative positions of the schools. (4marks)

Use the scale drawing to determine:

b) The distance between:

i) Afraha and Flamingo (2marks)

ii) Christ the King and Central (2marks)

c) The bearing of:

i) Christ the King from Flamingo (1mark)

ii) Central from Christ the King (1mark)

24. Mr. Ondieki wishes to take students for a tour. The number of students to be taken should be at least 60. Each girl should contribute ksh 1000 and each boy ksh 1500 and the money to be contributed must not exceed shs. 120000. If this trip is to be successful the number of boys must be greater than the number of girls. The boys must be less than 50.

(a) Write down four inequalities to represent this information taking the number of boys and girls to be x and y respectively. (4 marks)

(b) Represent the above information on the grid provided. (4 marks)

(c) Determine the optimum number of boys and girls to be taken in order to minimize the cost. (2 marks)

121/1
 MATHEMATICS
 PAPER 1
 JULY/AUGUST, 2016
 TIME: 2 ½ HOURS

NYANDARUA COUNTY MID – YEAR EXAM – 2016
Kenya Certificate of Secondary Education (K.C.S.E)

121/1
 MATHEMATICS
 PAPER 1
 JULY/AUGUST, 2016
 TIME: 2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

- a) Write your Name and Index number in the spaces provided above
- b) Sign and write the date of examination in the spaces provided.
- c) Answer all the questions in section I and only five questions from section II.
- d) All answers and working must be written on the question paper in the spaces provided below each question.
- e) Show all the steps in your calculations giving your answers at each stage in the spaces below each question.
- f) Marks may be given for correct working even if the answer is wrong.
- g) Non-programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.
- h) **This paper consists of 12 printed pages. Candidates should check the question paper to ascertain all the pages are printed as indicated and no questions are missing.**

FOR EXAMINERS USE ONLY

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

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SECTION I (50 MARKS)

Answer All questions in this section in the spaces provided

1. Evaluate without using calculator giving your answer in simplified form. (3mks)

$$\frac{\frac{1}{2} \text{ of } 3\frac{1}{2} + 1\frac{1}{2} \left(2\frac{1}{2} - \frac{2}{3} \right)}{\frac{3}{4} \text{ of } 2\frac{1}{2} \div \frac{1}{2}}$$

2. a) A dress maker had a ribbon which he intended to cut into equal length of either 28 cm, 16cm or 40cm.
Determine
a) The shortest length of ribbon that he would use to obtain an exact number of pieces. (2mks)

b) The number of 16cm pieces that can be obtained from the ribbon. (1mk)

3. Use logarithm tables to evaluate to 4 s.f. (4mks)

$$\frac{15.23^2 \times \sqrt{7.234}}{528.4}$$

4. Four interior angle of a polygon are each 155° , while the rest are each 160° , find the number of sides in this polygon. (3mks)

5. A metal bar with a cross-sectional area of 44cm^2 has a mass of 5.06kg. The density of the bar is 2.3 g/cm^3 . Calculate the length in cm of the bar. (2mks)

6. Given that $x = 3$, $y = 2$ and $z = -1$. Find the value of (3mks)

$$\frac{4xyz - 2xz^2 - 5y}{xy^3z + 3xz^3 + 4y}$$

7. Solve for x in the equation (2mks)
 $\sin(4x - 20^\circ) - \cos(x + 60^\circ) = 0$

8. The cost of buying a certain car outside Kenya is US \$ 4800. You intend to buy one such car through an agent who deals in Japanese yen. The agent charges 15% commission on the price of the car and a further 72220 Japanese yen for shipment.

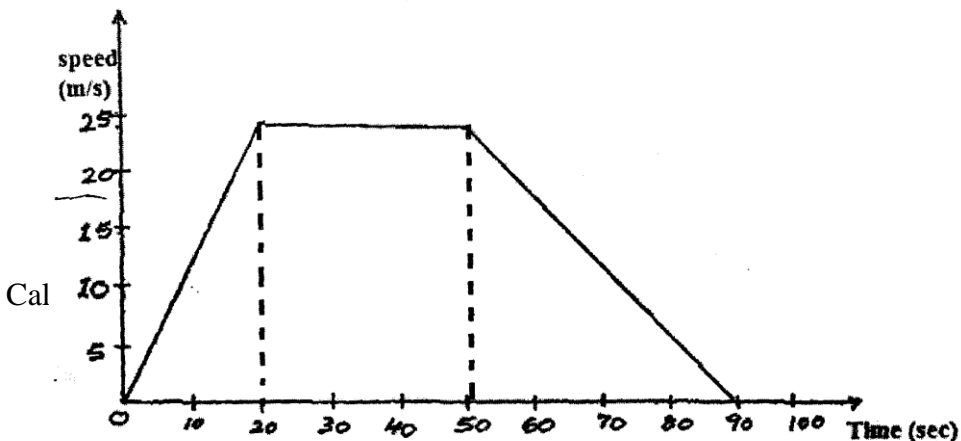
How much money in Kenya shillings will you need to send the agent to obtain the car. (4mks)

US \$1 = 117.20 Japanese yen.

US \$ 1 = Ksh. 103.34

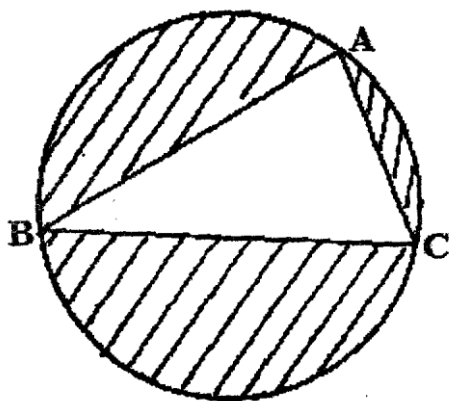
9. Given that $a = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$ and $b = \begin{bmatrix} 3 \\ 0 \end{bmatrix}$. Determine the magnitude of the line OM if $OM = a - 3b$ and O is the origin. (3mks)

10. The diagram below is a speed time graph for a car that travelled between two stations in 90 secs.

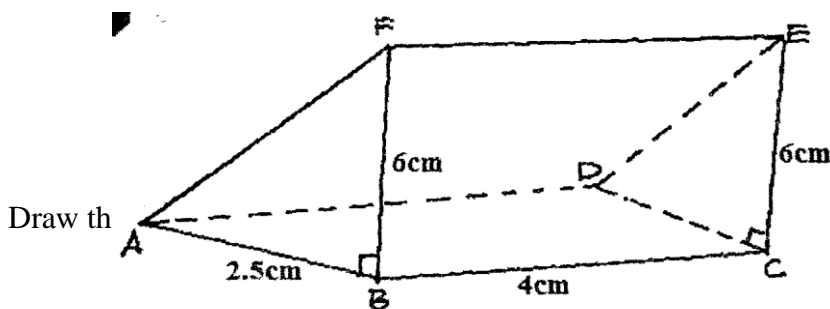


(3mks)

11. In the figure below a triangle ABC is enclosed in a circle AB= 6.3cm, AC = 4.2cm and BC = 5.7cm. Find the area of the shaded region. (5mks)



12. The figure below is a rectangular prism with a right-angled triangle ABC attached to its base. AB = 2.5cm, BF = 6cm and BC = 4cm.



Draw the

(2mks)

13. Solve the following simultaneous inequalities and show your solution on a number line. (3mks)

$$\frac{x-3}{3} < 1 \text{ and } 3x + 1 \geq -17$$

14. The angle of elevation of the top of a storey building from point P is 23.6° . From another point Q 6m from P and nearer to the base of the building the angle of depression from the top of the building is 35° . Calculate to 1 d.p the height of the building.

(4mks)

15. Simplify $\left(\frac{1}{3}\right)^{-3} \times 27^{\frac{-2}{3}} \times (4^{-1})^0$ (2mks)

16. The ratio of Eunice's cows to goats is 5 : 4. On a certain market day he sold a $\frac{1}{4}$ of the goats and $\frac{1}{5}$ of the cows. If she had sold 5 more animals from the herd only $\frac{2}{3}$ of the original number could have been left. How many animals were there before the sale?
(3mks)

SECTION II (50 MARKS)

Answer ONLY FIVE questions in this section

17. The following are masses of 25 students in form 4 class.

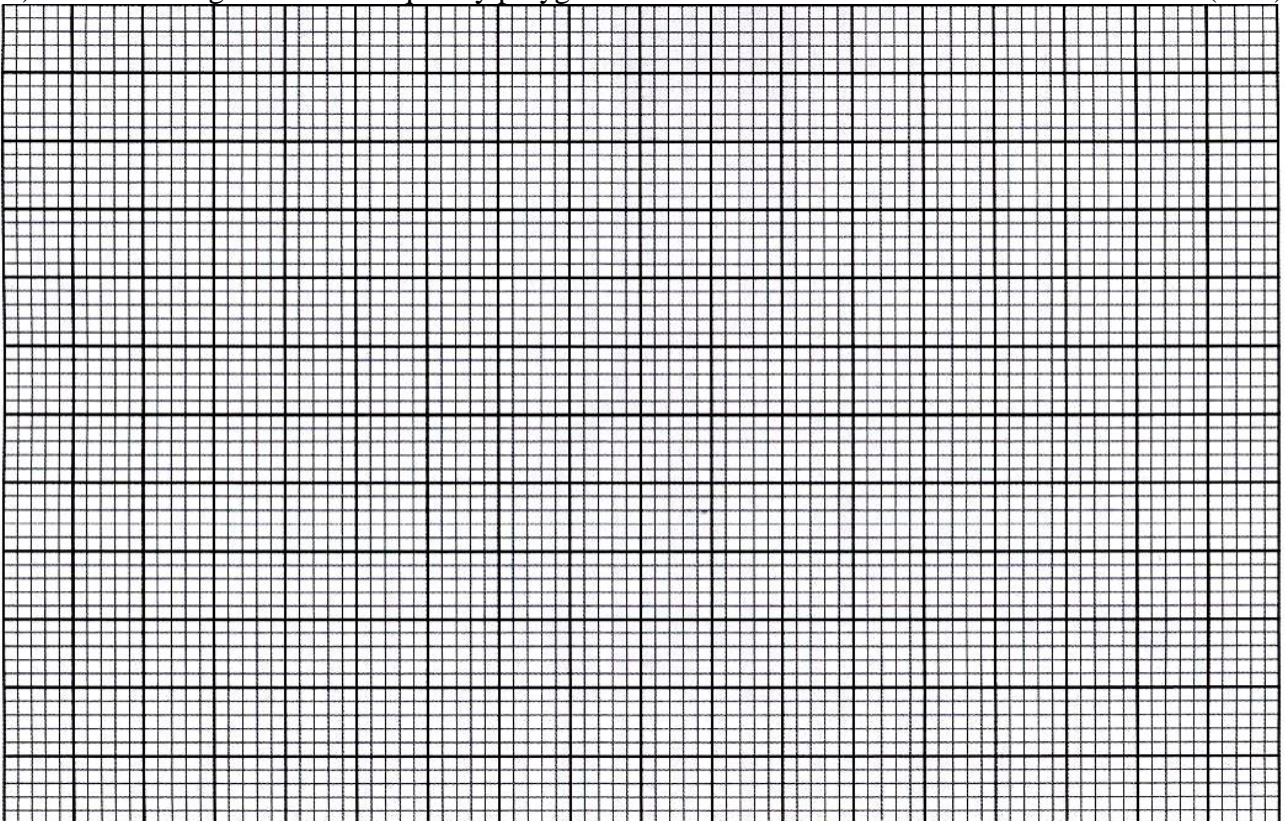
49, 51, 50, 60, 55, 45, 56, 51, 58, 59, 44, 59, 42, 50, 62, 46, 43, 57, 56, 52, 43, 41, 40, 54, 44.

a) Draw a frequency distribution table with lower class as 40—43. (3mks)

b) Estimate the median. (3mks)

c) On the grid provided draw a histogram for the data. (3mks)

d) On the same grid draw a frequency polygon. (1mk)

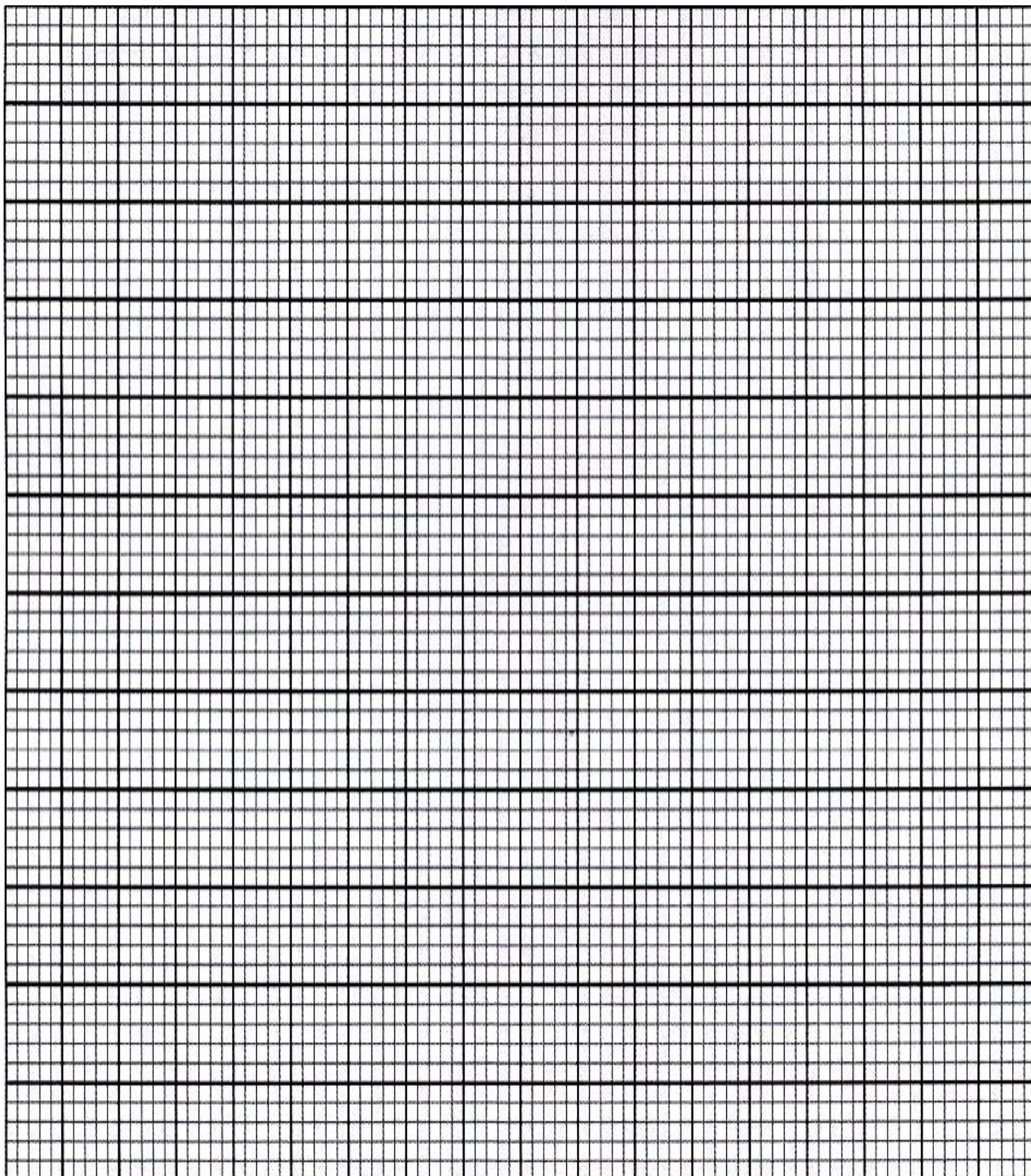


18. a) Using a ruler and compass only, construct ABC on the spaces provided below with $AB=7.4\text{cm}$, $BC=5.9\text{cm}$ and $AC = 9.3\text{cm}$ (2mks)
- b) Mark a point M on the same diagram, the mid-point of AB. (1mk)
- c) Using a ruler and compasses, construct a line passing through M and parallel to AC meeting BC at N. (2mks)
- d) Measure MN. (1mk)
- e) What figure is AMNC? (1mk)
- f) Drop a perpendicular line from M to intersect line AC at Q, hence determine the area of AMN correct to 2d.p. (3mks)

19. The points $P(1,5)$, $Q(2,2)$, $R(1,1)$ and $S(4,2)$ are vertices of a quadrilateral PQRS.

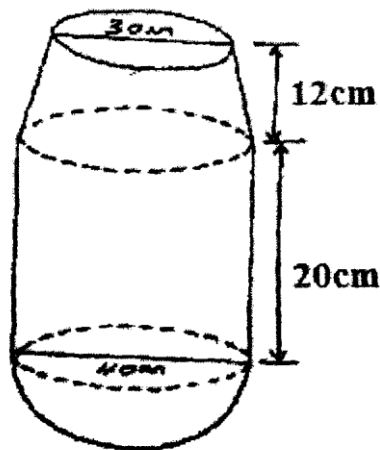
a) On the same grid provide, draw the quadrilateral PQRS.

(2mks)



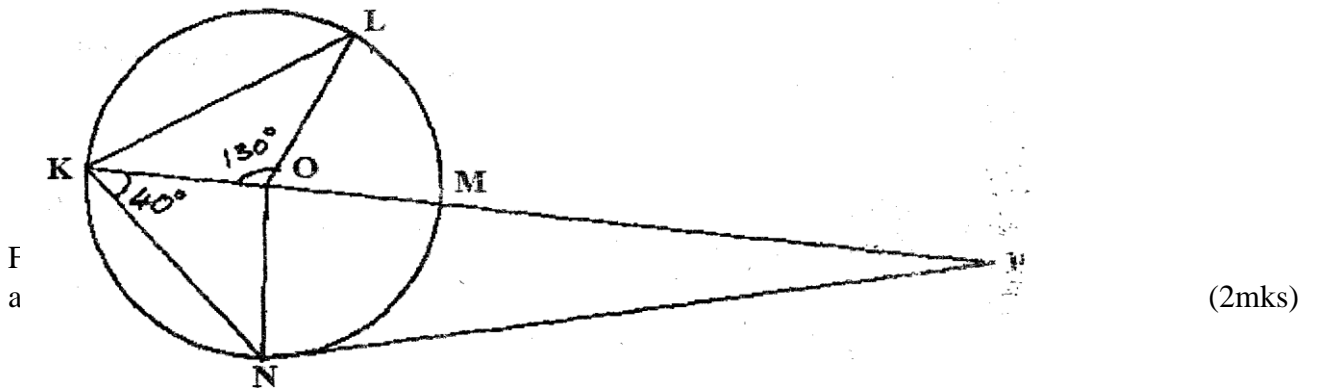
- b) On the same grid provided above draw $P^1Q^1R^1S^1$ image of PQRS under a rotation of positive quarter turn about the origin. State the co-ordinates of $P^1Q^1R^1S^1$.
(3mks)
- c) The point $P^{11}Q^{11}R^{11}S^{11}$ are the images of $P^1Q^1R^1S^1$ under reflection in the x-axis. On the same grid, draw quadrilateral $P^{11}Q^{11}R^{11}S^{11}$ and state its co-ordinates.
(3mks)
- d) Quadrilateral $P^{11}Q^{11}R^{11}S^{11}$ is the image of PQRS under a certain reflection. On your graph, draw the mirror line L for the reflection and find its equation.
(2mks)

20. A sulphuric acid storage tank is constructed as shown in the diagram below with frustrum of a cone on top, cylindrical body and hemispherical bottom.



- a) Given that the top diameter is 30m and the bottom is 40m. Calculate the total volume of the tank to the nearest m^3 . (Take $\pi = \frac{22}{7}$)
(7mks)
- b) A filler pipe takes 6 hours to fill a $\frac{1}{3}$ of the tank. If the tank is already $\frac{1}{4}$ full. At what time will it fill the tank if the filler pipe is opened at 8.20 am?
(3mks)

21. In the figure below KLM and N are points on the circumference of the circle centre O. The point K,O,M and P are on a straight line. PN is a tangent to the circle at N angle KOL = 130° and angle KN = 40°



b) angle OLN (2mks)

c) angle LNP (2mks)

d) angle LMN (2mks)

e) angle MPN (2mks)

22. A group of teachers decided to raise ksh. 144,000 to buy a plot of land. Each teacher was to contribute the same amount. Before the contributions were made five of the teachers retired. The remaining teachers had each to contribute more by ksh. 2400 to meet their target. If there were x teachers originally.
- (i) Write down an expression for the amount that teachers were to contribute originally. (1mk)
- (ii) Write down an expression for the amount that each teacher was to contribute after five teachers retired. (1mk)
- (iii) Write down an equation in x and solve for x . (5mks)
- (iv) Calculate the percentage increase of the contribution per teacher. (3mks)

23. a) A straight line passes through the point (8, -2) and (4, -4) has its equation in the form $ax + by + c = 0$ where a, b and c are integers. Determine the numerical values of a, b and c. (3mks)
- b) If the line at (a) above cuts the x -axis at point P, determine the co-ordinates of P. (2mks)
- c) Another line which is perpendicular to the line (a) above passes through point P and cuts the y axis at Q. Determine the co-ordinates of point Q. (3mks)
- d) Find the length of QP. (Leave your answer in surd form) (2mks)
24. A particle moves in a straight line such that its displacement x metres from a point O is given by $X = t^3 - 7t^2 - 5t + 7$. Calculate
- a) The initial displacement of the particle from O. (1mk)
- b) The time when the particle is momentarily at rest. (4mks)
- c) The distance moved by the particle during the 4th second. (3mks)
- d) The acceleration of the particle when $t = 3$ sec. (2mks)

121/2
 MATHEMATICS
 PAPER 2
 JULY/AUGUST, 2016
 TIME: 2 ½ HOURS

NYANDARUA COUNTY MID – YEAR EXAM – 2016
Kenya Certificate of Secondary Education (K.C.S.E)

121/2
 MATHEMATICS
 PAPER 2
 JULY/AUGUST, 2016
 TIME: 2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

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SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND TOTAL

--

SECTION I(50MARKS)

Answer ALL questions in this section in the spaces provided

1. The length and width of a rectangle is given by 5.0cm and 3.24 cm respectively. Calculate the percentage error in the calculation of its perimeter (3mks)

2. Make t the subject of the formula. (3mks)

$$W = \sqrt{\frac{t+r}{t}}$$

3. Simplify $\frac{7}{\sqrt{5}+\sqrt{3}} - \frac{7}{\sqrt{5}-\sqrt{3}}$ (3mks)

4. Ten people can build 6 houses in 21 days. How many people working at the same rate will build 12 similar houses in 15 days. (2mks)

5. A businessman invested sh. 450000 in a bank for two years. Calculate the amount he got after the two years if interest was compounded semi-annually at the rate of 3% per annum. (3mks)

6. The gradient function of a curve is given by $\frac{dy}{dx} = 3x^2 - 4$.

Find the equation of the curve given that $y=6$ when $x=4$. (3mks)

7. Find the sum of the first 20 terms of the series. (2mks)
 $15 + 18 + 21 + \dots\dots\dots$

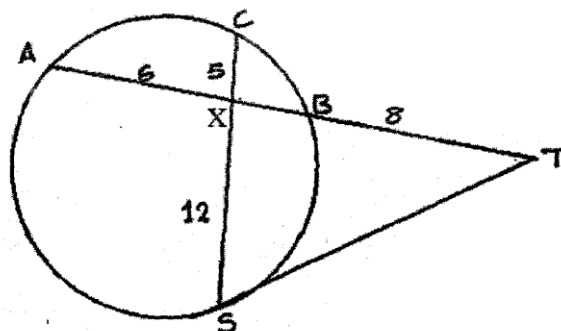
8. a) Expand $(1 - x)^4$ (1mk)

b) Use the first 4 terms of the expansion in part (a) above to find the value of $(0.8)^4$ to two decimal places. (2mks)

9. Solve the simultaneous equation (4mks)
 $2 \log y = \log 2 + \log x$
 $2^y = 4^x$

10. A processing company mixes three types of P, Q and R in the ratio $P:Q = 3:4$ and $Q:R = 1:2$. If the mixture contained 336 litres of R, find the required number of litres of Q. (3mks)

11. In the figure below, ST is a tangent to the circle at S. AXBT and CXS are straight lines. AX = 6 cm, SX = 12 cm, XC = 5 cm and BT = 8 cm.



Find the length of

a) XB

(2mks)

b) ST

(2mks)

12. Three quantities P, Q and R are such that P varies directly as Q and inversely as the square root of R. Given that P = 4 when Q is 12 and R is 9, determine the equation connecting P, Q and R. (3mks)

13. The figure below represents a triangular prism. The faces ABCD and ADEF and CBFE are rectangles. AB = 4cm, BC = 7cm, BF = 3.5cm and AF = 3.5cm.

Calculate the angle between faces BCEF and ABCD.

(3mks)

14. Points A (5,3) and B (2,5) are the ends of the diameter of a circle. Determine the centre of the circle and its equation in the form $x^2 + y^2 + ax + by + c = 0$. (4mks)

15. Solve for x in the equation $2 - 2 \sin^2 x = 2 \cos x - \frac{1}{2}$ for $0 \leq x \leq 360^\circ$. (4mks)

16. Point A ($48^{\circ}\text{N } 26^{\circ}\text{E}$) and B ($48^{\circ}\text{N } 84^{\circ}\text{E}$) are points on the earth surface. Calculate the distance between A and B in nautical miles. (3mks)

SECTION II (50 MARKS)

Answer ONLY five questions in this section

17. The table below shows monthly income tax rates in year 2008.

Income K£ p.a	Rate %
1- 5808	10
5809 – 11280	15
11281 – 16752	20
16753 – 2224	25
2225 – 27696	30
27697 and above	35

Mr. Waweru is a civil servant. His monthly earnings are a basic salary of ksh. 42000, a house allowance of ksh. 12000, medical allowance of sh .2, 680 and hardship allowance equivalent of 30% of his basic salary. He is entitled to a personal relief of sh. 1056 per month.

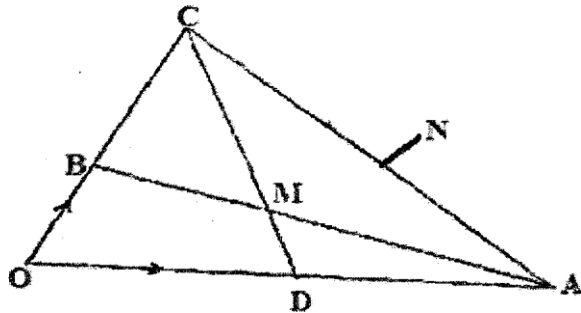
Calculate

- a) taxable income in k£ p.a (3mks)

- b) net tax per month in ksh (5mks)

- c) net pay per month in ksh (2mks)

18. In the figure below $OA = a$, $OB = b$ and $OC = 3OB$



a) Given that

i. $OM = tOA$

and $AM = sAC$, determine the position vector of M. Determine in terms of a and b.

(1mk)

ii. $CM = kCD$

(1mk)

b) Given that $CM = kCD$ and $AM = hAB$. Determine the values of the scalars k and h.

(5mks)

c) Show that points O, M and N are collinear.

(3mks)

19. a) Four officials are to be selected from a group of 18 girls and 6 boys. Calculate the probability of selecting 3 girls and one boy in the group. (3mks)

b) The probability that Wanjiku answers the first question correctly in a test is $\frac{2}{5}$. The probability that she gets the second one correct if she gets the first one correct is $\frac{3}{5}$ but if the first one is wrong, the probability that the second is answered correct is $\frac{4}{5}$. If the second one is correct, the chance of getting the third one correct is $\frac{3}{5}$ otherwise it is $\frac{1}{5}$. Draw a tree diagram and use it to find the probability that;

i. all the three are correct. (3mks)

ii. two out of the three are correct. (2mks)

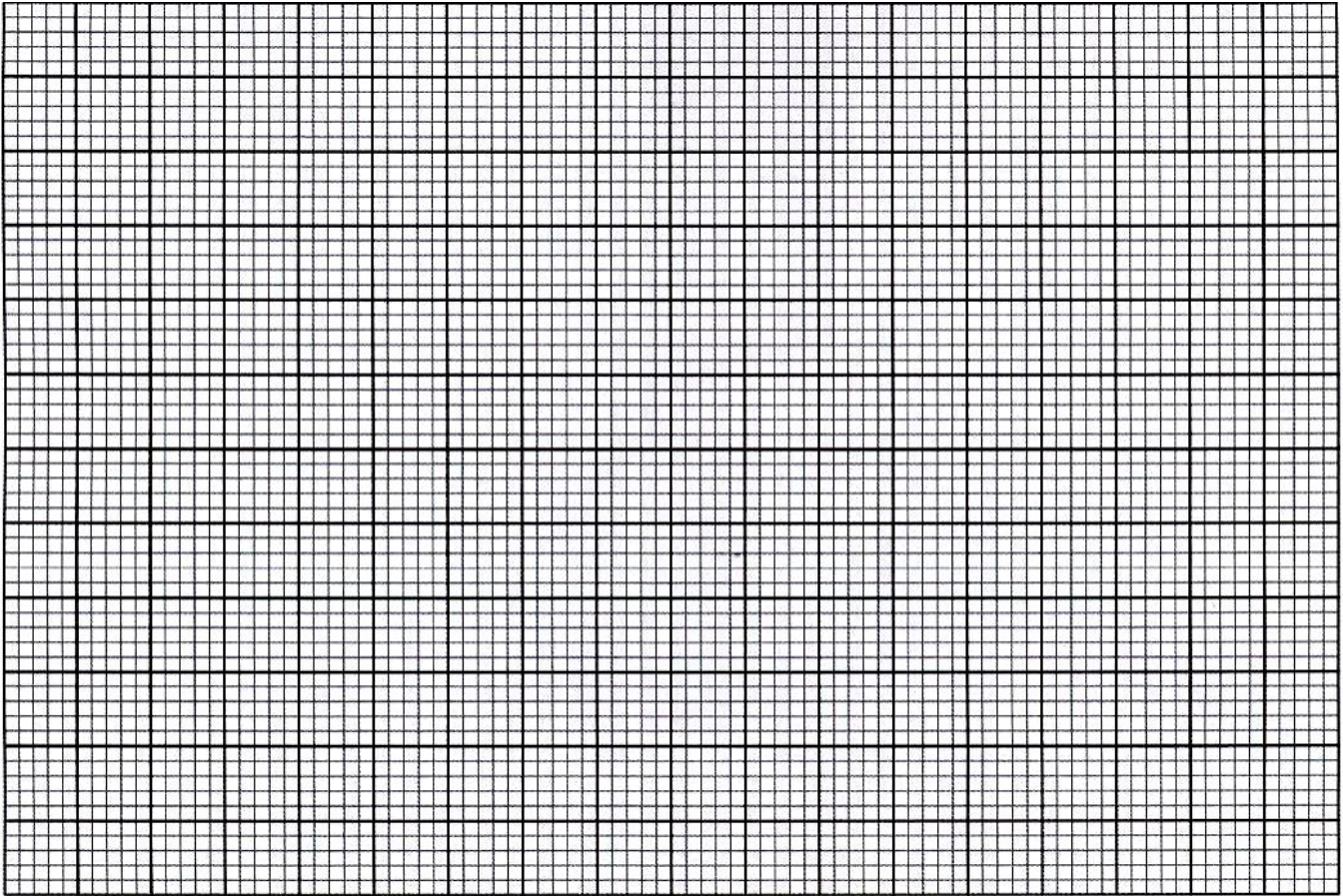
iii. at least two are correct. (2mks)

20. In a physics experiment, Kamau a form four student carried out an experiment to determine the average volume of irregular solids of the same shape. He started by submerging three solids in a measuring cylinder until the solids were 9. The table below shows the results.

Number of solids (x)	3	4	5	6	7	8	9
Measuring cylinder reading(cm^3) (y)	98	105	123	131	146	157	170

On the grid provided, draw the graph of x versus y by drawing the line of best fit

(4mks)



b) Use the line of best fit to determine
i) the average volume of soils. (3mks)

ii) the equation of the line (2mks)

c) Use the graph to determine the volume of water in the cylinder. (1mk)

21. The height in cm for 50 baboons in lake Nakuru national park were recorded as follows:

Heights (cm)	Number of baboons
31 – 35	4
36 – 40	8
41 – 45	15
46 – 50	13
51 – 55	7
56 - 60	3

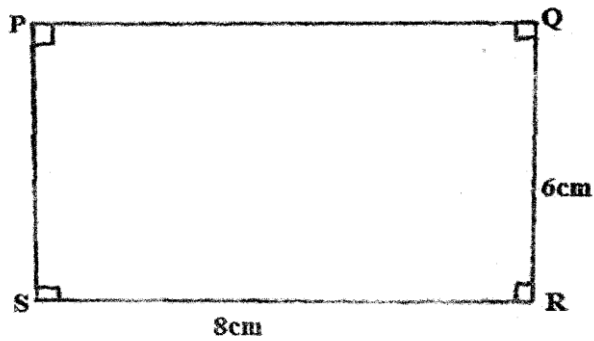
a) C (3mks)

b) Using 48 as suitable assumed mean calculate
i) the mean height (3mks)

ii) the variance (3mks)

iii) the standard deviation (1mk)

22. Below is a scale drawing of Mr. Njoroge's farm in form of a rectangle P,Q,R and S



a) A bore hole x is to be drilled in the farm such that it is equidistant from the points S and R. Given that x is also equidistant from the sides SP and SR,
i) locate the position of x (4mks)

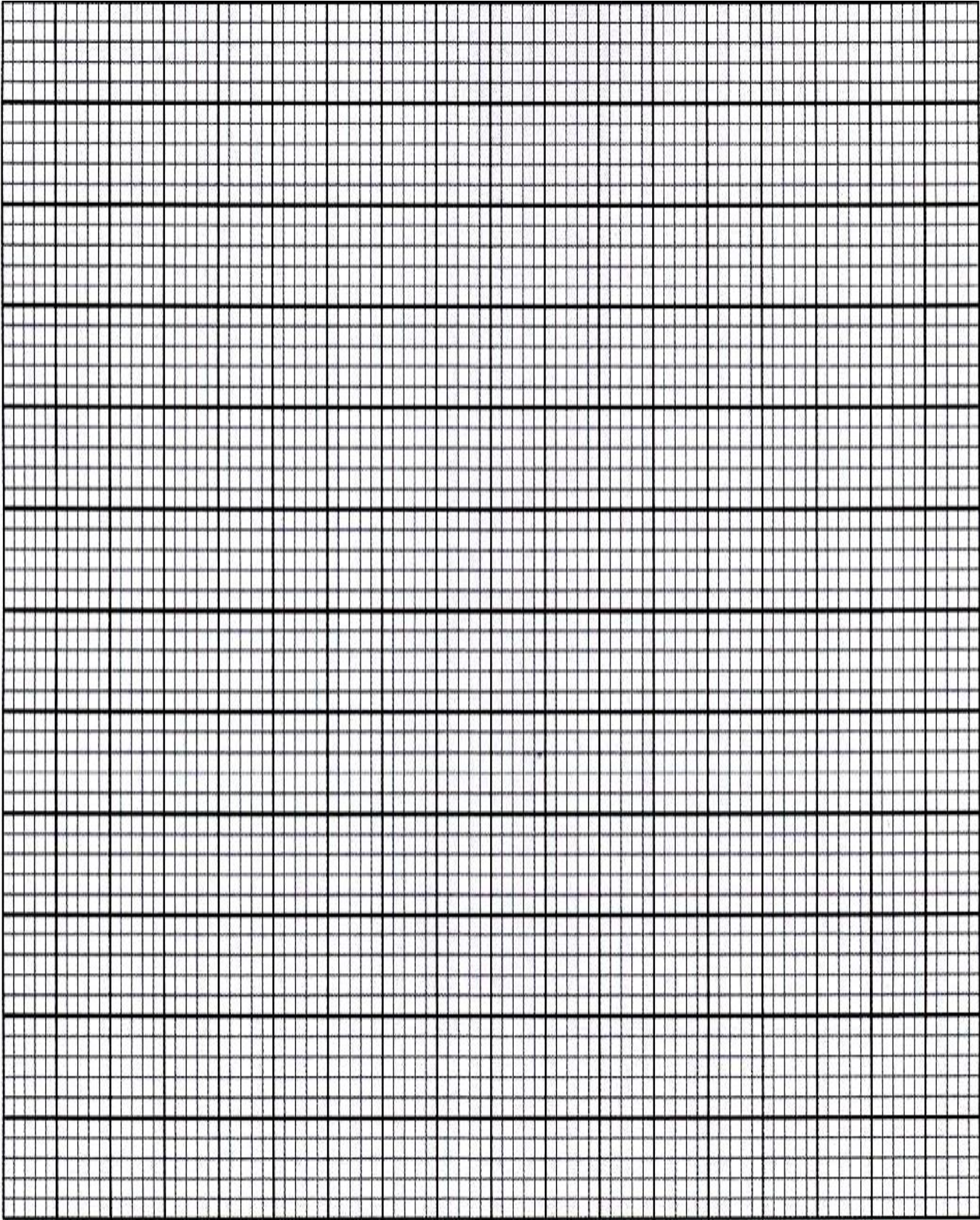
ii) measure the length XQ. (2mks)

b) A point Z is on the same side of edge SR as X. locate all the possible positions of Z given that $\angle SZR = 60^\circ$, use construction. (4mks)

23. A furniture supplier deals in two types of tables the ordinary tables and the special tables. The cost of each ordinary table is ksh.400 while that of each special table is ksh.900. The supplier is prepared to spend a maximum of ksh 22500. It is not profitable for him to supply less than 20 tables. The ordinary tables are less than twice the special tables but more than 15. Taking x to represent number of ordinary tables and y for special tables.

a) Write down all the inequalities in terms of x and y . (3mks)

b) On the grid provided, draw the graph to show all inequalities in (a) above. (4mks)



c) Given that an ordinary table gives a profit of ksh.150 while a special table gives a profit of ksh.300. Find the maximum possible profit. (3mks)

24. a) Use the mid-ordinate rule with 4 ordinates to find the area bounded by the curve $y = 9x - x^2$, the x - axis and the lines $x = 2$ and $x = 6$. (4mks)

b) Using trapezium rule with 4 strips, find the area in (a) above. (3mks)

c) Find the exact area by integration in (a) above. (3mks)

121/1
 MATHEMATICS
 AUGUST/SEPTEMBER
 PAPER 1
 2 ½ HOURS

RARIEDA SUB-COUNTY POST MOCK JOINT EXAMS 2016

Kenya Certificate of Secondary Education (K.C.S.E)

MATHEMATICS
 PAPER 1
 2 ½ HOURS

INSTRUCTIONS TO DANDIDATES

1. Write your name, index number and class in the spaces provided.
2. Sign and write date of the of the examination in the spaces provided.
3. The paper contains two sections: Section I and II
4. Answer ALL questions in section I and 2 **STRICTLY FIVE** questions from section II.
5. All working and answers must be written on the question paper in the spaces provided below each question.
6. Show all the steps in your calculations, giving you're your answers at each stage in the spaces below each question.
7. Marks may be awarded for correct working even if the answer is wrong.
8. Non-programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.

FOR EXAMINER'S USE ONLY

SECTION 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

SECTION II

17	18	19	20	21	22	23	24	25	TOTAL

GRAND TOTAL

This paper consists of 16 printed pages. Candidates should check to ensure that all pages are printed as indicated and no questions are missing.

SECTION I:(50 Marks).

Answers all questions in this section

1. Without using a calculator evaluate

(3 Marks)

$$\frac{\left(3\frac{1}{3} + 1\frac{1}{9}\right) \div 1\frac{1}{3}}{\left(4\frac{2}{9} - 2\frac{5}{9}\right) \times \frac{2}{3}}$$

2. The number $5.8\dot{1}$ contains an integral part and a recurring decimal. Convert the number into an improper fraction and hence a mixed fraction.

(3 Marks)

3. The gradient of curve at any point is given by $2x - 1$. Given that the curve passes through point $(1, 5)$, find the equation of the curve.

(3 Marks)

4. Simplify: $\frac{9x^2 - 1}{3x^2 + 2x - 1}$

(3 Marks)

5. A man invests KSh. 24,000 in an account which pays 16% interest p.a. The interest is compounded quarterly. Find the amount in the account after $1\frac{1}{2}$ years. (3 Marks)

6. Given that $-\frac{3}{5}x + 3y - 6 = 0$ is an equation of a straight line, find:

(i) The gradient of the line

(1 Mark)

(ii) Equation of a line passing through point (2,3) and parallel to the given line.
(2marks)

7. A two digit number is formed from the first four prime numbers.

(a) Draw the table to show the possible outcomes.

(1 Mark)

(b) Calculate the probability that a number chosen from the two digit numbers is an even number.

(1
Mark)

8. Solve for x given that
 $\text{Log}(x - 4) + 2 = \log 5 + \log(2x + 10)$ (3 marks)

9. The position vectors of A and B are given as $\mathbf{a} = 2\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$ and $\mathbf{b} = -2\mathbf{i} - \mathbf{j} + 2\mathbf{k}$ respectively.
Find to 2 decimal places, the length of vector \mathbf{AB} . (3 Marks)

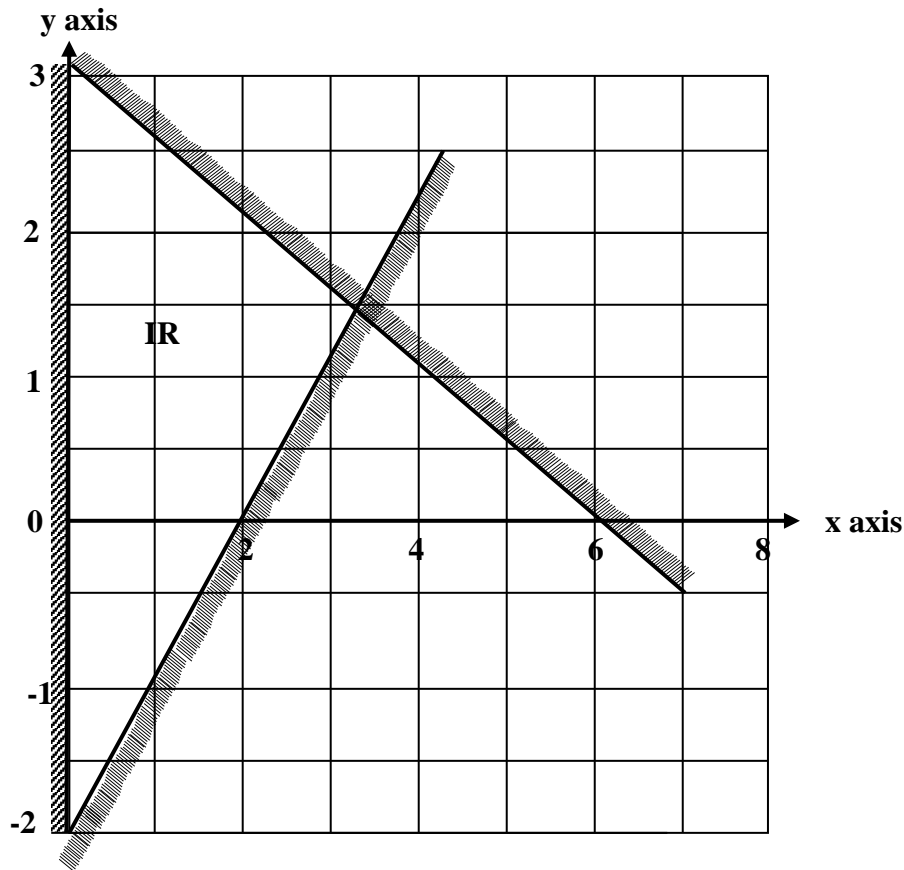
10. A regular polygon has internal angle of 150° and side of length 10cm.
(a) Find the number of sides of the polygon. (2 Marks)

- (b) Find the perimeter of the polygon. (2 Marks)

11. Solve for x in the equation. (3 Marks)

$$9^{(2x-1)} \times 3^{(2x+1)} = 243$$

12. The region R in the figure below is defined by the inequalities L1, L2 and L3.



Find the three inequalities

(3 Marks)

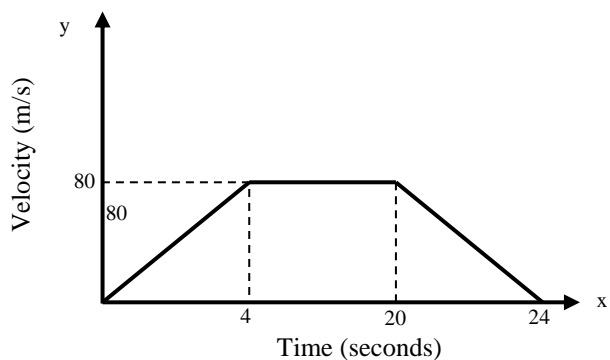
13. Two boys and a girl shared some money. The elder boy got $\frac{4}{9}$ of it, the younger boy got $\frac{2}{5}$ of the remainder and the girl got the rest. Find the percentage share of the younger boy to the girl's share. (4 Marks)

14. Use tables of reciprocals only to find the value of

$$\frac{5}{0.0829} - \frac{14}{0.581}$$

(3 marks)

15. The figure below is a velocity – time graph for a car. (not drawn to scale).



(a) Find the total distance traveled by the car?

(2 Mks)

(b) Calculate the deceleration of the car.

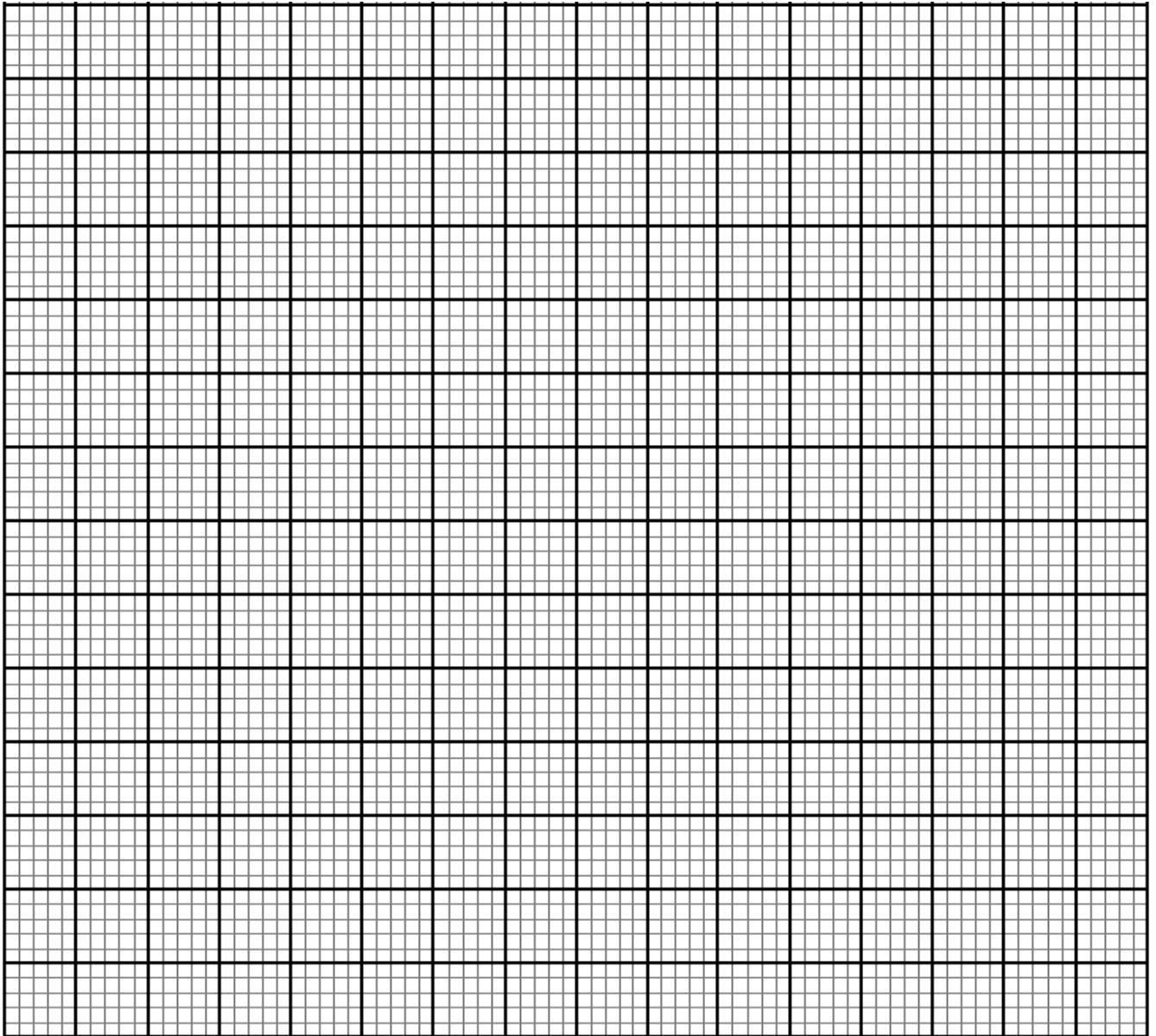
(2 Marks)

16. The table below shows marks obtained by a form four class in a certain school.

Marks (x)	$8 \leq X < 9$	$9 \leq X < 11$	$11 \leq X < 13$	$13 \leq X < 16$	$16 \leq X < 20$	$20 \leq X < 21$
No. of contents y	2	6	8	3	2	1

Use the table to represent the information on a histogram.
 Marks)

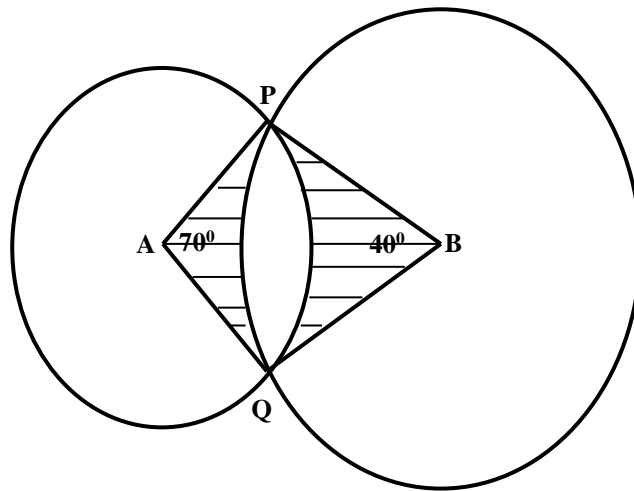
(3



SECTION II (50 MARKS):

Answer any five questions in this section.

17. The diagram below shows two circles, centres A and B which intersect at points P and Q.
Angle PAQ = 70° , angle PBQ = 40° and PA = AQ = 8cm.



Use the diagram to calculate

- (a) PQ to correct to 2 decimal places (2 Marks)
- (b) PB to correct to 2 decimal places (2 Marks)
- (c) Area of the minor segment of the circle whose centre is A (2 Marks)
- (d) Area of shaded region (4 Marks)

18. The income tax rates in a certain year are as shown below.

Income (k£ – p.a	Rate (KSh. per £)
1 – 4200	2
4201 – 8000	3
8001 – 12600	5
12601 – 16800	6
16801 and above	7

Omar pays Sh. 4000 as P.A.Y.E per month. He has a monthly house allowance of KSh.10800 and is entitled to a personal relief of KSh. 1,100 per month. Determine:

(i) his gross tax per annum in Kshs (2 Marks)

(ii) his taxable income in K£ per annum (2 marks)

(iii) his basic salary in Ksh. per month
(2marks)

(iv)his net salary per month (2 marks)

19. A straight line passes through the points (8, -2) and (4, -4).
(a) Write its equation in the form $ax + by + c = 0$, where a, b and c are integers. (3 Marks)

(b) If the line in (a) above cuts the x-axis at point P, determine the coordinates of P. (2 Marks)

(c) Another line, which is perpendicular to the line in (a) above passes through point P and cuts the y-axis at the point Q. Determine the coordinates of point Q. (3 Marks)

(d) Find the length of QP (2 Marks)

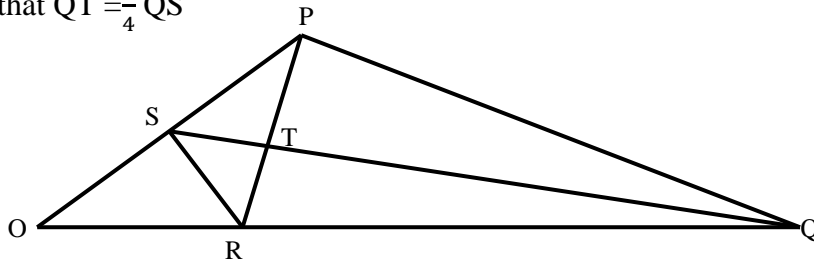
20. A bus and a Nissan left Nairobi for Eldoret, a distance of 340 km at 7.00 a.m. The bus travelled at 100km/h while the Nissan travelled at 120km/h. After 30 minutes, the Nissan had a puncture which took 30 minutes to mend.

(a) Find how far from Nairobi the Nissan caught up with the bus (5 Mks)

(b) At what time of the day did the Nissan catch up with the bus? (2 Marks)

(c) Find the time at which the bus reached Eldoret (3 Marks)

21. The figure below shows triangle OPQ in which $OS = \frac{1}{3}OP$ and $OR = \frac{1}{3}OQ$. T is a point on QS such that $QT = \frac{3}{4}QS$



- (a) Given that $OP = p$ and $OQ = q$, express the following vectors in terms of p and q .
- (i) \vec{SR} (1 Mark)

(ii) \vec{QS} (2 Marks)

(iii) \vec{PT} (2 Marks)

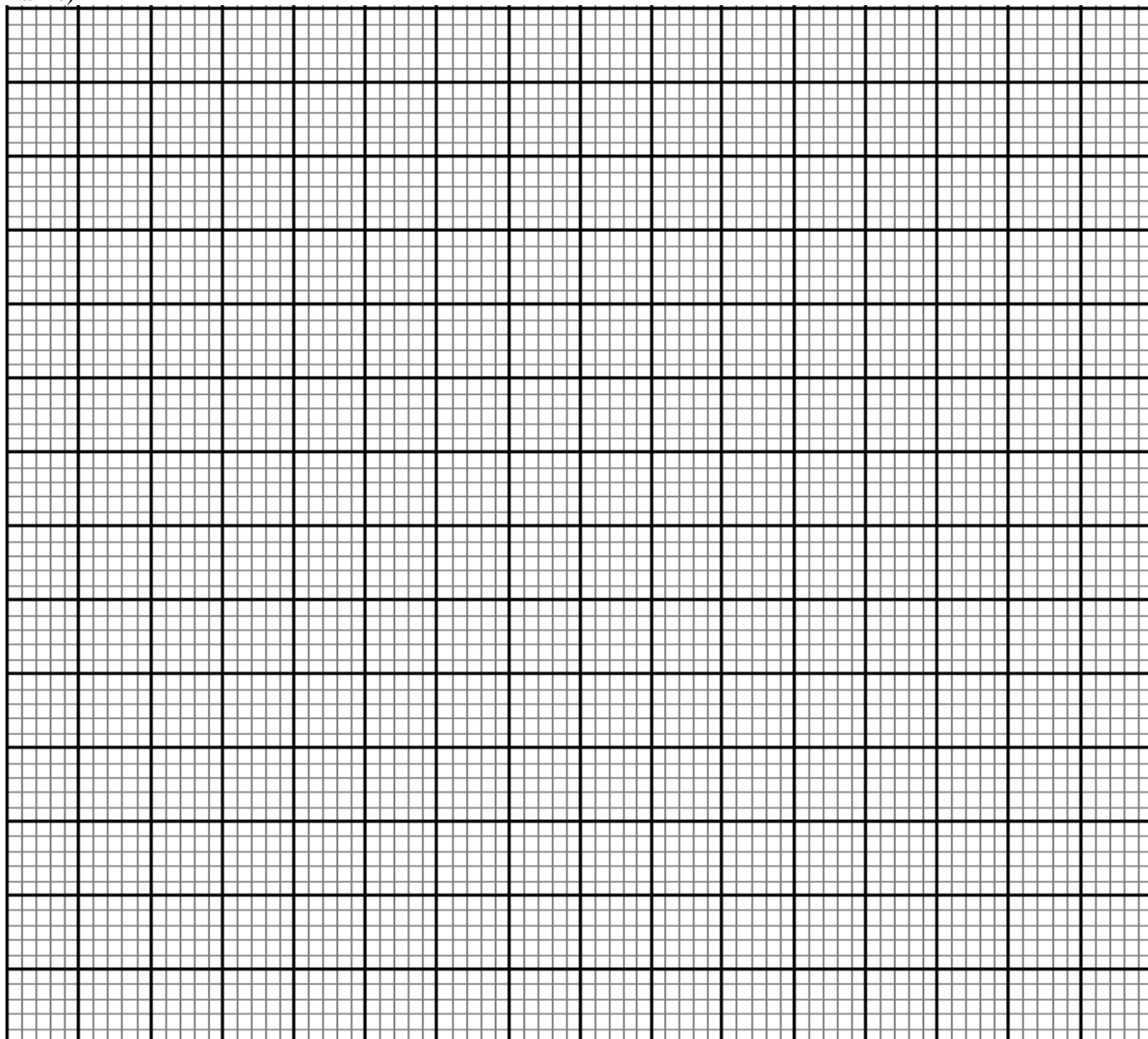
(iv) \vec{TR} (2 Marks)

- (b) Hence or otherwise show that the points P, T and R are collinear. (3 Marks)

22. On the grid provided below:

- (a) Draw triangle ABC whose coordinates are A (8,6), B(6,10) and C(10,12) and its image A'B'C' after undergoing a reflection in the line $y = x$. Write the co – ordinates of A' B' C' (4

Marks)



- (b) Triangle A'B'C' undergoes an enlargement centre (0,0) scale factor $\frac{1}{2}$ to form triangle A''B''C''. Draw triangle A''B''C''. (3 Marks)

(c) Triangle ABC is stretched with y – axis invariant and stretch factor of $\frac{1}{2}$ to obtain triangle A''B''C''. Draw triangle A''B''C''. (3 Marks)

23. Three Kenyan warships A, B and C are at sea such that ship B is 450km on a bearing of 030° from ship A. Ship C is 700km from ship B on a bearing of 120° . An enemy ship D is sighted 1000km due south of ship B.

(a) Taking a scale of 1cm to represent 100km locate the position of the ships A, B, C and D. (4 Marks)

(b) Find the compass bearing of:

(i) Ship A from ship D (1 Mark)

(ii) Ship D from ship C (1 Mark)

(c) Use the scale drawing to determine

(i) The distance of D from A (1 Mark)

(ii) The distance of C from D (1 Mark)

(d) Find the bearing of:

(i) B from C (1 Mark)

(ii) A from C (1 Mark)

24. (a) Fill the table below for the function $y = 2x^2 + 6x - 5$, for $-4 \leq x \leq 3$ (2 Marks)

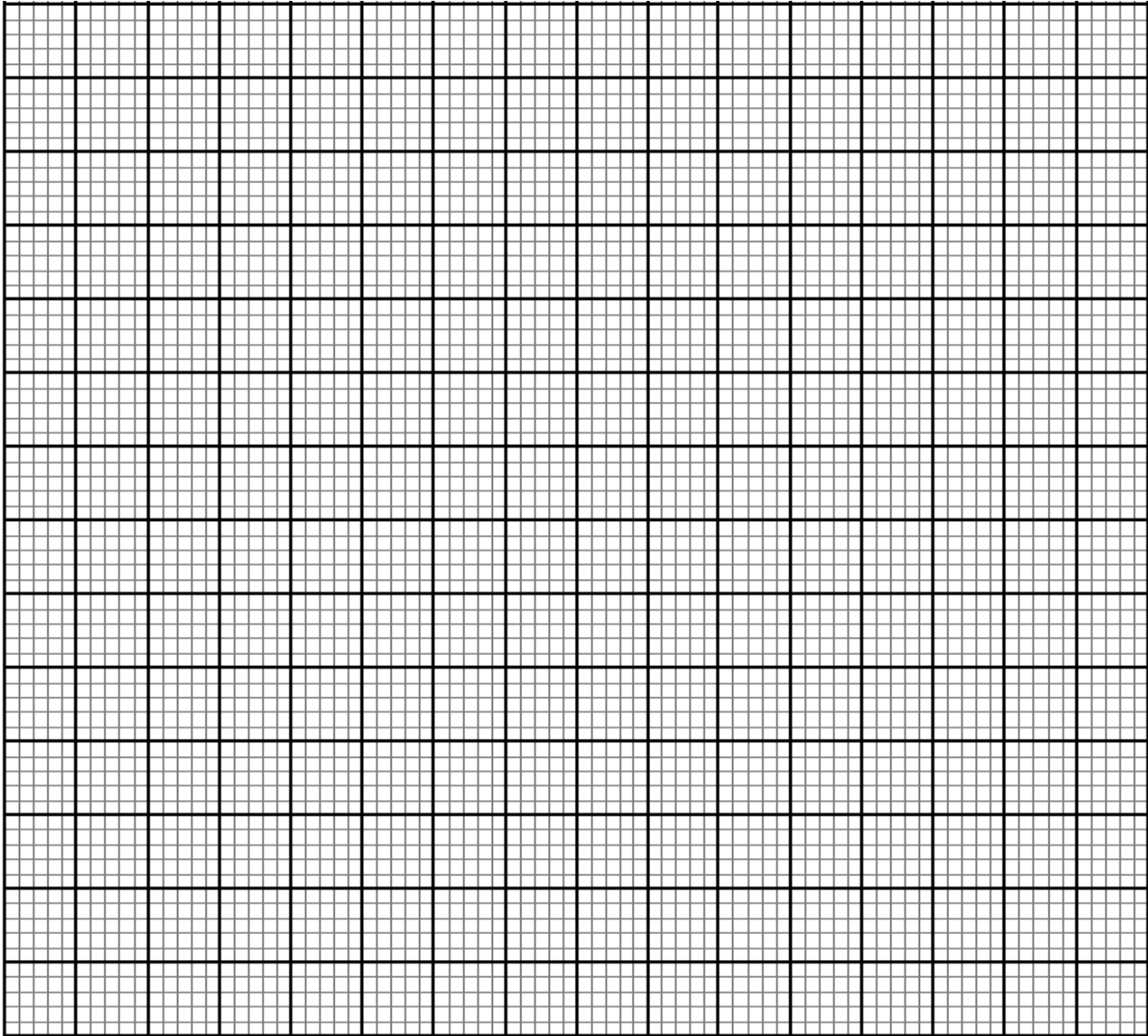
X	-4	-3	-2	-1	0	1	2	3
Y								

(b) (i) Draw the curve for $y = 2x^2 + 6x - 5$, for $-4 \leq x \leq 3$ on grid given (1 Mark)

(ii) On the same axes, draw line $y = 7x + 1$ (1 Mark)

(c) Determine the values of x at the points of intersection of the curve $y = 2x^2 + 6x - 5$ and line $y = 7x + 1$ (1 Mark)

(d) Find the actual of the region bounded by the curve $y = 2x^2 + 6x - 5$ and line $y = 7x + 1$ (4 Marks)



121/1
Mathematics
Paper 1
2 ½ Hours
JUNE- 2016

CENTRAL YEARLY MEETING OF FRIENDS (CYMF) -2016
Kenya Certificate of Secondary Examination (KCSE)

121/1
Mathematics
Paper 1

INSTRUCTIONS TO CANDIDATES

- i) Write your name, school and index number in the spaces provided above.
- j) Sign and write the date of the examination in the spaces provided above.
- k) This paper consists of two sections: Section I and Section II**
- l) Answer **ALL** the questions in **section I** and only **FIVE** questions from **section II**.
- m) Show all the steps in your calculations, giving your answers at each stage in the spaces provided below each question.
- n) Marks may be given for correct working even if the answer is wrong.
- o) **Non – programmable**, silent electronic calculators **and** KNEC mathematical tables may be used, except where stated otherwise.
- p) Candidates should answer the questions in English

For Examiner’s use Only

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

SECTION II

17	18	19	20	21	22	23	24	TOTAL

GRAND

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This paper consists of 15 printed pages. Candidates should check to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION 1: (50 MARKS)

Answer all question in this section in the spaces provided

1. School fees charged in three day secondary schools this year compares as follows; school A charges $\frac{3}{4}$ of fees charged in school B. School B charges twice the fees charged in school C. If school C charges Kshs 12,000, express fees charged in the three schools in the ratio of C:A:B.
(3mks)

2. Simplify the expression $\frac{a^2 - b^2}{a^2 + ab - a - b}$ (3mks)

3. Given that $A = x^2 + 2xh$, find the positive value of x when $A = 360$ and $h = 13$ (3mks)

4. A metal bar with a cross-sectional area of 44cm^2 has a mass of 5.06kg . The density of the bar is 2.3g/cm^3 . Calculate the length, in cm, of the metal bar (3mks)

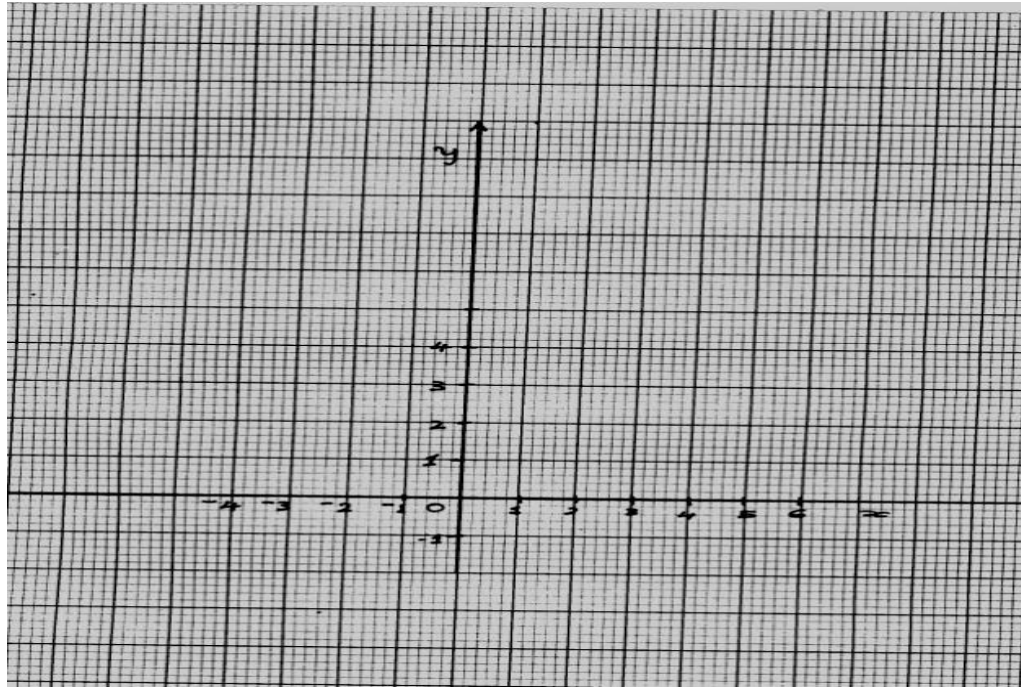
5. Baba Yao spent $\frac{1}{5}$ of his salary on house rent, $\frac{3}{8}$ on loan repayment, Ksh,26,000 on domestic expenses and saved the rest. If he saved Ksh 8,000, calculate his monthly salary (3mks)

6. Given that $\cos 60^\circ = \frac{1}{2}$, without using mathematical tables or calculator, find ,leaving your answers in surd form;

(a) $\sin 60^\circ$ (2mks)

(b) $\tan 30^\circ$ (1mk)

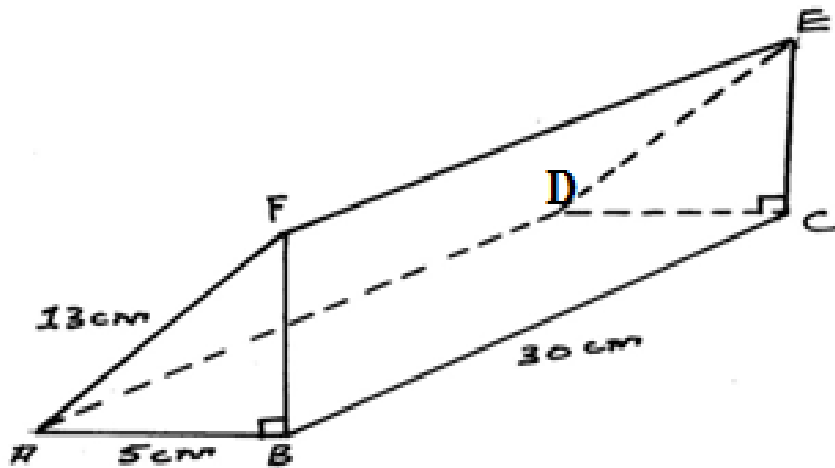
7. (a) The vertices of a triangle PQR are P(2,1),Q(5,1) and R(3,3).The triangle PQR is mapped onto triangle P¹Q¹R¹ by a translation $T \begin{pmatrix} -4 \\ 0 \end{pmatrix}$.On the grid provided below, draw the triangle PQR and its image P¹Q¹R¹. (2mks)



(b) State the type of congruence between the object and image triangle (1mk)

8. The volume of a hemisphere is 41.2cm^3 . Calculate, correct to one decimal place, the radius of the hemisphere (3mks)

9. The figure below represents a triangular prism. $AB=5\text{cm}$, $AF=13\text{cm}$, $BC=30\text{cm}$ and angle ABF is a right angle.



Calculate the total surface area (T.S.A) of the prism.

(3mks)

10. Solve the inequality given below and represent the solution on a number line

$$-5x - 3 > 2x + 4$$

(2mks)

11. The sum of four consecutive odd numbers is 120. If X represents the smallest of the odd numbers, determine the four odd numbers

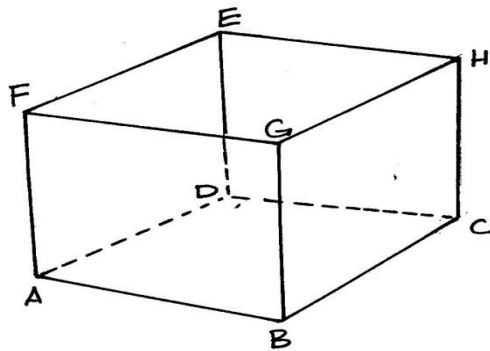
(3mks)

12. The length of a rectangle is twice that of its width. If the area of the rectangle is 200cm^2 . Calculate
 (a) Calculate the length and width of the rectangle (2mks)

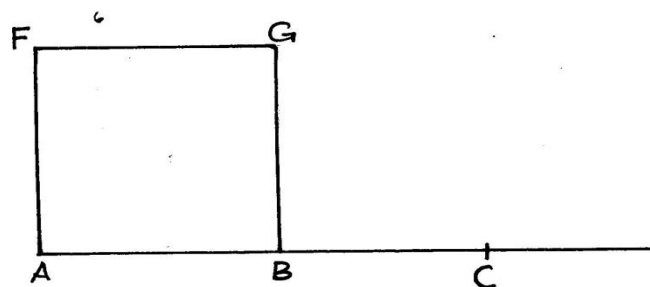
(b) the perimeter of the rectangle (2mks)

13. Three partners Ambia, Bela and Chaka raised Ksh 20,000, Kshs 30,000 and Kshs 50,000 respectively to start an M-Pesa business. After a while they realized a profit which they shared in the ratio of their contributions. If Ambia and Chaka received Kshs, 1050 in total. Calculate the total profit realized from the business. (3mks)

14. The figure shown below represents a cube of side 3cm. Ends ABCD and EFGH are open



Complete vertices of (3mks)

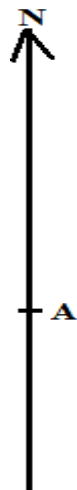


and label all the remaining the net of the cube below

15. Tinkeyi started her journey from town P at 8.00a.m. After walking for 12km at an average speed of 4km/h, she arrived at town Q. She stayed at town Q for 30 minutes. She then took a lift in a car which travelled at an average speed of 72 km/h and arrived at town R at 11.45 a.m. Calculate the distance between towns P and R via Q in kilometers (4mks)

16. A police station B is 60 km from town A on a bearing of 045° . A hospital C is 100km from the police station on a bearing of 150° .

(a) Using a scale drawing complete the drawing below to show the position of B and C. (2mks)



(b) Determine the distance, in kilometer, from town A to hospital C (2mks)

SECTION II(50 MARKS)

Answer only five questions in the section in the spaces provided

17. A salesman sold 300 bags of maize to a retailer at Kshs .2000 each .He was given a commission of 3%.The salesman allowed a discount of 0.2% on the maize sold. This discount was deducted from his commission.
- (a) Calculate
- (i) The discount allowed (2mks)
- (ii) The net commission the salesman got (3mks)
- (b)The retailer sold all the bags of maize at Ksh, 2400 each and paid Ksh 12000 for transport. Calculate the profit made by the retailer (3mks)
- (c)In additions a value added tax (V.A.T)of 16 % was charged on the profit made by the retailer .Calculate the amount of tax collected. (2mks)

18. The base of an open rectangular tank is 3m by 2.5m and its height is 4m.

(a) Calculate

(i) The capacity of the tank in litres (3mks)

(ii) The total surface area, in m^2 of the tank. (2mks)

(b) An open cylindrical tank has an equal capacity and same height as the rectangular tank in (a) above. Calculate correct to one decimal places;

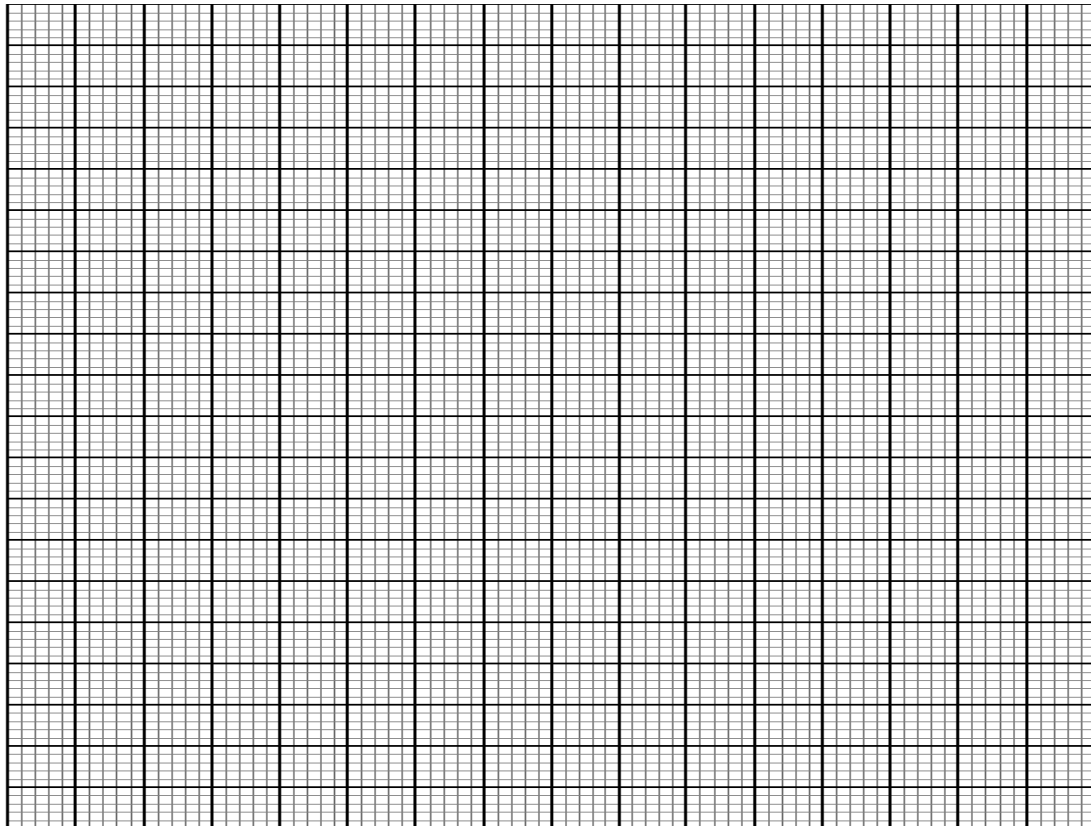
(i) The radius of the cylindrical tank (3mks)

(ii) The total surface area, in the m^2 , of the tank (2mks)

19. Marks scored by students in a mathematics test were recorded in the frequency distribution table shown below;

Marks	21-30	31-40	41-50	51-60	61-70	71-80
No. of students	2	3	14	19	7	5

(a) On the grid provided below, draw a cumulative frequency curve (ogive) for the distribution in the table above (4mks)



(b) Use your graph to estimate

(i) The median mark (3mks)

(ii) Interquartile range (2mks)

(iii) Semi-interquartile range (quartile deviation) (1mk)

20. A piece of wire is bent to form a rectangle whose length is 6cm more than the width. The area of the rectangle formed is 567cm^2 .

(a) Determine the length of the wire (4mks)

(b) The same piece of wire could be bent to form a semi-circle. Determine the area that could be enclosed by the same semi-circle correct to one decimal place. (4mks)

(c) Express the area of the semi-circle as a percentage of the area of the rectangle, correct to 3 significant figures (2mks)

21. (a) Using a ruler and a pair of compasses only, construct triangle ABC and ABD on either side of line AB below, such that; $\angle DAB = \angle DBA = \angle ABC = \angle BAC = 60^\circ$. (3mks)



- (b)(i) Name the quadrilateral AD BC (1mk)

- (ii) Construct a circle touching all the sides of the quadrilateral (3mks)

- (d) Calculate, correct to one decimal place, the area of the region enclosed by the quadrilateral but outside the circle. (3mks)

22. In a certain shop the cost of 3 spades and 2 hammers is Kshs.1180 and the cost of 2 spades and one hammer is Kshs 680. Find, using matrix method ,the cost of one spade and one hammer. (6mks)

(b)In another shop, the cost of a spade is 15% higher while the cost of a hammer is 10% lower. Find the total cost of 5 spades and 6 hammers in the shop (4mks)

23. The rates of taxation for income earned in a certain year were as follows;

Income Ksh p.m	Tax rate (%)
1- 19200	10
19201-29000	15
29001-38800	20
38801- 48600	25
48601-58400	30
Above 58400	35

Mr Tembo earned a monthly basic salary of Kshs.50,740. He received monthly allowances amounting to 35% of his basic salary and a tax relief of sh .1162.

Calculate;

(a) Mr. Tembo's taxable income (2mks)

(b) Mr. Tembo's gross tax (4mks)

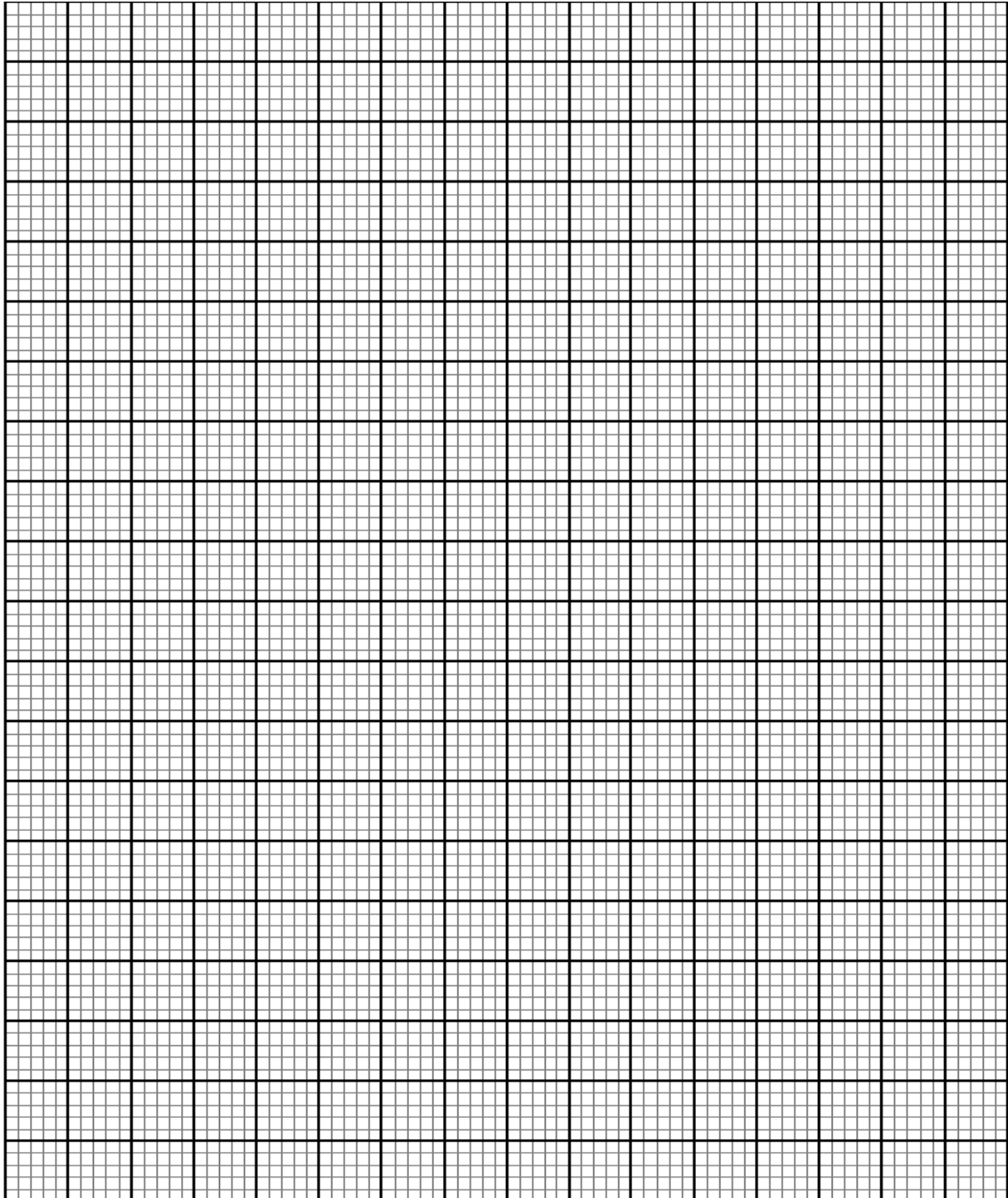
(c) Mr. Tembo's net tax (2mk)

(d) Mr. Tembo's net salary (2mks)

24. (a) Complete the table below using the quadratic function $y = x^2 + 2x - 2$. (1mk)

X	-6	-5	-4	-3	-2	-1	0	1	2	3	4
y											

(b) Draw the graph of $y = x^2 + 2x - x$ on the grid provided below (3mks)



(c) Estimate the area bounded by the curve, x-axis, the lines $x = 1$ and $x = 4$ using three equal strips.

i. Using trapezoidal rule (2mks)

ii. Using mid-ordinates rule (2mks)

iii. By integration (2mks)

121/2
 MATHEMATICS
 PAPER 2
 JUNE- 2016
 TIME: 2½ HOURS

CENTRAL YEARLY MEETING OF FRIENDS (CYMF) -2016
Kenya Certificate of Secondary Education (K.C.S.E)

INSTRUCTIONS TO CANDIDATES

- Write your name, school and index number in the spaces provided above
- This paper contains two sections; **Section 1** and **Section II**.
- Answer all the questions in **section 1** and only **five** questions from **Section II**
- All workings and answers must be written on the question paper in the spaces provided below each question.
- Marks may be given for correct working **even if** the answer is wrong.
- Non programmable silent electronic calculators and KNEC Mathematical tables may be used **EXCEPT** where stated otherwise.
- Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- Candidates should check carefully to ascertain that all the pages are printed as indicated and no questions are missing.

FOR EXAMINER’S USE ONLY

Section 1

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
Marks																	

Section II

Question	17	18	19	20	21	22	23	24	Total
Marks									

GRAND TOTAL

This paper consists of 16 printed pages. Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.

SECTION 1(50MARKS)

Answer all questions in this section in the spaces provided.

1. Evaluate using Logarithms

(4mks)

$$\frac{(0.0021+0.0035)^{\frac{1}{2}}}{1.38 \times 27.42}$$

2. Rationalize the denominator

(2mks)

$$\frac{\sqrt{2}}{\sqrt{5-\sqrt{3}}}$$

3. Make x the subject

(3mks)

$$P = \sqrt[3]{\frac{bx^2 - ax}{x}}$$

4. Expand the given binomial up to the term with x^4 : $(1+3x)^6$

Use your expansion to evaluate $(1-3)^6$ correct to 4 decimal places

(4mks)

5. Solve the equation below using the quadratic formula method

$$3x^2 - 7x + 2 = 0$$

(3mks)

6. Solve for x

(3mks)

$$\frac{81^{2x} \times 27^x}{9^x} = 729$$

7. The sum of the first 14 terms of an A.P = 595, Given that the sum of the first 8 terms is 220, Find the first term and the common difference. (4mks)

8. Determine the centre and the radius of a circle given that the equation of the circle is

$$4x^2 + 4y^2 - 32x + 16y - 16 = 0$$

(3mks)

9. Solve the equation for P (3mks)
 $\text{Log}_2(2p+3) - 2 = \log_2(p-2)$

10. Mrs. Amayo bought a plot of land valued at Ksh 226,500, If it appreciates at the rate of 14% p.a.
Determine the price of the plot after 5 years. (3mks)

11. Solve $2\sin^2x - 3\sin x + 1 = 0$ for $0^\circ \leq x \leq 360^\circ$ (3mks)

12. Nine men working 8 hours a day can weed a field in 15 days. How many hours a day must 27 men work in order to weed the same field in 5 days? (3mks)

13. Two towns are on the surface of the earth, at $(35^{\circ}\text{S}, 25^{\circ}\text{W})$ and $(35^{\circ}\text{S}, 17^{\circ}\text{E})$. Calculate the distance in kilometers correct to 1 decimal place, between the two towns. (Use earth's radius $R = 6370\text{km}$)

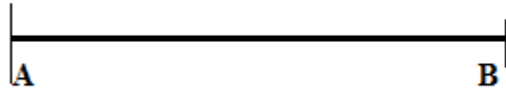
(3mks)

14. A function is given as $y = 3 \sin (2x - 45^{\circ})$. State the period and the Amplitude of the wave. (2mks)

15. Jane bought a T.V set by paying a deposit of sh 2400 plus 15 equal monthly instalment of sh 500 each. The hire purchase price was 10% more than the marked price. What was the marked price.

(3mks)

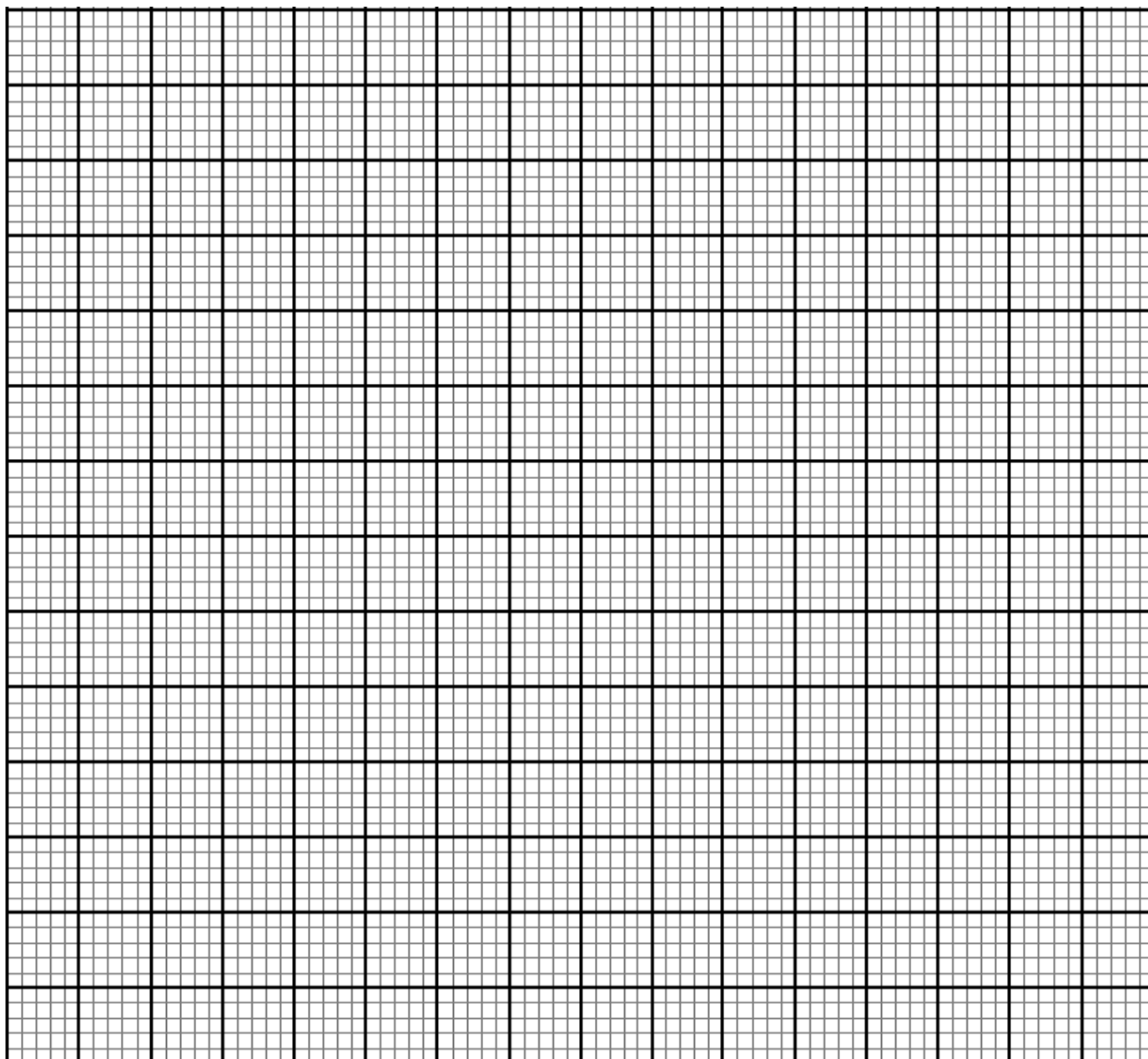
16. On the line segment AB shown below construct the locus of a point P such that $\angle APB$ is 60° on one side of AB. (3mks)



SECTION II (50 MARKS)

Answer only five questions in this section in the spaces provided

17. (a) Draw the graph of the function $y=2x^2+4x-3$ on the graph paper provided for $-4 \leq x \leq 2$. (5mks)



(b) Use your graph to solve the equations

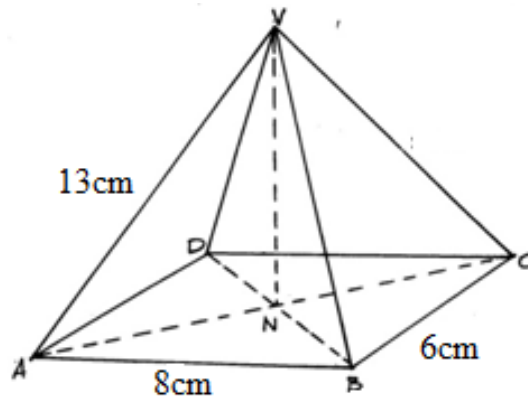
(i) $2x^2+4x-3=0$

(2mks)

(ii) $2x^2+x-5=0$

(3mks)

18. The figure below represents a right pyramid on a rectangular base. $AV=13\text{cm}$, $AB=8\text{cm}$, $BC=6\text{cm}$



Calculate, correct to 1 decimal place.

(a) the length AC (2mks)

(b) the length VN (2mks)

(c) the angle between line AV and the base ABCD (2mks)

(d) the angle between plane VAD and the base ABCD (2mks)

(e) the angle between the plane VAB and the base ABCD

(2mks)

19. The table below shows marks obtained by 100 Form four students in a school in Kakamega county

% Marks	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
No of students	5	7	2x	10	19	4x	20	6	2	1

(a) Determine the value of x

(2mks)

(b) Using an assumed mean of 52, calculate;

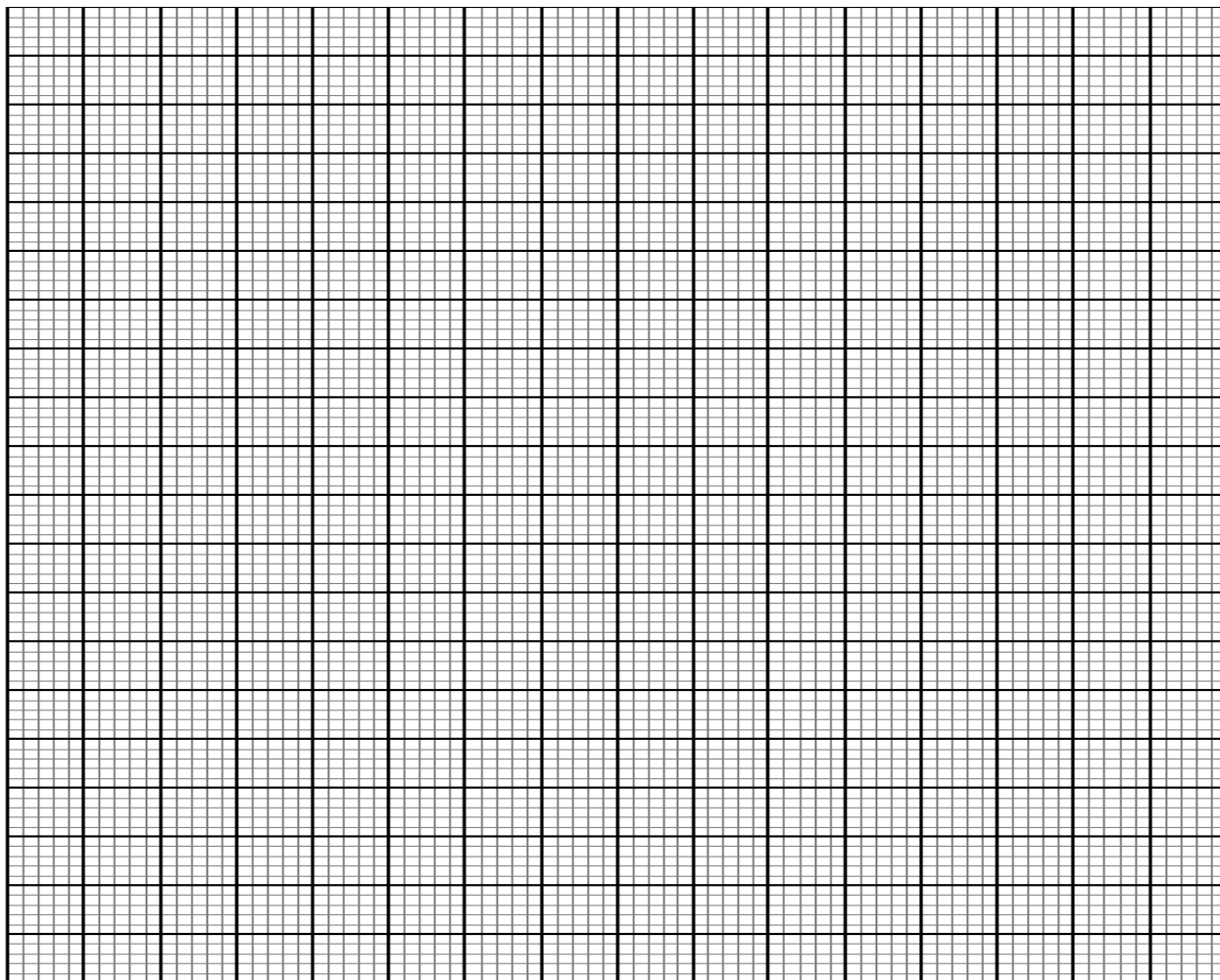
i) the mean

(6mks)

ii) the standard deviation

(2mks)

20. Triangle A (1,11)B(2,6)C(4,10) is mapped on to Triangle A¹(10,4)B¹(5,3) C¹(9,1) by transformation M



(a) Plot triangles ABC and A¹B¹C¹ on the grid provided. (2mks)

(b) Describe transformation M fully. (3mks)

(c) Triangle A¹B¹C¹ is further transformed to A¹¹B¹¹C¹¹ by a transformation.

$$N = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

(a) Determine the co-ordinates of A¹¹B¹¹C¹¹ (2mks)

(b) Plot the triangle $A^{11}B^{11}C^{11}$ (1mk)

(c) Describe transformation N fully (2mks)

21. The probability that Wanyama is selected to represent the school in Drama is $\frac{3}{5}$. If he is selected the probability of him going to Nairobi is $\frac{5}{7}$ otherwise if not, the probability of him going to Nairobi is $\frac{1}{6}$.

(a) Represent the above information on a tree diagram. (2mks)

(b) Find the probability that

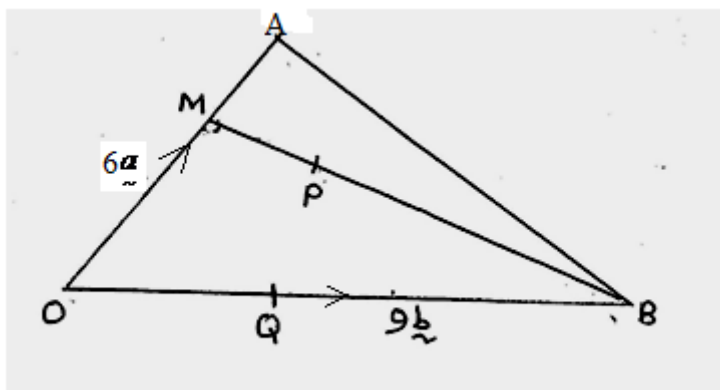
(i) he is selected and goes to Nairobi (2mks)

(ii) he is selected but does not go to Nairobi (2mks)

(iii) he is not selected but goes to Nairobi (2mks)

(iv) he goes to Nairobi (2mks)

22. In triangle OAB, $\vec{OA} = 6\vec{a}$ $\vec{OB} = 9\vec{b}$, M is the mid-point of OA and P lies on MB such that $MB = 5MP$.



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

(i) \vec{AB} (1mk)

(ii) \vec{MB} (1mk)

(iii) \vec{MP} (1mk)

(iv) \vec{AP} (3mks)

(b) Given that Q lies on OB such that $\vec{OQ} = 3\vec{b}$ express \vec{AQ} in terms of \vec{a} and \vec{b} . (1mk)

(c) Hence show that A, P and Q are collinear (3mks)

23. The relationship between two variables S and T is given by the equation $S=KT^n$ where K and n are constant

T	2	3	4	5	6	7
S	12.8	28.8	51.2	80.8	115.2	156.8

(a) Write down the linear equation relating to S and T (1mk)

(b) Complete the table above for the linear equation relating to S and T(to one decimal place) (2mks)

(c) Draw a suitable straight line graph to represent the data (3mks)

(d) Use your graph to determine the value of K and n (2mks)

(e) Find the value of S when T =3.5 (2mks)

24. A particle moves along a straight line such that its displacement S metres from a given point is

$$S = t^3 - 5t^2 + 3t + 4$$

where t is time in seconds. Find:

(a) The displacement of the particle at t=5 (2mks)

(b) The velocity of the particle when $t=5$ (3mks)

(c) The value of t when the particle is momentarily at rest (3mks)

(d) The acceleration of the particle when $t=2$ (2mks)

121/1
 MATHEMATICS ALT. A
 PAPER 1
 JULY/AUGUST - 2016
 TIME: 2 ½ HOURS

SAMETA SUB-COUNTY JOINT EVALUATION TEST-2016
Kenya Certificate of Secondary education (K.C.S.E)

121/1
 MATHEMATICS
 PAPER 1
 2 ½ HOURS

INSTRUCTIONS TO THE CANDIDATES

- a) Write your **name** and **Random no.** the spaces provided above.
- b) Sign and write **date** of examination in the spaces provided above.
- c) This paper consists of **two** sections; **Section I** and **Section II**.
- d) Answer **All** questions in **Section I** and only **Five** questions from **section II**
- e) **All** answers and working **must** be written on the question paper in the spaces provided below each
- f) question.
- g) Show all the steps in your calculations giving answers at each stage in the spaces provided below each
- h) question.
- i) Marks may be given for correct working even if the answer is wrong.
- j) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.
- k) **This paper consists of 16 printed pages. Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.**
- m) Candidates should answer questions in **English**.

For examiner's use only.

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

GRAND

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TOTAL

1. Evaluate $\frac{-4 \text{ of } (-4 + -5 \div 15) + -3 - 4 \div 2}{84 \div -7 + 3 - -5}$ (3 mks)

2. Simplify $\frac{9x^2 - 1}{3x^2 + 2x + 1}$ (1 mk)

3. Evaluate without using a calculator or mathematical table leaving your answers as a simplified fraction. (2 mks)

$$\frac{\frac{4}{11} \text{ of } \frac{3}{4} - \frac{1}{20}}{\left(3 + \frac{1}{3}\right) \div \left(1 + \frac{1}{10}\right)}$$

4. A poultry farmer has twenty times as many hens as turkey and three quarters as many ducks as turkeys.
 (a) If there are t, turkeys, write down a simplified expression in terms of t for the total number of birds on the farm. (1 mk)

(b) Give that he has 72 ducks, calculate as a percentage the sum of turkeys and ducks to the number of hens in the farm. (2 mks)

5. Use tables of reciprocals only to work out. (3 mks)

$$\frac{5}{0.0396} + \frac{12}{0.593}$$

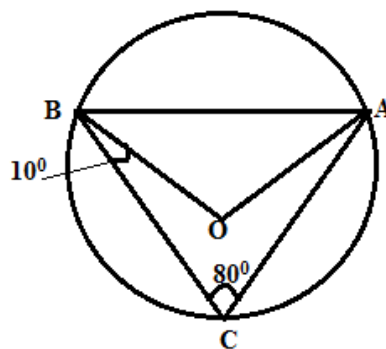
6. A straight lines passes through points A(-2,6) and B(4, 2).
 (a) M is the midpoint of line AB. find the coordinates of N. (2 mks)

(b) Determine the equation of a straight line passing through point M and is perpendicular to AB. (2 mks)

7. An open right circular core has radius of 5cm and a perpendicular height of 12cm. Calculate the surface area of the core. (take $\pi=3.142$). (3 mks)

8. Moraa spends a total of sh. 970 on buying 3 text books and 5 pens. if had bought 2 textbooks and 8 pens she would have saved sh. 90. Find the cost of one textbook. (3 mks)

9. In the figure below O is the centre of the circle. $\angle BCA = 80^\circ$ and $\angle CBO = 10^\circ$. Determine the size of $\angle CAB$. (3 mks)



10. In a bookstore, books packed in cartons are arranged in rows such that there are 50 cartons in the first row, 48 cartons in the next row, 46 in next and so on.
 (a) How cartons will be there in 8th row. (2 mks)

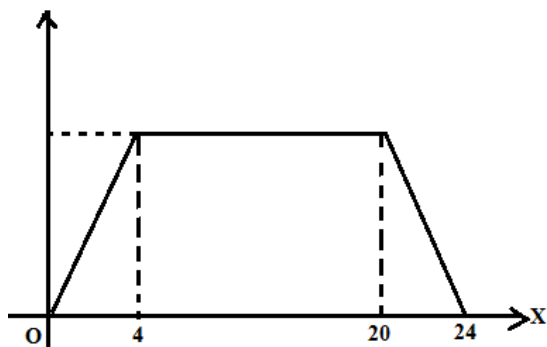
- (b) If there are 20 rows in total, find the total number of cartons in the books store. (2 mks)

11. Find the of x if. (3 mks)

$$\left(\frac{27}{8}\right)^{x+7} = \left(\frac{4}{9}\right)^{-3x}$$

12. The image of a point K(1,2) after translation is K¹ (-1,2). what is the coordinate of the point R whose image is R¹ (-3,3) after undergoing the same translation. (3 mks)

13. The figure below is a velocity time graph for a car.



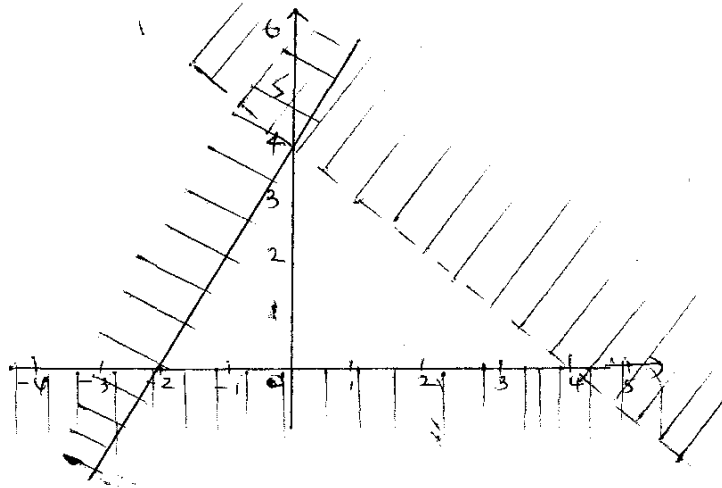
(a) Find the total distance travelled by the car (2 mks)

(b) Calculate the deceleration of the car. (2 mks)

14. Security light poles have been erected along both sides of a street in Kisii town. The poles are 50m apart along the left hand side of the road while they are 80m apart along the right hand side. At one end of the road the poles are directly opposite each other. How many poles will be erected by time the poles are directly opposite each other at end of the road? (3 mks)

15. The exterior angle of a regular polygon is equal to one third of the interior angle. Calculate the number of number of sides of the polygon. (3 mks)

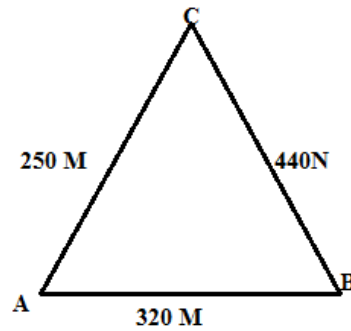
16. Write down the inequalities that define the unshaded region marked R in the figure ,below. (3 mks)



17. Kisii county government is to construct a floor of an open wholesale market whose area is 800m^2 . The floor is to be covered with a slab of uniform thickness of 200mm . In order to make the slab, sand, cement and ballast are to be mixed such that their masses are in the ratio $3:2:3$ respectively. The mass of dry mass of dry slab of volume 1m^3 is 200kg .
- (a) Calculate
- (i) The volume of the slab. (2 mks)
 - (ii) The mass of the dry slab. (2 mks)
 - (iii) The mass of cement to be used. (2 mks)
- (b) If one bag of cement is 50kg , find the number of bags to be purchased. (1 mk)
- (c) If a lorry carries 10 tonnes of ballast, calculate the number of lorries of ballast to be purchased. (3 mks)
18. Paul is a sales executive earning sh $20,000$ and a commission of 8% for the sales in excess of $100,000$. In January 2014 he earned a total of 48000 in salaries and commissions.
- (a) Determine the amount of sales he made in that month. (4 mks)
- (b) If the total sales in the month of February and March increased by 18% and then dropped by 25% respectively. Calculate.
- (i) Paul's commission in the month of February. (3 mks)
 - (b) If the total earnings in the month of March. (3 mks)

19. Two tanks are similar in shape. The capacity of the tanks are 1,000,000 litres and 512,00 litres respectively.
- (a) Find the height of the smaller tank if the larger one is 300cm tall. (5 mks)
- (b) Calculate the surface area of the tank if the smaller one has a surface area of 768cm^3 (3 mks)
- (c) Calculate the mass of the larger tank if the mass of the larger one is 800kg. (2 mks)
20. The vertices of a triangle ABC are A(2,5) B(4,3) and C(2,3). It represents half-turn about the origin.
- (a) Draw triangle ABC and $A^1B^1C^1$ under it. (4 mks)
- (b) T represents a reflection in the line $x=0$ and k represents a translation $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$. Find the coordinates of $A^{11}B^{11}$ and C^{11} and $A^{111}B^{111}C^{111}$. Hence draw triangle $A^{11}B^{11}C^{11}$. (4 mks)
- (c) Find the area of the triangle $A^{11}B^{11}C^{11}$. (2 mks)

21. Ombati owns a farm that is triangular in shape as shown below.



- (a) Calculate the size angle BAC. (2 mks)
- (b) Find the area of the farm in hectares. (3 mks)
- (c) Ombati wishes to irrigate his farm using a sprinkler machine in the farm such that it is equidistant from points A, B and C.
- (i) The sprinkler rotates in a circular motion so that the maximum point reached by the water jets is the vertices A, B and C. Calculate the area outside the farm that will be irrigated. (3 mks)

22. Transline bus left Nairobi at 8.00 am and travelled Kisii at an average speed of 80km/h. A car left Kisii at 3.30 am and travelled to Nairobi at an average speed of 120km/h. Given that the distance between Nairobi and Kisii is 400km, Calculate.
- (a) The time the car arrived in Nairobi. (3 mks)
- (b) The time the two vehicles met. (4 mks)
- (c) The distance from Nairobi to the meeting point. (2 mks)
- (d) The distance of the bus from Kisii when the car arrived in Nairobi. (2 mks)
23. Town B is 102km on the bearing of 122° from town A. Town C is 94 km on bearing of 062° from B. Town D is on a bearing of 073° from A and 336° from C.
- (a) Using a scale of 1cm to represent 20km, draw a scale diagram to show the relative positions of town A, B, C and D. (4 mks)
- (b) Using your diagram, determine.
- (i) The bearing B from D. (1 mk)
- (ii) The bearing of A from C. (1 mk)
- (iii) The distance from town A to D. (1 mk)
- (iv) The distance from town B and D. (1 mk)

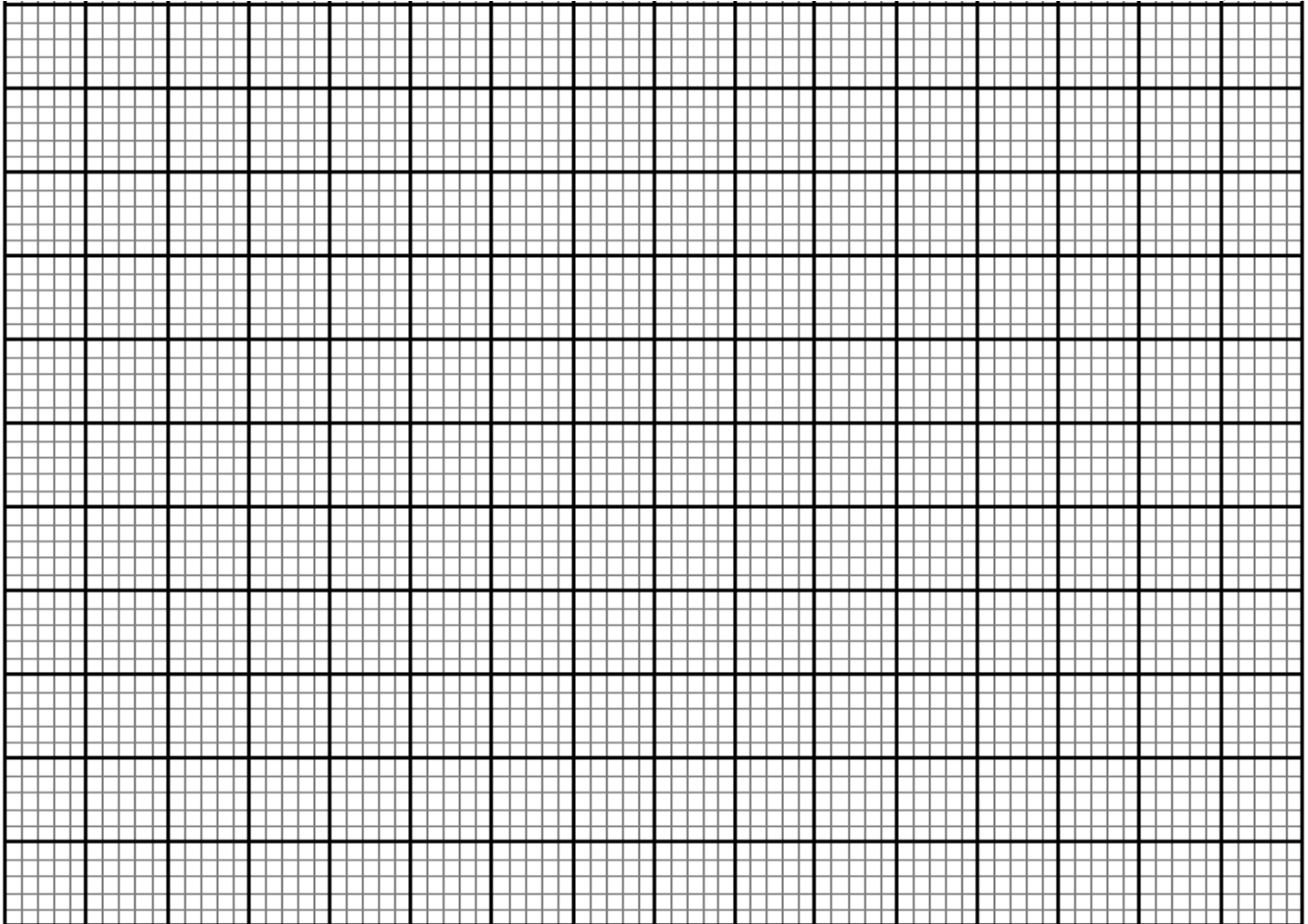
24. The table below gives some of the values of x and y for the functions $y = \frac{1}{2}x^2 + 22x + 1$ in the interval $0 \leq x \leq 6$.

x	0	1	2	3	4	5	6
y	1					23.5	

(a) Complete the values in the table above. (1 mk)

(b) Use the values in the table to draw the graph of function on the grid provided below. (2 mks)

(2 mks)



(b) Using the graph and the mid-ordinate rule with 6 stripes, estimate the area bounded by the curve, the x-axis, the y-axis and the line $x=6$. (3 mks)

(d) Using integration, calculate the exact area and hence find percentage error made when mid-ordinate rule is used. Give your answer correct to 2.dp. (4 mks)

121/2
 MATHEMATICS ALT. A
 PAPER 2
 JULY/AUGUST - 2016
 TIME: 2 ½ HOURS

SAMETA SUB-COUNTY JOINT EVALUATION TEST-2016

Kenya Certificate of Secondary education (K.C.S.E)

121/2
 MATHEMATICS
 PAPER 2
 2 ½ HOURS

INSTRUCTIONS TO THE CANDIDATES

- l) Write your **name** and **Random no.** the spaces provided above.
- m) Sign and write **date** of examination in the spaces provided above.
- n) This paper consists of **two** sections; **Section I** and **Section II**.
- o) Answer **All** questions in **Section I** and only **Five** questions from **section II**
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For examiner's use only.

Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

**GRAND
TOTAL**

SECTION 1(50 marks)

Answer all the questions in this section in the spaces provided.

1. Use logarithms, correct to 4 decimal places, to evaluate; (4 mks)

$$\frac{(1934 \times 0.0569)^2}{436}$$

2. Solve the quadratic equation (3 mks)

$$3x^2 - 4x - 5 = 0$$

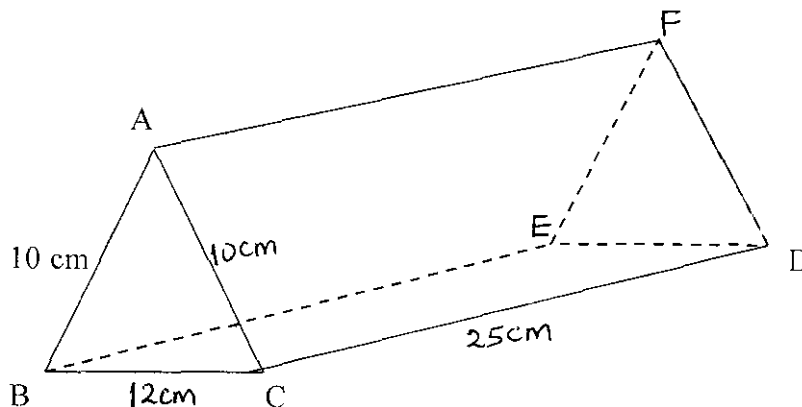
giving the roots correct to 3 decimal places.

3. Without using a calculator, find the value of (3 mks)

$$\frac{1}{2} \log_3 9 - \log_3 \frac{2}{3} + \log_3 54$$

4. Onsongo bought a new car for sh 750 000 and used it for three years. Over this period the car had been depreciating at a steady rate. He sold it through an agent who charged a commission of 8 % of its current price. If Onsongo received sh 462, 246 from the agent, determine the annual rate of depreciation of the car. (3 mks)

5. In the figure below, ABCDEF is a prism 25 cm long whose triangular ends are isosceles triangles. Calculate the angle the line AE makes with the base BCDE. (3 mks)



6. Given that $x = \sqrt{6}$, simplify the quadratic expression $x^2 + 3x - 12x^{-1}$, giving the answer in the surd form $a + \sqrt{b}$, where a and b are real numbers. (2 mks)
7. A contractor requires 24 tonnes of concrete to construct a building. He mixes cement, sand and gravel such that the ratio of cement to sand is 2: 3 and the ratio of cement to gravel is 1 : 3 : 5. Determine the number of 50 kg bags of cement he requires in constructing the building. (4 mks)
8. Make t the subject of the formula (3 mks)
- $$e^2 = \frac{t - k}{k(1 - kt)}$$
9. The quantity P varies as the square of the quantity Q and inversely as the quantity R . If $P = 40$ when $Q = 10$ and $R = 36$, express P in terms of Q and R . (2 mks)
10. Solve the equation (3 mks)
- $$6 \cos^2 x - \sin x - 4 = 0 \text{ for } 0^\circ \leq x \leq 180^\circ$$
11. The equation of a circle is $x^2 + y^2 + 6x - 14y + 58 = r^2$. If the circle passes through the point (2, 7), determine its radius and the coordinates of its centre. (4 mks)
12. Without using tables or a calculator, evaluate $(0.97)^4$, giving the answer correct to 4 decimal places. (3 mks)
13. A lady measured the internal dimensions of her room and recorded them as 4.3 m and 3.6 m. Calculate the maximum area of a carpet she can order to cover the floor of her room. (3 mks)
14. The third and sixth terms of a geometric progression (G.P.) are -64 and 8 respectively. Find;
(a) the common ratio, (2mks)

(b) the first term of the G.P. (1mk)

15. Calculate the standard deviation of the set of numbers
29, 31, 28, 29, 31, 46, 39, 31, (4mrks)

16. Given the matrices $B = \begin{pmatrix} 3 & 2 \\ -1 & 4 \end{pmatrix}$ and $C = \begin{pmatrix} -9 & 14 \\ 3 & 0 \end{pmatrix}$, find the inverse of B.
Hence find a 2×2 matrix A such that $BA = C$. (3 mks)

SECTION II (50 marks)

Answer only five questions in this section in the spaces provided.

17. (a) Expand $(2t - 1)(t - 1)(t - 2)$. (2 mks)

- (b) The height, s , metres of a stone thrown vertically upwards from a cliff after a time, t , seconds is given by the equation $S = bt - at^2 + 10$, where a and b are constants. The following table gives some of the values of s and t .

(i)

T	0	1	2	3	4	5	6	7	8	9	10
S		4.51						45.9			-80

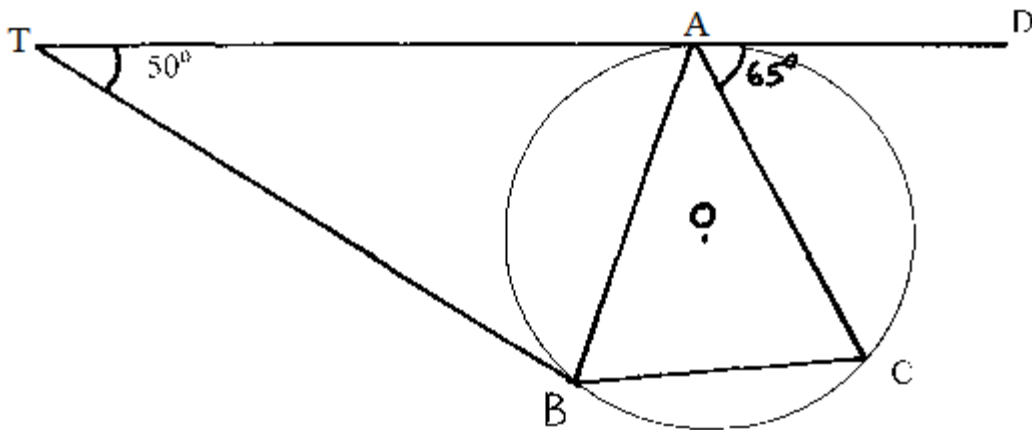
Determine the values of a and b .

Hence write down the equation of s in terms of t . (5 mks)

- (ii) Use the equation in (b)(i.) above to complete the table above. (2 mks)

- (iii) Give the maximum height attained by the stone. (1 mk)

18. In the figure below, TAD and TB are tangents to a circle centre, O. $\angle ATB = 50^\circ$ and $\angle DAC = 65^\circ$



- (a) Find, giving reasons, the size of the following angles;
- (i) $\angle TAB$ (2 mks)
- (ii) $\angle TBC$. (2 mks)
- (b) Show that triangle ABC is isosceles. (2 mks)
- (c) Given that the radius of the circle is 8.4 cm, calculate the area of the minor segment cut off by the chord BC. (4 mks)

19. A certain Sub-county advertised for a tender to construct its headquarters. Two contractors A and B assessed the work. Contractor A indicated would do the same work in 12 months while contractor B indicated would do the same work in 18 months. The two contractors were awarded the tender. Contractor B did the work for three months then it was joined by contractor A.

(a) Determine;
 (i) the fraction of the work done by contractor A in 3 months, (2 mks)

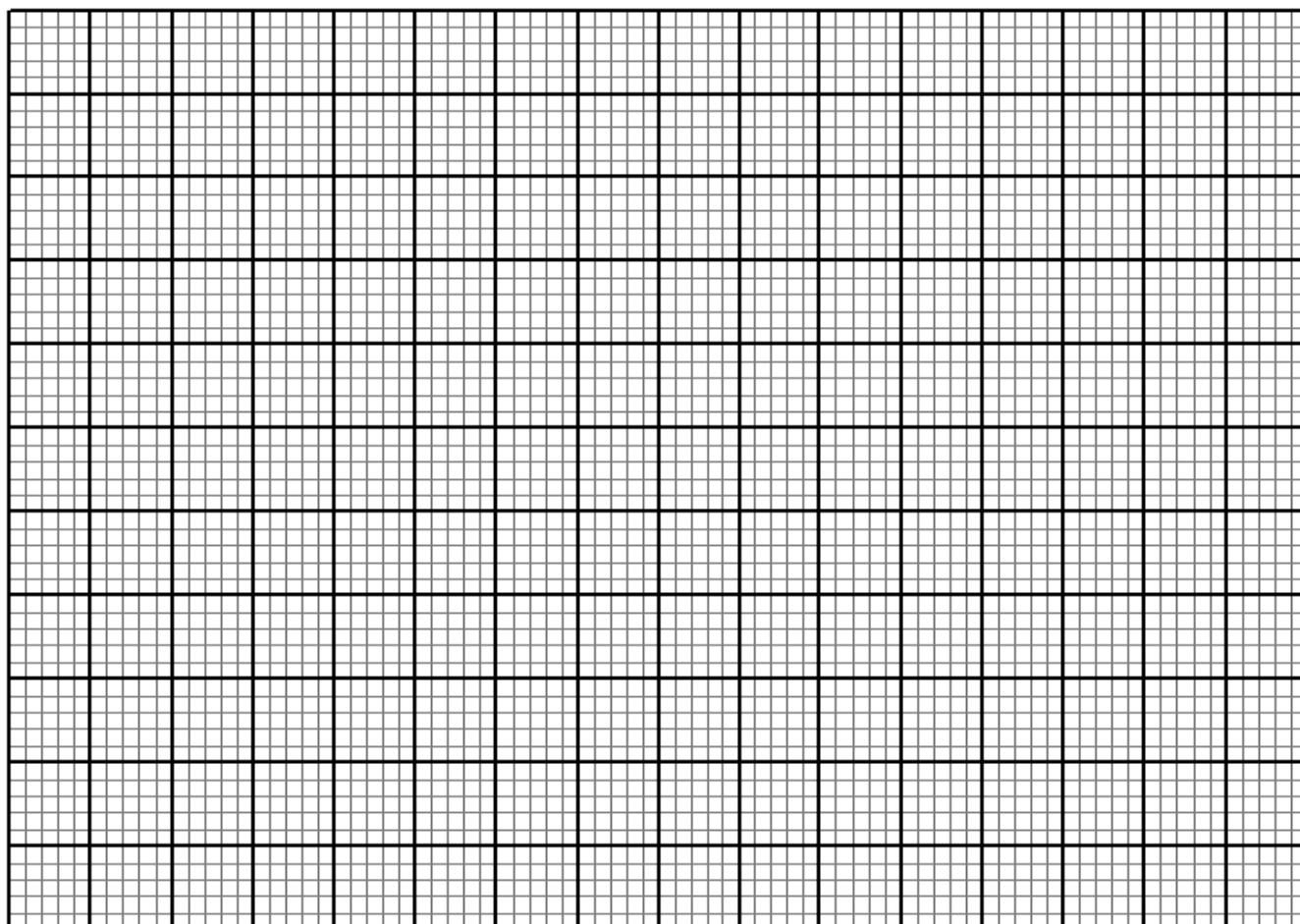
(ii) how long the two contractors took to complete the remaining work. (4 mks)

(c) Given that contractors A and B would incur expenditure amounting to sh 120 000 per month and sh 90 000 per month respectively, calculate the total expenditure of each contractor. (4 mks)

20. (a) Complete the table below for the function $y=x^3 +4x-x-6$. (2 mks)

x	-5	-4	-3	-2	-1	0	1	2	3
y	-26			4		-6		16	

(b) On the grid provided draw the graph of function $y=x^3 +4x^2 - x-6$. (3 mks)



(c) Use the graph to solve the equations.

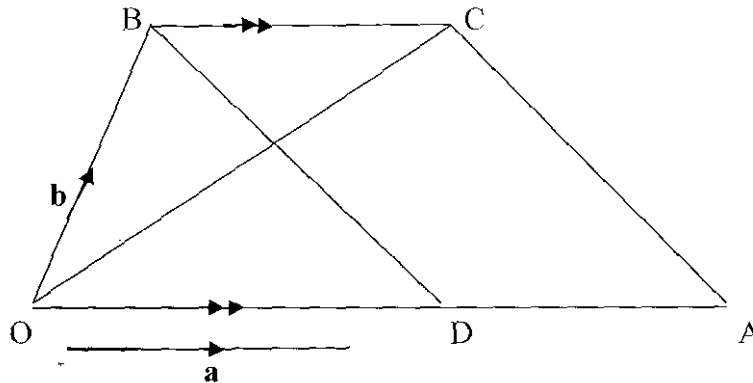
(i) $y = x^3 + 4x^2 - x - 6 = 0$.

(2 mks)

(ii) $y = x^3 + 4x^2 - 3x$

(3 mks)

21. The figure below shows a trapezium OBCA in which $BC \parallel OA$ and $\mathbf{OA} = \mathbf{a}$ and $\mathbf{OB} = \mathbf{b}$. The lines OC and BD intersect at X. The ratio $OD : DA = 2 : 1$ and $OA = 3 BC$.



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

(i) OC

(1 mk)

(ii) BD

(2 mks)

(b) Given that $\mathbf{OX} = s \mathbf{OC}$ and $\mathbf{BX} = t \mathbf{BD}$, express \mathbf{OX} :

(i) in terms of \mathbf{a} , \mathbf{b} and the scalar s .

(1 mk)

(ii) in terms of \mathbf{a} , \mathbf{b} and the scalar t .

(1 mk)

(c) Use the results in above to find the values of the scalars of s and t .

(4 mks)

(d) Find the ratio $\mathbf{BX} : \mathbf{XD}$.

(1 mk)

22. An opaque bag contains a mixture of one hundred red, blue and green beads, all of the same size. The probability of picking a red bead at random from the bag is $\frac{3}{5}$ and the probability of picking a blue bead at random from the bag is $\frac{3}{10}$.

(a) Determine;
(i) the fraction of green beads in the bag. (3 mks)

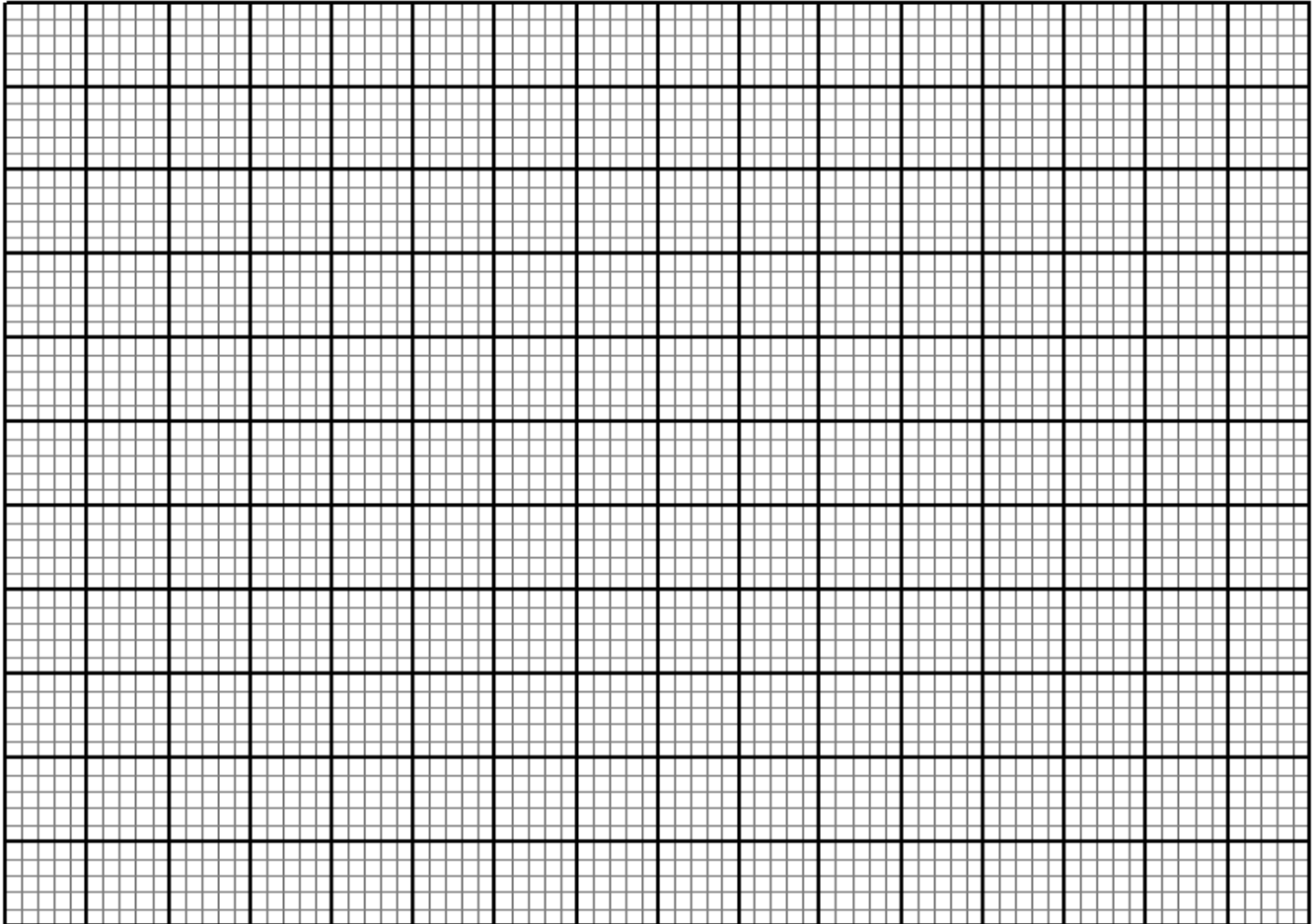
(ii) the number of beads of each colour in the bag. (3 mks)

(b) Two beads are picked at random from the bag in succession with replacement. Determine the probability that the two beads are of the same colour. (4 mks)

23. A principal of a certain Girls High school had sh 21 000 available and decided to purchase a number of Kiswahili and Business studies text books. A Kiswahili text book and a Business studies text book costs sh 280 and sh 350 respectively. She has to buy at least 26 Kiswahili text books and twice the number of Business studies text books bought must be less than the number of Kiswahili text books. Take the number of Kiswahili text books and of Business studies text books bought to be x and y respectively.

(a) Write down three inequalities satisfying the conditions in the information above. (3 mks)

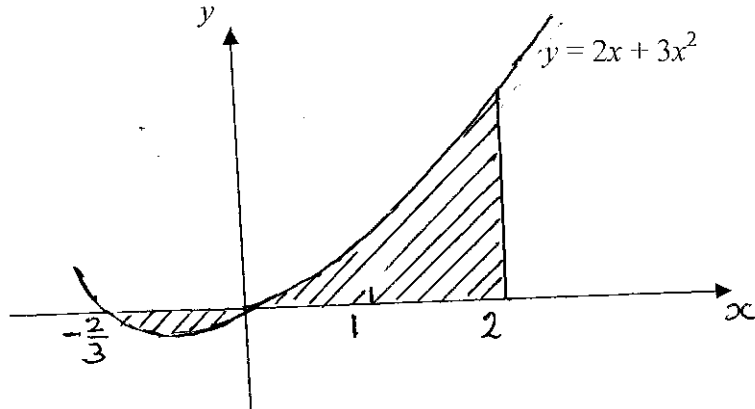
(b) On the grid provided, represent the inequalities in (a) above and shade out unwanted regions. (3 mks)



(c) Determine the number of text book of each kind that must be bought for the total cost to be minimum. Hence find the minimum cost. (4 mks)

24. (a) Find the gradient of the curve $y = x^2 \left(x + \frac{1}{2} - \frac{1}{x} \right)$ at point $\left(1, \frac{1}{2} \right)$ (3 mks)

(b) The figure below shows a sketch of the curve $y = 2x + 3x^2$.



Find;

(i) $\int (2x + 3x^2) dx$ (1 mk)

(ii) the shaded area between $x = -\frac{2}{3}$ and $x = 0$, (2 mks)

(iii) the shaded area between $x=0$ and $x=2$, (2 mks)

(iv) the total shaded area. (2 mks)

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MATHEMATICS

PAPER 1

JULY/AUGUST 2016

TIME: 2 $\frac{1}{2}$ HOURS

SUKEMO JOINT MOCKS
KENYA CERTIFICATE OF SECONDARY EDUCATION (K.C.S.E)
MOCK EXAMINATIONS

INSTRUCTIONS TO CANDIDATES

- Write your **name**, **index number**, **signature** and **date** of the examination in the spaces provided
- The paper contains two sections. Section I and section II
- Answer **ALL** questions in section I and any five questions in section II
- Answers and working **must** be written on the question paper in the spaces provided below each question
- Show all steps in your calculation below each question
- Marks may be given for correct working even if the answer is wrong
- Non programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise

FOR EXAMINERS' USE ONLY

SECTION I

QUESTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
MARKS																	

SECTION II

QUESTION	17	18	19	20	21	22	23	24	TOTAL
MARKS									

GRAND TOTAL

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SECTION I (50 MKS)

Answer **ALL** the questions from this section.

1. Evaluate:

(3mks)

$$\frac{-4 \text{ OF } [(-4 + -5 \div 15)] + -3 - 4 \div 6}{84 \div -7 + 3 - -5}$$

2. If $\log 2=0.30103$ and $\log 3=0.47712$ find the logarithm of 36 without using tables or calculators. (3mks)

3. Find the equation of the perpendicular to the line below at its y-intercept. Leave your answer in the form of $y=mx +c$. (3mks)

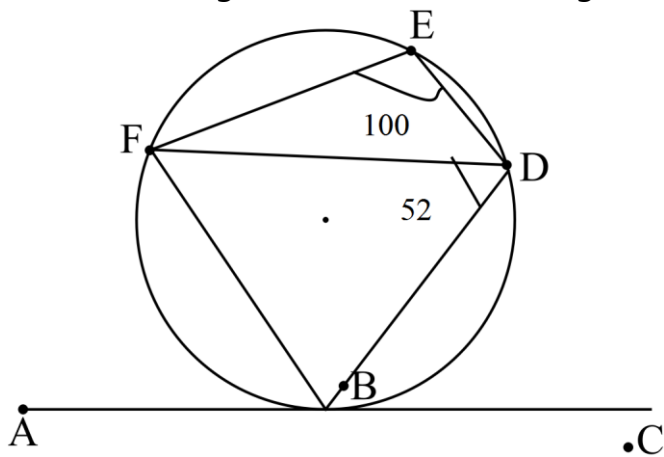
$$\frac{4}{9}x - \frac{1}{3}y = 1$$

4. Simplify the expression given by $\frac{x}{x-3} - \frac{2x+3}{x^2-3x}$ (3mks)

5. Under an enlargement the images of the points A(3,1) and B(1,2) are A¹(3,7) and B¹(7,5). Find the centre and the scale factor of the enlargement.

(3mks)

6. In the figure below, ABC is a tangent to the circle at B. find giving reasons angles:-



i. FBA (1mk)

ii. DBC

(2mks)

7. Solve for x in the equation below without introducing logarithms

$$5^{2x-1} = 60^{2x-1}$$

(3mks)

8. The table below shows masses of fifty students in a form one class.

Mass (kg)	Frequency
25-30	6
30-35	10
35-40	24
40-45	7
45-50	4

a) State the modal class.

(1mk)

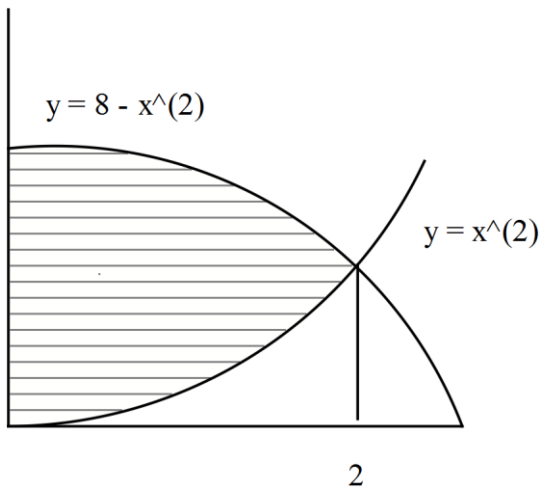
b) Calculate to 3 d.p the median mass.

(2mks)

9. Solve the following pair of linear inequalities. Hence determine the integral values that satisfy the inequalities. $-5 - 2x < -3$ and $\frac{x}{5} + \frac{1}{3} \leq 1$.
(3mks)

10. Given that the position vectors of points P and Q are $r = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$ and $q = \begin{pmatrix} 5 \\ 4 \end{pmatrix}$. M is a point on PQ such that $PM:MQ = 2:1$. Find the coordinates of M.
(3mks)

11. Calculate the area of the shaded region. (3mks)



12. Use square, squareroot and reciprocal tables only to evaluate the following giving your answer to 2 decimal places.

$$(3\text{mks})$$
$$\frac{2}{\sqrt{34.46}} + \frac{2}{(8.67)^2}$$

13. Solve the simultaneous equations.

(4mks)

$$\frac{p}{q+1} = \frac{1}{4}, \frac{p-3}{p+q} = \frac{2}{3}$$

14. The angle of elevation of the top of the tower from the foot of a building is 63.51° . the angle of depression of the top of the building from the top of the tower is 18.43° . the building and the tower are 30 m apart. Find:

a) The height of the tower.

(1mk)

b) The height of the building.

(2mks)

15. Two towns M and N are 300km apart. A lorry left town M at 10.00a.m and travelled towards N at an average speed of 80km/h. At 10.45a.m a Nissan matatu left town N for town M at an average speed of 100km/h. calculate the distance covered by the lorry when it met the Nissan matatu. (3mks)

16. A commercial bank in Kenya buys and sells Foreign currencies as shown below;

Currency	Buying (Ksh)	Selling(Ksh)
1 Euro	102.15	102.26
100 Japanese Yen	75.73	75.82

A Japanese travelling from Italy arrives in Kenya with 9000 Euros. He converts all the 9000 Euros to Kenya shillings at the bank. While in Kenya he spends Ksh.398,580 and then converts the remaining kshs to Japanese yen at the bank before leaving for Japan. Calculate the amount in Japanese yen that he receives.

(4mks)

SECTION II (50 MKS)

Answer **only 5** questions from this section.

17. The attendance at a party consisted of 35 men, a number of women and some children. The number of women was one and a half that of the children present.

a) If there are a total of 65 participants, how many women attended the party?

(3mks)

b) During the party, each child took one bottle of soda, the men took two bottles each while some women took two and others three. Given that five crates each containing 24 bottles of soda were consumed, how many women took two bottles of soda?

(5mks)

c) Each crate of soda was bought for sh.432 plus a deposit of sh.10 per bottle incase it broke. How much money did the party organizers pay at the soda depot?

(2mks)

18. Three warships P, Q and R are at sea such that ship Q is 400km on a bearing of $N30^{\circ}E$ from ship P. Ship R is 750km from ship Q on a bearing of $S60^{\circ}E$ from ship Q. An enemy ship S is sighted 1000km due south of ship Q.

a) Use scale drawing to locate the positions of ships P, Q, R and S.

(4mks)

b) Find the compass bearing of: (2mks)

i. Ship P from ship S.

ii. Ship S from ship R.

c) Use the scale drawing to determine: (2mks)

i. The distance of S from P.

ii. The distance of R from S.

d) Find the bearing of: (2mks)

i. Q from R.

ii. P from Q.

19. A bus and a matatu left vihiga for Moi's Bridge, 240 km away at 8.00a.m. They travelled at 90km/h and 120km/h respectively. After 20 minutes the matatu had a puncture which took 30 minutes to mend. It then continued with the journey.

a. How far from Vihiga did the matatu catch up with the bus? (6mks)

b. At what time did the matatu catch up with the bus? (2mks)

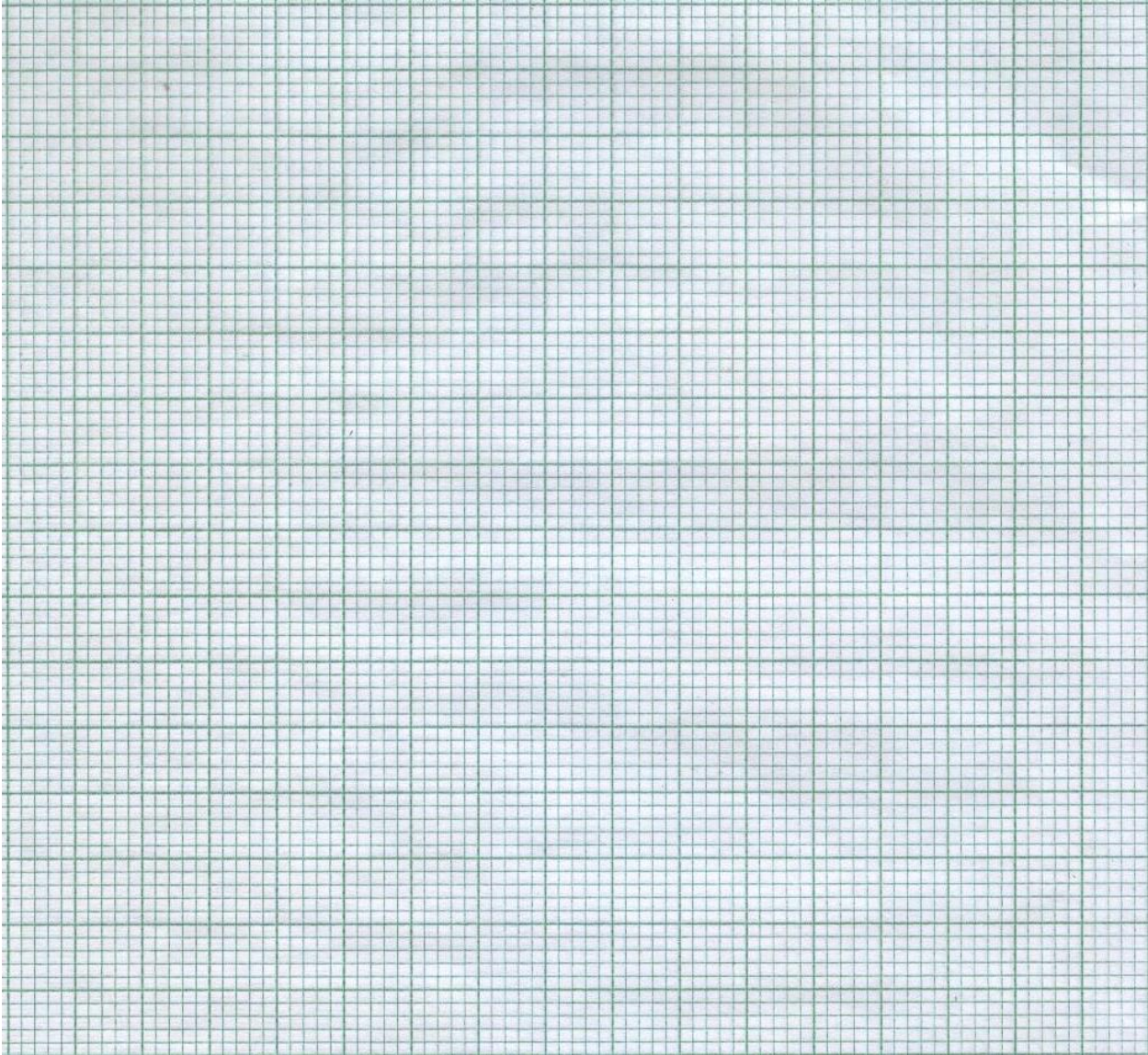
c. At what time did the bus reach Moi's Bridge? (2mks)

20. (a) Complete the table below.

(2mks)

θ	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
$\tan \frac{1}{2}\theta$	0	0.27		1	1.73	3.73		-3.73	-1.73		-0.58		0
$2\cos\theta$		1.73	1			-1.73		-1.73		0	1	1.73	2

b) Using the grid provided draw the graph of $y = \tan \frac{1}{2}\theta$ and $y = 2\cos\theta$. (5mks)



c) Use your graph to solve;

i. $\tan \frac{1}{2}\theta - 2\cos\theta = 0$ (1mk)

ii. $2\cos\theta - 1.5 = 0$ (2mks)

21. (a) Express as a single fraction in its simplest form $\frac{200}{x} - \frac{200}{x+4}$
(2mks)

(b) When driven in town, a car runs x km on each litre of petrol.

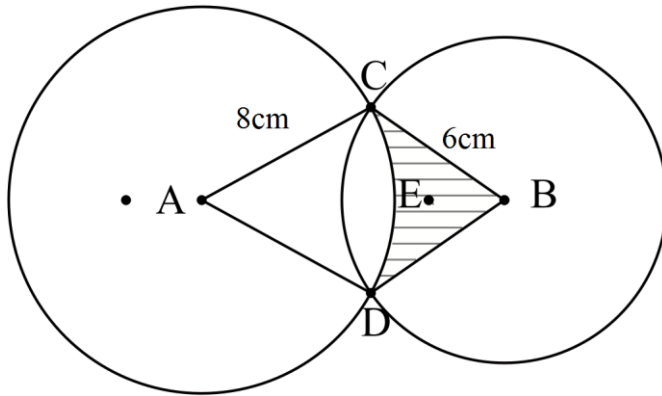
i. Find in terms of x , the number of litres of petrol used when the car is driven 200km in town. (1mk)

ii. When driven out of town, the car runs $x+4$ km on each litre of petrol. It uses 5 litres less petrol to go 200km out of town than to go the same distance in town. Use this information to write down an equation involving x , and show that it simplifies to $x^2 + 4x - 160 = 0$ (3mks)

(c) Solve the equation $x^2 + 4x - 160 = 0$ (3mks)

(e) Calculate the total volume of the petrol when the car is driven 40km in town. (1mk)

22. The figure below shows two circles intersecting at C and D. The centres are A and B with radii 8cm and 6cm respectively. $AB = 10\text{cm}$.



Determine:

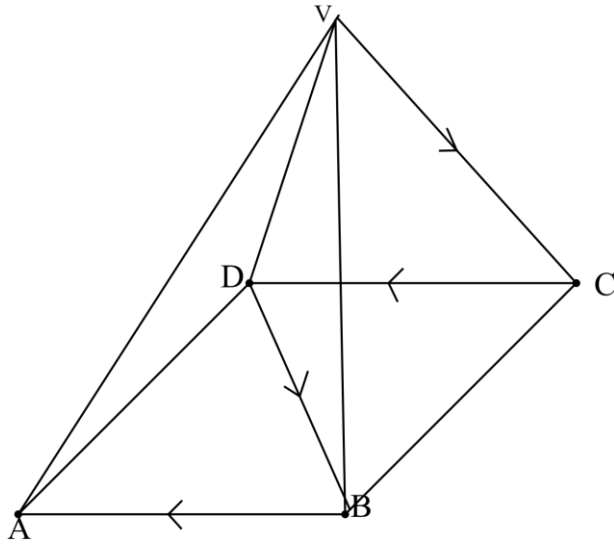
- i. Size of angle DAC. (4mks)

- ii. Size of angle DBC. (2mks)

- iii. Area of sector of ACMD. (2mks)

- iv. Area of the shaded region. (2mks)

23. The figure below shows a right pyramid standing on a square base ABCD and with a path marked on it.



- a. Sketch the net of the pyramid and label all the vertices. (2mks)

- b. On the sketch show the path marked on the diagram. (2mks)

- c. Given that the pyramid above has measurement $AB = BC = 20\text{cm}$ and the slant height of the pyramid is 26 cm , calculate the surface area of the pyramid. (6mks)

24. As a car passes the point P on a straight road, its speed is 15m/s with a uniform acceleration of 0.25m/s^2 for 20 seconds until it reaches the point Q. the car travels for a further 10 seconds with a constant acceleration of 0.5m/s^2 until it reaches point S.

a. Find;

i. The speed at Q. (2mks)

ii. The distance PQ. (2mks)

iii. The speed at S. (2mks)

iv. The total distance travelled. (2mks)

b. Calculate the average speed of the car between P and S leaving your answer as a mixed number. (2mks)

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MATHEMATICS
PAPER 2
2 ½ HOURS
JULY 2016

SUKEMO JOINT EVALUATION TEST
Kenya Certificate of Secondary Education
 Mathematics paper 1

INSTRUCTIONS TO CANDIDATES

1. Write your name, Admission Number, Class and Index Number.
2. The paper contains two sections: Section I and II
3. Answer ALL questions in section I and ANY FIVE questions from section II.
4. All working and answers must be written on the question paper in the spaces provided below each question.
5. Marks may be awarded for correct working even if the answer is wrong.
6. Negligent and untidy work will be penalized.
7. Non-programmable silent electronic calculators and four figure mathematical tables are allowed for use.
8. This paper consists of 15 printed pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.

FOR EXAMINER’S USE ONLY

SECTION I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL

GRAND TOTAL

SECTION II

17	18	19	20	21	22	23	24	TOTAL

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SECTION A 50 MARKS

1. Solve for x given: (3 marks)
$$\log_{27}(x + 7) - \log_{27}(x - 1) = \frac{2}{3}$$
2. The equation of a circle is given by $2x^2 + 6x + 2y^2 + 8y = 0$. Find the centre and radius of the circle.
(3 marks)
3. Solve for θ for values of $0^\circ \leq \theta \leq 360^\circ$ (3 marks)
$$3 - 3 \cos \theta = 2 \sin^2 \theta$$
4. Find the equation of the tangent and the normal to the curve $y = x^2 - 3x + 5$ which is parallel to the line $y = 5x + 4$.
(4 marks)
5. The triangle T has vertices at the points (1,K), (3,0) and (11,0) where K is a constant. Triangle T is transformed onto the triangle T^1 by the matrix $\begin{pmatrix} 6 & -2 \\ 1 & 2 \end{pmatrix}$. Given that the area of triangle T^1 is 364 square units, find the value of K.
(4 marks)

6. Expand $(3x^2 + 2x^{-2})^6$. State the independent term. (2 marks)
7. Find the co-ordinates of the point A (-4,2) after a rotation of 60° about the origin followed by a reflection in the line $y = -x$, leaving your answer in surd form. (3 marks)
8. A curve passes through the points (-1,0) and (2,0). Find the equation of the curve in the form $y = ax^2 + bx + c$, where a, b, c are constants. (2 marks)
9. A point P divides **AB** with co-ordinates A (2, -1, 4) and B (6, -3, 5) externally in the ratio 3 : 1. Find the co-ordinates of P and the magnitude of **OP**. (4 marks)

10. XY and RS are parallel chords on opposite sides of the centre of a circle of radius 13cm. If XY = 24 cm and RS = 20 cm, find the distance between the chords. Give your answer truncated to 4 s.f.
(3 marks)

11. From a 35 metre high window, the angle of depression to the top of a nearby streetlight is 50° . The angle of depression to the base of the streetlight is 56.5° . How high is the streetlight correct to 3 d.p.
(4 marks)

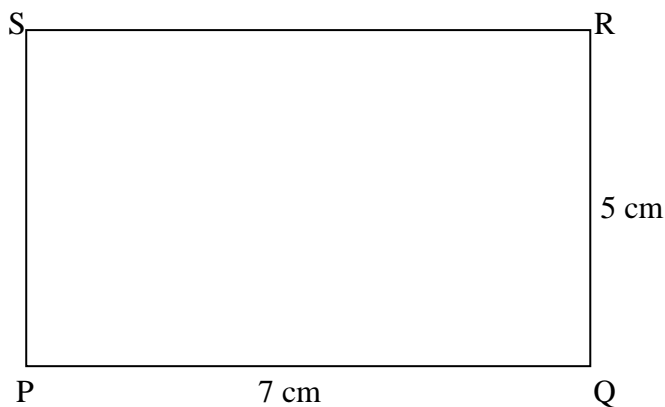
12. Simplify: (3 marks)

$$\frac{4}{\sqrt{5} + \sqrt{2}} - \frac{3}{\sqrt{5} - \sqrt{2}}$$

13. Two variables P and Q are such that P varies partly as the square root of Q and partly as Q. Determine the relationship between P and Q when Q = 16, P = 500 and when Q = 25, P = 800.
(3 marks)

14. The 10th, 25th and the last term of an AP are 313, 193 and -7. Find the number of terms in the series.
(3 marks)

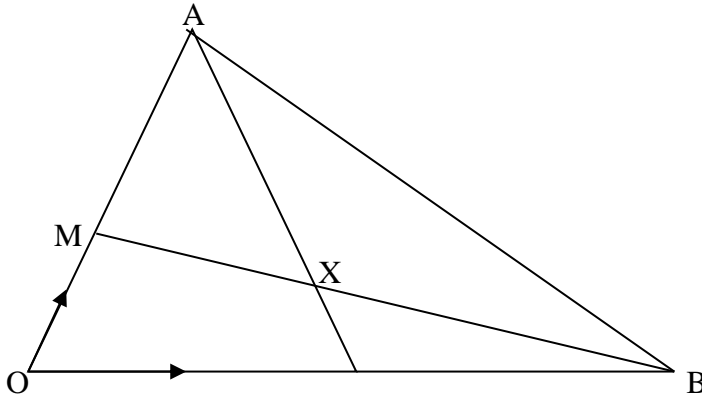
15. The figure below shows a rectangle PQRS with PQ = 7 cm and QR = 5 cm. A variable point T inside the rectangle is such that angle PTQ $\geq 90^\circ$ and angle STR $\geq 90^\circ$. By shading the unwanted region locate the region in which T lies.
(3 marks)



16. A lady bought a car on hire purchase terms. She paid a deposit of Sh 320,000. On the balance, compound interest was charged at 18% p.a. for 4 years. The interest charged and the balance were paid in 48 equal monthly installments of Sh 34,980. Calculate the price of the car to the nearest shilling.
(3 marks)

SECTION II

17. The figure below shows a triangle OAB in which M divides OA in the ratio 2 : 5 and N divides OB in the ratio 5 : 3. AN and BM intersect at X.



- (a) Given that $OA = \mathbf{a}$ and $OB = \mathbf{b}$, express in terms of \mathbf{a} and \mathbf{b} .
- (i) \mathbf{AN} (1 mark)
- (ii) \mathbf{BM} (1 mark)
- (b) If $AX = kAN$ and $BX = hBM$ where k and h are constant, write two expressions for OX in terms of \mathbf{a} , \mathbf{b} , k and h . Find the values of k and h . (8 marks)

18. The age distribution of workers in a factory is given in the following table.

Age yrs	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55
Frequency	2	10	12	23	10	8	2	3

(a) Using a suitable assumed mean, calculate the mean and the standard deviation. (4 marks)

(b) Draw an Ogive for the above distribution and use it to find the median, interquartile range and quartile deviation. (6 marks)

graph.

19. Mueni earns a basic salary of Ksh 55,000. She is housed by the employer and is given taxable allowances amounting to Ksh 10,580. The table below shows income tax rates.

Monthly taxable pay K£	Rate of tax Ksh / £
1 – 435	2
436 – 970	3
971 – 1505	4
1506 – 2040	5
Excess over 2040	6

(a) If taxable income is gross salary plus $\frac{15}{100}$ of basic salary calculate her total monthly tax in Ksh per month. (5 marks)

(b) Mueni is entitled to personal relief of Ksh 1200 per month. Determine her net tax in Ksh per month. (2 marks)

(c) If she pays NHIF Sh 320, and contributes Sh 5,000 as shares to cooperative society. In addition she contributes Ksh 13,000 towards her loan repayment, calculate her net salary. (3 marks)

20. Four towns P, Q, R and S are located on the earth's surface at the following co-ordinates P (0° , 15° W), Q (0° , 15° E), R (45° N, 15° E), S (45° N, 15° W). At noon, two aircrafts A and B each flying at a

speed of 350 km/h start simultaneously from P and S and flew towards Q and R respectively. Each aircraft flies along the parallel of latitude.

(a) Determine the distance from:

(i) P to Q (2 marks)

(ii) S to R (2 marks)

(b) Calculate the time taken by:

(i) A from P to Q (2 marks)

(ii) B from R to S. (2 marks)

(c) Determine at what time of the day each aircraft arrives at its destination. (2 marks)

21. (a) Two variables x and y are connected by the law $y = \left(\frac{m}{x} + n\right)^{\frac{1}{2}}$ for all positive values of x .

(i) Convert the equation above into linear form.

(ii) State the variables to be plotted against each other to give a straight line graph.
(1 mark)

(b) The table below gives corresponding values of x and y . Complete the table by filling the blank boxes.

x	1.5	2	2.5	3	3.5	4
y	$\sqrt{13}$	$\sqrt{11}$	$\sqrt{9.8}$	3	$\sqrt{8.43}$	$\sqrt{8}$

(c) By drawing a suitable linear graph, determine:

(i) the values of m and n .

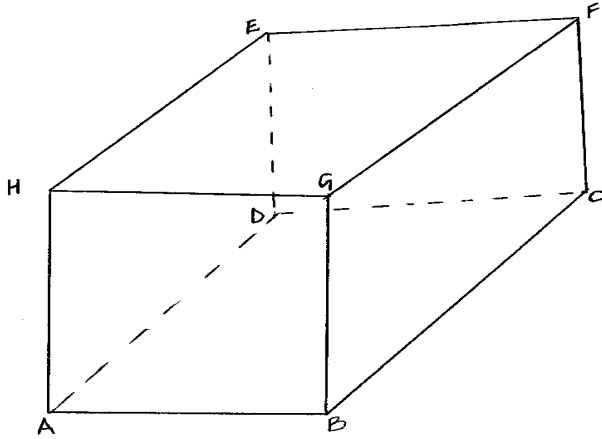
(5 marks)

graph.

(ii) the law connecting y and x .

(1 mark)

22. The diagram below shows a cube of sides 20cm. calculate to one decimal place:



(a) The length of AF (2 marks)

(b) The length of BF (2 marks)

(c) The size of the angle between plane BFD and the base ABCD. (2 marks)

(d) The shortest distance between point B and the plane ACF. (2 marks)

(e) Find the angle θ made by the line HF and its skew line BC. (2 marks)

23. For a mathematics contest examination, at least 4 but not more than nine students are to be chosen to make a group. The ratio of the number of boys to the number of girls must be less than 2 : 1 and there must be more boys than girls. If x and y represent the number of boys and girls respectively:

(a) Write down in their simplest form all the inequalities in x and y . (4 marks)

(b) On the grid provided, graph the inequalities in (a) above, by shading the unwanted region and clearly indicate the region that satisfy the inequalities by letter R. (4 marks)

graph.

(c) By use of a search line, or otherwise find the composition of the contest group of:

(i) Largest size (1 mark)

(ii) Smallest size (1 mark)

24. Draw on the same set of axes, the graph of $y = \sin x$ and $y = 2\sin(x + 30^\circ)$ in the range $-240^\circ \leq x \leq 240^\circ$. Using a scale of x axis 1 cm rep 30° , y axis 1 cm rep 0.5 units.

graph.

- (a) Find the period and the amplitude of the functions.
- (b) What transformation maps the graph of $y = \sin x$ onto the graph of $y = 2 \sin(x + 30^\circ)$.
- (c) State the phase angle of $y = 2 \sin(x + 30^\circ)$

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