CEKENA
MATHEMATICS PAPER 1
121/1

SECTION 1 (50MARKS)

1. Without using tables or calculator evaluate

$$\frac{(-2) \times 7 + (-4) \div (-3)}{3 \times (-2) + 5 \times (-4)}$$ (3mks)

2. The average lap time for 3 athletes in a long distance race is 36 seconds, 40 seconds and 48 seconds respectively. If they all start the race at same time, find the number of times the lowest runner will have been over lapped by the fastest at the time all cross the starting point together again.   (3mks)

3. Line L1 passes through the points A (1,2) and B (3, -4). Find the equation of L2 passing through the mid-point of AB and perpendicular to L1, leaving your answer in the form ax+by+c=0   (4mks)

4. Evaluate using logarithms

$$\sqrt{\frac{4.283 \times (0.009478)^2}{\text{Log } 9.814}}$$ (4mks)

5. Given that the position vectors of points P and Q are P = $\begin{pmatrix} -4 \\ -2 \end{pmatrix}$ Q . M$\begin{pmatrix} 5 \\ 4 \end{pmatrix}$ a point on PQ such that PM:MQ = 2:1. Find the coordinates of M   (3mks)

6. Mutua has 21 coins. The total value of the coins is Kshs. 72. There are half as many ten shillings coin as there are five shilling coins. If the rest are one shilling coin, find the number of five shilling coins mutual has.   (2mks)

7. The figure below is a velocity time graph of a car
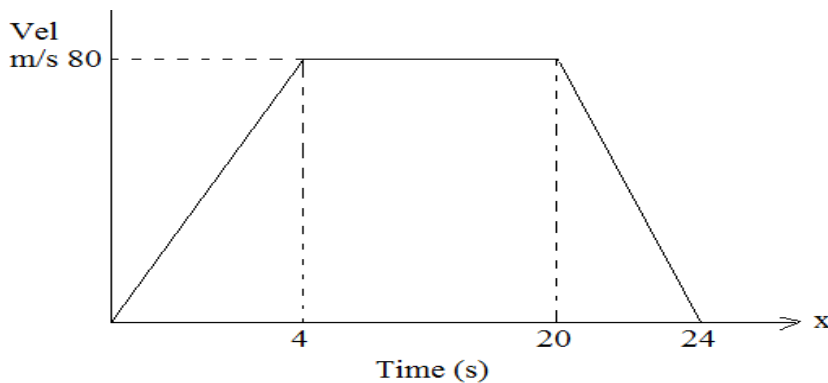
a) Find the total distance travelled by the car.   (1mk)
b) Calculate the deceleration of the car.   (2mks)

8. A contractor was to finish a piece of work in 80 days. He employed 150 workers to work for 6 hours a day. After 30 days he found out that only a quarter of the work has been done. How many more workers did he require to finish the work in time?   (3mks)

9. Find the integral values of the inequalities $x \leq 2x + 7 \leq {}^{-1}/_3 x + 14$ hence represent the solution on a number line.   (3mks)

10. One interior angle of a polygon is equal to 80^0 and each of the other interior angles are 128^0. Find the number of sides of the polygon.   (3mks)

11. Sketch and label the net of prism shown below
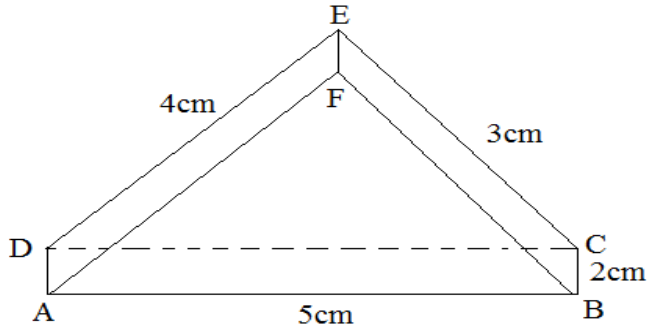
12. A Kenya Bank buys and sells foreign currencies as shown

	Buying (Kshs)	Selling (Kshs)
1 Euro	84.15	84.26
100 Japanese Yen	65.37	65.45

A Japanese travelling from France to Kenya had 5000 Euros. He converted all the 5000 Euros to Kenya shillings at the bank. While in Kenya, he spent a total of Kshs. 289850 and then converted the remaining Kenya shillings to Japanese Yens at the Bank. Calculate the amount in Japanese Yen that he received. (3mks)

13. Find the value of x in the following equations
$$(4)^{-2x} = (^1/_{32})^{3x-4}$$ (3mks)

14. The volumes of two similar cylinders are 4752 cm^3 and 1408cm^3. If the area of the curved surface of the cylinder of the smaller cylinder is 352 cm^2, find the area of the curved surface of the larger cylinder. (3mks)

15. Without using calculator or mathematical tables find the value of
$$\frac{0.0060 \times 2.4 \times 0.3^2}{0.9 \times 0.00015 \times 160}$$ (3mks)

16. A carpenter constructed a closed wooden box with internal measurement 1.5 meters long, 0.8 metres wide and 0.4 metres high. The wood used in constructing the box was 1.0cm thick and has a density of 0.6gm/cm^3
Determine:
a) Volume in cm^3 of the wood used in constructing the box. (3mks)
b) Mass of the box in kilogram correct to 1 decimal place

SECTION II (50 MARKS)
*Answer any FIVE questions from this section*

17. Judy has two dairy farms A and B. Farm A produces milk with 4 ½ percent fat and B produces milk with 5 ¾ percent fat.
a) Determine;
   i) The total mass of milk fat in 70kg of milk from A and 40kg of milk from farm B. (3mks)
   ii) The percentage of fat in a mixture 70kg of milk from A and 40kg of milk from farm B. (2mks)
b) Determine the range of values of mass of milk from B that must be used in 60kg mixture so that the mixture may have at least 5% fat.

18. The vertices of triangle PGR are P(0,0), Q(6,0) and R(2,4)
a) Draw triangle PQR on the grid provided
b) Triangle P1Q1R' is the image of a triangle PQR under an enlargement scale factor, ½ and centre (2,2). Write down the coordinates of triangle P^{1}Q^{1}R^1 and plot on the same grid. (2mks)
c) Draw triangle P^{11}Q^{11}R^{11} the image of triangle P^{1}Q^{1}R^1 under a positive quarter turn about points (1,1) (3mks)
d) Draw a triangle P^{111}Q^{111}R^{111} the image of triangle P^{11}Q^{11}R^{11} under reflection in the line y=1 (2mks)
e) Describe fully a single transformation that maps triangle P^{111}Q^{111}R^{111}onto triangle P^{1}Q^{1}R^1 (2mks)

19. The figure below shows two circles on radii 10.5 and 8.4cm and with centres A and B respectively. The common chord PQ 9cm
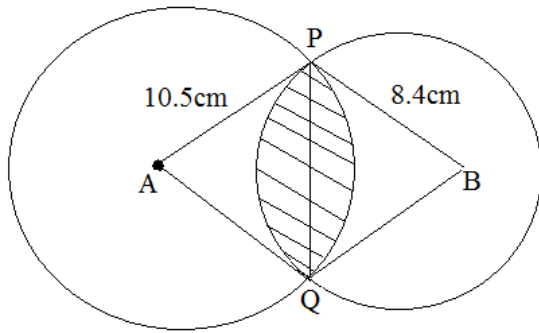
a) Calculate angle PAQ (2mks)
b) Calculate angle PBQ (2mks)
c) Calculate the area of the shaded part. (6mks)

20. Four towns P, R, T and S are such that R is 80km directly to the north of P and T on a bearing of 290^0 from P at a distance of 65km. S is on a bearing of 330^0 from T and a distance of 30km. Using a scale of 1 cm to represent 10km, make an accurate scale drawing to show the relative position of the towns (4mks)

Find:
a) The distance and the bearing of R from T (3mks)
b) The distance and the bearing of S from R (2mks)
c) The bearing of P from S (1mk)

21. The figure below shows a solid made up of a conical frustum and a hemispherical top. The dimensions are as indicated.
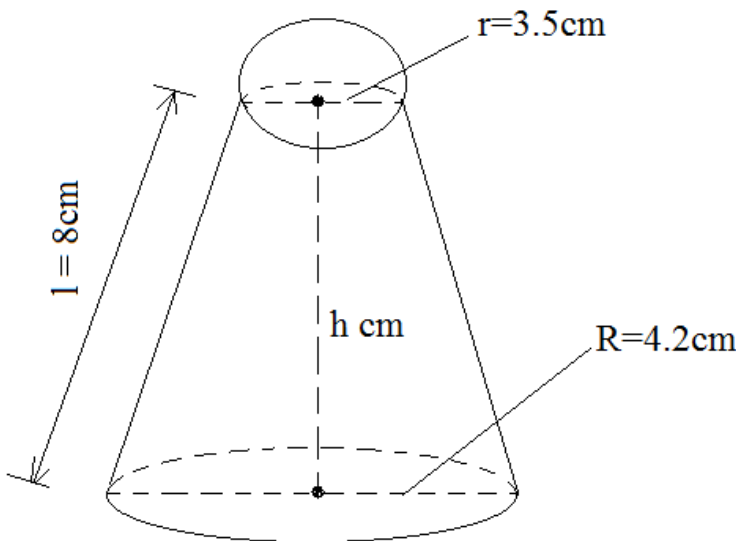
The top radius r = 3.5cm, bottom radius R = 4.2cm, slant l = 8cm and the height of the frustum part is h cm.

a) Find the surface area of the solid (Take $\pi = \frac{22}{7}$) (5mks)
b) If a similar solid has a total surface area of $81.51cm^2$, determine the radius of its base, to the nearest whole number. (1mk)
c) i) Find the height, h, of the frustum. (1mk)
    ii) Hence determine the volume of the solid (3mks)

22. A bus and a matatu left Vihiga for Moi's Bridge, 240km away at 8.00a.m. They travelled at 90km/h and 120km/h respectively. After 20minutes 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)

23. The table below shows marks obtained by 120 candidates. Frequencies for all the groups and also the area and height of the rectangle for the group 30-60 marks are shown.

Marks	0-10	10-30	30-60	60-70	70-100
Frequency	12	40	36	8	24
Area of rectangle			36		
Height of rectangle			1.2		

a) i) Complete the table   (2mks)
   ii) on the grid provided below draw a histogram to represent the distribution.   (4mks)
   iii) State the group in which the median lies.   (1mk)
   iv) A vertical line drawn through the median mark divides the total area of the histogram into two equal
       parts. Using this information, estimate the median mark.   (2mks)
24. A circular lawn is surrounded by a path of uniform width of 7m. The area of the path is 21% that of the lawn.
   a) Calculate the radius of the lawn   (4mks)
   b) Given further that the surrounding the lawn is fenced on both sides by barbed wire on posts at intervals of 10
       metres and 11 metres on the inner and outer sides respectively   (4mks)
   c) Calculate the total cost of the posts if one post costs sh. 105.   (2mks)

CEKENA
MATHEMATICS PAPER 2
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SECTION I (50 MARKS)
Answer all questions in this section

1. Without using a calculator or mathematical table evaluate

    $\frac{1}{3}$ of (2 ¾ - 5 ½) x 3 $\frac{6}{7}$ ÷ $\frac{9}{4}$ (3mks)

2. Make x the subject of the formula

    $V = m \sqrt{\dfrac{a - x}{x}}$ (3mks)

3. a) Expand $(x - 0.2)^5$ in ascending power of x (2mks)
    b) Using your expansion up to the fourth term to evaluate 9.8^5

4. Simply $\dfrac{3 - \sqrt{7}}{3 + \sqrt{7}}$ - $\dfrac{\sqrt{3}}{3 - \sqrt{7}}$ leaving your answer in the form $a + b\sqrt{7}$ where a and b are constants (3mks)

5. Calculate the percentage error in volume of a cone whose radius is 9.0cm and slant length 15.0cm (3mks)

6. A Solve for x $\left(\log_3^x\right)^2$ - $\frac{1}{2}\log_3^x$ = $\frac{3}{2}$ (3mks)

7. A. circle whose centre is c (2,3) passes through a point p(a,b). A point m(-2, $\frac{-5}{2}$) is the midpoint of the line segment cp

    a) Calculate the co-ordinates of p
    b) Determine the equation of the circle in the form $ax^2 - by^2 + cx + dy + e = 0$, whwrw a, b, c, d and e are integers. (3mks)

8. Simplify $\dfrac{2x - 2}{6x^2 - x - 12} \div \dfrac{x - 1}{2x - 3}$ (3mks)

9. Solve for x given that the following is a singular matrix

    $\begin{pmatrix} 1 & 2 \\ x & x-3 \end{pmatrix}$ (2mks)

10. Solve for x in the following equation

    $\sin(\frac{1}{2}x - 10^0) = \cos 2x$ (3mks)

11. A quality A is partly constant and partly varies as quantity B. Given that A = -10 when B = 2.5 abd A = 10 when B = 1.25. Find the value of A when B = 1.5. (4mks)

12. In the figure below, AB is a tangent, meeting chords CDE at B. AD = 5cm, CD = 4cm, DF = 3.6cm, EB = 7.5cm and DE = xcm
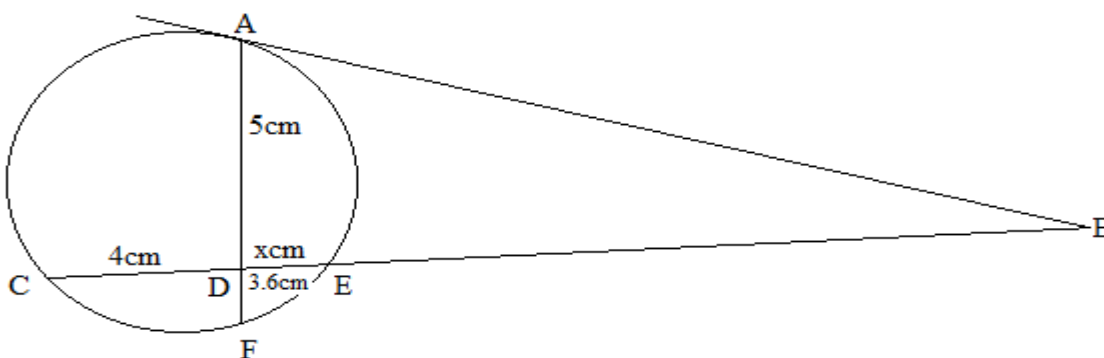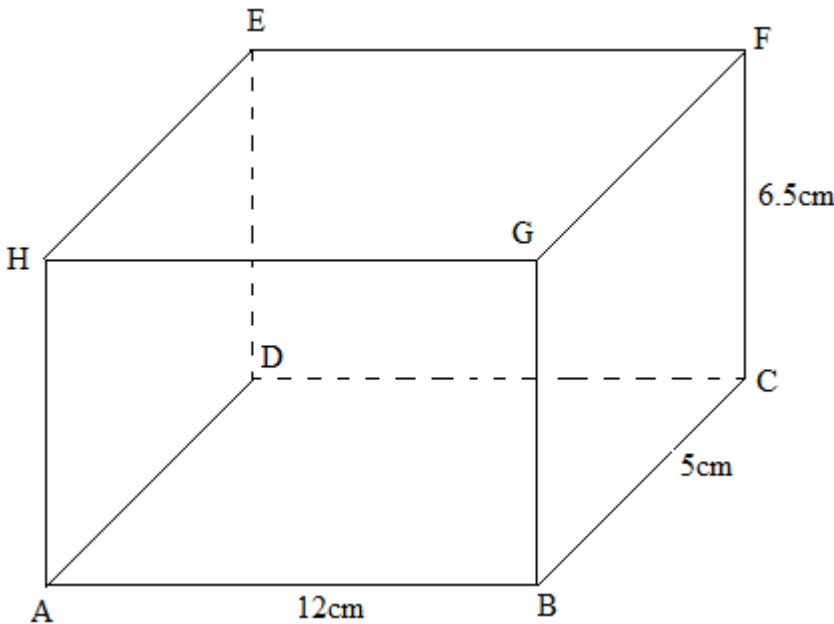
Determine
a)   The value of x   (1mk)
b)   The length of AB   (2mks)

13. The figure below is a cuboid ABCDEFGH. AB = 12cm, BC = 5cm and CF = 6.5cm

a)   State the projection of AF on the plane ABCD   (1mk)
b)   Calculate the angle between AF and the plane ABCD correct to 2 decimal places   (3mks)

14. The price of a new car is Ksh. 800,000. If it depreciates at a constant rate to 550,000 within 4 years, find the annual rate of depreciation.   (3mks)

15. In the figure below, AB is parallel to DE, DE bisects angle BDG, angle DCF = 60^0, angle CFG = 110^0.
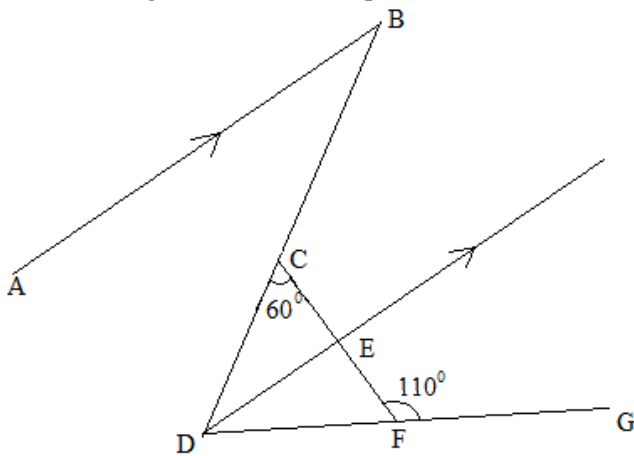
Find giving reasons

a) $\angle$CDF   (2mks)

b) $\angle$ABD   (2mks)

16. A blouse whose marked price is Sh. 800 is sold to a customer after allowing him a discount of 13%. If the trader makes a profit of 20%, find how much the traderr paid for the blouse.   (2mks)

SECTION II (50 MARKS)
Answer only five questions in this section

17. a) Salome invested Kshs. 250,000 for 2 ½ years in an account which paid 16% compound interest p.a. The interest is compounded quarterly. At the end of 2 ½ years she withdrew all the amount and spent it to the nearest thousands to buy for similar motor cycles. She earned an average of Kshs. 10,000 from each motorcycle per month.
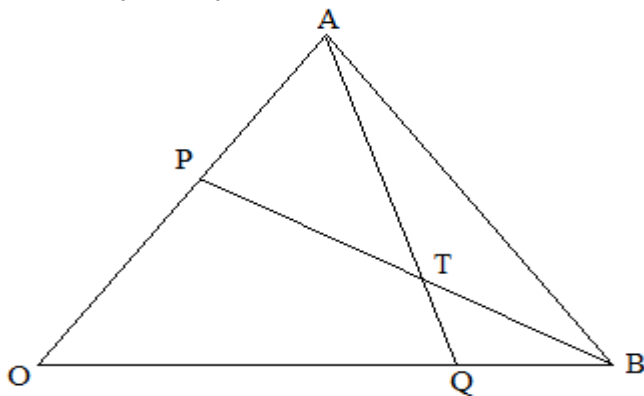   Find;
    i) The amount she withdrew at the end of 2 ½ years (2mks)
    ii) The cost of each motocycle. (2mks)
    iii) The total earnings from the motorcycles for 3 years (2mks)
  b) She decided to sell all the motorcycles after depreciating at an average rate of 20% p.a. for the 3 years
    Find;
    i) The new value of each motorcycle after depreciation. (2mks)
    ii) The profit earned from her initial investiment to the nearest shilling. (2mks)

18. In the triangle below P and Q are points on OA and OB respectively such that OP:PA = 3 : 2 and OQ : QB = 1 : 2. AQ and PQ intersect at T. Given that OA = a and OB = b

  a) Express AQ and PQ in terms of a and b (2mks)
  b) Taking BT = kBP and AT = hAQ where h and k are real numbers
    i) Find two expressions for OT in terms of a and b (2mks)
    ii) Use the expression in b(i) above to find the values of h and k. (4mks)
  c) Give the ratio BT : TP (2mks)

19. An arithmetic progressive (AP) has the first term a and the common difference d.
  a) Write down the third, ninth and twenty fifth term of the AP in terms of a and d. (1mk)
  b) The AP above is increasing and the third, ninth and twenty fifth terms form the first three consecutive terms of a Geometric Progression (GP) The sum of the seventh and twice the sixth terms of the AP is 78.
    Calculate:-
    i) the first term and common difference of the AP. (5mks)
    ii) the sum of the first nine terms of the AP. (2mks)
    iii) The difference between the fourth and the seventh terms of an increasing AP. (2mks)

20. The probability that three candidates, Anthony, Beatrice and Caleb will pass an examination are ¾ , $^2/_3$ and $^4/_5$ respectively. Find the probability that:-
  a) all the candidates will pass (2mks)
  b) all the three candidates will not pass (2mks)
  c) only one of them will pass (2mks)
  d) only two of them will pass (2mks)
  e) at most two of them will pass (2mks)

21. a) Complete the table below for the function y = (3 – x) (x + 1)

x	-3	-2	-1	0	1	2	3	4
x+1	-2	-1		1		3	4	
3-x	6	5	4		2	1		-1
y	-12	-5		3	4		0	-5

b) Use the value in the table to draw the graph of $y = (3-x)(x+1)$. Use the following scale.
Horizontal axis 2cm for 1 unit
Vertical axis 1cm for 1 unit (3mks)

c) Use your graph in part (b) above to solve the following quadratic equations
i) $-x^2 + 2x + 3 = 0$ (2mks)
ii) $-x^2 + x + 6 = 0$ (3mks)

22. Use a ruler and a pair of compasses only all constructions in this question.
a) Construct the rectangle ABCD such that AB = 7.2cm and BC = 5.6cm. (3mks)
b) Construct in the same diagram the Locus L_1 of points equidistant from A and B to meet with another Locus L_2 of points equidistant from AB abd BC at M. Measure the acute angle formed at M by L_1 and L_2
(3mks)
c) Construct on the same diagram the locus of point K inside the retangle such that K is less than 3.5cm from point M. Given that point K is nearer to B than A and also to BA than BC, shade the possible region where K lies. Hence calculate the are of this region. Correct to one decimal place. (4mks)

23. 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?
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? (6mks)
c) Each crate of soda was bought for sh. 432 plus plus a deposit od sh. 10 per bottle in case it broke. How much money did the party organizers pay at the soda depot? (2mks)

24. Given that $y = 2 \sin 2x$ and $y = 3 \cos (x + 45^0)$
a) Complete the table below:

x	0^0	20^0	40^0	60^0	80^0	100^0	120^0	140^0	160^0	180^0
2 sin 2x	0		1.97		0.68	-0.68	-1.73		-1.28	0.00
3 cos (x+45^0)	2.12	1.27		-0.78		-2.46			-2.72	-2.12

b) Use the data to draw the graph of $y = 2 \sin 2x$ and $y = 3 \cos (x + 45^0)$ for $0^0 \le x \le 180^0$ on the same axis on the grid provided below. (5 mks)
c) State the amplitude and period of each curve (2mks)
d) Use the graph to solve the equation $2 \sin 2x - 3 \cos (x\ 45^0) = 0$ for $0^0 \le x \le 180^0$ (1mks)
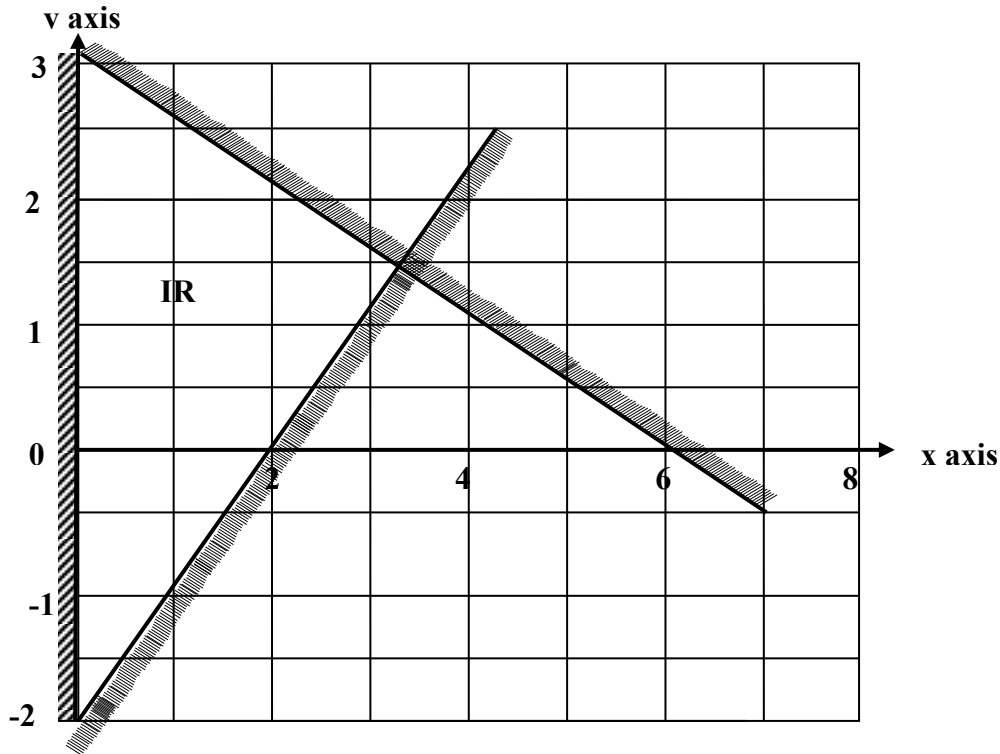
EMBU CLUSTER
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MATHEMATICS
PAPER 1

SECTION I:(50 Marks). Answers ALL questions in this section

1. Without using a calculator evaluate (3 Marks)

$$\frac{\left(3\frac{1}{3} + 1\frac{1}{9}\right) \div 1\frac{1}{3}}{\left(4\frac{2}{9} - 2\frac{5}{9}\right) x \frac{2}{3}}$$

2. The number $5.8\overset{\bullet\bullet}{1}$ 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 ½ 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
   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 150^0 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)

$$9^{(2x-1)} x 3^{(2x+1)} = 243$$

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 Metres)
(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≤X<9	9≤X<11	11≤X<13	13≤X<16	16≤X<20	20≤X<21
No. of contents y	2	6	8	3	2	1

Use the table to represent the information on a histogram. (3 Marks)

SECTION II (50 MARKS): Answer any five questions in this section.

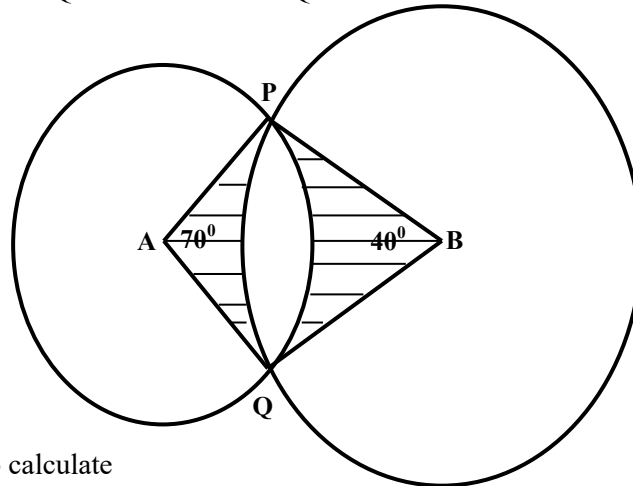17. The diagram below shows two circles, centre A and B which intersect at points P and Q.
Angle PAQ = 70^0, angle PBQ = 40^0 and PA = AQ = 8cm.
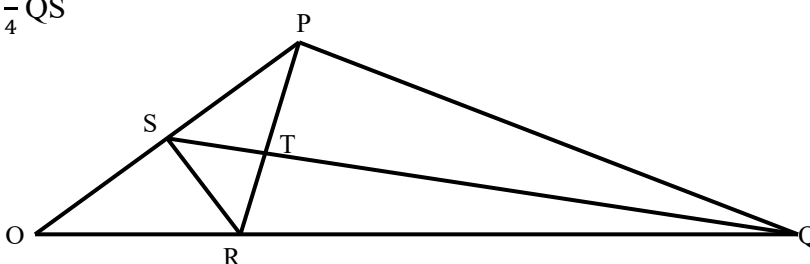

Use the diagram to calculate
(a) PQ to correct to 2 decimal places   (2 Marks)
(b) PB to correct to 2 decimal places   (2 Marks)
(c) Area of the minor segment of the circle whose centre is A   (2 Marks)
(d) Area of shaded region   (4 Marks)

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 Minutes)
(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) SR   (1 Mark)
(ii) QS   (2 Marks)
(iii) PT   (2 Marks)
(iv) TR   (2Marks)

(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 ½ 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 ½ 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 030^0 from ship A. Ship C is 700km from ship B on a bearing of 120^0. 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)
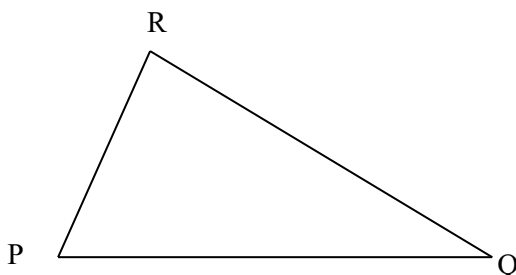24. (a) Fill the table below for the function y = $2x^2$ + 6x – 5, for -4≤x≤3   (2 Marks)

X	-4	-3	-2	-1	0	1	2	3
Y								

 (b)   (i) Draw the curve for y = $2x^2$ + 6x – 5, for -4≤x≤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   (1 Mark)
        y = $2x^2$ + 6x – 5 and line y = 7x + 1
 (d) Find the actual of the region bounded by the curve y = $2x^2$ + 6x – 5 and line y = 7x + 1   (4 Marks)

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MATHEMATICS
PAPER 2

SECTION 1 (50 MARKS): ANSWER ALL QUESTIONS IN THE SECTION.

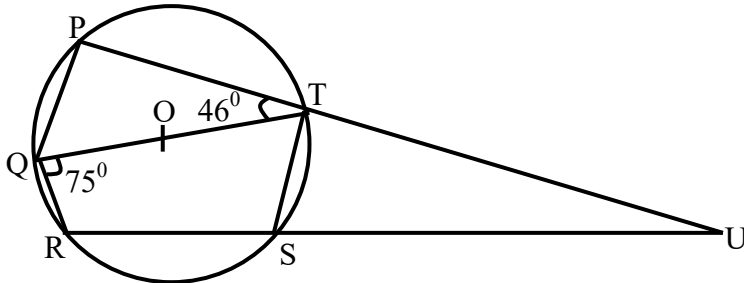1. Use logarithms to evaluate (4 Marks)

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$

2. Form the quadratic equation whose roots are $x = -\frac{5}{3}$ and $x = 1$ (2 Marks)

3. W varies directly as the cube of x and inversely as y. Find W in terms of x and y given that W = 80 when x = 2 and y = 5. (2 Marks)

4. A cold water tap can fill a bath in 10 minutes while a hot water tap can fill it in 8 minutes. The drainage pipe can empty it in 5 minutes. The cold water and hot water taps are opened for 4 minutes. After four minutes all the three taps are opened. Find how long it takes to fill the bath. (3 Marks)

5. Object A of area 10cm^2 is mapped onto its image B of area 60cm^2 by a transformation. Whose matrix is given by $p = \begin{pmatrix} x & 4 \\ 3 & x+3 \end{pmatrix}$. Find the positive values of x (3 Marks)

6. Make P the subject of the formula in $L = \frac{2}{3}\sqrt{\frac{x^2 - PT}{y}}$ (3 Marks)

7. (a) Expand the expression $\left(1 + \frac{1}{2}x\right)^5$ in ascending order powers of x, leaving the coefficients as fractions in their simplest form. (2 Marks)
   (b) Use the first three terms of the expansion in (a) above to estimate the value of $(1.05)^5$ (2 Marks)

8. By rounding each number to the nearest tens, approximate the value of $\frac{2454 \times 396}{66}$
   Hence, calculate the percentage error arising from this approximation to 4 significant figures. (3 Marks)

9. Without using a calculator or mathematical tables, express $\frac{\sqrt{3}}{1 - Cos\ 30^0}$ in surd form and simplify (3 Marks)

10. Kasyoka and Kyalo working together can do a piece of work in 6 days. Kasyoka, working alone takes 5 days longer than Kyalo. How many days does it take Kyalo to do the work alone? (3 Marks)

11. The second and fifth terms of a geometric progression are 16 and 2 respectively. Determine the common ratio and the first term. (3 Marks)

12. A particle moves along a straight line AB. Its velocity V metres per second after t seconds is given by
    $v = t^2 - 3t + 5$
    Its distance from A at the time t = 1 is 6 metres.
    Determine its distance from A when t = 3 (3 marks)

13. On the triangle PQR, draw a circle touching PR, QP produced and QR produced. (3 Marks)

14. Two containers have base area of 750cm^2 and 120cm^2 respectively. Calculate the volume of the larger container in litres given that the volume of the smaller container is 400cm^3. (3 Marks)

15. Solve for x in the equation
    $2\ Sin^2\ x - 1 = Cos^2\ x + Sin\ x$, where $0^0 \leq x \leq 360^0$. (4 Marks)

16. Find the radius and the coordinate of the centre of the circle whose equation is
    $2x^2 + 2y^2 - 3x + 2y + \frac{1}{2} = 0$ (4 marks)

SECTION II (50 MARKS): ANSWER FIVE QUESTIONS IN THIS SECTION.

17. A bag contains 5 red, 4 white and 3 blue beads. Two beads are selected at random.
    (a) Draw a tree diagram and list the probability space. (3 Marks)
    (b) Find the probability that
        (i) The last bead selected is red. (2 Marks)
        (ii) The beads selected were of the same colour (2 Marks)
        (iii) At least one of the selected beads is blue (3 Marks)

18. The figure below shows a circle centre O in which line QOT is a diameter. Angle QTP = 46^0, angle TQR = 75^0 and angle SRT = 38^0, PTU and RSU are straight lines.

Determine the following, giving reasons in each case:
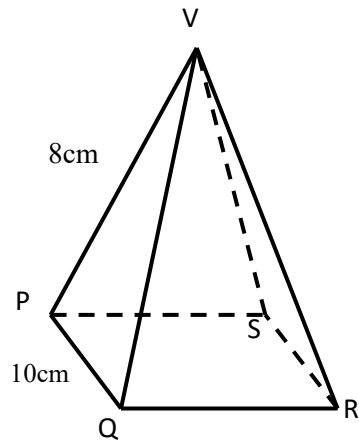   (a) angle RST (2 Marks)
    (b) angle SUT (2 Marks)
    (c) angle PST (2 Marks)
    (d) obtuse angle ROT (2 Marks)
    (e) angle SQT (2 Marks)

19. P, Q and R are three villages such that PQ = 10km, QR = 8km and PR = 4km where PQ, QR and PR are connecting roads.
    (a) Using a scale of 1cm rep 1 km, locate the relative positions of the three villages (2 Marks)
    (b) A water tank T is to be located at a point equidistant from the three villages. By construction locate the water tank T and measure its distance from R. (3 Marks)
    (c) Determine the shortest distance from T to the road PQ by construction (2 Marks)
    (d) Determine the area enclosed by the roads PQ, QR and PR by calculation (3 Marks)

20. For a sample of 100 bulbs, the time taken for each bulb to burn was recorded. The table below shows the result of the measurements.

Time (in hours)	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
Number of bulbs	6	10	9	5	7	11	15	13	8	7	5	4

    (a) Using an assumed mean of 42, calculate
        (i) the actual mean of distribution (4 Marks)
        (ii) the standard deviation of the distribution (3 Marks)
    (b) Calculate the quartile deviation (3 Marks)

21. A plane leaves an airport P (10^0S, 62^0E) and flies due north at 800km/h.
    (a) Find its position after 2 hours (3 Marks)
    (b) The plane turns and flies at the same speed due west. It reaches longitude Q, 12^0W.
        (i) Find the distance it has traveled in nautical miles. (3 Marks)
        (ii) Find the time it has taken (Take $\pi = \frac{22}{7}$, the radius of the earth to be 6370km and 1 nautical mile to be 1.853km) (2 Marks)
    (c) If the local time at P was 1300 hours when it reached Q, find the local time at Q when it landed at Q (2 Marks)

22. PQRSV is a right pyramid on a horizontal square base of side 10cm. The slant edges are all 8cm long. Calculate

(a) The height of the pyramid (2 Marks)
(b) The angle between
   (i) Line VP and the base PQRS (2 Marks)
   (ii) Line VP and line RS (2 Marks)
   (iii) Planes VPQ and the base PQRS (2 Marks)
(c) Volume of the pyramid (2 Marks)

23. Complete the table below for the functions $y = \sin 3\theta$ and $y = 2\cos(\theta + 40^0)$ (2 Marks)

θ^0	0^0	10^0	20^0	30^0	40^0	50^0	60^0	70^0	80^0	90^0
3 Sin 3θ	0	1.50		3.00			0.00			-3.0
2 Cos (θ + 40⁰)	1.53	1.29			0.35			-0.69		-1.29

(a) On the grid provided, draw the graphs of $Y = 3\sin 3\theta$ and $y = 2\cos(\theta + 40^0)$ on the same axis.
   Take 1 cm to represent 10^0 on the x-axis and 4 cm to represent 2 unit on the y – axis. (5 marks)
(b) From the graph find the roots of the equation.
   (i) $\frac{3}{4}\sin 3\theta = \frac{1}{2}\cos(\theta + 40^0)$ (2 Marks)
   (ii) $2\cos(0 + 40^0) = 0$ in the range $0 \le \theta \le 90^0$ (1 Mark)

24. The gradient function of a curve is given by the expression $2x + 1$. If the curve passes through the point (-4, 6)
   (a) Find:
      (i) The equation of the curve (3 Marks)
      (ii) The values of x, at which the curve cuts the x-axis (3 Marks)
   (b) Determine the area enclosed by the curve and the x –axis (4 Marks)

**CEKENA MOCK**
121/1
MATHEMATICS PAPER 1

SECTION 1

1. Evaluate
$$\frac{(^1/_4 - \,^3/_8) \div 3^1/_2 + 1\,^5/_6}{^3/_7 \text{ of } 3^2/_3 - 3^4/_7 - (^{-5}/_4)}$$
(3 mks)

2. Three angles of a polygon are 125,140 and 160. The remaining angles are 145^0 each. Calculate the sum of the interior angles of the polygon (3 mks)

3. A dealer has two types of grades of tea A and B. Grade A costs Ksh. 140 per kg. grade B costs Ksh. 160 per kg. If the mixture is sold at Ksh. 180 per kg and the dealer makes a profit of 20%. Find the ratio in which the two grades should be mixed (3 mks)

4. Evaluate
$$\frac{(^1/_{125})^{2/3} \times (^{16}/_{25})^{-1/2}}{32^{-3/5}}$$
(4 mks)

5. List all the intergral values of X which satisfy the inequality

$$\frac{4 + x}{-3} > 3x + 2 > -13$$
(3 mks)

6. The equation of line L_1, is $10y = 4x - 20$. Line L_1 intersects another line L_2 perpendicularly at the point P (10, 2). Find the coordinates of point M where L_2 intersects with line $x = 12$ (3 mks)

7. Use tables of square roots and reciprocals to evaluate (3 mks)
$$\frac{10}{\sqrt{0.625}} + \frac{4}{\sqrt{164}}$$

8. In the triangle PQR below PQ = 13cm, PR = 15cm and $<PQR = 75^0$
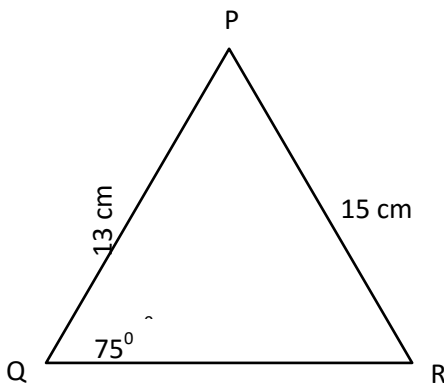
Calculate correct to 3 significant figures the area of the triangle PQR (3 mks)

9. A sector of a circle of radius 42cm subtends an angle of 120^0 at the centre of the circle. The sector is folded into an inverted right cone.
   Calculate:-
   (i) The base radius of the cone (3 mks)
   (ii) To one decimal place the vertical height of the cone (1 mk)

10. Simplify the expression: $\dfrac{x - 3}{x + 3} - \dfrac{x^2 - 3x}{x^2 - 9}$ (3 mks)

11. Murimi bought 50 physics terxt books and 60 mathematics text books for a total of Ksh. 85,500. Had Murimi bought half number of physics text books and one and a half times the number of mathematics text books he would have paid Ksh. 5250 more.
    (i) Form 2 equations to represent the above information (1 mk)
   (ii) Use matrix method to find the price of a physics book and a mathematics text books (3 mks)

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12. A commercial bank buys and sells foreign currencies at the rate shown below:

	Buying	Selling
100 Japanese yen	84.0	84.2
1 Us dollar	88.6	88.7

A tourist went to Kenya with 500,000 yen. He changed the money to Ksh. In a bank which charged a commission of 5%. He spent ¾ of the money and converted the rest to Us dollars when leaving the country. How much money to the nearest dollars did he go back with? (3 mks)

13. XYZ is a triangle. Draw the locus of a point M such that XYZ is equal to angle XMZ and Y must lie on the locus of M (3 mks)
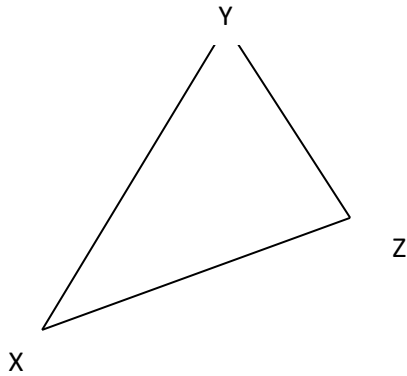

14. A point P has the coordinates (1, 2, 3) if PQ = 5i + j + 2k, find:-
    (a) The coordinates of point Q (2 mks)
    (b) The modulus of PQ (1 mk)

15. The figure below represents a right pyramid. A string is fixed at A, then passes through mid points of edges DC, VC, VB and finally at A. Given that the dimension of the base is a square of side 5cm and VA = VB = VC =VD = 6cm.Draw the net representing the right pyramid (3 mks)
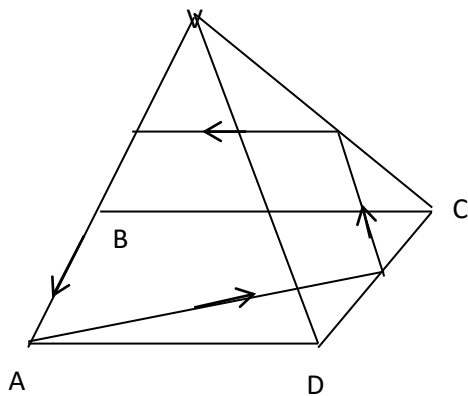
16. In the figure below AB is parallel to CD, BC and AD intersect at E. Given DE:EA = 5:1 and BC = 12cm. Calculate the length of EC (3 mks)

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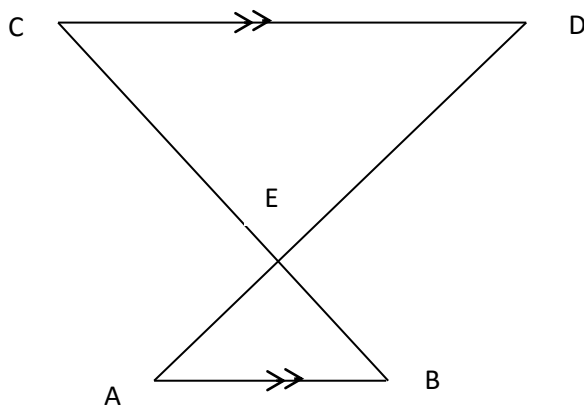
SECTION II

(Answer only five questions in this section)

17. Three partners Mutua, Muthoka and Mwikai contributed Sh. 600,000, Sh. 400,000 and Sh. 800,000 respectively to start a business of a matatu plying Mbumbuni – Machakos route. The matatu carries 14 passangers with each paying Ksh. 250. The matatu makes two rounds trips each day, Sh. 6000 is used to cover running costs and wages.
    (a) Calculate their net profit per day (2 mks)
    (b) The matatu works for 25 days per month and service every month at a cost of Ksh. 10,000. Calculate their monthly profit in June (1 mk)
    (c) The three partners agreed to save 40% of the 24% to be shared in the ratio of their contribution. Calculate Muthoka's share in month of July (4 mks)
    (d) The matatu developed a mechanical problem and they decided to sell through agent who charged a commission of 5% on selling price. Each partner received 475,000, from the agent after he had taken commission. Determine the price at which the agent sold the matatu (3 mks)

18. (a) Complete the table below for the equation $y = x^2 – 6x + 5$

X	0	1	2	3	4	5	6
X^2	0		4	9		25	
-6x	0						-36
5	5	-6			-24		
Y	5					0	

(2 mks)

(b) Draw the graph of $y = x^2 – 6x + 5$ using values in the table (3 mks)
(c) Use the graph to solve the equation
    (i) $x^2 – 6x + 5 = 0$ (1 mk)
    (ii) $x^2 = 6x – 7$ (2 mks)
    (iii) $x^2 – 6.5x + 5 = 0$ (2 mks)

19. Four towns A,B,C and D are situated such that town A is 40km from B on a bearing of 310^0. C is 60km fro B on a bearing of 570^0E. Another town D is 50km from A on a bearing of $N70^0$E.
    (a) Using a scale of 1cm to represent 10km, show the relative position of the towns (4 mks)
    (b) From your scale drawing determine:
        (i) Bearing and distance of D from C (2 mks)
        (ii) Bearing and distance of B from D (2 mks)
        (iii) Bearing and distance of A from C (2 mks)

20. A matatu left town K at 7.00a.m and travelled towards town M at an average speed of 60km/hr.
    A car left town M at 9.00a.m and travelled towards K at an average speed of 50km/hr. The distance between the two towns is 324km.
    Find:-
    (a) The time each vehicle arrived at their destination
        (i) Matatu (2 mks)
        (ii) Car (2 mks)
    (b) (i) The distance the matatu covered before the car started to move from town M to town K (1 mk)
        (ii) The time the two vehicles met on the way (3 mks)
   (iii) How far the car was from town K when they met (2 mks)

21. In the figure below, O is the centre of the circle. PQ is a tangent to the circle at N. Angle NCD is 10^0 and angle ANP is 30^0
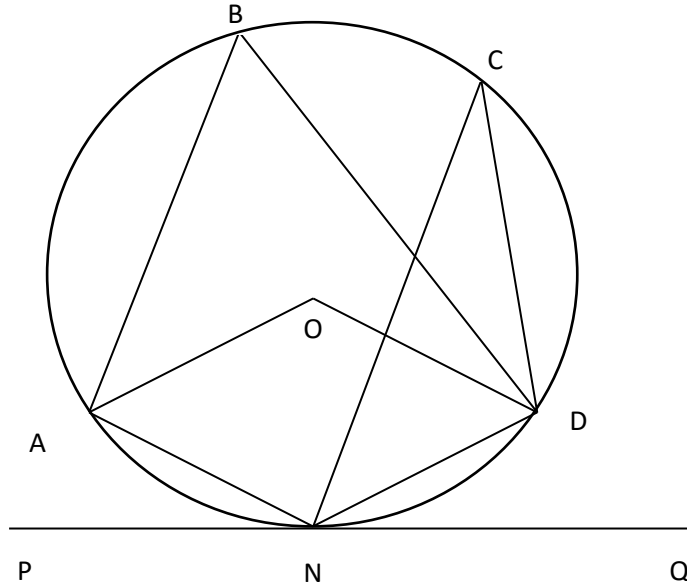
Giving reasons find
  (a) Angle DON   (2 mks)
  (b) Angle DNQ   (2 mks)
  (c) Angle DBA   (2 mks)
  (d) Angle ONA   (2 mks)
  (e) Angle ODN   (2 mks)

22. The histogram below represents the distribution of marks obtained in a test. The frequency of the second class is 3.
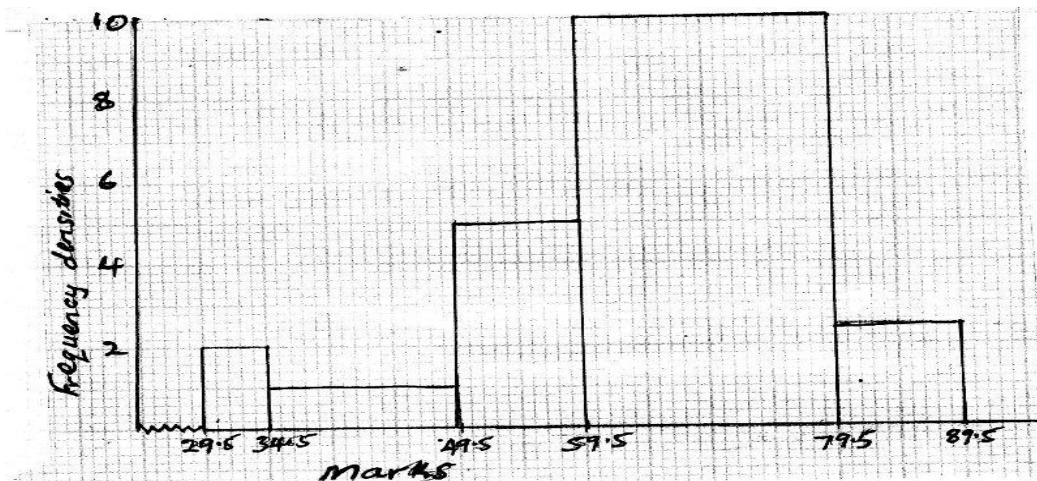
(a) Complete the table below   (3 mks)

Ma rks		35 – 49			
Frequency		3			

(b) Use the table in (a) above to find
  (i) The mean mark   (4 mks)
  (ii) Median mark   (3 mks)

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23. A metal sphere has a radius of 5cm and density of 2.4g/cm^3
    (a) Calculate the mass of the ball in kg (4 mks)
    (b) The ball is dropped into cylindrical container which is partly filled with water. The ball is fully submerged and the cylinder has a radius base of 8cm. Calculate the change in water level (3 mks)
    (c) The sphere is melted down to form a metal cyluinder of base radius of 5cm. Calculate the height of the cylinder formed (3 mks)
24. 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 =2 (3 mks)
    (b) The value (s) of t when the particle is momentarily at rest (3 mks)
    (c) The displacement when the particle is momentarily at rest (2 mks)
    (d) The acceleration of the particle when t =5 (2 mks)

CEKENA MOCK
MATHS PAPER 2
SECTION I (50 MARKS)
Answer all questions in this section

1. Use logarithms to 4 decimal place to evaluate

$$\left(\frac{0.7841 \times 0.1356}{\text{Log } 84.92} \right)^{1/3}$$

(4 mks)

2. The top of a table is a regular pentagon. Each side of the pentagon measures 40.0cm. Find the maximum percentage error in calculating the perimeter of the top of the table (3 mks)

3. Without using a calculator or mathematical tables, Simply completely leaving your answer in form,
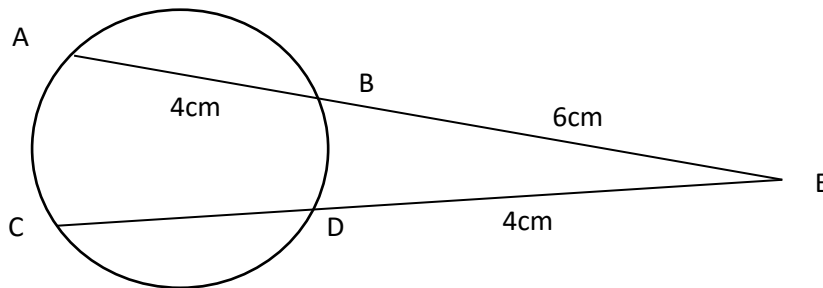
$$a + b\sqrt{c}$$

$$\frac{1 - \text{Cos } 60^0}{1 + \tan 30^0}$$

(3 mks)

4. Use the trapezium rule with seven ordinates to find the area bounded by the curve
   $Y = x^2 + 1$, lines $x = -2$, $x = 4$ and x – axis (3 mks)

5. Given that $x = \sqrt[3]{\dfrac{+p}{2u + p}}$ make P the subject of the formula (3 mks)

6. The figure below shows a circle with secants ABE and CDE, it AB = 4cm and BE = 6cm and DE = 4cm, Find the length of CD (2 mks)

7. A curve passes through the point (1, -2). Given that $\frac{dy}{dx} = 3x^2 - 4x + 1$,
   Find the equation of the curve (3 mks)

8. Water flows from a pipe at the speed of 250litres per minute. If the pipe is used to drain a tank full of water measuring 3.2m by 2.5m by 2m. How many minutes would it take to drain the tank completely (3 mks)

9. The data below shows the age of 10 students picked at random in a secondary school, 6, 11, 13, 14, 8, 7, 12, 20, P and 9. If $\sum f x^2 = 1360$. Determine the value of P hence find the standard deviation to 3 d.p (3 mks)

10. Solve for x in the equation
    $2 \sin^2 x - 1 = \cos^2 x + \sin x$ for $0^0 \leq x \leq 360$ (4 mks)

11. Solve for x in $3\log_3 x + 4 = \log_3 24$ (3 mks)

12. The resistance to the motion of a car is partly varies as the square of the speed. At 40km/h the resistance is 530N and at 60km/h it is 730N. What will be the resistance at 70km/h (4 mks)

13. In a transformation, an object with area 4cm^2 is mapped onto an image whose area is 48cm^2 by a transformation matrix $\begin{pmatrix} y + 1 & y \\ 4 & 2 \end{pmatrix}$ (3 mks)

   Find the value of y

14. Margaret and Otieno had a hall each. The capacity of each hall was 1920 people. When filled completely Margaret would have equal number of people in x rows of seats while Otieno would have equal number of people in x + 4 rows of seats. The number of people in each row in Margaret hall is 2 more than the number of people in each row in Otieno hall. Calculate the number of people per row in Otieno's hall. (4 mks)

15. Write an equation of a circle that has a diameter whose end points are (2, 7) and (-6, 15) in the form $x^2 + y^2 + ax + by + c = 0$ where a, b and c are integers (3 mks)

16. (a) Expand $(1 + \frac{1}{4}x)^7$ upto the terms in x^4 (1 mk)
    (b) Use the expansion above to estimate the value $(0.975)^7$ correct to 4 significant figures (2 mks)

SECTION 2 (50 MKS)
*Attempt only five questions in this section*

17. The Hire purchase (H.P) price of a public address system was Ksh. 276,000. A deposit of Ksh. 60,000 was paid followed by 18 equal monthly instalments. The cash price of the public syatem was 10% less than the H.P price.
    (a) Calculate
       (i)   The monthly instalments (2 mks)
       (ii)   The cash price (2 mks)
    (b) A customer decided to buy the system in cash and was allowed a 5% discount on the cash price. He took a bank loan to buy the system in cash. The bank charged compound interest on the loan at the rate of 20% p.a. The loan was repaid in 2 years. Calculate the amount repaid to the bank by the end of the second year. (3 mks)
    (c) Express as a percentage of the hire purchase price, the difference between the amounts repaid to the bank and the hire purchase price. (3 mks)

18. (a) Complete the table below for graphs of Y = Sin x and Y = 2 sin (x + 30)

| x	0	30	60	90	120	150	180	210	240	270	300	330	360
Sin x	0		0.87			0.5			-0.87			-0.5	
2sin(x+30)	1	0.5		1.74		0	-1				-1		

   (b) On the grid provided draw the graphs of Y = sinx and Y = 2 sin(x=30) for O   x 360^0 (4 mks)
   (c) State the transformation that maps Y = sin x onto Y = 2 sin (x + 30) (2 mks)
   (d) Find the values of x which satisfy the equation Sin x – 2 sin (x + 30) = 0 (2 mks)

19. (a) An arithmetic progession is such that the first term is -5, the last is 135 and the sum of the progression is 975. Calculate
       (i)   The number of terms in the series (4 mks)
       (ii) The common difference of the progression (2 mks)
    (b) The sum of the first three terms of a geometric progression is 27 and first term is 36. Determine the common ration and the value of the fourth term (4 mks)

20. boat P leaves port A(45^0N, 50^0W) and sails at an average speed of 10knots. It sails due east along a parallel ofLatitude to B(45^0N, 42^0W) and then sails due north to C(48^0N, 42^0W). Another boat Q leaves D(55^0N, 10^0W) at the same time as P leaves A. it sails due west and then due South to meet boat P and C.
    (a) How long does it take boat P to reach point C? (4 mks)
    (b) If boat Q sails at the same speed as boat P. How long does the former take to reach point (4 mks)
    (c) At what speed would boat Q have sailed to reach point C at the same time as boat P (2 mks)

21. The probability that our school will host soccer and rugby tournament this year is 0.8. If we host, the probability of winning soccer is 0.7. If we don't host the probability of winning soccer is 0.4. If we win soccer the probability of winning rugby is 0.8, otherwise if we lose the probability of winning rugby is 0.3.
 (a) Draw a tree diagram to represent this information. (2 mks)
 (b) Use the tree diagram to find:-
    (i)   The probability that we lose both games (2 mks)
    (ii) The probability that we will win only one game (3 mks)
    (iii) The probability that we will host and lose both games (2 mks)
    (iv) The probability that we win at least one game, if we host (1 mks)

22. The figure below shows a right pyramid VABCD with a square base of side 6cm. VA =VB = VC = VD = 12cm
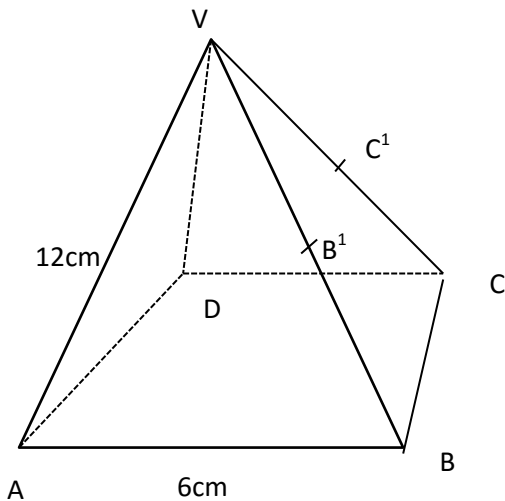
(a) Calculate:-
 (i) The height of the pyramid correct to 2 d.p (3 mks)
 (ii) The angle between the planes VAD and VBC correct to 2 significant figures (3 mks)
(b) B^1 and C^1 are points on VB and VC respectively such that $VB^1:VB = VC^1:VC = 1:3$
 Calculate the angle between plane ABCD and AB^1C^1D (4 mks)

23. In the figure below, E is the mid-point of AB. OD:DB = 2:3 and F is the point of intersection of OE and AD
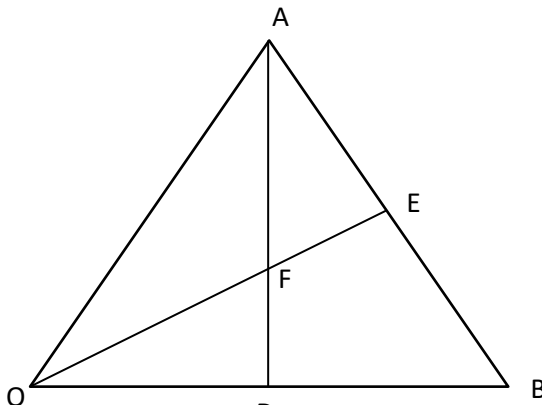
(a) Given that OA = a and (D) express in terms of a and b

  (i)   OE (1 mk)

  (ii) AD (1 mk)

(b) Given further that AF = t AD and OF = s OE where s and t are scalars,
   Find the values of s and t (5 mks)

(c) Show that O, F and E are collinear (3 mks)

24. A relief organization has to transport at least 80 people and at least 18 tonnes of supplies to site. There are two types of vehicle available, type A and type B. Type A can carry 900kg of supplies and 6 people while type B can carry 1350kg of supplies and 5 people. There at most 12 vehicles of each type available. By taking x to represent the number of vehicles of type A and y to represent the number of vehicles of type B.
(a) Write down all the inequalities to represent the above information (4 mks)
(b) On the grid provided draw all inequalities in (a) above (4 mks)
(c) Use the graph in (b) above to determine the least number of vehicle required at the site (2 mks)

KIRINYAGA WEST
**121/1**
MATHEMATICS
Paper 1

SECTION I (50 MARKS)
Answer ALL questions in this section

1. Without using a calculator or mathematical table, evaluate

    $$\frac{0.27 \times 9}{\sqrt{29.16}}$$

    (3 marks)

2. Find the possible values of x in the equation.

    $$9^{x^2} = 27^{(2x+12)}$$

    (3 marks)

3. Paint x cost Ksh 50 per litre while paint y cost Ksh 70 per litre. In what proportion must x be mixed with y to produce a mixture costing Ksh 58 per litre?

    (3 marks)

4. Calculate the area of the shaded region given that AC is an arc of a circle centre B. Given that AB = BC = 14cm, CD = 8cm and angle ABD = 75^0.   (3 marks)
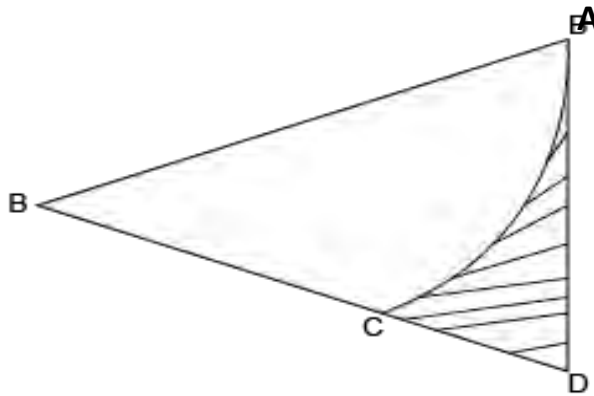
5. A half the interior angles of an **n** sided irregular polygon measures 135^0 each. The remaining half measures 165^0 each. Find **n**.   (3 marks)

6. Use square roots, reciprocal and square tables to evaluate to 4 significant figure.

    $$(0.06458)^{\frac{1}{2}} + \left(\frac{2}{0.4327}\right)^2$$

    (4 marks)

7. A straight line whose equation is 4y + 3x = 12 cuts the x and y axis at P and Q.
    Calculate the co-ordinates of P and Q.   (3 marks)

8. Convert 154.50^0 into radian and write your answer in terms of π^C.   (2 marks)

9. In the figure below NP = 11.6cm, < PMN = 70^0 and < PNQ = 45^0.   (3 marks)
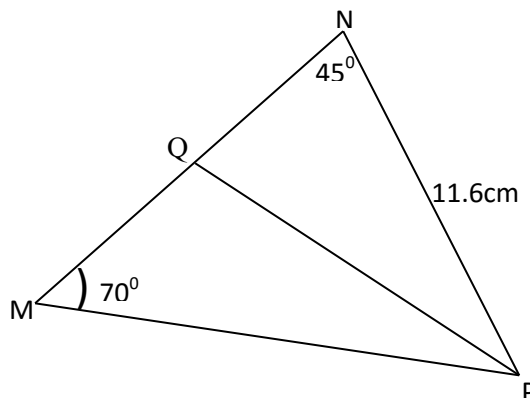
10. Write down the inequalities that define the unshaded region marked R in the figure below. (3 marks)
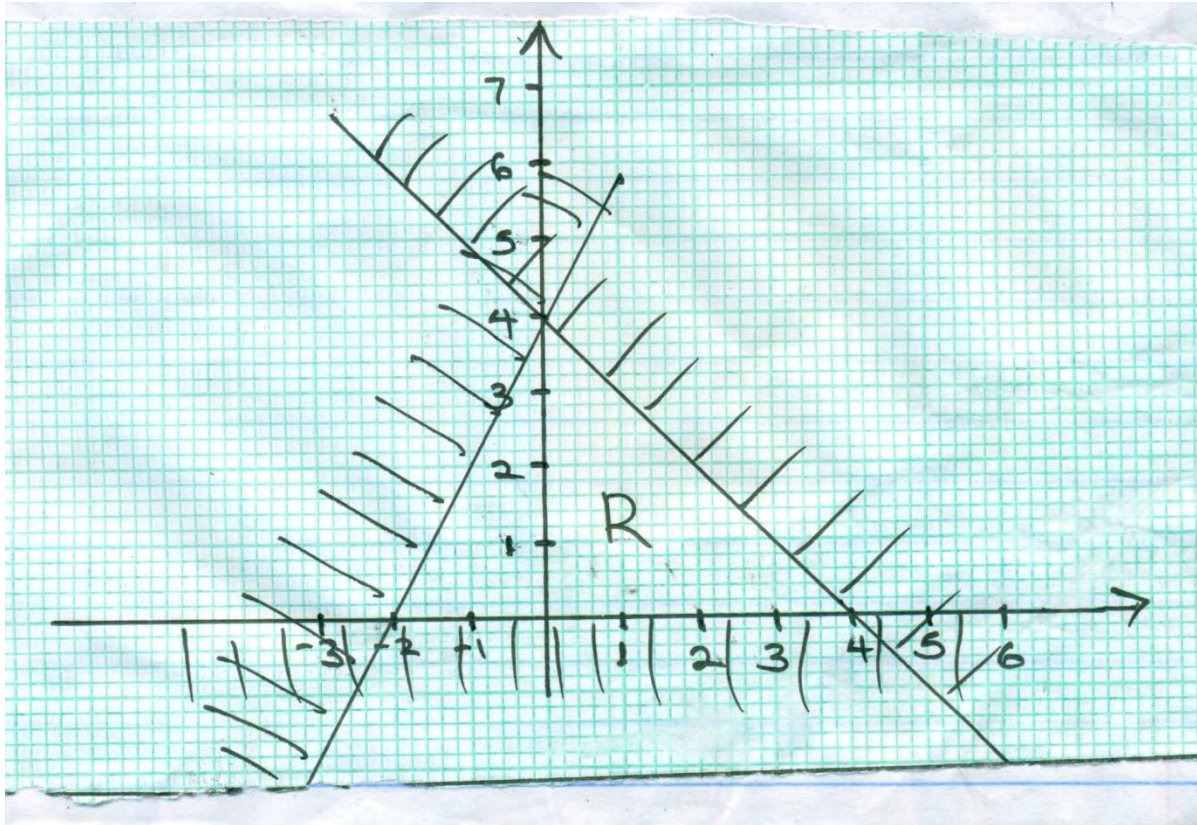
11. The length of a room is 4m longer than it's width. Find the length of the room if it's area is $32m^2$.

(4 marks)

12. A Kenyan tourist left Germany for Kenya through Switzerland. While in Switzerland, he bought a watch worth 52 Deutsche marks. The exchange rate was as follows:

1 Swiss France = 1.28 Deutsche Mark

1 Swiss France = 45.21 Kenya Shillings

Find the value of the watch in Kenya Shillings.   ` (3 marks)

13. Two similar solid have surface area of $48cm^2$ and $108cm^2$ respectively. Find the volume of the smaller solid if the bigger one has a volume of $162cm^3$.   (3 marks)

14. Give that $\underset{\sim}{a} = 2\underset{\sim}{i} + 3\underset{\sim}{j} - 5\underset{\sim}{k}$ and $\underset{\sim}{b} = \underset{\sim}{i} - 5\underset{\sim}{j} + 7\underset{\sim}{k}$. Evaluate $|2\underset{\sim}{a} + \underset{\sim}{b}|$ (3 marks)

15. A triangle with vertices A(1, 1) and B (1, 5) and C (4,5) is rotated half turn about the origin. Determine the co-ordinates of its image.   (4 marks)

16. Mutune bought three pens and four exercise books for a total of Ksh 155 while Bingo bought two similar pens and five similar exercise books for a total of Ksh 150. Determine the cost of a pen and that of an exercise book.

(3 marks)

SECTION II (50 MARKS)

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

17. a) Find the equation of a straight line passing through the points (3, 2) and (-3, 6) giving your answer

in the form $\dfrac{x}{a} + \dfrac{y}{b} = 1$ when a and b are constants.   (4 marks)

b) State the co-ordinates of A and B at which the line in (a) above cross the x – axis and
y – axis respectively.   (2 marks)

c) Using the information in (a) and (b) above find the area of triangle AOB, where O is the origin.

(2 marks)

d) Find the acute angle the line in (a) above makes with the X axis.   (2 marks)

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18. The table below shows marks obtained by 100 candidates at East side high school in biology examination.

Marks	15-24	25-34	35-44	45-54	55-64	65-74	75-84	85-94
Frequency	6	14	24	14	x	10	6	4

   a) Determine the value of x. (2 marks)
   b) State the modal class (1 mark)
   c) Calculate the median mark (3 marks)
   d) Calculate the mean mark (4 marks)

19. A water tank is represented by the solid shown below which is a hemisphere on a cylinder. The base radius of the cylinder is 7m and the height of the tank is 15m. (use $\pi = \frac{22}{7}$)
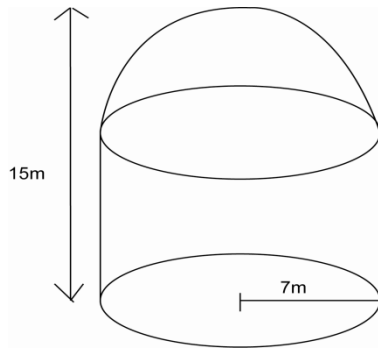
   a) Calculate the volume of the hemispherical part. (2 marks)
   b) Calculate the volume of the cylindrical part. (2 marks)
   c) Calculate the capacity of the tank. (4 marks)
   d) Calculate the total surface area excluding the base. (2 marks)

20. a) Given the matrix $A = \begin{pmatrix} 3 & 4 \\ 2 & 3 \end{pmatrix}$ find the inverse of A. (2 marks)

   b) Two universities, TECK and KCT purchased beans and rice. TECK bought 90 bags of beans and 120 bags of rice for a total of sh 360, 000. KCT bought 200 bags of beans and 300 bags of rice for a total of sh 850,000. Use the matrix method to find the price of one bag of each item. (5 marks)
   c) The price of beans later decreased in the ratio 4 : 5 while the price of rice increased by 20%.
      A businessman bought 20 bags of beans and 30 bags of rice. How much did he pay? (3 marks)

21. The boundaries PQ, QR, RS and SP of a ranch are straight such that: Q is 16km on bearing of 040^0 from P; R is directly south of Q and east of P and S is 12 km on a bearing 120^0 from R.
   a) Using a scale 1 cm represent 2km, show the above information in a scale drawing. (3 marks)
   b) From the scale drawing determine
      (i) the distance in kilometres of P from S. (2 marks)
      (ii) The bearing of P from S. (2 marks)
   c) Calculate the area of the ranch PQRS in square kilometres. (3 marks)

22. A number of nurses working at Kibera health centre decided to raise Sh. 144,000 to buy a plot of land. Each nurse was to contribute the same amount. Before the contribution were collected five of the nurses retired. This meant that the remaining nurses had to pay more to meet the target.
   a) If there were **n** nurses originally, find the expression of the increase in contribution per nurse. (3 marks)
   b) If the increase in the contribution per nurse was Sh. 2,400, find the number of nurses originally at the health centre. (3 marks)
   c) How much would each nurse have contributed if the 5 nurses had not retired? (2 marks)
   d) Find the percentage increase per nurse because of the retirement. (2 marks)

23. a) Use the trapezium rule to estimate the area under the curve $y = x^2 + x - 6$ over the interval $0 \le x \le 8$ using 8 trapezia. (4 marks)
   b) Find the exact area under the curve in (a) above. (4 marks)
   c) Find the percentage error in the estimated area in (a) above. (2 marks)

24. In the figure below, DA is a diameter of the circle ABCDE centre O. TCS is a tangent to the circle at C, AB = BC and angle DAC = 38^0.
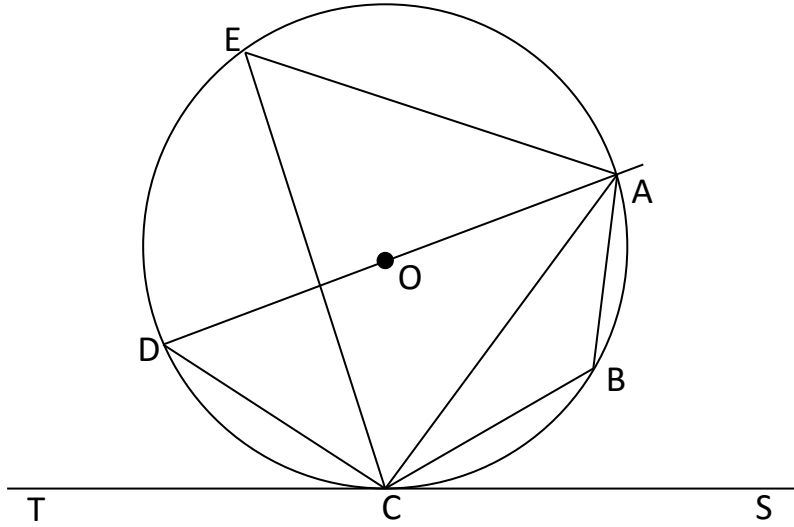
Giving reasons, determine the following angles.

a) <DCT   (2 marks)
b) < DEA   (2 marks)
c) <ACB   (2 marks)
d) < BDC   (2 marks)
e) < BOA   (2 marks)

KIRINYAGA WEST
121/2
MATHEMATICS
Paper 2

SECTION I (50 MARKS)
Answer ALL questions in this section in the spaces provided.

1. Use logarithms to 4 decimal places to evaluate. (4 marks)

$$\left(\frac{0.7841 \text{ x } \sqrt{0.1356}}{\log 84.92}\right)^{\frac{1}{3}}$$

2. A train moving at 20m/s take 15 seconds to completely cross a bridge which is 30m long.
   What is the length of train in m. (3 marks)

3. The width of a room is 8m less than length. Find the measurement of the room if the area is 48m^2.

4. Find the percentage error in the total length of four rods measuring 12.5cm, 24.5cm, 12.9cm and 10.1cm all the nearest 0.1cm. (3 marks)

5. Simplify the following surds leaving your answer in the form $a + b\sqrt{c}$

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

   (3 marks)

6. Find the value of x given that

$$\log_2(x^2 - 2) - \log_2(\frac{1}{2}x + 5) - 1 = 0$$
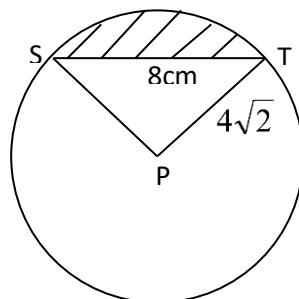
   (3 marks)

7. The quantities P, Q and R are such that P varies directly as the square of Q inversely as the square root of R.
   When P = 24, Q = 2 and R = 9.
   Determine
   i) the line connecting P, Q and R (3 marks)
   ii) the value of P when Q = 5 and R = 36. (1mk)

8. Make y the subject of the formula. (3 marks)

$$V = \left(\frac{ax^2 y}{w - y}\right)^{\frac{1}{2}}$$

9. The figure below shows a circle with centre P and radius $4\sqrt{2}$ cm. If the length of the chord ST is 8cm, show that the shaded area is (8π - 16)cm^2 (3 marks)

10. Expand $\left(1 + \frac{1}{4}x\right)^5$ upto the term in x^4. Hence evaluate $(0.95)^5$ giving your answer correct to 4 S.F. (3 marks)

11. Mary and Jane working together can cultivate a piece of land in 6 days. Mary alone can complete the work in 15 days. After the two had worked for 4 days Mary withdrew the services. Find the time taken by Jane to complete the remaining work. (3 marks)

12. Determine the equation of the tangent to the curve $y = \dfrac{4x^3 + 4}{x^2}$ at the point x = 2. ` (3 marks)

13. The fifth term of an arithmetic progression is 11 and the twenty fifth term is 51.
Calculate the first term and the common difference of the progression. (3 marks)

14. The coordinates of the end points of the diameter of a circle are A(3, -2) and B(5. 1).
Find the equation of a circle in the form $ax^2 + by^2 + cx + dy + e = 0$ (3 marks)

15. In the figure below QT is a tangent to the circle at Q. PXRT and QXS are straight lines. PX = 6cm, RT = 8cm, QX = 4.8cm and XS = 5cm. (4 marks)
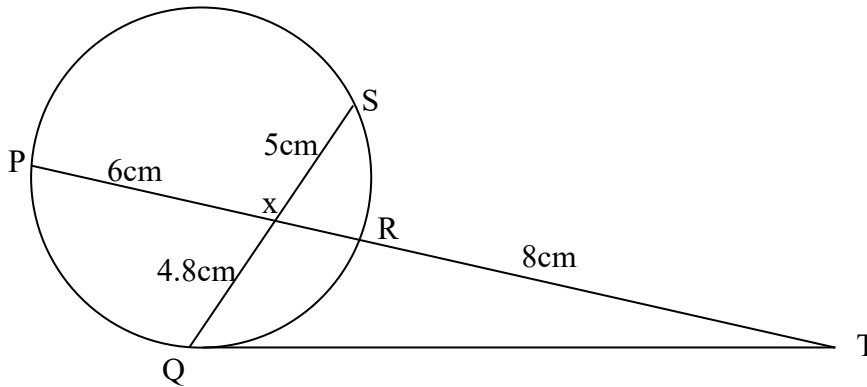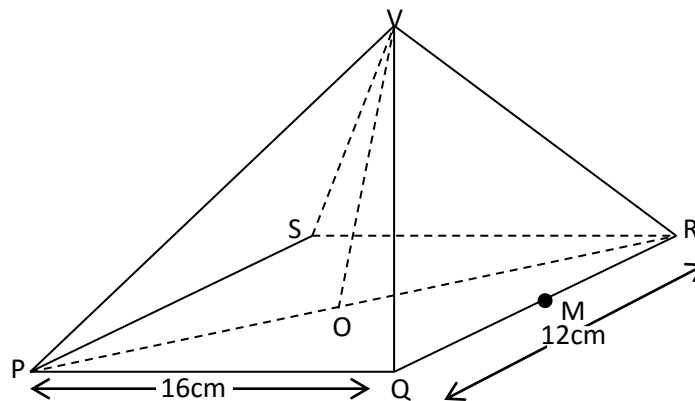

Find the length of QT (3 marks)

16. Find in radians in the values of x in the interval $0^0 \le x \le 2\,\pi^c$ for which $2\cos^2 x - \sin x = 1$
(leaving your answer in terms of π) (4 marks)

SECTION II (50 MARKS)
Answer only five questions from this section in the space provided.

17. Ken, Tom and Peter compete to hit the bull's eye in a game of dart. The probabilities of each hitting the bull's

eye are Ken $\dfrac{2}{5}$, Tom $\dfrac{1}{4}$ and Peter $\dfrac{3}{7}$ respectively.

    a) Use the tree diagram to show the possible outcomes. (2 marks)
    b) Calculate the probability that:-
        i) All three hit the target. (2 marks)
        ii) Only one hits the target. (3 marks)
        iii) Two hit the target. (3 marks)

18. The figure below represents a right pyramid with vertex V and a rectangular base PQRS.
VS = VP = VQ = VR = 18 cm. PQ = 16cm and QR = 12cm. M and O are the mid points of QR and PR respectively.

Determine:
a) The length of the projection of line VP on the plane PQRS. (3 marks)
b) The size of the angle between line VP and the plane PQRS to 2 d.p. (3 marks)

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c) The size of the angle between the planes VQR and PQRS (4 marks)

19. At the beginning of the year 2004, Kamau bought two houses, one in Thika and the other in Nairobi, each at Kshs 3,750,000. The value of the house in Thika appreciated at the rate of 12% p.a.
   a) Calculate the value of the house in Thika after 9 years to the nearest shillings. (2 marks)
   b) After n years, the value of the house in Thika was Ksh 8,290,055 while the value of the house in Nairobi was Ksh 8,822,271.
      i) Find n (4 marks)
      ii) Find the annual rate of appreciation of the house in Nairobi. (4 marks)

20. a) Complete the table below for the function $y = 2 \sin x$ and $y = 3 \sin (x + 30^0)$ for the $-180^0 \leq x \leq 180^0$ to 2 d.p. (2mks)

x	-180^0	-150	-120	-90	-60	-30	0	30	60	90	120	150	180
$y = 2 \sin x$	0.00		-1.73				0.00			2.00			0.00
$y = 3 \sin(x + 30^0)$	-2.60				0.00					1.50			

   b) on the same axis draw the graphs of $y = 2 \sin x$ and $y = 3 \sin (x + 30^0)$ for $-180^0 \leq x \leq 180^0$. (4 marks)
   c) From the graph determine the period and amplitude of the graph $y = 3 \sin (x + 30^0)$. (2 marks)
   d) Use your graph to solve the equation $2 \sin x = 3 \sin (x + 30^0)$ (2 marks)

21. A plane S flies from a point P (40^0N, 45^0W) to a point Q (35^0N, 45^0W) and then onto a point T (35^0N, 135^0E).
   a) Given that the radius of the earth is 6370km find the distance from P to Q in Km. (2 marks)
   b) Find in nm
      (i) the shortest distance between Q and T. (2 marks)
      (ii) the longest distance between Q and T (to the nearest tens) (2 marks)
   c) Find the difference in time taken when S flies along the shortest and longest routes if its speed is 420 knots (4 marks)

22. The table below shows the distribution of marks scored by 60 students in a test.

Marks	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
Frequency	2	5	6	10	14	11	9	3

   a) On the grid provided draw a cumulative frequency curve of the data. (3 marks)
   (Take 1cm to represent 5 students on the vertical scale and 1 cm to represent 10 marks on the horizontal scale).
   b) From the curve in (a) above
   (i) estimate the median mark (1 mark)
   (ii) Determine the quartile deviation. (2 marks)
   (iii) Determine the 10th and 90th percentile range. (2 marks)
   c) It is given that students who score over 45 marks pass the test. Use your graph in (a) above to estimate the percentage of students that pass. (2 marks)

23. The diagram shows a triangle OPQ in which M and N are points on OQ and PQ respectively such that OM = $\frac{2}{3}$ OQ and PN = $\frac{1}{4}$ PQ. Lines PM and ON meet at X.
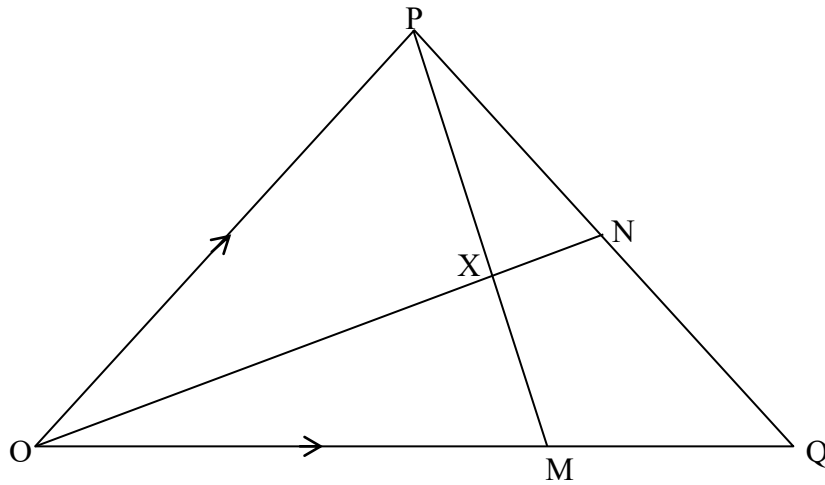
a) Given that $\overrightarrow{OP}$ = p and $\overrightarrow{OQ}$ = q. Express in terms of P and q the vectors.

   i) $\overrightarrow{PQ}$ (1 mark)

   ii) $\overrightarrow{PM}$ (1 mark)

   iii) $\overrightarrow{ON}$ (2 marks)

b) You are further given that $\overrightarrow{OX}$ = k$\overrightarrow{ON}$ and $\overrightarrow{PX}$ = h $\overrightarrow{PM}$

  i)   Express OX in two difference ways.   (2 marks)

  ii)   Find the value of h and k.   (3 marks)

  iii) Find the ratio PX : XM   (1 mark)

24. A particle moves along a straight line such that its displacement S metres from a given point is
$S = t^3 – 6t^2 + 9t + 3$ where t is the time in seconds. Find:-

a)   The displacement of the particle at t = 3s.   (2 marks)

b)   The velocity of the particle where t = 4s   (3 marks)

c)   The value of t where the particle is momentarily at rest.   (3 marks)

d)   The acceleration of the particle when t = 4s.   (2 marks)

BUURI EAST
121/1
MATHEMATICS
PAPER 1
SECTION I (50 MARKS):
Answer all the questions in this section in the spaces provided.

1. Without using a calculator evaluate. (3 marks)
 $$\frac{-4(3+1)-18\div6+5}{-3\times-6+-1\times11}$$

2. The distance between Jane's home and her school is $^4/_5$ of 8km. One day she run ¼ of the way and walked the rest of the journey. What distance did she walk? (3 marks)

3. Otiende works for a coffee processing company as a sales man. He is paid on Monthly basis as per agreement below.
    a) A basic pay of sh. 20,000 per Month.
    b) A commission of 2% for goods sold up to a maximum of sh. 200,000.
    c) A commission of 4% for goods sold over sh. 200,000 in that Month.
       In a certain Month he sold goods worthy sh. 600,000. Calculate his total pay for that Month. (3 marks)

4. Draw the net of the solid shown in the figure below. Measurements are in centimeters. (3 marks)
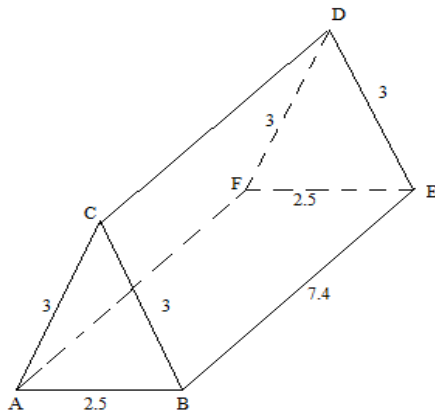
5. Solve for Y in the equation. $8^{y+1} - 2^{3y+1} = 48$ (3 marks)

6. Simplify the expression; $\frac{12x^2+ax-6a^2}{9x^2-4a^2}$ (3 marks)

7. A line P whose equation is $y = \frac{1}{3}x + 4$ is parallel to another line Q. Find
    The equation of line Q in the form $y = mx + c$ given that it passes through Point (3, 6) (3 marks)

8. Simplify without using tables or calculators; $\frac{1}{1-\sin 45^0}$ (3 marks)

9. The figure below shows a triangle ABC in which AB = 6cm, BC = 11cm and angle ABC = 100^0. Calculate to the decimal places the length of AC. (3 marks)
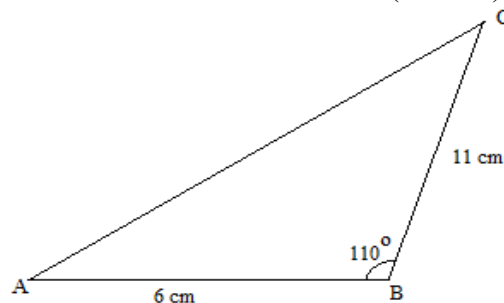
10. The figure below shows a triangular – based pyramid. If the solid is made up of a material of density 1.25g/cm^3, calculate the mass of the solid. (3 marks)

6 cm

20 cm

4 cm
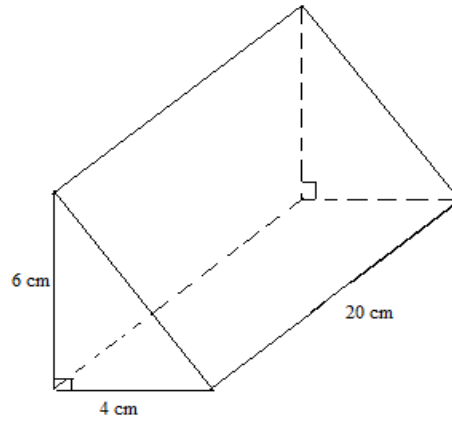
11. A football match between Arsenal FC and Chelsea FC started at 1500hrs. It lasted for the official 90 minutes with a half time break of 15 minutes. The Referee added five extra minutes for injuries and other stoppages. Find the time the match ended. (3 marks)

12. Write down the inequalities that satisfy the unshaded region labelled R. (3 marks)

R
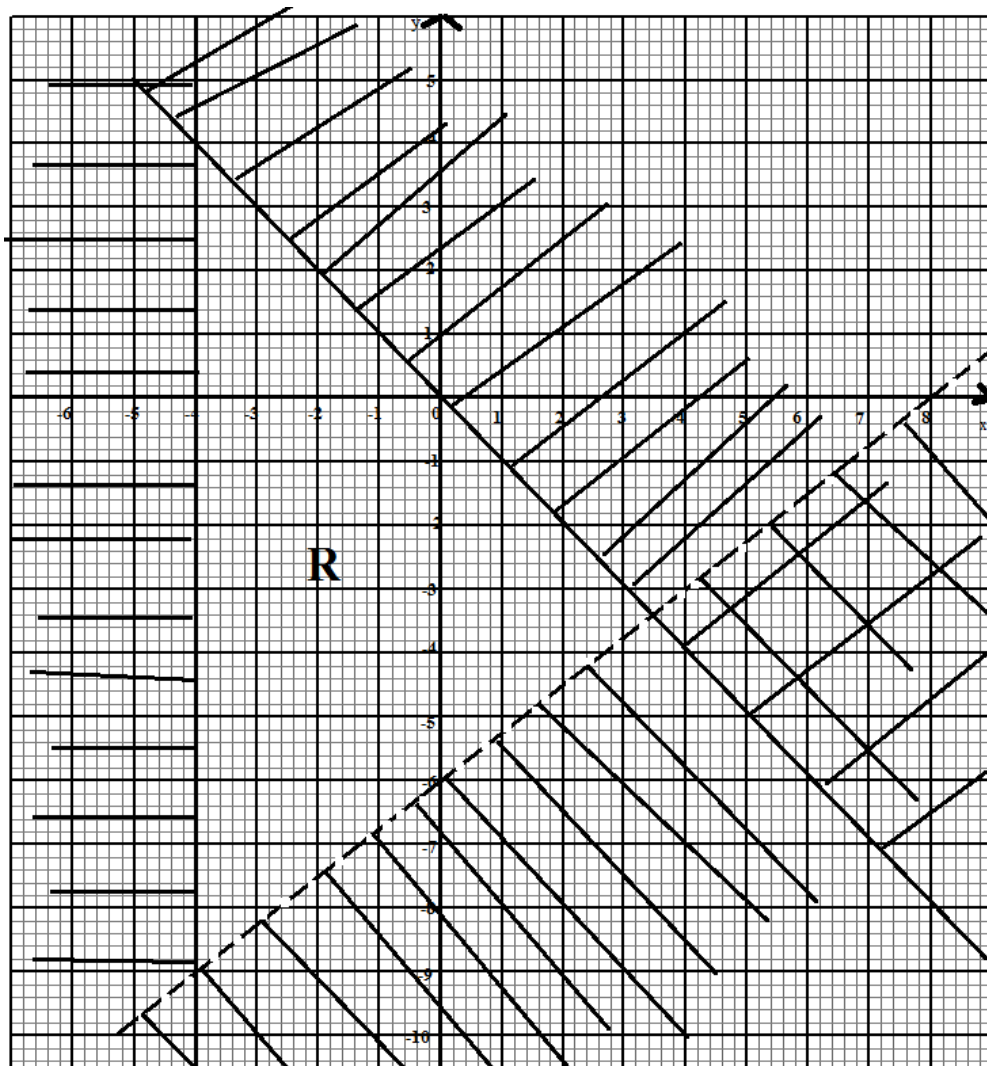
13. The width of a rectangular hall of Ruiri Girls Secondary School is 16m less than its length. Calculate the length of the hall if its area is 132m². Hence calculate its perimeter. (4 marks)

14. Town A is 80km due east of town B. Town C is on a bearing of 234^0 form town B. If town C is 100km from town A, by scale drawing find the distance of town C from town B. (4 marks)

15. a) Find the inverse of the matrix $\begin{pmatrix} 7 & 4 \\ 3 & 2 \end{pmatrix}$. (1 mark)

   b) Using matrix method, solve the simultaneous equations. (2 marks)
   $7x + 4y = 14$
   $3x + 2y = 8$

16. Use tables of square roots and reciprocals to find the value of x. (3 marks)

$$x = \sqrt{\frac{1}{15.36} + \frac{3}{1.302}}$$

SECTION II(50 marks).

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

17. a) On the grid provided draw the quadrilateral PQRS whose vertices are P (-5, 4), Q(-3, 4), R (-5, 3) and S (-4, 3). (1 mark)

    b) On the same grid draw:-
    i) P'Q'R'S' the image of PQRS under a reflection in the line $y = 0$ (2 marks)
    ii) P"Q"R"S" the image of P'Q'R'S' under a rotation of $+ 180^0$ about (0,0) (2 marks)
    iii) P'''Q'''R'''S''' the image P"Q"R"S" under an enlargement scale -2, centre (4, 0) (2 marks)

    c) Name the quadrilaterals that are
    i) Directly congruent (1 mark)
    ii) Oppositely congruent (2 marks)

18. The figure below shows a frustrum. The top and bottom radii are 5cm and 10cm respectively, while the vertical height of the frustrum is 12cm.
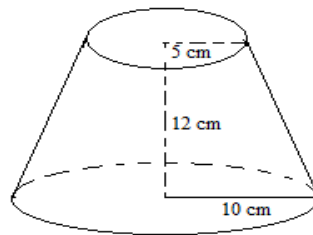
   Find the:-
   a) Slant height of the frustum. (3 marks)
   b) Curved area of the frustum. (3 marks)
   c) Volume of the frustum. (4 marks)

19. Kiriari is a market centre 600km from Kisumu town.
   A bus starts from Kisumu for Kiriari at 7.00am at an averge speed of 80 km/h. At 8.30 am a car started from Kisumu to Kirari and moved at an average speed of 120 km/hr.
   i) The distance bus covered before the car started moving. (3 marks)
   ii) The relative speed for the two vehicles. (2 marks)
   iii) The time the car overtook the bus. (1 mark)
   iv) Distance covered by the car before overtaking the bus. (2 marks)
   v) Distance from Kiriari to the car at the time the car was overtaking the bus. (2 mark

20. The height of 36 student in a class was recorded to the nearest centimeter as follows:-

148	159	158	163	166	155	155	179	158
161	160	157	165	165	175	173	172	178
147	168	157	172	165	154	170	157	167
155	159	173	171	168	160	172	156	167

   a) Make a frequency distribution table using a class interval of 5 and starting with the class 145 – 149. (2 marks)

b) From the table above
   i) Calculate the mean mark (3 marks)
   ii) Calculate the median (3 marks)
d) Draw a frequency polygon using the table in (a) above. (2 marks)

21. Kibirichia Boys Secondary School. Intends to buy a certain number of chairs For Ksh. 16,200. The supplier agreed to offer a discount of Ksh. 60 per chairWhich will enable the school to get 3 chairs more.Taking y as the originally intended number of chairs:-
    a) Write an expression in terms of y for
       i) Original price per chair. (1 mark)
       ii) Price per chair after discount. (1mark)
    b) Determine
       i) The number of chair the school originally intended to buy. (4 marks)
       ii) Price per chair after discount. (2 marks)
       iii) The amount of money the school would have saved per chair of it got the intended number of chairs at a discount of 15%. (2 marks)

22. a) Without using a protractor, construct triangle ABC such that angle ABC = 60^0, BC = 8cm and AC = 9cm. Measure AB. (3 marks)
    b) Draw a perpendicular from A to BC and measure its length. (2 marks)
    c) Hence calculate the area of triangle ABC. (2 marks)
    d) Locate a point D on BC such that the area of triangle ABC is three times that of triangle ABD. (3 marks)

23. In triangle ABC, shown below, AB = a AC = b point M lies on AB such that AM: MB = 2:3 and point N lies on AC such that AN: NC = 5:1 line BN intersects line MC at X.
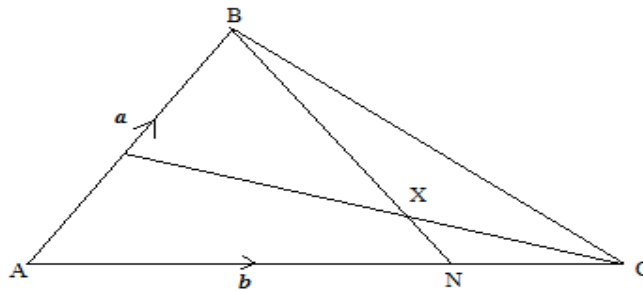
a) Express the following in terms of a and b
   i) **BN** (1 mark)
   ii) **CM** (1 mark)
b) Given that **BX** = k**BN** and **CX** = r**CM** where k and r are scalars
   i) Write two different expressions for **AX** in term of a, b, k and r (4 marks)
   ii) Find the values of k and r (4 marks)

24. A particle moves such that t seconds after passing a given point O is given by
$$S = t(t-2)(t-1)$$
a) Find its velocity when t = 2 second (3 marks)
b) Find its minimum velocity. (3 marks)
c) Find the time when the particles is momentarily at rest. (3 marks)
d) Find its acceleration when t = 3 seconds. (1mark)

BUURI EAST STANDARDS
121/2
MATHEMATICS

SECTION I (50 MARKS):
Answer all the questions in this section in the spaces provided.

1. Make P the subject of the formula in; $x = \sqrt{\dfrac{y(p-y)}{p-i}}$ (3 marks)

2. The length of a rectangle is 8.3cm and its width is 5.45cm. Calculate.
    a) The relative error in the area of the rectangle. (3 marks)
    b) The percentage error in the area. (1 mark)

3. The figure shown below is a circle centre O (not drawn to scale). Find the value
    of angles a, b and c given that $< PSR = 30^0$. (3 marks)
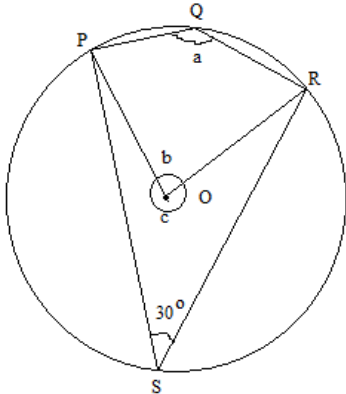
4. The first term of an arithmetic sequence is -5 and the common difference is 3.
    a) List the first 5 terms of the sequence. (1 mark)
    b) Determine the sum of the first 40 terms of the sequence. (2 marks)

5. a) Given the vectors $a = 3i - j + 2k$, $b = 4i + 2j - k$ and $p = 2a - b$. Express
        p in terms of i, j and k. (2 marks)
    b) Hence calculate $|p|$ correct to 3 significant figures. (1 mark)

6. A quantity X varies directly as Y and the square of Z. when Y = 2 and Z = 5, X = 150.
    Find:-
    a) The law governing X, Y and Z (2 marks)
    b) The value of X when Y = 4 and 2 = 3 (1 mark)

7. Find accurately the shaded area. (3 marks)
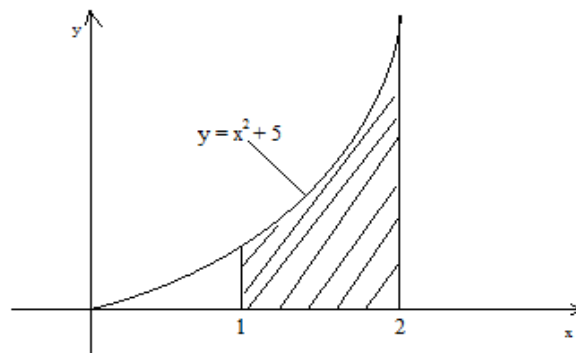
8. Simplify the following surd leaving answer in the form $a + b\sqrt{c}$ (3 marks)
    $\dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

9. Evaluate the following expression without using mathematical tables or a   calculator.
    $3\log_{10}4 + \log_{10}125 - 3\log_{10}2$ (3 marks)

10. The diagram below represents a wedge whose cross – section is a right angle triangle. PQVU is a rectangle and the dimensions are as shown.
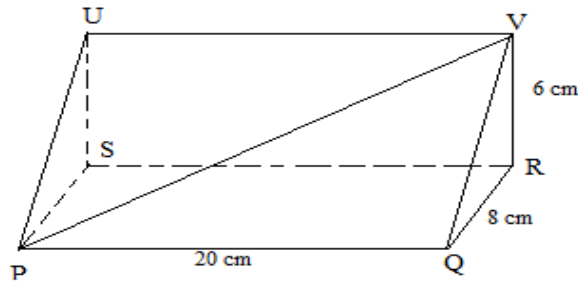
Calculate to 2 decimal places:-
   a) The length of PV (2 marks)
   b) The size of the angle between PV and plane PQRS. (2 marks)
11. a) Expand $(1 + x)^6$ upto the forth term. (1 mark)
    b) Using the binomial expansion in (a) above estimate the value of 1.9^6 (2 marks)
12. A transporter has two types of trucks to transport maize. Type A carries 2000bags whole type B carries 3000 bags per trip. The transporter has to transport 120,000 bags. He has to make not more than 50 trips. Type B trucks are to make atmost twice the number of trips made by type A. Taking x to be the number of trips made by type A truck and y to be the number of trips made by type 3. Write down all the inequalities representing this information. (3 marks)
13. The equation of a circle is $x^2 + y^2 – 4x + 8y = 5$. Find the centre and the radius of the circle. (3 marks)
14. Solve for x in the equation below using the completing the square method. (3 marks)
    $x^2 – 7x + 10 = 0$
15. Mr Sudan works for a company earning a basic salary of 30,000 and house allowance of 12,000. In a certain year the government charged tax on PAYE basis using the table below.

Income in Ksh per Month	Rate(% per Ksh)
1 – 10,000	5
10,001 – 20,000	10
20,001 – 30,000	20
Over 30,0000	30

   If Sudan is given a personal relief of sh. 3,000 per Month, find tax he pays in that month. (3 marks)
16. Triangle A'B'C' is the image of triangle ABC under a transformation matrix $T = \begin{pmatrix} 1 & 3 \\ 2 & 2 \end{pmatrix}$
   If the area of triangle A'B'C'D' is 25.6cm^2, find the area of the object. (3 marks)

SECTION II(50 marks).
Answer *only five* **questions in this section in the spaces provided.**
17. a) On the same diagram construct:-
       i) Triangle PQR such that PQ = 9cm, PR = 7cm and triangle RPQ = 60^0 (2 marks)
       ii) The locus of a point M such that M is equidistant from P and Q. (1mark)
       iii) The locus of a point N such that RN ≤ 3.5cm. (1 mark)
    b) On the diagram in part (a)
       i) Shade the region B, containing all the points enclosed by the locus on M and the locus of N such that PM ≥ QM. (2marks)
       ii) Find the area of the region shaded in part (b) (i) above. (4 marks)
18. An examination involves a written test and a practical test. The probability That a candidate passes the written test is $^6/_{11}$. If the candidate passes the written test, then the probability of passing the practical test is $^3/_5$, otherwise it would be $^2/_7$.
    a) Illustrate this information in a tree diagram. (2 marks)
    b) Determine the probability that a candidate

   i)   Passes both tests   (2 marks)
   ii)   passes the written test only   (2 mark)
   iii) passes only one test   (2 marks)
   v)   fails both test   (2 marks)

19. Mr Rao is a water supplier in a certain market. He has a tank which holds 20,000 litres. The tank is being filled with water from two pipes P and Q. water flows at the rate of 150L/minute through pipe P and 100l/minute through pipe Q.
    a) If the tank is empty and the two pipes are opened at the same time, calculate the time taken to fill the tank.
    (3 marks)
    b) On a certain day Mr Rao started with an empty tank, opened pipes P and Q for 30 minutes, after which he opened pipe R to supply his customers. R supplies water at a rate of 20 litres per minute.
    Calculate the time it took to fill the tank. (7 marks)

20. Complete the table below by filling in the blank spaces. (2 marks)

x^0	0^0	30^0	60^0	90^0	120^0	150^0	180^0	210^0	240	270^0	300	330	360^0
Cos x^0	1.00		0.50			-0.87		-0.87					
2 Cos ½ x	2.00	1.93					0.00						

    a) On the grid provided using a scale of 1cm to represent 30^0 on the horizontal axis and 4 cm to represent 1 unit on the vertical axis draw the graph of
       $y = \cos x^0$ and $y = 2\cos ½ x^0$ (4 marks)
    b) State the amplitude and period of y = 2cos ½ x (2 marks)
    c) Use your graph to solve the equation (2 marks)
       2 cos ½ x – cos x = 0

21. a) Taking the radius of the earth R = 6371km and $\pi = \frac{22}{7}$, calculate correct to 2 d.p the distance between the two cities, A (60^0N, 29^0W) and B (60^0N, 31^0E) along the parallel of latitude. (3 marks)
    b) If it is 1200hrs at city A, what is the local time at city B? (3 marks)
    c) An aeroplane flew due South from a point P (60^0N, 45^0E) to point Q.
    The distance covered by the aeroplane was 800km. Determine the position of Q. (4 marks)

22. The marked price of a television set is 25,600. On cash payment a customer is given a discount of 5% on the marked price. The T.V can also be bought on hire purchase terms by paying a deposit of sh 12,640 and 16 equal Monthly installments of sh. 1450 each.
    a) Calculate
    i) Cash price of the machine (2 marks)
    ii) The hire purchase value (3 marks)
    iii) Calculate the rate of compound interest charged per Month for hire purchase terms. (4 marks)
    Iv) Find difference between cash price value and hire purchase value. (1 mark)

23. The table below shows masses of 100 form 4 students.

Mass Kg	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
No of students	4	6	10	14	22	24	14	6

    Find:-
    a) Mean mass (4 marks)
    b) Variance (5 marks)
    c) Standard deviation (1 mark)

24. In the figure below ABC is a tangent to the circle at B. Given that $< ABG = 40^0$, $< BGD = 45^0$ and $< DBE = 25^0$
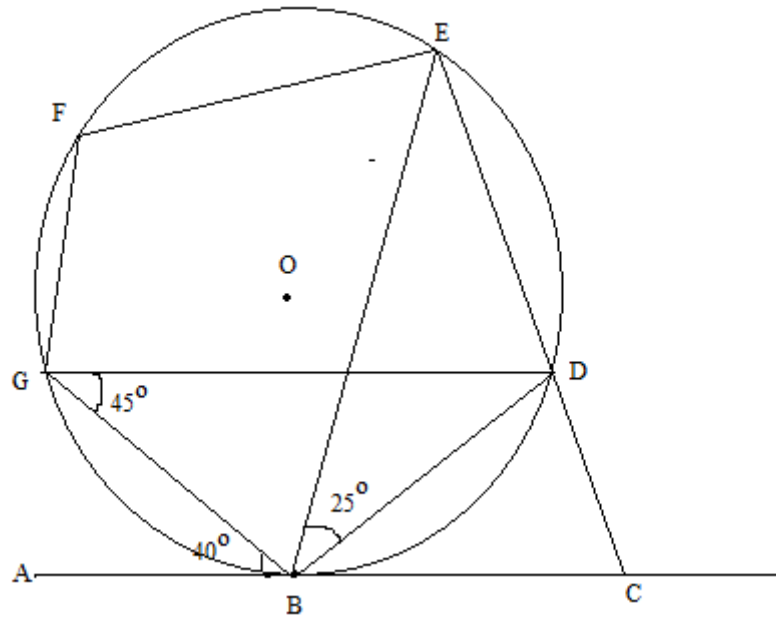
Find the size of the following angles giving reasons in each case
a)   <BDG   (2 marks)
b) <DGE   (2 marks)
c) <EFG   (2 marks)
d) <CBD   (2 marks)
e) <BCD   (2 marks)

MURANG'A SOUTH
121/1
MATHEMATICS
PAPER 1

SECTION I (50 MARKS)
Answer all questions in this section

1. During a football match, sh. 1,462,800was realized from stadium entrance fees. If the entrance fee was sh. 80 per person, calculate how many fans paid to watch match. (2 marks)

2. Three women Kezia, Mary and Alice contributed money to buy a vehicle. Kezia contributed$\frac{1}{3}$of the total amount, Mary contributed $\frac{3}{8}$of the remaining amount and Alice contributed the rest of the money. The difference in the contribution between Mary and Alice was sh. 60,000. Calculate the cost price of the vehicle. (3 marks)

3. Simply without using mathematical tables or calculators. (3 marks)

$$\sqrt[3]{2744} \times \sqrt{2\frac{41}{64}}$$

4. Use logarithm to solve tables to evaluate; (4 marks)

$$\left(\frac{45.3 \times 0.00697}{0.534}\right)^{\frac{1}{3}}$$

5. A chord AB of length 13cm subtends an angle of 67° at the circumference of a circle centre O. Find the radius of the circle to the nearest whole number. (3 marks)

6. A metal weighs 83.16 grams when totally immersed in a cylinder of radius 3cm, the height of water level in the cylinder rises by 0.49 cm. Calculate density of the metal. (3 marks)

7. The figure below is a semi cylinder of length 18 cm and radius 3.5 as shown.

   Draw a labeled net of the solid. (2 marks)
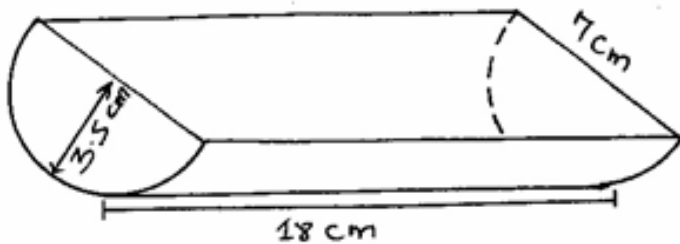
8. A salesman is paid a salary of sh. 25,000. He gets a commission of 3.5% on sales above sh. 100,000 and an additional 1.5% if the sales exceed sh. 500,000. In the month of December the salesman received earnings totaling sh. 61,500. Calculate the total sales he made that month. (3 marks)

9. The sum of interior angle of a regular polygon is twelve times its exterior angle. Find the number of sides of the polygon and name the polygon. (4 marks)

10. In a botanical experiment the length of 60 leaves of a certain type of a tree were measured correct to the nearest 0.1cm.

Length (cm)	3.0 − 3.4	3.5 − 3.9	4.0 − 4.4	4.5 − 4.9	5.0 − 5.4	5.5 − 5.9	6.0 − 6.4	6.5 − 6.9	7.0 − 7.4
No. of leaves	1	4	9	14	12	10	6	3	1

   a) State the modal class. (1 mark)
   b) Calculate the median height. (3marks)

11. Given that $\underline{a} = 5i + 4j$, $\underline{b} = 3i − 2j$ and $\underline{c} = 7i + 10j$. Find the scalars **m** and **n** such that
    $m\underline{a} + n\underline{b} = \underline{c}$ (3marks)

12. Simplify the expression

$$\frac{x^2 - 9}{6 - 11x + 3x^2}$$

(3 marks)

13. A circle O has the equation $x^2 + y^2 = 4$. The area of the circle in first quadrant is divided into 5 vertical strips each of width 0.4 cm. The table below shows the values of x and y for the first quadrant of the circle.

x	0	0.4	0.8	1.2	1.6	2.0
y	2.0	1.96	1.83	1.6	1.2	0

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

14. A businessman bought 100 textbooks and 80 pens for sh. 25,600. If she had bought twice as many textbooks and half as many pens she would have paid sh. 7,400 less. Find the cost of one textbook and one pen. (3 marks)

15. The area occupied by a lake on a map is $28\ cm^2$. If the scale of the map is 5cm to 1 km
Calculate the actual area of the lake on the ground in hectares. (3 marks)

16. Waweru had walked two thirds away across a bridge when he saw an approaching train $60\ m$ away. He ran back only to reach the bridge at the same time as the train was moving at $25\ m/s$ and Waweru ran at $10\ m/s$, find the length of the bridge. (3 marks)

SECTION B (50 Marks)
Answer any five questions in this section.

17. Meshack and Kelvin contributed shs. 60,000 and sh. 90,000 respectively in order to start business. They employed a manager and agreed to pay him sh. 4,500 per month from the profit made each year. They also agreed that 20% of the profit made each year would be put back into the business while the rest would be shared between them in the ratio of their initial contribution. During the first year they made a profit of sh. 365,000. Calculate:-
    a) The manager's annual salary for that year (1 mark)
    b) The money put back into business that year. (2marks)
    c) The business net profit for that year. (2marks)
    d) How much each partner received that year. (3marks)
    e) The capital for the following year. (2marks)

18. a) Given that $A = \begin{pmatrix} 2 & 3 \\ 4 & 4 \end{pmatrix}$, $B = \begin{pmatrix} x & 1 \\ 2 & 3 \end{pmatrix}$ and that AB is a singular matrix, solve for x. (4 marks)
    b) A clothes dealer sold 3 shirts and 2 trousers for sh. 840 and 4 shirts and 5 trousers for sh. 1,680. Form a matrix equation to represent the above information. Hence find the cost of 1 shirt and the cost of 1 trouser. (6 marks)

19. Using ruler and compass only:-
    a) Construct triangle ABC such that AB $= 5$ cm, AC $= 6$ cm and angle $BAC = 67.5°$. Measure BC. (4 marks)
    b) On the same diagram, construct a circle which passes through the verticals of the triangle ABC. Measure the radius. (3 marks)
    c) Calculate the area of the part that is outside the triangle but within the circle. (3 marks)

20. The figure below is a plot of land ABCD where AD $= 84\ cm$, BC $= 75.8\ cm$, $\angle ABD = 27°$, DAB is a right angled triangle and $\angle DCB = 82°$.

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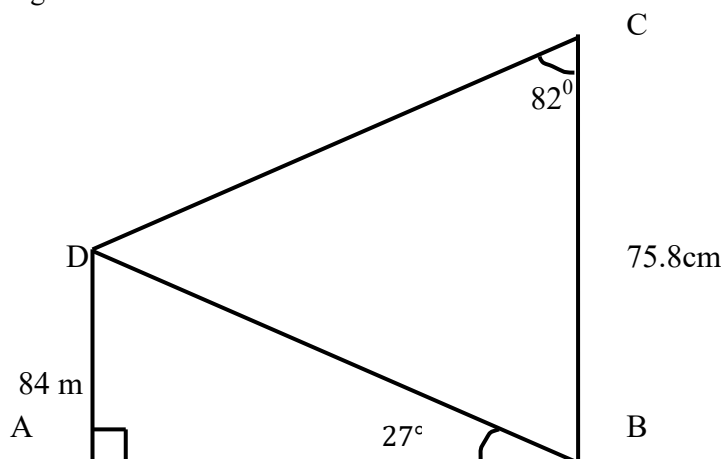
Leaving your answer to 1 decimal place determine;
   a)   The length AB.   (2 marks)
      Leaving your answer to 1 decimal place determine;
   b)   The length AB.   (2 marks)
   c)   The length of DB.   (2 marks)
   d)   The length of DC.   (4marks)
   e)   The area of the plot in hectares.   (2marks
21.   The L1 and L2 lines whose equations are $ax + by + c = 0$ and $qy = k$ intersect at P $(8, 8)$.
   a)   If the lines make angles of 135° and 45° respectively with x axis. State their gradient.   (2 marks)
   b)   Find the equation of the lines above   (4marks)
   c)   Find the equation of another line L3 passing through the $(1, 2)$ and parallel to line L1   (4marks)
22.   (a) $P'Q'R'$ is the image of PQR with vertices P $(4,2)$ Q $(1,1)$ and R $(5,1)$ under a rotation. If P′ is $(-6 , -4)$,
      Q' $(-3, -3)$ and R' $(-7, -3)$, draw triangles PQR and $P'Q'R'$.   (2 marks)

   (b) $P''Q''R''$ is the image of PQR under a translation $T = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$. Write down the coordinates of $P''Q''R''$ and draw
      it.   (3 marks)
   (c) $P'''Q'''R'''$ with vertices $(-6, 2)$, $(-3, 1)$ and $(-7, 1)$ respectively is the image of PQR under transformation T.
      Draw $P'''Q'''R'''$ and describe it fully.   (3 marks)
   (d) $P^4Q^4R^4$ is the image of PQR under a $+ 90^0$ rotation about the origin. State the coordinates of $P^4Q^4R^4$.
                                                                                                         (2 mks)
23.   The figure below is a solid which is partly a cylinder, frustum and hemisphere. The top radius is 3cm while the
      radius of the hemisphere part is 10cm. The length of the frustum is 14 cm while the height of the cylinder is 14
      cm.
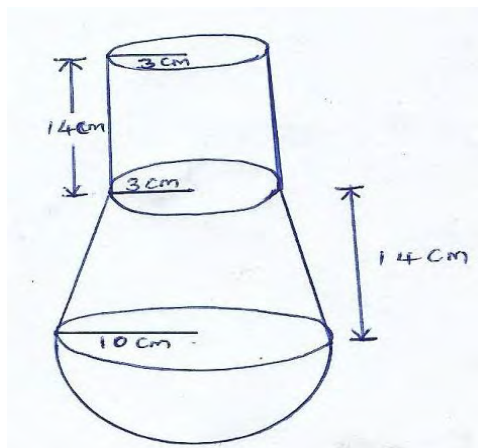
   Determine:-
   a)   The curved surface area of the cylindrical part of the solid.   (2marks)
   b)   Curved surface of the hemispherical part.   (2marks)
   c)   The curved surface area of the frustum part of the solid.   (4marks)
   d)   The total surface area of the solid.   (2 marks)
24.   The equation of a normal to a curve at $(0, 3)$ is $2y + x = 6$.
   a)   Find the equation of its tangent in the form $y = mx + c$ (2 marks)
   b)   The gradient function of the curve at $(0 ,3)$ is $2 - 2x$
      i.   Find the equation of the curve   (3 marks)
      ii.   Find the turning point of the curve   (3marks)
   c) Sketch the curve.   (2 marks)

MURANG'A SOUTH
121/2
MATHEMATICS PAPER 1

SECTION I (50 Marks)
Answer all questions in this section.
1. The surface of spherical ball is increased by 21% after pressure was pumped in.
    a) Find the circumference of the original ball if one with increased pressure has a circumference of 55cm.
    (2marks)
    b) Calculate the percentage in volume of the ball. (2marks)
2. Simplify $\frac{4\sqrt{3}}{3-2\sqrt{3}}$ leaving your answer in the form $a\sqrt{b} + c$ (2marks)
3. In the figure below, AOB is a sector whose area is $7.2\ cm^2$ subtending an angle 2.5 radians at the centre O.
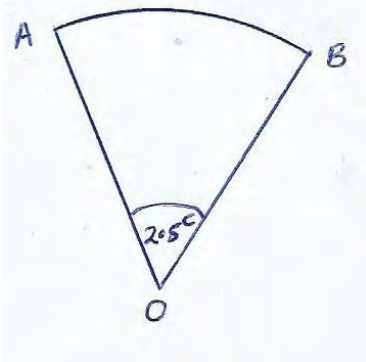
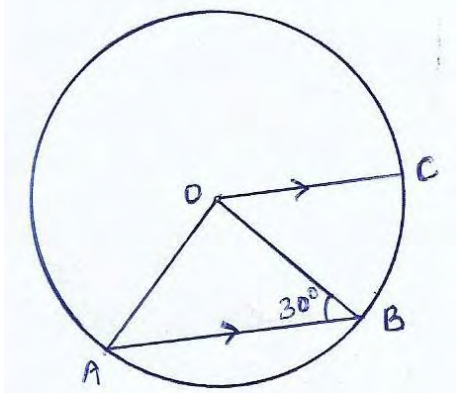

    Calculate:
    a)   Calculate the radius of the sector. (2marks)
    b)   The length of the arc AB. (2marks)
4. O is the center of the circle. Given AB is parallel to OC and angle $ABO = 30°$, find angle ACO. (3marks)

5. A man can till $\frac{1}{2}$ of a piece of land in 4 days while his wife can till $\frac{5}{8}$ of the same piece of land in 3 days. How many days will the two take to till the whole piece of the land when working together? (3marks)
6. A mother's age is the square root of her daughters, After five years, the mother will be $4\frac{1}{2}$ times as old as the daughter. Find the daughter's present age. (4marks)
7. Solve y for the equation;
    $\log_{10}(3y + 2) - 1 = \log_{10}(y - 4)$ (3marks)
8. a) Expand $\left(1 - \frac{3}{2}x\right)^6$ upto the term in x^4. (1 mark)
    b) Hence evaluate the first four terms of the expansion to evlaute $(1.03)^6$ to four significant figures (2marks)
9. Write down the equation of a circle centre(0,2) and raduis 3 units, leaving your answer in the form $ax^2 + by^2 + cx + dy + e = 0$. (3 marks)
10. PQR is a triangle of area $9\ cm^2$. If PQ is the fixed base of the traingle and 6cm long draw it and describe the locus of point R. (3marks)

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11. A class has 18 boys and 12 girls. Three pupils are chosen at random from the class. What is the probability of choosing all the girls. (2marks)

12. A farmer wishes to purchase some goats and cows. He can buy at most 3 either animals. On avergae a cow and a goat cost sh. 12,000 and shs. 4,000 respectively. He has shs. 240 000 to spend and the number of cows should be at most twice the number of goats. He must buy more than five cows. List all the inequalities to represent the above information. (4 marks)

13. Given that $\frac{dy}{dx} = 2x^2 + 3$ and that $y = 3$ when $x = 0$, find the value of y when $x = \frac{1}{3}$. (3 marks)

14. The position of two towns X and Y are given to the degree as X$(45°N, 10°E)$ and Y $(45°N, 70°E)$
    Find:-
    i. The difference in longitude. (1mark)
    ii. The distance between the two towns in nautical miles to the nearest whole number. (2marks)
    iii. Solve the equation $\sin(5x - 20)° = -0.8660$ for vlaues of x between$0°$ and $90°$ (2marks)

15. Vector $AO = 6i - 2j + 3k$ and $OB = -2i + 3j - k$. A point C divides AB in the ratio of $3:1$. Find AC in terms of $i, j$and k. (3marks)

SECTION II (50 MARKS)
Answer only FIVE questions in this section.

16. Halima deposited sh. 500,000 in a financial institution which paid simple interest at a rate of 6% per annum. At the end of 2 years, She withdrew then invested the money in shares. The value of the shares depreciated at the rate of 4% during the first year of the investment. In the next 3 years, the value of the rate of the shares appreciated at the rate of 6% every four months.
    a) Calculate the amount that Halima invested in shares. (3marks)
    b) Calculate the value of Halima's shares.
       i. At the end of the year. (2marks)
       ii. At the end of the fourth year to the nearest shillings. (3marks)
    c) Calculate Halima's gain from the shares as a percentage. (2marks)

18. An arithmetic progression of 41 terms is such that the sum of the first five terms is 560 and the sum of the five last terms is -250. Find:-
    a) The first term and the common difference (5marks)
    b) The last term. (2marks)
    c) The sum of progression. (3marks)

19. a) Complete the table below, giving values correct to decimal places. (2marks)

$x°$	0	30	60	90	120	150	180
$2\sin x°$	0	1		2			
$1 - \cos x°$			0.5	1			2

   b) On the grid provided using the same scale and axes draw the graphs of $y = 2\sin x°$ and $y + \cos x° = 1$. (5 marks)

      Take the scale: $2\ cm$ for $30°$on the $x - axis$
               $2\ cm$ for 1 unit on the $y - axis$
   c) Use the graph in (b) above to:-
      i) Solve the equation$2\sin x° = 1 - \cos x°$ (1mark)
      ii) Determine the range of values for which $2\sin x° \geq 1 - \cos x°$ (1mark)
      iii) State the amplitude of $2\sin x°$ (1mark)

20. The diagram below represents a pyramid standing on rectangular base ABCO. V is the vertex of the pyramid and VA = VB = VC = VD = 26 cm. M and N are the midpoints of BC and AC respectively. $AB = 24\ cm$ and $BC = 18\ cm$.
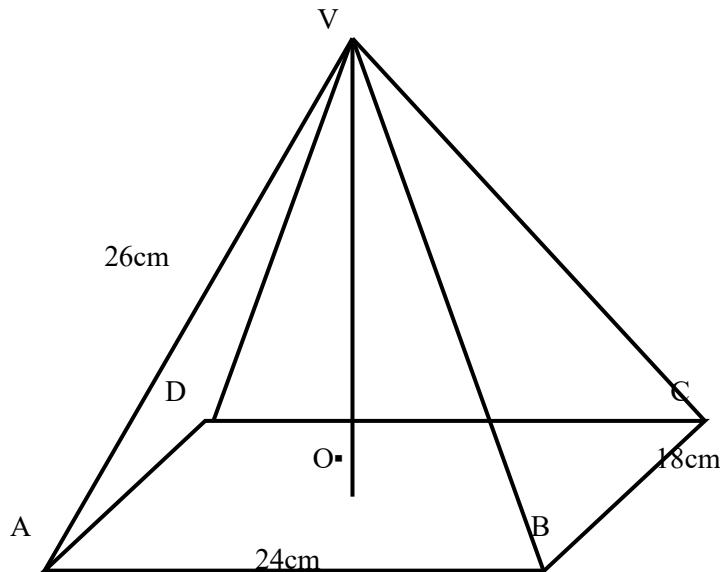
Calculate:-

    a)   The line of the length AC   (2marks)

    b)   The length of projection of the VA on the plane ABCD.   (1mark)

    c)   The angle between line VA and the plane ABCD.   (2marks)

    d)   The vertical height of the pyramid.   (2marks)

    e)   The size of the angle between the planes VBC and ABCD.   (3marks)

21. 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 an equation connecting R, S and T.   (4marks)

    b)   i. Find the value of R when S = 360 and T = 1.5.   (2marks)

          ii. Find the percentage change in R if S increases and T decreases by 20%.   (4mark

22. (a) The acceleration of a particle t seconds after passing a fixed point is given by $a = 3t - 3$. Given that the velocity of the particle when $t = 2$ seconds is 5 m/s, find: -

    i. Its velocity when t = 4 seconds   (3marks)

    ii. Its displacement at this time.   (3marks)

    (b) Find the area bounded by the graph $x = 9y - y^3$ and the y axis.   (4marks)

23. The table below shoes the marks scored by forty form 4 students in a mathematical test.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Frequency	2	4	5	7	10	6	3	2	1

    a)   Using an assumed mean score of 55, calculate the mean of the data.   (3marks)

    b)   Calculate the lower quartile.   (2marks)

    c)   On the grid provided, draw the cumulative frequency curve to represent the above distribution.(3marks)

    d)   From the graph, estimate:-

         i.   The 5th decile.   (1 mark)

         ii.   Range of marks of the middle 80% of the students.   (1 mark)

24. ABCD is quadrilateral with vertices $A\ (-7, 2)B\ (-2,1)C\ (2, 8)D\ (-7, 7)$. $A'\ B'\ C'\ D'$ is the image of ABCD under a transformation matrix $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

(i) Find the coordinates of $A'\ B'\ C'\ D'$.   (2marks)

(ii) On the grid provided draw ABCD and A' B' C' D'   (2marks)

    a) (i) Find A" B" C" D" the image of the of A' B' C' D' under the transformation matrix $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ (2mks)

        (ii) On the same grid draw A" B" C" D"   (1mark)

    b) (i) Find the single matrix that maps A" B" C" D" onto ABCD.   (2marks)

        (ii) Describe the transformation fully.   (1mark)

COMPLIANT 1
121/1
**MATHEMATICS**
PAPER 1
  SECTION 1: (50 MARKS)
  __Answer ALL Questions in this section__

1. The marked price of a car in a dealer's shop was Ksh. 450,000/=. Nasieku bought the car at 7% discount. The dealer still made a profit of 13%. Calculate the amount of money the dealer had paid for the car.   (3mks)

2. Evaluate: (3mks)

    $$\frac{½ + 2^4/_5 \text{ of } 8 \div 6(2 \text{ x } 4^2/_5)}{^2/_4 \text{ of } 6(8 \div 3^1/_3)}$$

3. A man was born in 1956. His father was born in 1928 and the mother three years later. If the man's daughter was born in 1992 and the son 5 years earlier, find the difference between the age of the man's mother and that of his son.   (3mks)

4. Solve for x in the equation:
    $\text{Log}_8(x + 6) - \text{Log}_8 (x - 3) = {}^1/_3$
        (3mks)

5. Solve the simultaneous equations:
    $\frac{x}{2} + \frac{y}{3} = \frac{-13}{6}$, $\frac{2y - x}{3} = 11$ (4mks)

6. Simplify: $\frac{12x^2 - 27}{4 - (2x + 1)}$ (3mks)

7. Find the angle the line $3y = 2x + 6$ makes with the x-axis.   (3mks)

8. The curved surface area of a cylindrical container is 880cm^2. Calculate to one decimal place the capacity of the container in litres given that the height is 17.5cm. (Take $\pi = {}^{22}/_7$).

9. State all the integral values of a which satisfy the inequality $\frac{3a + 2}{4} \le \frac{2a + 3}{5} \le \frac{4a + 15}{6}$ (4mks)

10. Line L_1 passes through the points A (1, -2) and B(3, -4). Find the equation of the line L_2 passing through the mid-point of AB and perpendicular to L_1, leaving your answer in the form $ax + by + c = 0$.   (4mks)

11. 1.5 litres of water (density 1g/cm^3) is added to 5 litres of alcohol (density 0.8g/cm^3). Calculate the density of the mixture.   (3mks)

12. A map of a certain town is drawn to a scale of 1:50,000 on the map, the railway quarters cover an area of 10cm^2. Find the area of the railway quarters in hectares.   (2mks)

13. ABCD is a rectangle. AB = 10cm, AD = AX = 6cm and XY is an arc of a circle centre D.
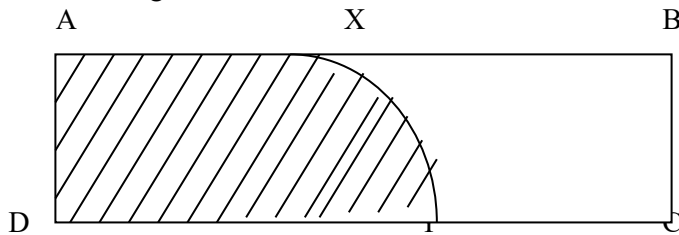
    Calculate the area of the shaded region. (Take π= 3.142)   (3mks)

14. If cos $\propto= \frac{15}{17}$, find without using tables or calculators sin $\propto$ and tan $\propto$.   (3mks)

15. Express 1.441441 .... in the form p/q where p and q are integers. (q # o)   (3mks)

16. Leonorah Jerop was on top of a cliff 30m high sees two boats P and Q out at sea. Both boats were in the same line and the angle of depression from Leonorah to P was 42^0 and the angle of depression from Leonorah to Q was 27^0. Calculate the distance then between the two boats.   (3mks)

SECTION II (50 MARKS)

Answer any five questions in this section

17. The figure below shows two circles of radii 10.5cm and 8.4cm and with centres A and B respectively. The common chord PQ is 9cm.
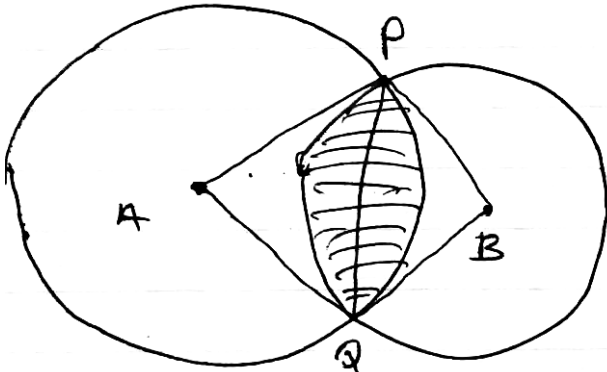
    (a)   Calculate angle PAQ.   (2mks)
    (b)   Calculate angle PBQ.   (2mks)
    (c)   Calculate the area of the shaded part.   (6mks)

18. Every Sunday Barmao drives a distance of 80km on a bearing of 074^0 to pick up her sister Afandi to go to church. The church is 75km from Afandi's home on bearing of $S50^0E$. After church they drive a distance of 100km on a bearing of 260^0 to check on their friend Akoth before Barmao drives to Afandi's home to drop her off then proceed to her house.

    (a)   Using a scale of 1cm to represent 10km, show the relative positions of these places.   (4mks)
    (b)   Use your diagram to determine:
         (i)   The true bearing of Barmao's home from Akoth's house.   (1mk)
         (ii)   The compass bearing of the Akoth's home from Afandi's home.   (1mk)
    (c)   (i) The distance between Afandi's home and Akoth's home.   (2mks)
         (ii) The total distance Barmao travel every Sunday.   (2mks)

19. The vertices of triangle PQR are P(O,O), Q(6,0) and R(2,4).
    (a) Draw triangle PQR on the grid provided.   (1mk)
    (b) Triangle P'Q'R' is the image of a triangle PQR under an enlargement scale factor, ½ and centre (2,2). Write down the co-ordinates of triangle P'Q'R' and plot on the same grid.   (2mks)
    (c) Draw triangle P"Q"R" the image of triangle P'Q'R' under a positive quarter turn, about points (1,1)
                                                                   (3mks)
    (d) Draw triangle P"'Q"'R"' the image of triangle P"Q"R" under reflection in the line y = 1.   (2mks)
    (e) Describe fully a single transformation that maps triangle P"'Q"'R"' onto P'Q'R'.   (2mks)

20. A pail is in the shape of a container frustrum with base radius 6cm and top radius 8cm. The slant height of the pail is 30cm as shown below. The pail is full of water.
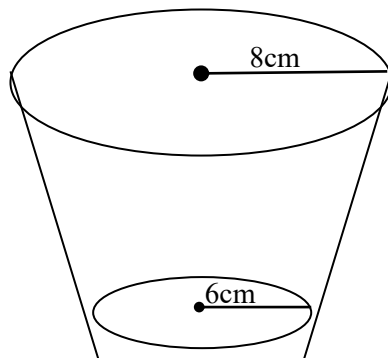
    (a)   Calculate the volume of water.   (6mks)
    (b)   All the water is poured into a cylindrical container of circular radius 7cm, if the cylinder has the height of 35cm, calculate the surface area of the cylinder which is not in contact with water.   (4mks)

21. (a) A bus travelling at 99km/hr passes a check-point at 10.00a.m. and a matatu travelling at 132km/h in the same direction passes through the check point at 10.15a.m. If the bus and the matatu continue at their uniform speeds, find the time the matatu will overtake the bus.   (6mks)

(b) Two passenger trains A and B which are 240m apart and travelling in opposite directions at 164km/h and 88km/h respectively approach one another on a straight railway line. Train A is 150 metres long and train B is 100 metres long. Determine time in seconds that elapses before the two trains completely pass each other.   (4mks)

22. (a) Solve the equation: $\dfrac{x+3}{24} = \dfrac{1}{x-2}$ (4mks)

(b) A rectangular room is 4m longer than its width. If its area is $12m^2$, find its dimensions and hence the perimeter of the room.   (6mks)

23. Using a ruler and a pair of compasses only, construct triangle ABC, such that AB = 5cm, BC = 6cm and AC = 6.4cm. Locate the locus of P such that it is equidistant from the sides AB, BC and AC. Measure the shortest distance, r between side AB and the centre P using length r and centre P. Draw a circle. Measure CP.   (10mks)

24. QRST is a rhombus. The equations of QR, RS and TS are 2x + y = 7, x = 1 and 2x + y = -1 respectively. Determine:-

(a)   The co-ordinates of Q and S.   (4mks)
(b)   The co-ordinates of m, the point of intersection of the diagonals.   (2mks)
(c)   The co-ordinates of R and T.   (4mks)

COMPLIANT 1
121/2
MATHEMATICS
PAPER 2
SECTION 1: (50 MARKS)
Answer ALL Questions in this section

1. Using logarithms, evaluate (4mks)

$$\sqrt[3]{\frac{4.684 \log 314.2}{\tan 87^0}}$$

2. Make x the subject of the formula: (3mks)

$$A = \sqrt{\frac{1-x}{1+x}}$$

3. A surveyor gave the length and width of a rectangular plot as 80m and 55m respectively. Find his percentage error in the area of the rectangular plot. (3mks)

4. Find the radius and centre of the circle whose equations is $2x^2 + 2y^2 - 6x + 10y + 9 = 0$. (4mks)

5. Simplify: $\dfrac{2}{2\sqrt{3}+\sqrt{2}} - \dfrac{2}{2\sqrt{3}-\sqrt{2}}$

   Giving your answer in surd form with a rational denominator. (3mks)

6. Expand $\left(x + \dfrac{a}{x^2}\right)$ in descending powers of x up to the term independent of x. If this independent term is 1215, find the value of a. (4mks)

7. The sum of Shs. 50,000 is invested in a financial institution that gives 12%p.a. The interest is compounded quarterly. Find the total investment after 3 years. (3mks)

8. If $\dfrac{p+3q}{2p-q} = \dfrac{3}{4}$ find the ratio p : q. (3mks)

9. The angles of a triangle are in the ratio 8 : 7 : 3. If the longest side of the triangle is 5.4cm. Calculate the length of the shortest side. (3mks)

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

11. Six men take 28 days working for 10 hours a day to pack 4480 parcels. How many more men working 8 hours a day will be required to pack 2500 parcels in 4 days? (3mks)

12. A bird flies from its nest to some food in three stages. The routes are described by the following vectors.

$$\begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix}, \quad \begin{pmatrix} 7 \\ 10 \\ 5 \end{pmatrix} \quad \text{and} \quad \begin{pmatrix} 4 \\ -2 \\ -7 \end{pmatrix}$$

Find the distance between the bird's nest and where the food is. (3mks)

13. The size of an interior angle of a regular polygon is $3x^0$ while exterior is $(x-20)^0$. Find the number of sides of the polygon. (3mks)

14. In what ratio must "Murang'a" coffee costing sh. 25g per 100g be mixed with "Kisii" coffee costing sh. 17.50 per 100g, so that by selling the mixture at sh. 25 per 100g, a profit of 25% is made? (3mks)

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15. In the figure below, ABCDE is a cross-section of a solid. The solid has a uniform cross-section. Given that BG is a base edge of the solid, complete the sketch, showing the hidden edges with broken lines.

(2mks)

16.

$$y = 2x - x^2$$

Find the coordinates of A. (3mks)
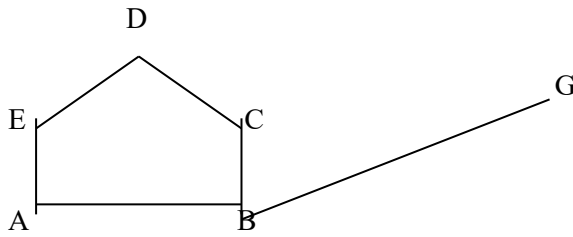
SECTION II (50 MARKS)
Answer any five questions in this section

17. Mr. Chesingei earned an annual basic salary of Kenya pounds 12360 when the rates of taxation were as in the table below.

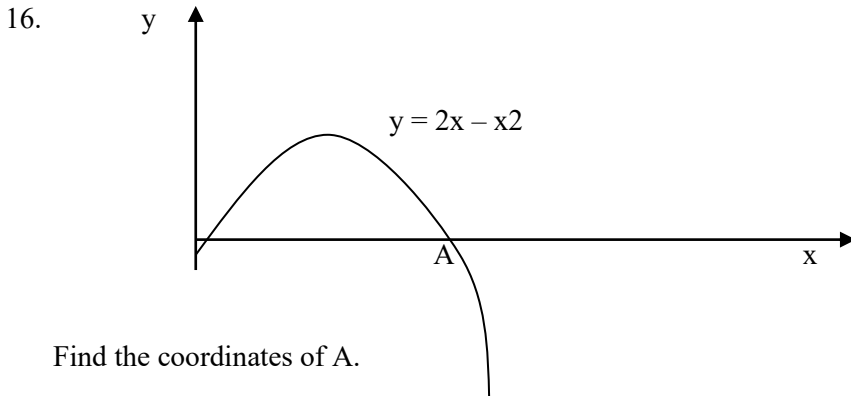| Monthly income (pounds)	Rates (%)
1 – 484	10
485 – 940	15
941 – 1396	20
1397 – 1852	25
1853 and above	30

Apart from the basic salary, he is entitled to a house allowance of Kshs. 12,000 and medical allowance of Kshs. 6,000 per month.
(a) Calculate Chesingei's monthly taxable income in Kenya pounds. (3mks)
(b) Calculate Chesinge's monthly net income if he is given a tax relief of Ksh. 980 per month. Give your answer in Kenyan shillings. (5mks)
(c) How much more tax should he have paid per month in Kenya pounds if his monthly salary is increased by Ksh. 2500. (2mks)

18. The table below shows the distribution of marks scored by 100 candidates of Cheptiret Boys High school in an examination.

Marks	1– 10	11 – 20	21 – 30	31 – 40	41–50	51–60	61–70	71–80	81–90	91–100
No. of candidates	2	5	8	19	24	18	10	6	5	3

(a) Draw a cumulative frequency curve to illustrate the information above. (4mks)

(b) From your graph, find:
   (i)   Median   (2mks)
   (ii)   Inter-quartile range   (2mks)
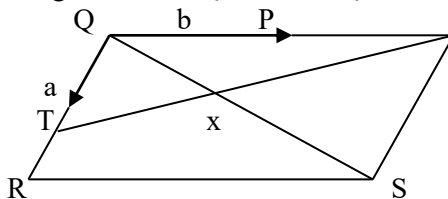   (iii) Pass mark if 70% of the students passed.   (2mks)
19. The figure below shows a circle centre O in which QOT is a diameter. $<QTP = 46^0$, $TQR = 75^0$ and $SRT = 38^0$, PTU and RSU are straight lines.
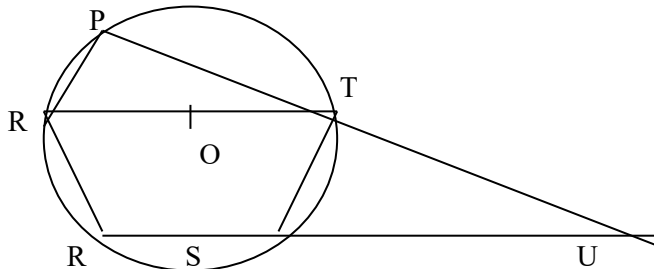
Calculate the following angles giving a reason in each case.
(a) $<RST$ (2mks)
(b) $<SUT$ (2mks)
(c) $<PST$ (2mks)
(d)   Obtuse $<ROT$ (2mks)
(e) $<SQT$ (2mks)
20. In the figure below, QT = a and QP = b.

(a) Express the vector PT in terms of a and b.   (1mk)
(b) If PX = kPT, express QX in terms of a, b and k, where k is a scalar.   (3mks)
(c) If QR = 3a and RS = 2b, write down an expression for QS in terms of a and b.   (1mk)
(d) If QX = tQS, use your result in (b) and (c) to find the value of k and t.   (4mks)
(e) Find the ratio PX : XT.   (1mk)
21. The law $E = KX^n$ gives an expression for the energy E joules stored in a spring for the extension xcm. The table below shows the value of E and the corresponding value of X.

xcm	2	2.5	3	3.5	4	5
E (joules)	108	169	243	330	432	675

Determine graphically the values of k and n. Write the equation connecting E and X.   (10mks)
22. The first term of an Arithmetic Progression (AP) is 200. The sum of the first 10 terms of AP is 24500.

(a) (i) Find the common difference.   (2mks)
     (ii) Given that the sum of the first n terms of the AP is 80100, find n.   (2mks)
(b) The 3rd, 5th and 8th terms of another AP, form the first three terms of a Geometric Progression (GP). If the common difference of AP is 5, find:-
     (i)   The first term of the GP.   (4mks)
     (ii)   The sum of the first 12 terms of the GP, to four significant figures.   (2mks)
23. (a) Fill the table below, giving the values correct to 2 decimal places.
     (3mks)

x^0	0	30	60	90	120	150	180	210	240	270	300	330	360
Sin2x													
3cosx-2													

(b) On the grid provided, draw the graphs of $y = \sin 2x$ and $y = 3\cos x - 2$ of $0^0 \leq x \leq 360^0$; on the same axes. Use the scale of 1cm to represent 30^0 on the x-axis and 2cm to represent 1 unit on the y-axis.

(c) Use the graph in (b) above to solve the equation:

$3 \cos x - \sin 2x = 2$

24. The probabilities of Makori, Newton and Patrick going to school on Monday are $^6/_7$, $^7/_8$ and $^8/_9$ respectively. Find the probability that:-
(a) They will all go to school on Monday. (2mks)
(b) None of them will go to school on Monday. (2mks)
(c) At least one of them will go to school on Monday. (3mks)
(d) At most one of them will go to school on Monday. (3mks)

11) Write down the inequalities that define the unshaded region marked R in the figure below. (3mks)
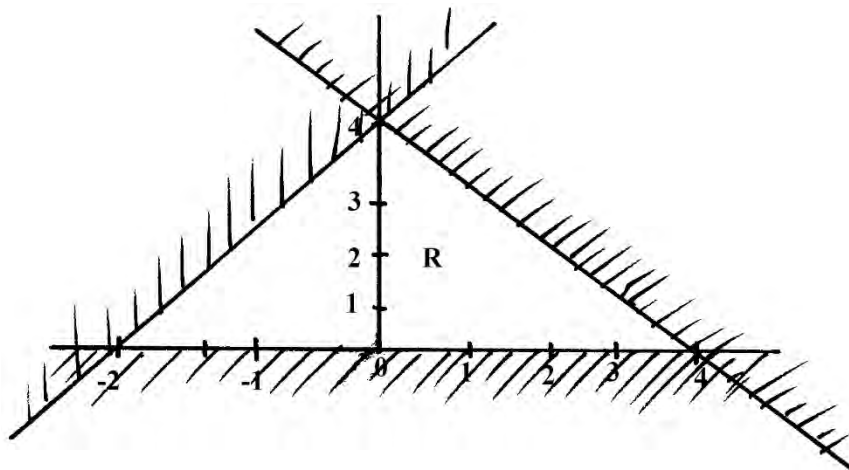
12) Use Logarithm tables to evaluate (4mks)

$$\sqrt{\frac{32.4 \times 0.04352}{(5.24)^2}}$$

13) Calculate the area of the shaded region below, given that AC is an arc of a circlecentre B. AB=BC=14cm CD=8cm and angle ABD = 75^0 (3marks)
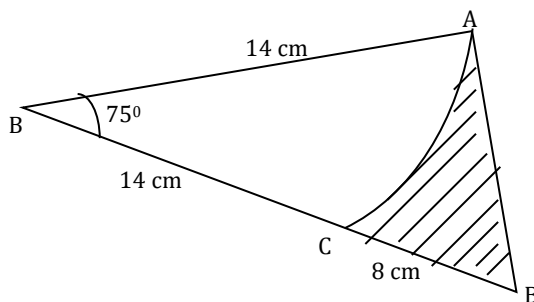
14) A boy whose eye level when standing is 1.6 m, stands in front of a building 30 m tall. He observes the top of the building at an angle of elevation of 42^0. Find the distance between the boy and the building leaving your answer correct to 4 significant figures. (3marks)

15) The figure below shows a sketch of a solid cuboid EFGHIJKL. Complete the sketch. (3mks)
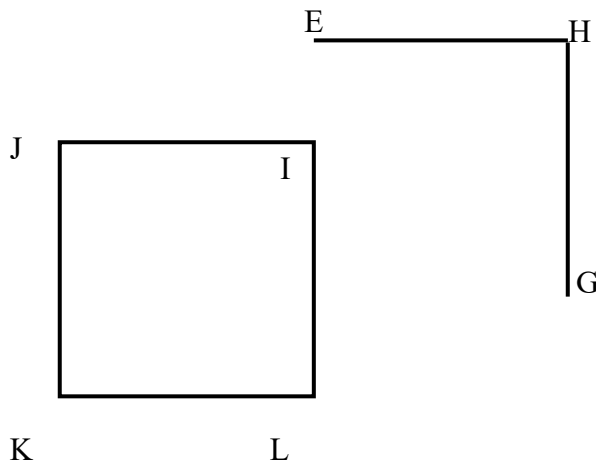
16) Vector **p** passes through points (10,20) and (6,10) while **q** passes through points (x,12) and (-10,-18). If **p** and **q** are parallel, find x. (3 marks)

SECTION (50 MARKS) ˜
Answer any five questions in this section in the spaces provided.

17. Atieno is a sales executive earning a salary of Ksh. 20,000 and a commission of 8% for the sales in excess of Ksh 100,000. If in January 2010 she earned a total of Ksh.48, 000 in salaries and commissions.
   a) Determine the amount of sales she 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) Atieno's commission in the month of February   (3 mks)
    (ii) Her total earning in the month of March   (3 mks)

18. (a) Find the inverse of the matrix   (2 mks)

    $$\begin{bmatrix} 2 & 5 \\ 4 & 3 \end{bmatrix}$$

    (b) A transport company has two types of vehicles for hire: Lorries and buses. The vehicles are hired per day. The cost of hiring two lorries and five buses is Sh. 156,000 and that of hiring 4 lorries and three buses is Sh. 137,000.
    (i) Form two equations to represent the above information.   (2 mks)
    (ii) Use matrix method to determine the cost of hiring a lorry and that of hiring a bus.   (3 mks)

    (c) Find the value of x given that $\begin{bmatrix} 2x-1 & 1 \\ x^2 & 1 \end{bmatrix}$ is a singular matrix   (3 mks)

19. a) The points A(2, 6), B(1, 1) C(3, 4) and D(5, 3) are vertices of a quadrilateral ABCD. Plot ABCD on the grid below to form quadrilateral ABCD.   (2 mark)
    b) ABCD undergoes a rotation of positive 90^0, about the origin. on the same grid, draw the image A'B'C'D' and state the coordinates of A'B'C'D'.   (3 marks)
    c) A'B'C'D' undergoes a reflection in the X – axis to give A''B''C''D''. On same grid, draw A''B''C''D'' and state the coordinates of A''B''C''D''   (3 marks)
    d) A''B''C''D'' is the image of ABCD under a reflection. On the grid, mark the mirror line and state its equation.   (2 marks)

20. The figure below shows a bucket of depth 30cm used to fill a cylindrical tank of radius 1.2m and height 1.35m which is initially three-fifth full of water.
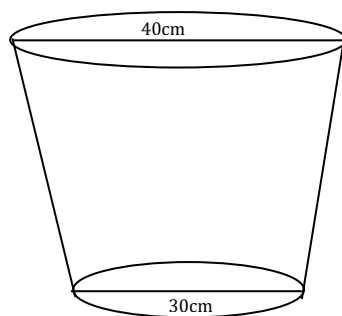
Calculate;
(a) The capacity of the bucket in litres   (5mks)
(b) The volume of water required to fill the tank in litres   (2mks)
(c) Calculate the number of buckets that must be drawn to fill the tank   (3mks)

21.) Forty students in a form 2 class were weighed and their masses recorded to the nearest kilogram as shown below.

45	48	56	39	47	36	45	37	46
35	43	51	42	47	47	40	46	
41	45	43	46	54	42	51	39	
42	45	44	49	50	46	39	42	
48	50	38	45	35	52	46		

a) Starting with the class 35-39 tabulate this data in a frequency table (2marks)
b) Find the modal frequency (1 mark)
c) calculate the mean mass of the students (4marks)
d) Estimate the median mass (3marks)

22.) Four ships are at sea such that a streamliner S is 150km on a bearing of 025° from a cargo ship C. A trailer T is 300km on a bearing of 145° from the cargo ship and a yacht Y is due West of C and on a bearing of 300° from T.

a) Using a scale of 1cm= 50km, draw on accurate scale drawing showing the positions of S, C, T and Y (4marks)

b) By measurement from your scale drawing determine:
   i) The distance and bearing of Y from S (2marks)
   ii) The distance ST (2marks)
   iii) The distance YT (2marks)

23) In a triangle OAB, M and N are points on OA and OB respectively, such that OM:MA= 2:3 and ON:NB= 2:1. AN and BM intersect at X. Given that OA =**a** and OB = **b**

(a) Express in terms of **a** and **b**:-
   (i) **BM** (1mark)

   (ii) **AN** (1mark)

(b) Taking BX = kBM and AX =hAN where **k** and **h** are constants express **OX** in terms of
   (i) **a, b** and **k** only (2marks)
   (ii) **a, b**, and **h** only (2marks)

(c) Use the expressions in **(b)** above to find values of **k** and **h** (4marks)

24) The table below gives some values of X and Y for the function $y=\frac{1}{2}x^2 + 2x + 1$ in the interval $0\leq x\leq 6$

a) Complete the values in the table below (2marks)

X	0	1	2	3	4	5	6
Y			7			23.5	

b) Using the values, estimate the area bounded by the curve, x-axis ,y-axis and the line x=6 by the trapezium rule ,use 6 trapezia (3marks)
c) By integration, calculate the exact area bounded in (a) above (3marks)
d) Find the percentage error made, when the trapezium rule is used, to 2.d.p (2mks)

**GATUNDU SUB COUNTY FORM FOUR 2018 EVALUATION EXAM**
121/2
MATHEMATICS
PAPER 2

SECTION 1(50 MARKS)

Attempt all questions in this section

1. Simplify $\dfrac{6}{\sqrt5 + \sqrt3} - \dfrac{4}{\sqrt5 - \sqrt3}$ giving your answer in the form $\sqrt{a} + b\sqrt{c}$

   where a, b and c are constants. (3marks)

2. Find all the integral values of x which satisfy the inequalities.
   $3(3 - x) < 5x - 9 \le 2x + 8$ (4marks)

3. Solve the equation
   $2 \log 15 - \log x = \log 5 + \log(x - 4)$ (3marks)

4. A bag contains 5 white balls, 3 black balls and 2 green balls. A ball is picked at random from the bag and not replaced. In three draws find the probability of obtaining white, black and green in that order. (2marks)

5. Use binomial coefficients to expand:
   $(2x - \sqrt3)^4$ (3marks)

6. Given that $a = b + \ b^2 + \sqrt[6]{\ }$, make c the subject of the formula. (3marks)

7. Mrs. Beth wants to buy a flat screen television set on hire purchase. The cash price is *Kshs. 28,000*. She can pay the cash price or make a down payment of *Kshs. 8,000* and *15* monthly instalments of *Kshs. 2,000* each. Calculate the rate of interest charged per month. (3mks)

8. Solve for x in the equation $2\sin(x - {}^\pi/_6)^c = -\sqrt3$ for the range $0 \le x \le 2\pi\ c$ (3marks)

9. The area of triangle ABC is $7cm^2$. Find the area of the image of *ABC*, if it's transformed using the matrix
   $\begin{pmatrix} 4 & 5 \\ 1 & 2 \end{pmatrix}$. (3 marks)

10. PQR is a triangle of area $9cm^2$. If PQ is the fixed base of the triangle and is *6cm* long, draw it and describe the locus of point R. (3marks)

11. In the figure below, AB is a tangent, meeting chord *CDE at B.*
   $DE = x\ cm$, $EB = 7$.
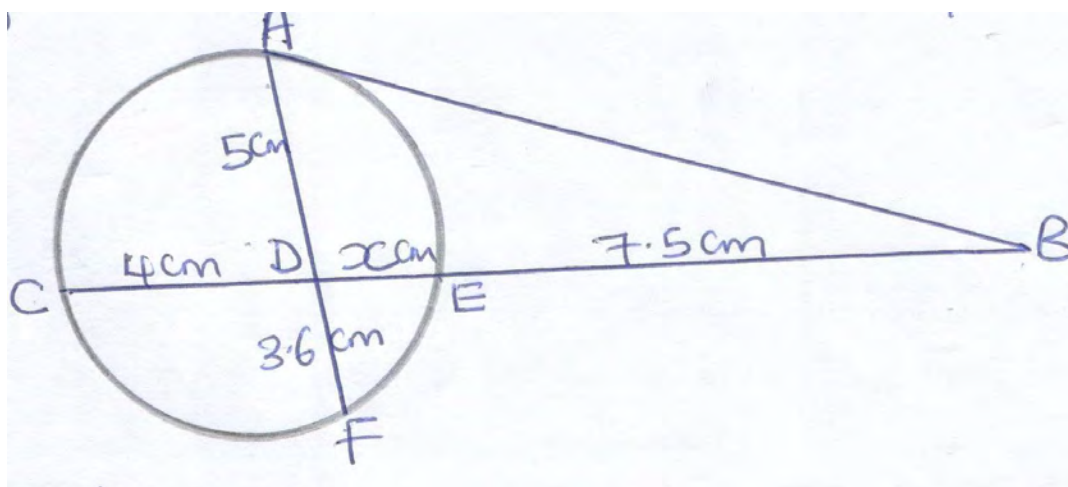

Determine :
a) The value of *X*. (1mark)

b)   The length of *AB* correct to *2* decimal places.

12.   The lengths of two similar iron bars were given as *12.5m* and *9.23m*.
    a)   Calculate the maximum possible difference in the lengths between the two bars.   (2marks)
    b)   Calculate the percentage error in the difference between the two lengths: correct to (4sf)   (2marks)

13.   Using a ruler and a pair of compasses only:
    a)   Construct a triangle *ABC* such that *AB = 6CM, BC = 8cm* and   *ABC - 135⁰*.   (2marks)
    b)   Using *BC* as the base, construct the height of triangle *ABC* in (a) above and measure the height of triangle *ABC* in (a) above and measure the height.   (2marks)

14.   In a Maths test, the scores of eight Form Two students are as follows;
    45, 52, 54, 55, 57, 57, 62 and 66.
    Calculate the standard deviation of the scores. (Correct to 1
    Decimal place)

15.   a)   Show that the circle with equation $(x - 3)^2 + (y - 4)^2 = 25$ passes through the origin   (1 mark)
    b)   Find the co-ordinates of another point (not the origin) where the circle cuts the *x* – axis.   (2marks)

16.   Three quantities *P, Q and R* are such that *P* varies jointly with *Q* and the square of *R*. Find the percentage decrease in *P* if *Q* is increased by *50%* and *R* is decreased by *20%*.   (3marks)

Section 11 (50 marks)
Attempt only FIVE questions in this section

17.   In the figure below, *XW* is a diameter of the circle centre *O*. Points *X,Y,W,Z* are on the circumference of the circle. Angle *XWY = 72⁰, YZ = YX* and line *UZV* is a tangent to the circle at *Z*
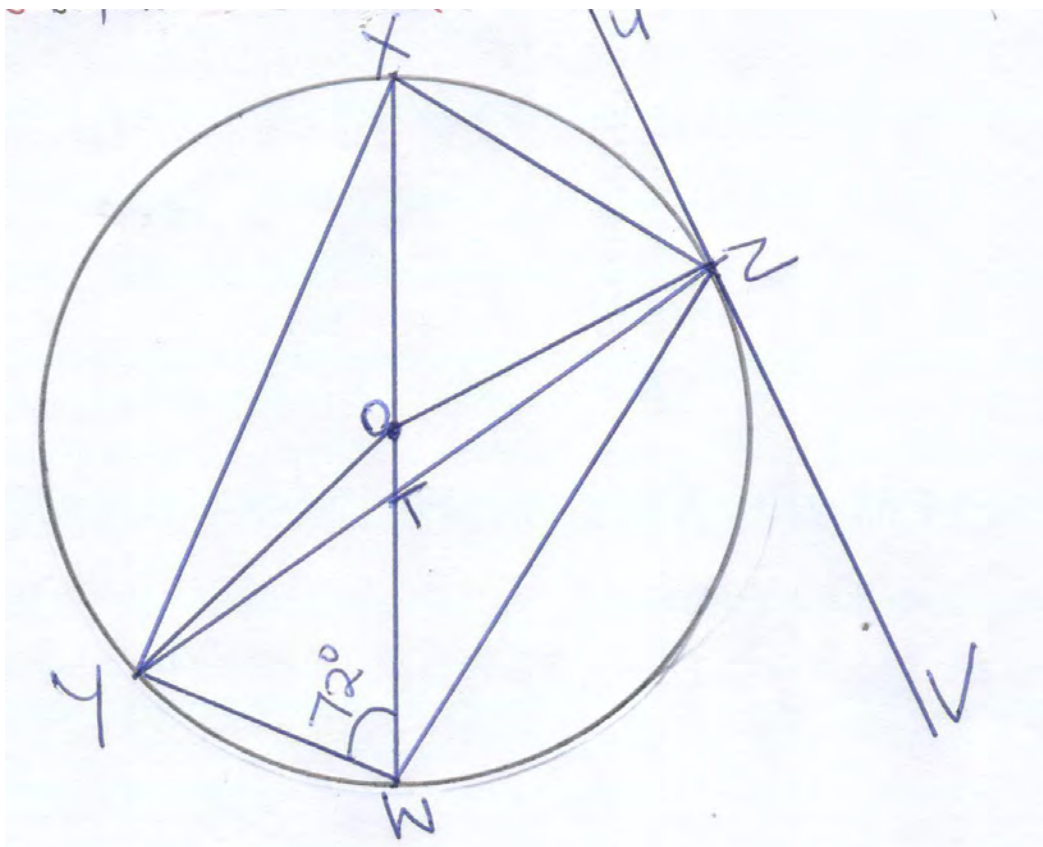
Giving reasons, calculate the size of:

a) ∠ YXW   (2marks)
b) ∠ XYZ   (2 marks)
c) ∠ OYZ   (2 marks)
d) ∠ WTZ   (2marks)
e) ∠ WZV   (2marks)

18. a) The first term of an Arithmetic Progression *(AP) is 2*. The sum of the first *8* terms of the *AP is 156*.
    i) Find the common difference of the *AP*   (2marks)
    ii) Given that the sum of the first n terms of the *AP* is *416,* find *n*.   (2marks)
    b) The *3rd, 5th* and *8th* terms of another *AP* from the first three terms of a Geometric progression *(GP)*. If the common difference of the *AP* is *3*, Find:
    i) The first term of the *GP*   (4marks)
    ii) The sum of the first *9* terms of the *GP*, to *4 significant figures*.   (2marks)

19. Complete the table below for the function y = 2 sin θ and y = 2 Sin(2θ + 60)⁰ on the same axis for 0⁰≤ θ ≤ 360⁰.   (4marks)

θ	0	30⁰	60	90⁰	120⁰	150	180⁰	210⁰	240⁰	270⁰	300⁰	330⁰	360⁰
2sinθ		1.0		2.0			0.00		-1.73	-2.00		-1.00	0.00
2sin(2θ + 60)⁰		1.7			-	0.0	1.73	1.73		-1.73	-		

Using the grid provided, draw the graph of y = 2sinθ and y = 2sin (2θ + 60) *on the same axis for* 0⁰ ≤ θ ≤ 360⁰   (4marks)

   a) Use your graph to find
i) The period and amplitude of *y = 2sin(2θ + 60)⁰.*   (2marks)
ii) The value of θ for which *y = 2sin θ = 2sin(2θ + 60)⁰*   (1 mark)
b) Describe the transformation that would map *y = 2sinθ onto y = 2 sin(2θ + 60⁰)*   (1mark)

20. a) *A* and *B* are points on the earth surface on the opposite ends of the diameter through the center of the earth. A is located at *(33⁰N, 51⁰E).*

     i) Find the position of B   (1mark)
     ii) Calculate the distance between points A and B in Km. Use R = 6370Km and $\pi = \frac{22}{7}$ (2 marks)
   b) Two cities lie on the equator at *X(0⁰,32⁰E)* and *Y(0⁰,45⁰E).* Calculate the shortest distance between *X* and *Y* to the nearest kilometer.   (3marks)
   c) A helicopter leaves a wildlife station *P(70⁰N,32⁰E)* and flies due south at *700 Km/hr for 3 hours* to station *Q*. Find the position of *Q* .   (4 marks)

21. A water tank has *2* inlets *P* and *Q* and one outlet *R*. *P* can fill the tank in *6* hours while *Q* takes *8* hours when alone. *R* can empty the tank in *4 hours*.
    i) P and Q are opened at the same time and left for *3* hours before p is closed. Find the fraction of water in the tank after the *3* hours.   (2 marks)
    ii) After *P* was closed, *R* was opened. Find the time it will take to fill/empty the tank.   (3 marks)

   b) In order to prepare lunch for students in a school, the ratio of maize to beans is *M : B* . Maize costs *35/=* per

kg while beans costs *80/=* per kg.

If the school requests the supplier to mix in the ration above, the cost of the mixture would cost *66/=* per kg.

i)   Find the ratio of maize to beans.   (3 marks)

ii)   If the school uses *225kg* of the mixture per day. Find the amount of beans used daily.   (2 marks)

22. The table below shows the tax levied at different rates for different levels of income.

| Monthly taxable pay(shs)	Rate of tax
1 - 9,680	10%
9,681 – 18,800	15%
18,801 – 27,920	20%
27,921 – 37,040	25%
Over 37,040	30%

Relief: Every taxpayer receives a tax relief of *Shs. 1162* per month. Magdaline has a monthly salary of *shs. 26,000*. She is provided with a house at a nominal rent of *shs. 800* per month. The value of the house allowance is calculated as *15%* of her salary, less rent .

i)   Find her taxable income.   (2marks)

ii)   The amount of tax she pays.   (4mks)

iii) Calculate Magdaline's net salary.   (1 mark)

b) A man invests Kshs. 10,000 in an account which pays 16% interest p.a.The interest is compounded quarterly.

Find the amount in the account to the nearest shilling after $1\frac{1}{2}$year.   (3marks)

23. The figure *ABCDEF* below represents the roof of a house.

$AB = DC = 12M, BC = AD = 6M$,

$AE = BF = CF = DE = 5M$ and $EF = 8M$
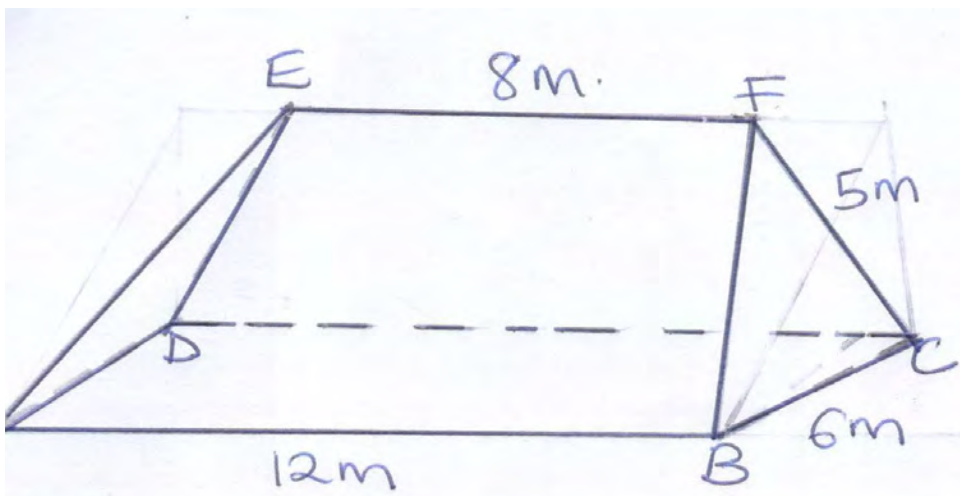
a) Calculate correct to 2 decimal places, the perpendicular distance of *EF* from the plane *ABCD*.   (2marks)

b) Calculate the angle between

i) Planes *ADE* and plane *ABCD*.   (2marks)

ii) The line *AE* and plane *ABCD* correct to 1 decimal place.   (3 marks)

iii) Plane *ABFE* and *DCFE* correct to 1 decimal place.   (3marks)

24. a) The gradient of the tangent to the curve $y = ax^3 + bx$ at the point *(1,1)*

is - *5*. Calculate the value of *a* and *b*.   (3 marks)

b) A particle moves in a straight line so that t seconds after passing a fixed point in the line, its velocity *V m/s* is

given by $V = \frac{1}{2}t^2 – 3t + 7$. Calculate;

i)   The velocity after 8 seconds.   (1mark)

ii)   The minimum velocity.   (2 marks)
iii) The distance travelled in the third second.   (4marks)

KIGUMO
121/1
MATHEMATICS ALT A
Paper 1

<u>**SECTION I**</u> (50 marks)
*Answer **all** the questions in this section in the spaces provided.*
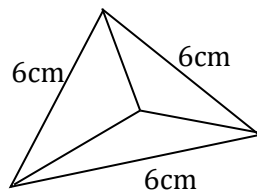
1. Evaluate (3 marks)
    $$\frac{-36 \div (6) \times 4 - (-3)}{-6 - 8 \div 2 + 17}$$

2. Use reciprocal tables to evaluate (4 marks)

    $$\frac{2}{0.346} - \frac{400}{79.6}$$

3. Solve for x in the following equation.
    $2 \sin (2x + 30^0) - 1 = 0$ for $0^0 \leq x \leq 270^0$ (3 marks)

4. The figure below shows a solid regular tetra pack of sides 6cm.

    (a) Sketch the net of the solid (1 mark)
    (b) Find the surface area of the solid (2 marks)

5. Find the range of value of x which satisfy the inequality below:
    $\frac{1}{4} (2x - 1) < \frac{1}{4} (x + 3) < 3 (x + 4)$ (3 marks)

6. Using the triangle shown on the grid, enlarge the object by a scale factor of 2, centre A. (2 marks)
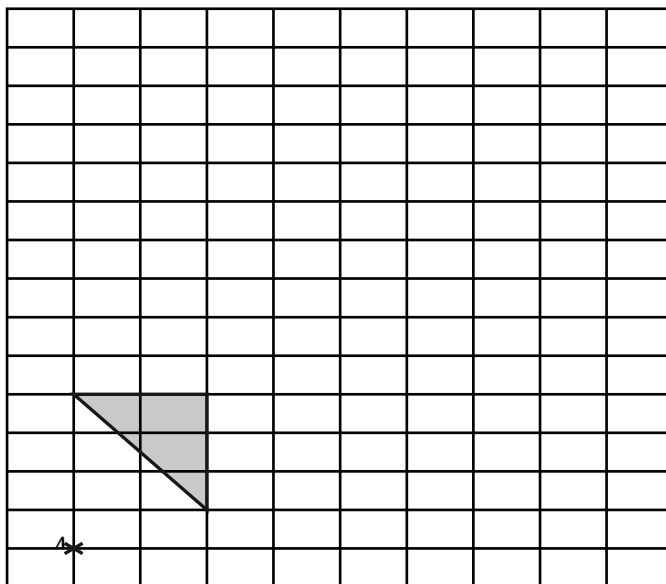
7. Find the value of t in the equation: (3 marks)

    $$\left(\frac{1}{64}\right)^t \times (512)^{\frac{10}{9}} = 4096$$

8. Solve the following simultaneous equations (4 marks)
    $x^2 + y^2 = 16$
    $y = 2x + 1$

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9. A Kenyan bank buys and sells foreign currencies at the exchange rates shown below.

	Buying (Kshs)	Selling (Kshs)
1Euro	148.56	149.00
1U.S Dollar	94.22	94.50

An American arrived in Kenya with 20,000 Euros. He converted all the Euros into Kenyan Shillings at the bank. He spent Kshs.2, 510,200 while in Kenya and converted the remaining Kenya shillings into U.S Dollars at the bank. Find the amount in dollars that he received. (4marks)

10. Solve for y in the equation. (3 marks)

$$\frac{6y-4}{3} - \frac{2y-1}{2} = \frac{6-5y}{6}$$

11. A number is formed by finding the difference between the products of prime numbers between 20 and 30 and that of prime numbers between 1 and 15. Find the number formed. Write the number in words. (3 marks)

12. Find **OB** and the coordinates of **B** given that $OA = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and $AB = \begin{pmatrix} -7 \\ 4 \end{pmatrix}$ (3marks)

13. Work out and give your answer in a simplified form.

$$\frac{2}{7}\text{of } 1\frac{3}{4}\left(\frac{6}{11} \times \frac{21}{12}\right) - 3\frac{1}{4} \div 2\frac{1}{2}$$ (3 marks)

14. Three trees M, N and O are such that N is the south M and to the East of O. How far is M from O given that form M to N is 1.7 m and from N to O is 4.6 m. (3 marks)

15. Factorise $h^2 - k^2$, hence evaluate $3282^2 - 3272^2$ (3marks)

16. A curve whose gradient function is $3x^2 -3$ has its two stationary points, one at point (-1, 8) and the other at point (1, b). Find its equation and the value of b. (3 marks)

SECTION II (50 marks)
Answer any Five (5) questions only in this section.

17. A house is to be sold either on a cash basis or through a loan. The cash price is sh1,750,000. The loan conditions are as follows: there is to be a down payment of 10% of the cash price and the rest of the money is to be paid through a loan at 10% per annum compound interest.
    A customer decided to buy the house through a loan.
    (a) (i) Calculate the amount of money loaned to the customer. (2 marks)
        (ii) The customer paid the loan in 3 years. Calculate the total amount paid for the house. (4 marks)
    (b) Find how long the customer would have taken to fully pay for the house if she paid a total of sh 1, 891,750. (4 marks)

18. a) Draw the graph of $2x^2 + 3x – 6$ for the values of x from -3 to 3. (5 marks)
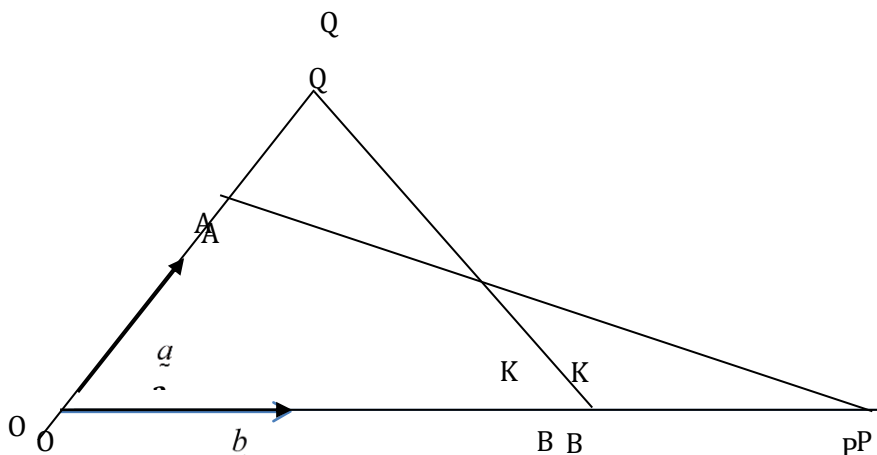   b) Use the graph to solve the equation:
   i) $2x^2 + 3x – 6 = 0$ (1 mark)
    ii) $2x^2 + 3x – 3 = 0$ (1 mark)
    c) Solve the equation $2x^2 + x – 7 = 0$ using the graph. (2 marks)

19. In the figure below, vector **OA** = $\underset{\sim}{a}$ and **OB**=$\underset{\sim}{b}$. **OP** = $2\underset{\sim}{b}$ and **OQ** = **OA** = 3: 2.

(a) Express the following vectors in terms of q and b.

(b) Express the following vectors in terms of q and b.
  (i)   **QB**   **(2 marks)**
  (ii) **AP**   **(1 mark)**

(c) The line QB and AP intersect at K. Given that **QK**=m **QB** and **AK**=n **AP** where m and n are scalars, by expressing OK in two different ways, find the ratio AK: KP.   **(7 marks)**

20. Three villages **R**, **S** and **T** are such that **S** is 3km on a bearing of N30^{0}E from **R** and **T** is 4km on a bearing of 120^0 from **S**.
  (a) (i) Using a scale of cm to represent 0.5km, draw a diagram to show the relative position of villages R, S and T   (3 marks)
      (ii)Find the distance and bearing of village **R** from T   (2 marks)
  (b) A straight main road runs from village **R** to **T**. Find the length of the shortest path from village **S** to the main road.   (2 marks)
  (c) After walking for 2.2km from the junction on**RT** along the path towards village **S**, a student notices that the angle of elevation to the top of a tree in the village is 22^0. Estimate the height of the tree in metres.
                                                                                (3 marks)

21. Two equal circles with centres P and Q and radius 7cm intersect at points A and B as shown in the figure below. Given that the distance between P and Q is 10cm. Line AB meets line PQ at X.
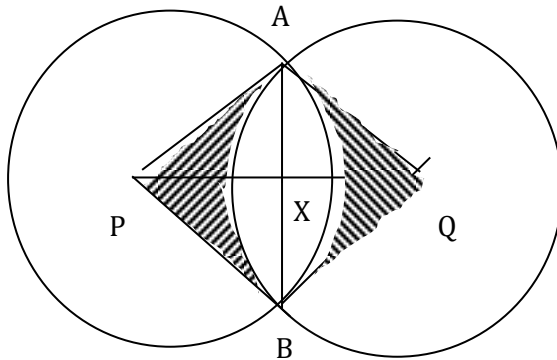
Calculate:
(a) The length of the chord AB correct to 2d.p   (2 marks)
(b) The angle APQ hence angle APB   (2 marks)
(c) The area of the shaded region.   (6 marks)

22. The figure below is the speed – time graph of a journey
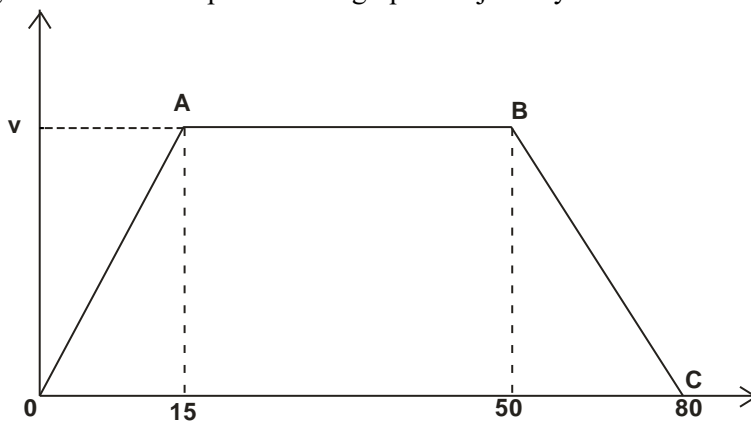
   If the total distance travelled in the 80 seconds is 920m, calculate:
a) The value of V.   (4 marks)
b) The acceleration during the first 15 seconds   (3 marks)
c) The distance travelled in the final 40 seconds.   (3 marks)

23. The diagram below a circle, centre O. PQ is a tangent to the circle at Q and PTOR is a straight line. QRST is a cyclic quadrilateral in which angle RTS = 350 and RT and QS are diameters. Giving reasons for your answer, find the size of:
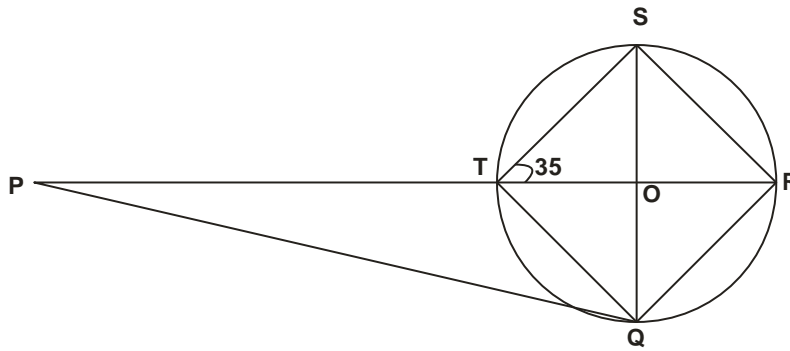
a) Acute angle ROS. (2 marks)
b) Angle RQS. (2 marks)
c) Angle PQR. (2 marks)
d) Angle QPT. (2 marks)
e) Angle PQT. (2 marks)

24. The table below shows a field book with measurements of a rice field. (AG = 250m)
   a) Make a sketch drawing of the rice field. (3 marks)

	G	
	200	F 70
E 60	130	
	100	D 80
C 40	60	
	40	B 50
	A	

b) Find the area of the rice field in hectares. (7 marks)

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KIGUMO
121/2
MATHEMATICS
Paper 2

SECTION I (50 marks)

Answer **all** the questions in this section.

1. Use logarithm tables to evaluate the following to four significant figures.   (4 marks)

$$\sqrt{\frac{4.562^2 \times 0.038}{6.82 \times 0.35}}$$

2. The fifth term of an arithmetic progression is 11 and twenty fifth terms is 51. Find the first term and common difference.   (2 marks)

3. Given that matrices P, Q, R are such that P = QR and P = $\begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$ and Q = $\begin{pmatrix} 4 & 0 \\ 2 & 1 \end{pmatrix}$. Find matrix R. (3 marks)

4. Solve for x in the equation.
    Log(x + 11) – 2log3 = log (9 – x)   (3 marks)
5. Given that the mean 9, 8, 5, 5 and 8 is 7; find the standard deviation of the number to 2 d.p.   (3 marks)
6. Find the equation of a straight line passing through (2, 1) and is Parallel to 3y=2x + 6 in the form ax + b + c =0   (3 marks)
7. A bus travelling at 80km/h leave a station at 11.15pm. Another bus travelling at 75 km/h leaves the same station at 11.45 pm in the same direction as the first one. At what time will their distance apart be 55km?   (3 marks)
8. The figure below shows part of a church badge which has a rotational symmetry of order 4 about the point marked with a dot. Draw the complete badge.   (3 marks)
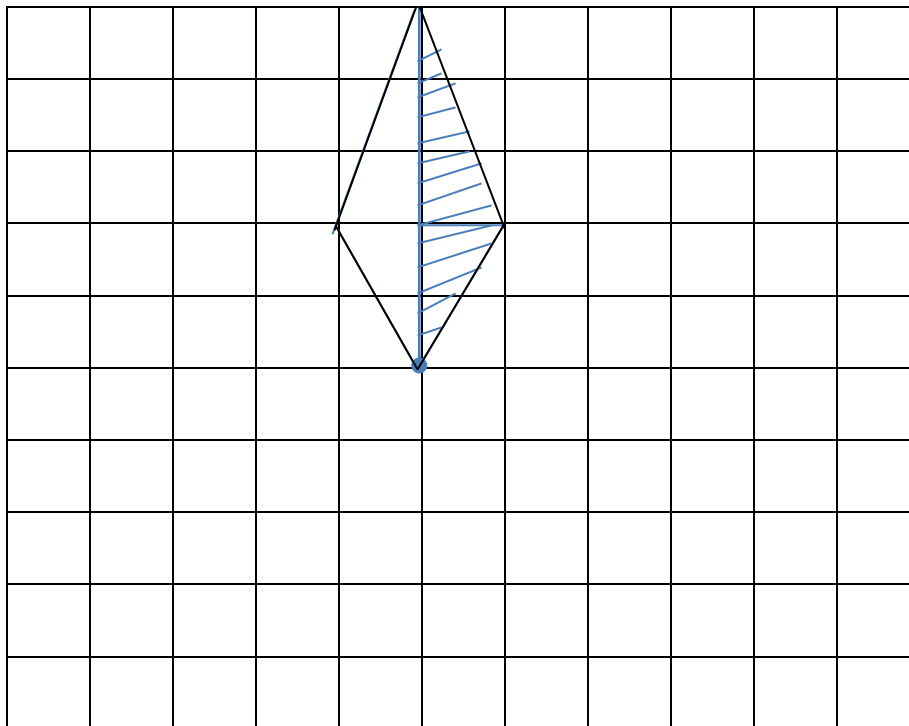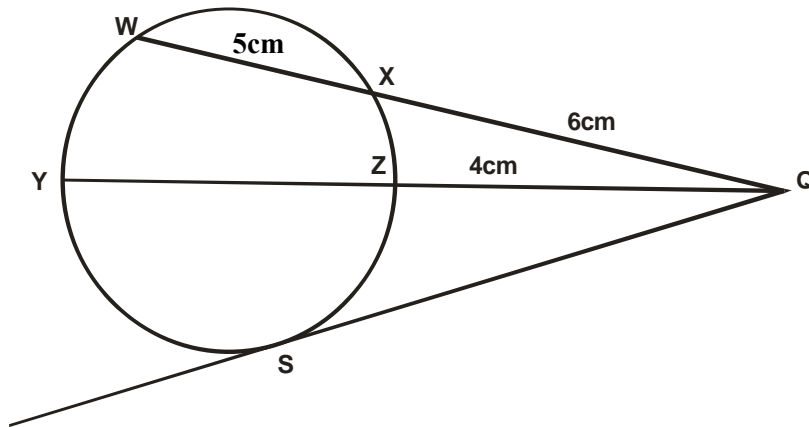

9. Simplify the expressions   (3 marks)

$$\frac{15t^2 y - 10ty^2}{3t^2 - 5ty + 2y^2}$$

10. a) Expand and simplify $(2 - x)^5$ in ascending powers of x upto and including the term in x^3 (2 marks)
    b) Hence approximate the values of $(1.98)^5$ to four significant figures.   (2 marks)

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11. Chord QX and YZ intersect externally at Q. The secant WQ =11cm and QX =6cm while ZQ=4cm

    a) Calculate the length of chord YZ (2 marks)
    b) Use the answer in i) above to find the length of the tangent SQ (2 marks)

12. Make **n** the subject of the formula in

$$S = \frac{a\,(1 - r^n)}{1 - r}$$ (3 marks)

13. A man deposits Sh. 500,000 in an investment which pays 12% per annum interest compounded quarterly. Find how many years it takes for the money to double. (3 marks)

14. A variable V varies jointly as the variable A and h. When A = 63 and h = 4, V = 84, find;
    (a) The value of V when A = 9 and h = 7 (1 mark)
    (b) The value of A when V = 4.5 and h = 0.5 (2 marks)

15. Rationalize and simplify

$$\frac{3\sqrt{5}}{\sqrt{45} + \sqrt{15}}$$ (3 marks)

16. Given that x, y and z are integers and that $8 \le x \le 10$, $5 \le y \le 7$, $4 \le z \le 6$.
Find the percentage error in $\frac{x+y}{z}$ (3 marks)

SECTION II (50 marks)

Answer any **Five (5) questions only** in this section.

17. a.) Using the first Principles and a small increment h, determine the derivative of $y = 3x^2 - 2$. (4 marks)
    b.) Find the equation to the normal of $3x^2 - y = 2$ at x=1 in the form y + mx=c. (4 marks)
    c.) Determine the stationary point and identify the nature of point. (2 marks)

18. The table below shows marks obtained by 50 students in Mathematics Examination

32	64	68	55	52	68	37	46	65	26
45	87	44	58	39	54	21	44	76	23
65	42	82	87	75	44	47	48	52	32
23	76	74	91	28	33	27	48	56	66
45	56	98	21	34	31	83	65	77	76

    (a.) Starting with 21 and using equal class intervals of 10, make a frequency distribution table. (2 marks)
    (b.) On grid provided, draw the cumulative frequency curve for the data. (4 marks)
    (c.) Using the graph (b.) above estimate:
        (i.) The upper quartile (2 marks)
        (ii.) The lower quartile (2 marks)

19. Linnet's basic salary is sh.100,000. She is housed by her employer and pays a nominal rent of sh.2000 which is deducted from her salary. She is entitled to an entertainment allowance of sh.5,000 and a responsibility allowance of sh.10,000. She has a bank loan and hire purchase repayments which she repays at the rate of sh.15,000 and sh.3,000 per month. She also makes cooperative share contributions of sh.5,000 per month. Calculate:
    (a) Her gross salary (1 mark)
    (b) Her taxable income in Ksh. (1 mark)

During that month, the table below was used to determine individual rate of income tax.

Income K£ p.m.			Rate (sh. per £)
1	-	484	2
485	-	940	4
941	-	1396	6
1397	-	1852	7
Over 1852			9

(c) Use the table to determine;

    (i) Her monthly gross tax (5 marks)

    (ii) Her net tax given that she is entitled to a tax relief of sh.1056 per month. (1 mark)

    (iii) Her net salary. (2 marks)

20. The Chord XY subtends an angle of 88° at the centre O. If the radius of the circle is 10cm, calculate:
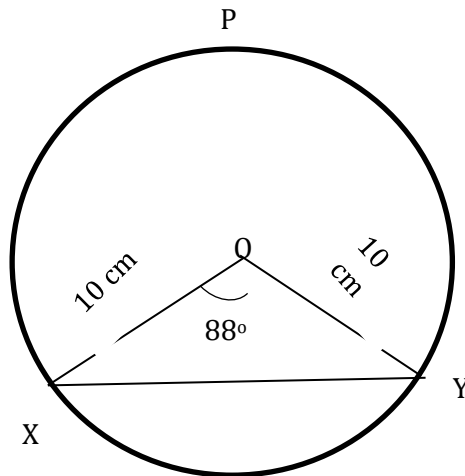
    (i) The area of the circle. (2 marks)

    (ii) The area of the major sector XPY, (3 marks)

    (iii) The area of triangle OXY (2 marks)

    (iv) The area of major segment (2 marks)

    (v) The area of the Minor segment (1 mark)

21. a) Complete the table below for the curves $y = 3\cos2x$ and $y = 2\sin(2x + 30)°$ (2 marks)

x	0	15	30	45	60	75	90	105	120	135	150	165	180
3cos2x	3	2.598	1.5	0	-		-3	-2.598	-1.5	0		2.598	3
2sin(2x+30)°	1		2						-2	-1.732	-1		1

b) On a graph paper, draw on the same axes the graph of $y=3\cos2x$ and $y=2\sin(2x+30)°$ for $0°\leq x \leq180°$ (4 marks)

a) State the amplitude period and phase angle of each curve (2 marks)

b) Use your graph to:-

    i) Estimate the value of x for which $3\cos2x – 2\sin(2x+30)° =0$ (1 mark)

    ii) Estimate the range of values of x for which $3\cos2x<2\sin(2x+30)°$ (1 mark)

22. Mungai, Koskei and Kandie are participating in an athletic competition. The probability that Mungai, Koskei, and Kandie completes the race in $\frac{3}{5}$, $\frac{1}{6}$, and $\frac{4}{7}$ respectively. Find the;

Probability that in a competition.

    (a) Only one of them completes the race. (3 marks)

    (b) All the three completes the race. (1 mark)

    (c) None of them completes the race. (1 mark)

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(d)   Two of them completes the race.   (3 marks)

(e)   At least one completes the race.   (2 marks)

23.   Use a pair of compasses and a ruler only in this question.

(a)   Construct triangle ABC in which AB = 5.8cm, AC = 4.2cm and <BAC = 45^0.Measure BC.   (3 marks)

(b)   (i)Draw escribed (external) circle of triangle ABC which touches BC.   (3 marks)

(ii)Draw P_1 the locus of points which move such that the area of triangle APB is half the area of triangle ABC.   (3 marks)

(c)   Mark $P_1$and P_2 the points where P and the circle meet. Measure $P_1 P_2$.   (1 mark)

24. A potter wants to make and sell serving bowls and plates. A bowl uses 5 kg of clay. A plate uses 4 kg of clay. The potter has 40 kg of clay and wants to make at least 4 bowls. The profit a bowl is ksh 35 and the profit on a plate is ksh. 30.

(a.) Form all the inequalities.   (3 marks)

(b.) On the grid provided draw the inequalities   (4 marks)

(c.) How many bowls and how many plates should the potter make in order to maximize profit?   (3 marks)

MERU CLUSTER
121/1
MATHEMATICS
Paper 1

1. Evaluate : $\dfrac{1}{{}^2/_5 \div {}^1/_2 \text{ of } {}^4/_9 - 1{}^1/_{10}} + 3{}^6/_9 \div {}^9/_4$

   giving your answer as a mixed number. (3 marks)

2. A rectangular tank measuring 5.2m long, 3.1m wide and 1.5m high is three quarters full of water. The water is then emptied into a cylindrical tank B of diameter 4.2m. Find the depth of water in tank B to the nearest centimetre. (3 marks)

3. Three numbers 1400, 1960 and n have a G.C.D and L.C.M of 70 and $2^3 \times 5^2 \times 7^2 \times 11$ respectively. Find the least possible value of n. (3 marks)

4. Using tables of reciprocals and square roots, evaluate (3 marks)

   $$\dfrac{0.3}{0.0351} + \sqrt{0.498}$$

5. Solve for x in $2^{2x} - 18 \times 2^x + 32 = 0$ (3 marks)

6. A bus takes 195 minutes to travel a distance of $(2x + 30)$ kilometres at an average speed of $(x - 20)$km/hr. Calculate the actual distance travelled. Give your answer to the nearest kilometre. (3 marks)

7. Marete, Gitonga and Kinyua shared sh.870 such that the ratio of Marete's share to Gitonga's share was $\frac{1}{2} : \frac{1}{3}$ while the ratio of Gitonga's share to Kinyua's was ${}^2/_3 : {}^1/_4$. How much did Kinyua get ? (3 marks)

8. A line AB is such that A(2, -6) and B(0, 4). Find the equation of the perpendicular bisector of line AB. (3 marks)

9. A Kenyan bank buys and sells foreign currency as shown below.

	Buying (Kshs)	Selling (Kshs)
1Us dollar ($)	63.00	63.20
1UK pound (£)	125.30	125.95

   A tourist arrived in Kenya with £9,600 which he converted into Kshs at a commission of 5%. He later used ${}^3/_4$ of the money before changing the balance to dollars at no commission. Calculate to the nearest dollar the amount he received. (4 marks)

10. Simplify $\dfrac{3}{\sqrt{5} - 2} + \dfrac{1}{\sqrt{5}}$ leaving your answer in the form $a + b \sqrt{c}$ where a, b and c are rational numbers. (3 marks)

11. Solve the inequalities $3x - 2 < 10 + x \geq 2 - 5x$ and represent the solution on a number line. (3 marks)

12. Without using a mathematical table or a calculator, solve the equation
    $\log (6x - 2) = 1 + \log (x - 3)$ (3 marks)

13. Use vectors to show that a triangle with vertices P(2, 3), Q(6, 4) and R(10, 5) is isosceles. (4 marks)

14. Solve for θ given the equation $2 \cos (2\theta + 20) = -0.5$ for $0^0 \leq \theta \leq 180$

15. Water and milk are mixed such that the ratio of the volume of water to that of milk is 4 : 1. Taking the density of water 1g/cm^3 and that of milk as 1.2g/cm^3, find the mass in grams of 2.5 litres of the mixture. (3 marks)

16. In the figure below shows a circle centre O. The line AB = 14cm is a tangent to the circle such that OA = OB and $\angle AOB = 120^0$
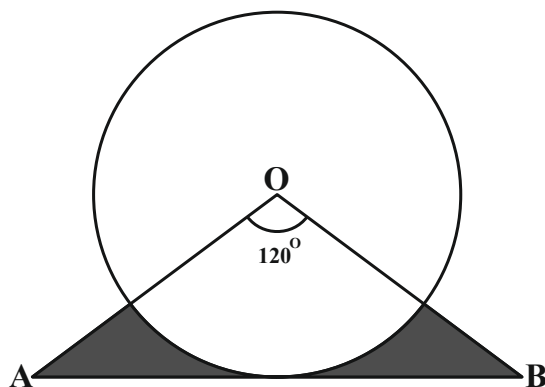
a) Calculate to 1d.p the radius of the circle. (1 mark)
b) The total area of the shaded region. (2 marks)

SECTION II : (50 Marks)
Answer any five questions in this section in the spaces provided.

17. In the year 2009, the price of a sofa set in a shop was Ksh.12,000
    a) Calculate the amount of money received from the sale of 240 sofa sets that year. (2 marks)
    b) i) In the year 2010, the price of each sofa increased by 25% while the number of sets sold decreased by 10%. Calculate the percentage increase in the amount received from the sales. (3 marks)
        ii) If at the end of the year 2010, the price of each sofa set changed in the ratio 16 : 15, calculate the price of each sofa set in the year 2011. (1 mark)
    c) The number of sofa sets sold in the year 2011 was P% less than the number of sofa sets sold in the year 2009. Calculate the value of p given that the amount received from sale in the two years were equal. (4 marks)

18. Four schools P, Q, R and S are such that Q is 20km at 040^0 from P. School R is to the East of P and on a bearing of 150^0 from Q. S is $S40^0E$ of P and 22km from R.
    a) Use a suitable scale drawing to show the position of the four schools. (4 marks)
    b) Use the scale drawing to determine :
        i) the bearing of S from R (1 mark)
        ii) the bearing of S from Q (1 mark)
        iii) the distance between school P and S in kilometres (2 marks)
        iv) the distance between school Q and R in kilometres. (2 marks)

19. Two towns X and Y are 360km apart. A Nissan travelling at 90km/hr left town X at 9.00a.m for Y. At 9.45a.m a saloon car travelling at 120km/hr left town Y for X on the same road.
Calculate :
a) the time of the day the two vehicles met to the nearest minute. (3 marks)

    b) How far from town X the two vehicles met to the nearest kilometre. (3 marks)
    c) A rally car travelling at 150km/hr left town X for Y at 10.15a.m of the same day. Calculate the time it caught up with the Nissan to the nearest minute. (4 marks)

20. The figure below shows two circles centres P and Q of radii 10cm and 7cm respectively. The two circles intersect at R and S so that they have a common chord RS.
Given that angle RPS = 56^0 and angle RQS = 80^0. Calculate to 2 decimal places the area of
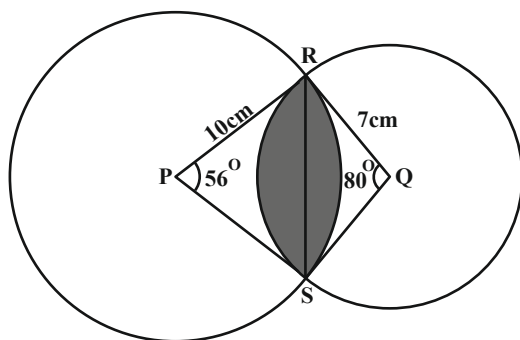
  a) sectors RPS and RQS (4 marks)
  b) triangles RPS and RQS (4 marks)
 **c)** the shaded region (take $\pi = {}^{22}/_7$) (2 marks)

21. The diagram below represents a conical vessel which stands vertically. The vessel contains water to a depth 30cm. The radius of the water surface in the vessel is 21cm (Take $\square = {}^{22}/_7$)
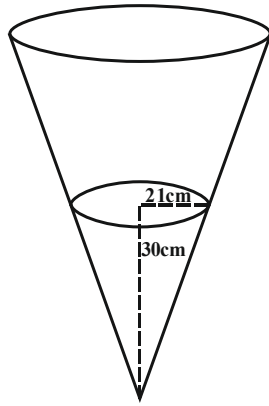
    a) Calculate the volume of the water in the vessel in cm^3 (2 marks)

    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   (2 marks)

    ii) the volume of the metal sphere in cm^3 (3 marks)

    iii) the radius of the sphere   (3 marks)

22. **a)** Complete the table below for the equation $y = x^3 - 5x^2 + 2x + 7$ in the range $-2 \leq x \leq 5$ (2 marks)

x	-2	-1	0	1	2	3	4	5
y		-1				-5		17

    b) Draw the graph of $y = x^3 - 5x^2 + 2x + 7$ (3 marks)

    c) Use your graph to solve the equation $x^3 - 5x^2 + 2x + 7 = 0$ (2 marks)

    d) By drawing a suitable straight line, use your graph to solve the equation
           $x^3 - 5x^2 + x + 4 = 0$ (3 marks)

23. The vertices of a triangle are A(3, -1), B(5, 2) and C(6, -2). The co-ordinates of A^1 the image of A under a translation vector T, are (1, 2)

      i)   Determine the translation vector T   (1 mark)

      ii)   Find the co-ordinates of B^1 and C^1 under translation vector T   (2 marks)

    b) In the figure below AD // BC. AC and BD intersect at E. Given that AE : EC = 2 : 5 and BD = 14cm, calculate the length of DE.   (3 marks)
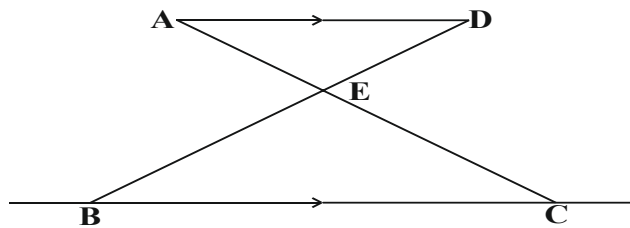
    c) The volume of two similar solid cylinders are 4913cm^3 and 1331cm^3. If the area of the curved surface of the larger cylinder is 1156cm^2. Find the area of the curved surface of the smaller cylinder.   (4 marks)

24. **a)** On the grid provided, draw a curve of the function $y = 3x^2 - 5x + 8$ from x = -3 to x = 3   (3 marks)

    b) Use the mid-ordinate rule with six strips to estimate the area between the curve, the x-axis and the lines x = -3 and x = 3   (3 marks)

    c) Assuming that the area determined by integration to be the actual area, calculate the percentage error in using the mid-ordinate rule.   (4 marks)

MERU CLUSTER

121/2
MATHEMATICS
**Paper 2**
SECTION I : (50 Marks)
Answer all the questions in this section in the spaces provided.

1. Use logarithm tables to evaluate :   (4 marks)
$$\left(\frac{6.792 x 0.3911}{\log 5}\right)^{\frac{3}{4}}$$

2. A farmer wishes to enclose a rectangular nursery against a long straight wall. He has 40m fencing wire. What is the largest area he can fence using the wire ?   (3 marks)

3. Given the equation m= $\sqrt{\dfrac{2t(t+x)}{4}}$ express x in terms of t and m

    Hence find the value of x when m = 15 and t = 9   (4 marks)

4. In calculating the volume of a cone a student had an error of 0.2% in π, 1.2% in the height and 0.4% in the radius. Calculate the percentage error involved in calculating the volume.   (3 marks)

5. **a)** Expand $\left(1+\dfrac{1}{8}x\right)^5$ up to the term x^3
                                                                                                          (1 mark)
    b) Use the expansion in (a) above to estimate the value of $(1.2)^5$ (2 marks)

6. The probability of a man hitting a target A is 0.7. The probability of the man hitting another target B depends on whether or not A has been hit. It is 0.6 if A is hit but 0.3 if A is not hit. Determine the probability of hitting at most one target.   (3 marks)

7. The gradient of function of a curve passing through (2, 10) is given by $3x^3 + 2x + 1$. Find the equation of the curve.   (4 marks)

8. In the figure below PXR is a chord of a circle centre O, passing through P, Q and R. X is a perpendicular bisector of PR. PX = 6cm and QX = 2cm.
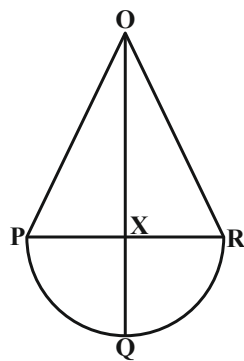
    Calculate the angle POR   (3 marks)

9. **a)** Given that P = $\begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$ and Q = $\begin{pmatrix} 2 & -3 \\ -1 & 2 \end{pmatrix}$ find the matrix PQ
                                                                                                          (1 mark)

    b) Hence solve the simultaneous equations
                2x - 3y = 5
                2y = x - 3   (3 marks)

10. Determine the quartile deviation for the set of numbers: 4, 2, 4, 5, 1, 2, 6, 7, 9 and 3   (2 marks)

11. A laptop depreciates in value every month by 3% of its value at the beginning of the month. If its value when new is Ksh.45,000. What will be its value after 10 months ? Give the answer to the nearest shilling.
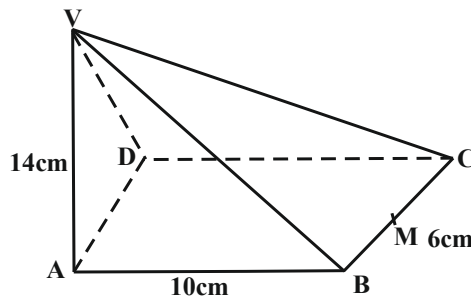   (3 marks)

12. a) Use a ruler and a pair of compasses only. Construct triangle QRS such that QR = QS = 5.4cm and angle QRS = 30⁰. Measure RS. (3 marks)

b) A point V is always on the same side of RS as Q. Draw the locus of V such that RQS is always twice angle RVS. (1 mark)

13. Find the radius and the centre of the circle whose equation is $x^2 + y^2 - 6x - 8y = 0$ (3 marks)

14. Murithi can do a piece of work in 6 hours, Ruto can do the same job in 10hrs while Jane can do the same job in 12 hours. If the three work together for 1 hour, what fraction of the job is left incomplete? (2 marks)

15. Two places R and T are on the same circle of latitude North of the equator. The longitude of R is 118⁰W and longitude of T is 133⁰E. The shortest distance between R and T measured along the circle of latitude is 5422 nautical miles. Find to the nearest degree the latitude on which R and T lie. (3 marks)

16. The area of the image of triangle ABC under a transformation using matrix $\begin{pmatrix} 4 & 5 \\ 1 & 2 \end{pmatrix}$ is 63cm²

Find the area of the triangle ABC. (2 marks)

SECTION II : (50 Marks)
Answer only five questions in this section in the spaces provided.

17. The figure below is a pyramid VABCD with a rectangular base ABCD. The vertex V is vertically above point A. VA = 14cm, AB = 10cm, BC = 6cm. M is the midpoint of BC.


Calculate :
a) the length of VM (2 marks)
b) The angle between VBC and ABCD (3 marks)
c) The angle between VC and the base ABCD (3 marks)
d) The volume of the pyramid. (2 marks)

18. Complete the table below for the following trigonometric equations : y = 3 cos 2x and y = 2 sin (2x + 30) (2 marks)

b) On the grid provided draw on the same axes, the graphs of y = 3 cos 2x and y = 2 sin(2x + 30)⁰ for $0^0 \leq x \leq 180$ (5 marks)

c) Use your graph to estimate the range of values of x for which 3 cos 2x < 2 sin(2x + 30)⁰ (giving your answer to the nearest degree) (1 mark)

d) State the amplitude and period of y = 2 sin (2x + 30)⁰ (2 marks)

19. Three quantities P, Q and R and such that P varies directly as the square of Q and inversely as the square root of R.

a) Write an expression of P in terms of Q and R (1 mark)

x	0	15	30	45	60	75	90	105	120	135	150	165	180
3 cos 2x	3	2.898	1.5	0	-1.5		-3		-1.5	0		2.598	3
2 sin(2x + 30)	1		2	1.732		0		-1.732	-2	-1.732	-1		1

b) Given that when P = 40, Q = 10 and R = 16. Find the value of P when Q = 7 and R = 64 (4 marks)

c) If Q is increased by 10% and R is decreased by 19%, find the percentage change in P. (5 marks)

20. OABC is a trapezium in which OA = a, OC = c and CB = 3a. CB is produced to D such that CB : BD is 3 : 1. E is a point on AB such that AB = 2AE. (1 mark)

    a) i) Express OE in terms of a and c (3 marks)

       ii) Express ED in terms of a and c (2 marks)

       iii) Show that O, E, D are collinear. (2 marks)

    b) In what ratio does D divide line CB (2 marks)

21. A businessman obtained a loan of sh.450,000 from a bank to buy a matatu valued at the same amount. The bank charges interest at 24% per annum compounded quarterly.

    a) Calculate the total amount of money the businessman paid to clear the loan in 1½ years to the nearest shilling. (3 marks)

    b) The average income realised from the matatu per day was sh.1500. The matatu worked for 3 years at an average of 280 days per year. Calculate the total income from the matatu. (2 marks)

    c) During the three years the value of the matatu depreciated at the rate of 16% per annum. If the businessman sold the matatu at its new value, calculate the total profit he realised by the end of the 3 years. (To the nearest shilling) (5 marks)

22. a) On the grid provided draw quadrilateral ABCD with co-ordinates A(3, 4), B(1, 1), C(3, 2) and D(5, 1) (1 mark)

    b) i) On the same axes draw quadrilateral $A^1B^1C^1D^1$ the image of ABCD under an enlargement centre origin and scale factor is -1 (2 marks)

       ii) State the co-ordinates of $A^1B^1C^1D^1$ (1 mark)

    c) i) On the same grid draw quadrilateral $A^{11}B^{11}C^{11}D^{11}$ the image of $A^1B^1C^1D^1$ under a reflection in the x-axis (2 marks)

       ii) Write the coordinates of $A^{11}B^{11}C^{11}D^{11}$ (1 mark)

    d) Describe fully a single transformation which maps ABCD onto $A^{11}B^{11}C^{11}D^{11}$ and find its matrix. (3 marks)

23. In the diagram below KNML is a circle centre O. PN is a tangent to the circle at N. KOMP is a straight line, angle NKM = 35^0 and angle KOL = 130^0
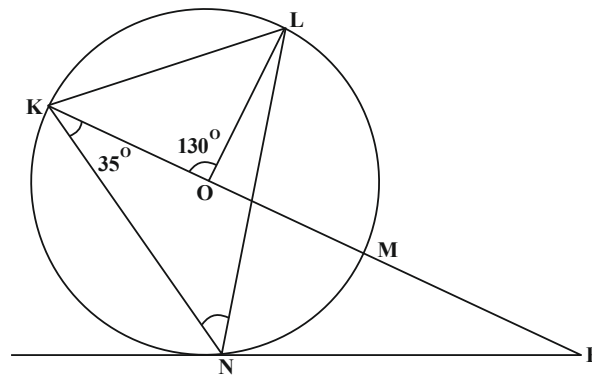
Giving reasons find :

i) ∠MLN (2 marks)

ii) ∠KLM (2 marks)

iii) ∠OLN (2 marks)

iv) ∠LNP (2 marks)

v) ∠MPN (2 marks)

24. A mobile dealer sells phones of two types Tecno and Samsung. The price of one Tecno and one Samsung phone is Ksh.2000 and Ksh.1600 respectively. The dealer wishes to have at least fifty mobile phones. The number of Tecno phones should be at least the same as those of Samsung phones. He has Ksh.120,000 to spend on phones. If he purchases X Tecno phones and Y Samsung 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. (3 marks)

    c) The profit on a Tecno phone is Ksh.200 and on a Samsung phone is Ksh.300. Find the number of phones of each type he should stock so as to maximise profit. (3 marks)

M.C. CLUSTER OF SCHOOLS FORM 4 EVALUATION TEST – 2018
121/1
MATHEMATICS
PAPER 1

1. Evaluate without using a calculator (2 Marks)

$$\frac{23.4 - 2(5.2 + 5.3))}{3.2 \times 1.2}$$

2. In Blessed Church choir, the ratio of males to females is 2:3. On one Sunday service, ten male members were absent and six new female members joined the choir as guests for the day. If on this day the ratio of males to females was 1:3, how many regular members does the choir have? (3 Marks)

3. A Kenyan bank buys and sells foreign currency as shown below.

|	Buying	Selling
	Kenya shillings	Kenya shillings
1 Euro	84.15	84.26
1 US Dollar	80.12	80.43

A tourist travelling from Britain arrives in Kenya with 5000 Euros. He converts all the Euros to Kenya shillings at the bank. While in Kenya he spends a total of KSh. 289,850 and then converts the remaining Kenya shillings to US dollars at the bank. Calculate (to nearest dollar) the amount he receives? (3 Marks)

4. Simplify the expression. (3 Marks)

$$\frac{4x^2 - 16y^2}{6x^2 - 8xy - 8y^2}$$

5. Complete the figure below so as to make the net of a cuboid. Hence determine the surface area of the cuboid. (4 Marks)
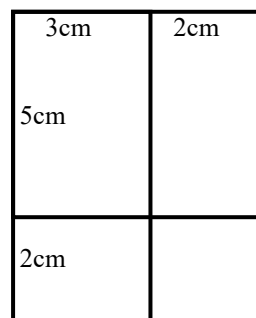
6. The sum of the interior angles of a regular polygon is 1080^0. Calculate
   (a) The number of sides of the polygon (2 Marks)
   (b) The sizes of the exterior and interior angles of the polygon. (2 Marks)

   If $3^{(2x)} - 4(3^x) + 3 = 0$. Find the possible values of x (3 Marks)

7. Three similar pieces of timber of length 240cm, 320cm and 380cm are cut into equal pieces. Find the largest possible area of a square which can be made from any of the three pieces. (3 Marks)

8. The sum of digits formed in a two digit number is 16. When the number is subtracted from the number formed by reversing the digits, the difference is 18. Find the number (3 Marks)

9. Solve for x given that (3 Marks)
   $Log_{10} (x - 1) + 1 = Log_{10} (x - 4)$

10. Three pens and four exercise books cost Sh. 87. Two pens and five exercise books cost Sh. 93. Find the cost of one pen and one exercise book. (4 Marks)

11. A farmer has enough feed to last 45 cows for 30 days. If he buys 5 more cows, how long will the feed last? (2 Marks)

12. Find the equation of the line perpendicular to $3x – 7y – 20 = 0$, and passes through the point (5,2) (3 Marks)

13. Wanza sold a bag of potatoes for Sh. 420 and made a profit. If she sold it at Sh. 320, she could have made a loss. Given that the profit is thrice the loss, how much did she pay for the bag of potatoes? (3 Marks)

14. In the figure below PQRS is a trapezium with QR parallel to PS. QR = 6cm, RS = 4cm, QS = 9cm and PS = 10cm.
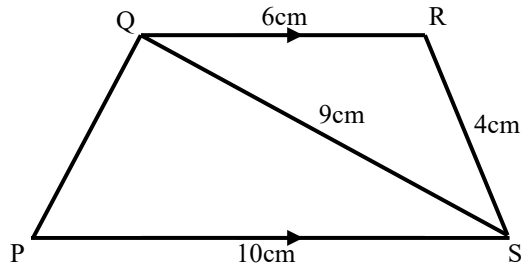
Calculate
(a) The size of angle SQR (2 Marks)
(b) The area of triangle PQS (2 Marks)

15. Given that Cos $(x – 20)^0$ = Sin $(2x + 32)^0$ and x is an acute angle, Find tan $(x – 4)^0$ (3 Marks)

SECTION II (50 MARKS)
Answer Only Five Questions In This Section

16. An expedition has 5 sections AB, BC, CD, DE and EA. B is 200m on a bearing of 050^0 from A. C is 500m from B. The bearing of B from C is 300^0. D is 400m on a bearing 230^0 from C. E is 250m on a bearing 025^0 from D.
    (a) Sketch the route (1 Mark)
    (b) Use the scale of 1cm to 50m to draw the accurate diagram representing the route. (5 Marks)
    (c) Use your diagram to determine
        (i) Distance in metres of A from E (2 Marks)
        (ii) Bearing of E from A

17. A business lady bought 100 quails and 80 rabbits for Sh. 25,600. If she had bought twice as many rabbits and half as many quails she would have paid Sh. 7,400 less. She sold each quail at a profit of 10% and each rabbit at a profit of 20%.
    (a) Form two equations to show how much she bought the quails and the rabbits (2 Marks)
    (b) Find the cost of each (3 Marks)
    (c) Calculate the profit she made from the sale of the 100 quails and 80 rabbits (3 Marks)
    (d) What percentage profit did she make from the sale of the 100 quails and 80 rabbits (2 Marks)

18. The table below shows the length of 40 seedlings.

Length in (mm)	Frequency
118-126	3
127 – 135	4
136 – 144	10
145 – 153	12
154 – 162	5
163 – 171	4
172-180	2

Determine
(a) (i) The modal class (1 Mark)
    (ii) The median class (2 Marks)
(b) (i) The mean of the seedlings (4 Marks)
    (ii) The median of the seedlings (3 Marks)

19. Find

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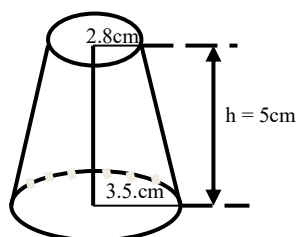
(a) The surface area of the frustrum (5 Marks)
(b) The volume of frustrum shown. (5 Marks)

21. Triangle ABC vertices A (-2, 6), B (2, 3) and C (-2, 3) is reflected in the line x = -3 to give the image

A$_1$B$_1$C$_1$. A$_1$B$_1$C$_1$ is translated by the vector $\binom{10}{2}$ to give image A$_2$B$_2$C$_2$. A$_3$B$_3$C$_3$ with coordinates   A$_3$ (6,-6)
B$_3$ (2,-3) and C$_3$ (6,-3) is the image of A$_2$B$_2$C$_2$ after transformation.
Plot all the triangles in the grid provided and determine.
(i) The transformation that maps A$_2$B$_2$C$_2$onto A3B$_3$C$_3$ (2 Marks)
(ii) The simple transformation that maps ABC onto A$_3$B$_3$C$_3$ (2 Marks)

22. In the figure below AOC is a diameter of the circle centre O; AB = BC and $\angle$ACD = 35^0. EBF is a
tangent to the circle at B. G is a point on the minor arc CD.
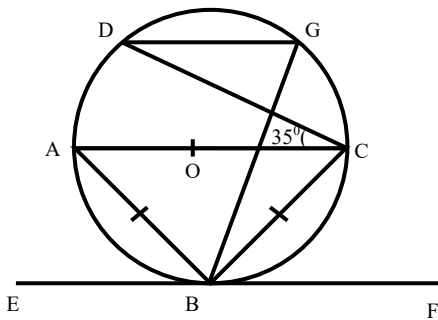
Giving reason
(a) Calculate the size of
(i) $\angle$BAD (3 Marks)
(ii) The obtuse $\angle$BOD (2 Marks)
(iii) $\angle$BGD (2 Marks)
(b) Show that $\angle$ABE = $\angle$CBF (3 Marks)

23. The diagram below shows the speed-time graph for a bus travelling between two stations. The bus
begins from rest and accelerates uniformly for 30 seconds. It then travels at a constant speed for 60
seconds and finally decelerates uniformly for 40 seconds.
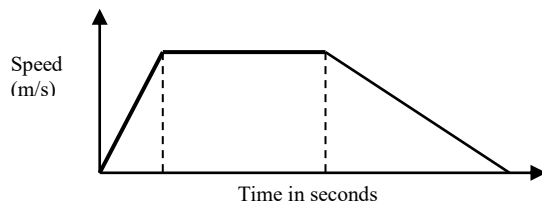
Given that the distance between the two stations in 2090m. Calculate
(a) The maximum speed, in km/h the bus attained (3 Marks)
(b) The acceleration (2 Marks)
(c) The distance travelled during the last 20 seconds (2 Marks)
(d) The time the bus takes to travel the first half of the journey (3 Marks)
24. The members of a photograph club decided to buy a camera worth Shs. 4000 by each contributing the
same amount of money. Fifteen member failed to pay their contribution due to various reasons. As a
result each of the remaining members had to contribute Sh. 60 more.
(a) Find the number of members in the club (7 Marks)
(b) What was the percentage increase in the contribution per month? (3 Marks)

M.C. CLUSTER OF SCHOOLS FORM 4 EVALUATION TEST – 2018
121/2
MATHEMATICS
PAPER 2

1. Use logarithms to evaluate   (4 Marks)

$$\sqrt[3]{\left(\frac{1.23 \times 0.0468}{Log_6}\right)}$$

2. Express in surd form. $\dfrac{1}{2 + Sin\ 45^0}$ (3 Marks)
   hence rationalize the denominator

3. A car is driven a distance of 30 km measured to the nearest Km in 20 min measured to the nearest min. Between what limit will the average speed be?   (3 Marks)

4. Make r the subject of the formula.   (3 Marks)

$$S = \sqrt{\frac{r^2 + 2xb}{n}}$$

5. In the diagram below, BT is a tangent to the circle at B. AXCT and BXD are straight lines. AX = 6cm, CT = 8cm, BX = 4.8cm and XD = 5cm.
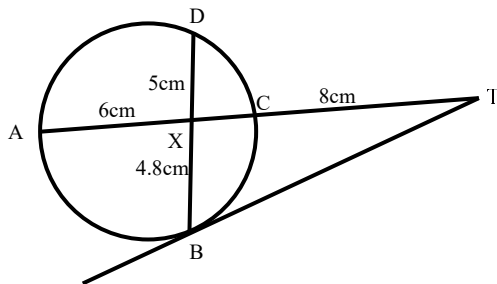
   Find the length of BT.   (2 Marks)

6. Given that X:Y = 1:2 and Z:Y = 2:3, Find the value of   (3 Marks)

$$\frac{x + y}{2z + 5x}$$

7. (a) Expand $(1 – 2x)^6$ in ascending powers of x up to the term in x^3.   (2 Marks)
   (b) Hence evaluate $(1.02)^6$ to 4 d.p.   (2 Marks)

8. Find the inverse of the matrix $\begin{pmatrix} 3 & 2 \\ 5 & 4 \end{pmatrix}$ (4 Marks)
   Hence or otherwise solve the simultaneous equations
   3x + 2y = 4
   5x + 4y = 9

9. A merchant blends 350kg of tea costing Sh. 84 kg with 140kg of tea costing Sh. 105 per kg. At what price must he sell the mixture to gain 25%   (3 Marks)

10. The life expectancy in hours of 106 bulbs are shown in the table below.

Expectancy (hrs)	90– 94	95-99	100-104	105-109	110-114	115-119	120-124	125-129	130-134	135-139
Frequency (f)	5	14	16	17	24	12	11	4	2	1

   Calculate the quantile deviation of the life expectancy   (4 Marks)

11. The equation of a circle is given as $3x^2 + 3y^2 – 12x + 18y + 8 = 0$. Find the centre and radius of this circle.   (4 Marks)

12. Quantity Q partly varies as quantity R and partly varies inversely as the square of R. Given that Q = 3 when R = 1 and Q = 5 when R = $\dfrac{1}{2}$
    (i) Find the equation connecting Q and R   (3 Marks)

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(ii) Find the value of Q when R = $\frac{3}{2}$ (1 Mark)

13. Find the integral values of x for which; $5 \leq 3x + 2$ and $3x - 14 < -2$ (3 Marks)

14. Three soldiers Mutiso, Nzangi and Kisilu went for a shooting practice. The probability of Mutiso, Nzangi and Kisilu hitting the target are $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{2}$ respectively. The three gentlemen hit the target only once, one after the other. What is the probability that the target was hit at least once? (2 Marks)

15. Solve for x in the equation. (3 Marks)

$Log_8 (x + 6) - Log_8 (x - 3) = \frac{2}{3}$

16. Given that $OA = i \pm 2j - 3k$ and $OB = 2i - j - 2k$
    Find $|AB|$ (2 Marks)

SECTION II – 50 MARKS
Answer only five questions from this section

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

X	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0	135^0	150^0	165^0	180^0
4 Cos 2x	4.00		2.00	0	-2.00	-3.46	-4.00	-3.46	-4.00	-3.46	-2.00		4.00
2 Sin (2x + 30)	1.00	1.73	2.00	1.73		0	-1.00	-1.73	-2.00	-1.73		0	1.00

(2 Marks)

(b) On the grid provided draw the graph of y = 4 Cos 2x and y = 2 Sin (2x + 30^0) for $0^0 \leq x \ 180^0$. Take the scale 1cm for 15^0 on the x – axis and 2cm for 1 unit on the y-axis. (5 Marks)
(c) (i) State the amplitude of y = 4 Cos 2x (1 Mark)
     (ii) Find the period of y = 2 Sin (2x + 30)^0 (1 Mark)
(d) Use your graph to solve 4 Cos 2x – 2Sin (2x + 30) = 0 (1 Mark)

18. A red and black dice are rolled and the events X, Y and Z are defined as follows.
    X = The red die shows a 4
    Y – The sum of the scores of the two dice is 6
    Z – The black die shows a 3

(a) Find the probability of event X (2 Marks)
(b) The probability of events X and Z (3 Marks)
(c) Which event is mutually exclusive to X (1 Mark)
(d) Which event is indepedent of X (2 Marks)
(e) The probability of event Y (2 Marks)

19. The diagram given below show triangle OAB. OA = a, OB = b. C divides OA in the ratio 2:3 and D divides OB in the ratio 3:4 while AD and BC meet at E.
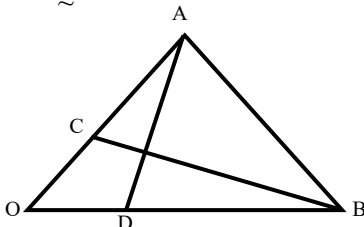
Find interm of a and b
(a) (i) QC (2 Marks)
    (ii) CB (4 Marks
(b) Given that CE = mCB and DE = nDA where m and n are scalars
    (i) Write down two distinct expressions for OE (2 Marks)
    (ii) Hence find the values of m and n (4 Marks

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(iii) Find O̰E interms of a a̰nd b o̰nly (1 Mark)

20. (a) Using a ruler and pair of compasses only, construct triangle ABC in which AB = 9cm, BC = 8.5cm and angle BAC = 60^0 (3 Marks)
    (b) One the same side of AB as C:
      (i) Determine the locus of a point P such that $\angle APB = 60^0$ (3 Marks)
      (ii) Construct the locus of R such that AR >B 4cm (2 Marks)
      (iii) Determine the region T such that $\angle ACT \geq \angle BCT$ (2 Marks)

21. An arithmetic progression has the first term a and the common difference d.
    (a) Write down the third, ninth and twenty – fifth terms of the progression. (3 Marks)
    (b) The progression is increasing and the third, ninth and twenty-fifth terms form the first three consecutive terms of a geometric progression. If the sum of the seventh term and twice the sixth term of the arithmetic progression is 78.
      Calculate
      (i) The first term and the common difference (5 Marks)
      (ii) The sum of the first nine terms of the arithmetic progression (2 Marks)

22. An aircraft leaves A (60^0N, 13^0W) at 1300 hours and arrives at B (60^0N, 47^0E) at 1700 hrs
    (a) Calculate the average speed of the aircraft in knots (3 Marks)
    (b) Town C (60^0N, 133^0N) has a helipad. Two helicopters S and T leaves B at the same time. S moves due West to C while T moves due North to C. If the two helicopters are moving at 600 knots.
      Find
      (i) The time taken by S to reach C (2 Marks)
      (ii) The time taken by T to reach C (2 Marks)
    (c) The local time at a town D (23^0N, 5^0W) is 1000 hours. What is the local time at B. (3 Marks)

23. A firm has a fleet of vans and trucks. Each van can carry 9 crates and 3 cartons. Each truck can carry 4 crates and 10 cartons. The firm has to deliver not more than 36 crates and at least 30 cartons.
    (a) If x vans and y trucks are available to make the delivery. Write down inequalities to represent the above information. (4 Marks)
    (b) Use the grid provided, to represent the inequalities in (a) above (4 Marks)
    (c) Given that the cost of using a truck is four times that of using a van, determine the number of vehicles that may give minimum cost (2 Marks)

24. (a) Sketch the graph of y = x^2 + 5 (2 Marks)
    (b) Using the mid-ordinate rule, with six strips, estimate the area enclosed by the curve, x-axis, y – axis and the line x = 3. (4 Marks)
    (c) Find the exact area by integration (2 Marks)
    (d) Calculate the percentage error made when the two methods above are used (2 Marks)

GATUNDU SUB COUNTY FORM FOUR 2018 EVALUATION EXAM
121/1
MATHEMATICS
PAPER I

Section 1 answer all questions in this section (50 marks)

1. Without using a calculator evaluate,(3mks)

   $$\frac{\frac{1}{2} \text{ of } 3 \frac{1}{2} + 1 \frac{1}{2} (2 \frac{1}{2} - \frac{2}{3})}{\frac{3}{4} \text{ of } 2 \frac{1}{2} + \frac{1}{2}}$$

2. Solve for x, given   (3 Marks)

   $$\frac{27^{x-1}}{3^{2x-1}} = 81^{2x}$$

3. The exterior angle of a regular polygon is equal to one – third its interior angle. Calculate the number of sides of the polygon and give its name.   (3marks)

4. A bank in Kenya buys and sells foreign currencies as follows.

	buying (Ksh)	Selling (kshs.)
1 Us dollar	85.86	86.06
1 sterling pound	142.41	142.73

   A tourist from united States of America converted 43521 US dollars into Kenya shillings.

   i)   Calculate the amount in Kenya shillings that she received   (1 mark)

   ii) While in Kenya, the tourist spent sh. 2437821 and converted the balancetosterling pounds. How much in Sterling pound did the tourist receive to the nearest sterling pound?   (3mks)

5. A Line passes through A (1, 1)   and B(x, y). The mid-point of AB is (3, 5). If line BC is perpendicular to AB, find the equation of line BC in the form of ax +by +c= 0   (4mks)

6. A car park area in ashopping mall measuring 54 m by 72 m is covered by equal square tiles find the area in m^2 of the largest size of the tiles if whole tiles are used.   (3 marks)

7. A minor arc of a circle subtends an angle of 120^0 at the centre of the circle. If the radius is 6.25 cm, find the length of the major arc giving your answer to 4 significant figures. (take $\pi = 3.142$). (2 marks)

8. Two similar container hold 2000cm^3 and 6.75 litres respectively. If the smaller container is 15.5cm in diameter, what is the radius of the larger container to 1 decimal place?   (3 mks)

9. Simplify fully the expression   (3mks)

   $$\frac{6x^2 - 9xy - 6y^2}{8x^2 - 2y^2}$$

10) Find the reciprocal of 20.95 to4 decimal places using the tables of reciprocals.   (1mark)

    Hence evaluate $\dfrac{5}{20.95}$ without using mathematical tables or calculator.   (2marks)

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KAKAMEGA NORTH SUBCOUNTY JOINT EXAMINATIONS
MATHEMATICS PAPER 1
SECTION I
Answer all questions in this section.

1. Without using a calculator or mathematical table evaluate: (3 marks)

$$\frac{2\frac{1}{5} + \frac{2}{3} \text{ of } 3\frac{3}{4} - 4\frac{1}{6}}{1\frac{1}{4} - 2\frac{2}{5} \div 1\frac{1}{3} + 3\frac{3}{4}}$$

2. Simplify: (3 marks)

$$\left[\frac{a^3 - ab^2}{a^4 - b^4}\right]^{-1}$$

3. A straight line passes through the point (-3,-4) and is perpendicular to the line whose equation is 3x + 2y = 11 and intersects the x=axis and y-axis at points A and B respectively. Find the length of AB. (3 marks)

4. Evaluate using squares, cubes and reciprocal tables. (4 marks)

$$\left[\frac{1}{\sqrt[3]{27.56}} + \frac{3}{(0.071)^2}\right]^{-2}$$

5. Given that $2 - 5x \le \frac{1}{3}(x + 7) \le 6 - \frac{1}{3}x$ and that x is an integer, find the sum of the smallest and the largest value of x. (3 marks)

6. Makau and Kilonzo live 20km apart. Makau leaves home at 10:00 am and walks to meet Kilonzo who started walking at 9:30 am to meet Makau. The speed of Makau and Kilonzo are in the ratio of 3:4. If they met at 11:30 am find their speeds. (3 marks)

7. In the figure below, lines AB and XY are parallel.
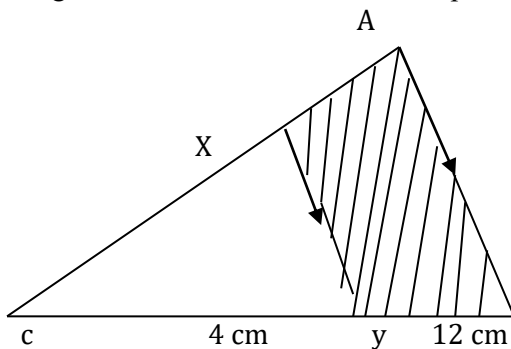
If the area of the shaded region is 36 cm², find the area of triangle CXY. (3 marks)

8. Given that log a = 0.30 and log b = 0.48 find the value of $\log\frac{b^2}{a}$. (2 marks)

9. In the figure below O is the centre of the circle diameter AB. $<AXP = 90^0$, AX = 4cm and PX = 10 cm. Calculate the radius of the semi-circle. (3 marks)
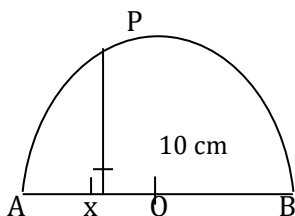
10. The gradient function of a curve that passes through the point (-1,-1) is 2x + 3). Find the equation of the curve. (3 marks)

11. Evaluate: (3 marks)

12.

$$\frac{\left(\frac{1}{27}\right)^{1/3} \, x \, (256)^{1/2} \, x \, 3^6}{(729)^{-1/3} \, x \, 72^2}$$

13. Estimate the area bounded by the curve $y = \frac{1}{2} x^2 + 1, x = 0, x = 3 \; and \; the \; x-axis$ using the mid-ordinate rule. Use three strips. (3 marks)

14. ABCD is a rhombus. The measure of angle ABC is 150^0. The diagonals of the rhombus intersect at E. The shorter diagonal measures 10cm. Calculate the length of the sides of the rhombus to the nearest integer hence calculate the area of the rhombus. (3 marks)

15. Three police posts are such that Q is on a bearing of 210^0 and 12 km from P while R is on a bearing of 150^0 and 8 km from P.
    (a) Using a suitable scale, draw a diagram to represent the above situation. (2 marks)
    (b) From the scale drawing determine:
        (i)   the bearing of Q from R (1 mark)

        (ii)   the distance of R from Q. (1 mark)

16. A student expands $(x - y)^2$ incorrectly as $x^2 + y^2$. Find his percentage error if he used this incorrect expansion for x = 4 and y = -5. Give your answer correct to 2 d.p. (3 marks)

17. A pulley is made up of two wheels of radii 6 cm and 9 cm respectively and the distance between their centres is 18 cm.
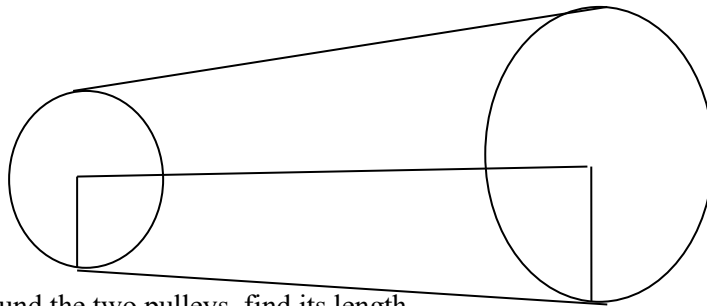

If a belt passes round the two pulleys, find its length. (4 marks)

SECTION II
Answer any five questions in this section.

17.   A circular lawn is surrounded by a path of uniform width of 7m. The area of the path is 21% that of the lawn.
    (a) Calculate the radius of the lawn. (4 marks)
    (b) Given further that the path surrounding the lawn is fenced on both sides by barbed wire on posts at intervals of 10 metres and 11 metres on the inner and outer sides respectively. Calculate the total number of posts required for the fence. (4 marks)
    (c) Calculate the total cost of the posts if one post costs sh 105. (2 marks)

18. A frustum with a regular pentagonal base is such that its top is of side 12cm and bottom is of side 24cm. If its perpendicular height is 20cm. Calculate:
    (a) The length of the slant edge. (5 marks)
    (b) The volume of the frustum. (5 marks)

19. Four trucks A, B, C and D take 10 days to transport 42,000 bags of maize to a depot. However, trucks A and B together take 30 days to transport the same number of bags while trucks C and D together take 15 days. Truck A carries 1 ½ times the number of bags B carries and C carries $1^4/_5$ times as much as D.
    (a) Determine the number of bags of maize transported by each truck per day. (5 marks)
    (b) All the trucks A, B C and D work together for 5 days, after which truck C and D are withdrawn. A and B work together for another 5 days after which truck A breaks down. How long does truck B take to complete the rest of the remaining bags? (5 marks)

20. Eunice bought some oranges worth Ksh 45, while Sharon spent the same amount of money but bought the oranges at a discount of 75 cents per orange.

(a) If Eunice bought an orange at Sh x, write down a simplified expression for the total number of oranges bought by Eunice and Sharon. (3 marks)

(b) If Sharon bought 2 more oranges than Eunice. Find how much each spent on an orange. (5 marks)

(c) Find the total number of oranges bought by Eunice and Sharon. (2 marks)

21. (a) The figure shows a velocity time graph of an object which accelerates from rest to a velocity Vm/s then decelerates to rest in a total time of 54 seconds. If the whole journey is 810 m,
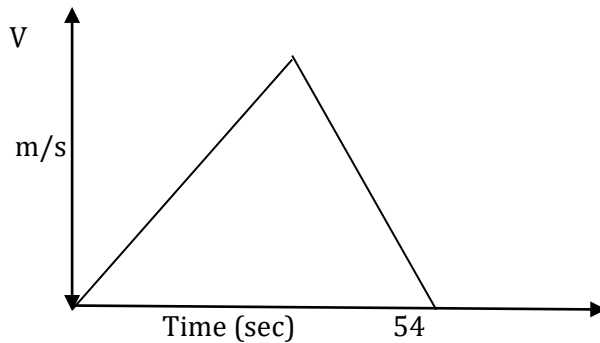
(i) Find the value of V. (2 marks)

(ii) Find the deceleration given the initial acceleration is $1 \frac{2}{3}$ m/s^2. (2 marks)

(b) A bus left town x at 10:45 am and travelled towards town Y at an average speed of 60 km/hr. A car left town X at 11:15am on the same day and travelled along the same road at an average speed of 100 km/hr. The distance between town X and town Y is 500 km.

(i) Determine the time of day when the car overtook the bus. (3 marks)

(ii) Both vehicles continued towards town Y at their original speeds. Find how long the car had to wait in town Y before the bus arrived. (3 marks)

22. The velocity of a particle t seconds after passing a fixed point O, is given by $V = at^2 + bt$ m/s, where a and b are constants. Given that its velocity is 2 m/s when t = 1 sec and it returns to 0 when t = 4.5 secs, calculate;

(a) The values of a and b. (4 marks)

(b) Hence find;

(i) The values of t when the particle is instantaneously at rest. (2 marks)

(ii) The total distance travelled by the particle during the first 4 seconds. (2 marks)

(iii) The maximum velocity attained by the particle. (2 marks)

23. (a) Complete the table below for the function $y = -4 - 6x + 3x^2 + 2x^3$. (3 marks)

x	-4	-3	-2	-1	0	1	2
y							

(b) Draw the graph of $y = -4 - 6x + 3x^2 + 2x^3$ for values fo x from -4 to 2. (3 marks)

(c) Use your graph to solve.

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

(ii) $4x^3 + 6x^2 - 12x - 8 = 0$ (2 marks)

24. A parallelogram OACB is such that **OA** = **a**, **OB** = **b**. D is the mid point of BC **OE** = h**OC** and **AE** = k**AD**.

(a) Express the following in terms of **a**, **b**, h and k.

(i) **OC** (1 mark)

(ii) **OE** (1 mark)

(iii) **AD** (1 mark)

(iv) **AE** (1 mark)

(b) Find the values of h and k. (4 marks)

(c) Determine the ratios:

(i) AE : ED (1 mark)

(ii) OE : OC (1 mark)

KAKAMEGA NORTH SUBCOUNTY JOINT EXAMINATIONS
MATHEMATICS PAPER 2

1. Evaluate without using tables or a calculator (4mks)

$$\sqrt{\frac{(0.000125)^{1/3} \times 0.0049 \times 3.9 \times 10^3}{0.325 \times \sqrt{0.0036}}}$$

2. Find the value of the term independent of x in the expansion of (3mks)

$$\left(3x^2 + \frac{1}{3x} \right)^6$$

3. Simplify the following giving your answer in the simplest form possible.

$$\frac{2}{\sqrt{6} + \sqrt{3}} - \frac{5}{\sqrt{7} - \sqrt{5}}$$ (3mks)

4. Without using tables or a calculator evaluate (3mks)

$$\frac{Tan\ 225\ -\ cos\ 330}{Sin\ 210\ +\ cos\ 840}$$

5. Given that $a = b + \sqrt{b^2 + c^2}$ make c the subject of the formular.

6. Two matrices A and B are such that

$$A = \begin{pmatrix} K & 4 \\ 3 & 2 \end{pmatrix} \quad B = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$$

Given that the determinant of $AB = 4$ find the image of triangle ABC where A = (2,0), B (3,2) and C (3,4) under stretch, stretch factor K, parallel to the X axis. (3mks)

7. a. Find the position vector **OC** of the centre of a circle C, whose equation is
        $2x^2 + 2y^2 + 4x - 6y - 26 = 0$ (2mks)
    b. If the circle passes through P (3, 2), use vector method to find the diameter
        of the circle. (2mks)

8. The sum of the digits in a three digit number is nine. The tens digit is half the sum of the sum of the other two and the hundreds digit is half the units digit.
    Find the total value of the number. (3mks)

9. Given that y is inversely proportional to x^n and β is the constant of proportionality and that $x = 2$, when y = 12, and x = 4, when y = 3, find the values of n and β. (4mks)

10. Find the exact area of the region bounded by the curve $y = 9x - x^3$ and the x axis. (4mks)

11. In the figure below, RP and RQ are tangents to the circle centre O, radius r cm. OQ produced meets PR produced at T. QT = 12cm and QR = 5cmCalculate the radius of the circle. (3mks)

P

R

5cm

T   12cm   Q   O
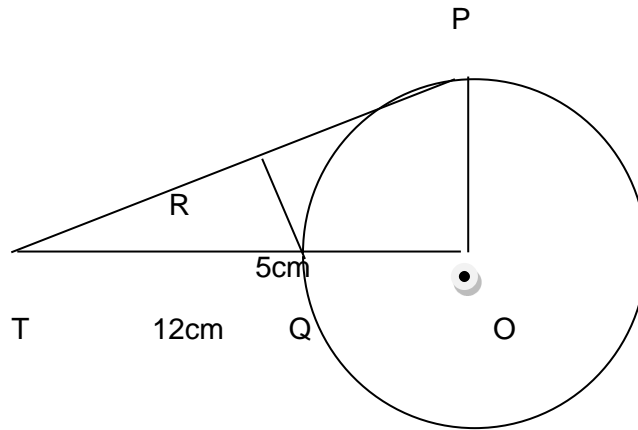
12. The figure below represents a right pyramid with a vertex V and a rectangular base, ABCD. VA = VB = VC = VD = 40 cm.
AB = 30cm and BC = 22cm. X is the mid-point of BC.
Calculate the size of the angle between planes VBC and ABCD (3mks)

V

D   C

22cm

A   30cm   B
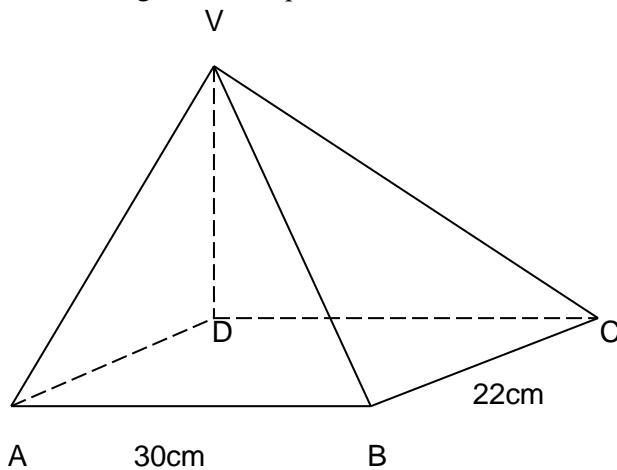
13.   Given that   **a** = 3**i** - 2**j** + 3**k** and
                       b = 2**i** - 4**j** - 3**k**

Find $|2\mathbf{a} - 3\mathbf{b}|$ (3mks)

14. If $25x^2 + k + 9$ is a perfect square find x (2mks)

15. The figure below shows a circle centre O touching the vertices A , B , C of triangle AB = 8.8cm , BC = 5.4cm and AC = 9.2cm.

A

8.8cm   9.2cm

B   5.4cm   C

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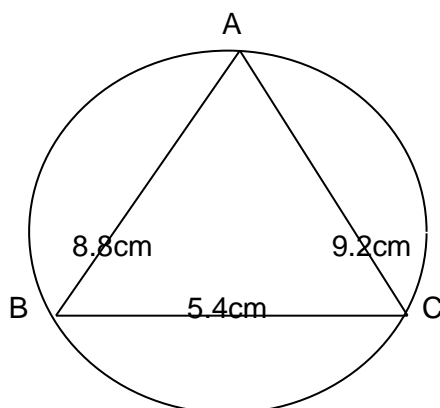
Calculate the radius of the circle to the nearest whole number. (3mks)

16. XAY is a tangent to the circle ABCD. AD is parallel to the straight line CBY . Angle ADC = 114°, and AB = BY

Calculate angles

   i.   ABC (1mk)
   ii. BCA (1mk)

17. The following table shows individual rates of income tax

Income K£ PA	Rate (sh. Per K£)
1 – 4512	2
4513 - 9024	3
9025 – 13536	4
13537 – above	5

Mr. Kariuki lives in a company house for which he pays a nominal rent of Ksh.610 per month. For taxation purpose, his basic salary is increased by 15%. He is insured and pays sh.1200 as premiums per month and claims insurance relief of K£ 36 per annum. He also claims a family relief of sh.660 per month. In addition, he is a member of a co-operative society, to which he remits Ksh.1500 per month, as shares. If Mr. Kariuki's P.A.Y.E is ksh.2400 per month, calculate his net salary in shillings per month. (10mks)

18. a. Using a ruler and a pair of compasses only construct
    i. Triangle ABC, such that AB = 9cm, AC = 7cm and $<$ CAB = 60° (2mks)
    ii. The locus of P , such that AP $\leq$ BP (2mks)
    iii. The locus of Q such that CQ $\leq$ 3.5cm
    iv. Locus of R such that angle ACR $\leq$ angle BCR (2mks)
   b. Find the area of the region satisfied by both P and Q (2mks)

19. Points D(0° , 24°E) , E(O°, 21°W) , F(60°S, 120°W) , G(60°S, 110°E) are marked in a globe representing the earth with radius = 0.7m.

(Taking π as $\frac{22}{7}$)

   a. Find the length of the arc DE. (3mks)
   b. If A is the centre of the latitude 60°S, and B is the centre of the latitude O° find
    i.   the length AB (3mks)
    ii. the area of the major sector AFG (4mks)

20. In a group of 40 people, 10 are healthy and every person of the remaining 30 has either high blood pressure, a high level of cholesterol or both. 15 have high blood pressure and 25 have high level of cholesterol. If a person is selected at random from this group, what is the probability that he/she

   a. Has high blood pressure only (4mks)
   b. Has high level of cholesterol only (2mks)
   c.. Has high blood pressure and high level of cholesterol (2mks)
   d. Has either high blood pressure or high level of cholesterol (2mks)

21. Three consecutive terms in a G.P are 3^{2x+1} , 9^{x} and 81 respectively.

   a. Calculate the value of x (2mks)
   b. Find the common ratio of the series. (2mks)
   c. Calculate the sum of the first 10 terms of the series. (3mks)
   d. Given that the 5th and 7th terms of the G.P in (a) above form the 1st two consecutive terms of an A.P

Calculate the sum of the 1st 20 terms of the A.P. (3mks)

22. Two variables y and x are believed to be related by the equation $y = x + ax^b$. The table below shows the corresponding values of x and y.

X	1	1.5	2	2.5	3	3.5	4
y	7.54	9.33	11.00	12.59	14.12	19.90	27.23

a. By drawing a suitable line graph, estimate the values of a and b. (9mks)
b. Write down the equation connecting y and x. (1mk)

23. The marks obtained by fifty candidates were recorded in the table below.

Marks	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69
No. of candidates	6	8	12	9	7	5	3

a. Draw a cumulative frequency graph and use it to estimate. (3mks)
   i. Median (1mk)
   ii. Quartile deviation (2mks)
   iii. The percentage number of candidates failing if the pass mark was 25 marks. (2mks)
   iv. The range of marks scored by the middle 30% of the candidates. (2mks)

24. A theatre has a seating capacity of 250 people. The changes are sh.100 for an ordinary seat and sh.160 for a special seat. It costs sh.16,000 to stage a
Show and the theatre must make a profit. There are never more that 200 ordinary seats and for a show to take place, at least 50 ordinary seats must be occupied. The number of special seats is always less than twice the number of ordinary seats.
a. Taking x to be the number of ordinary seats and y the number of special seats, write down all the inequalities representing the information above. (4mks)
b. On a graph paper, show the region represented by the above inequalities. (4mks)
c. Determine the number of seats of each type that should be booked in order to maximize profit. (2mks)

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NAKURU CLUSTER
121/1
MATHEMATICS
PAPER 1

SECTION I:(50 Marks). Answers ALL questions in this section

1. Without using a calculator evaluate (3 Marks)

$$\frac{\left(3\frac{1}{3} + 1\frac{1}{9}\right) \div 1\frac{1}{3}}{\left(4\frac{2}{9} - 2\frac{5}{9}\right) x \frac{2}{3}}$$

2. The number $5.8\dot{1}\dot{ }$ 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 ½ 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

   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 **AB**. (3 Marks)

10. A regular polygon has internal angle of 150^0 and side of length 10cm.

    (a) Find the number of sides of the polygon. (2 Marks)

    (b) Find the perimeter of the polygon. (2Marks)

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 Metres)
(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≤X<9	9≤X<11	11≤X<13	13≤X<16	16≤X<20	20≤X<21
No. of contents y	2	6	8	3	2	1

Use the table to represent the information on a histogram. (3 Marks)

SECTION II (50 MARKS): Answer any five questions in this section.

17. The diagram below shows two circles, centre A and B which intersect at points P and Q.
Angle PAQ = 70^0, angle PBQ = 40^0 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.

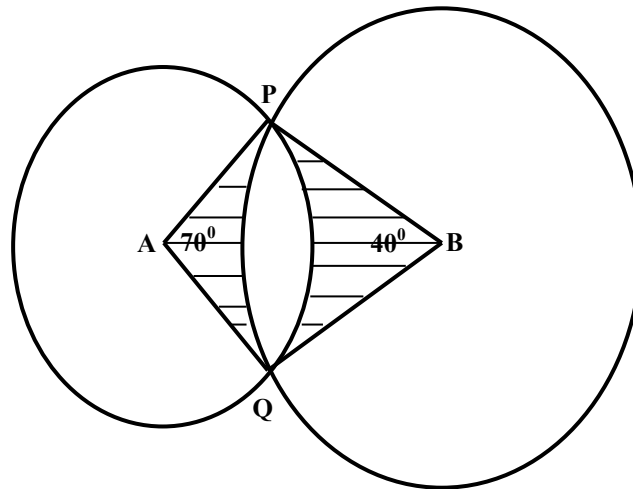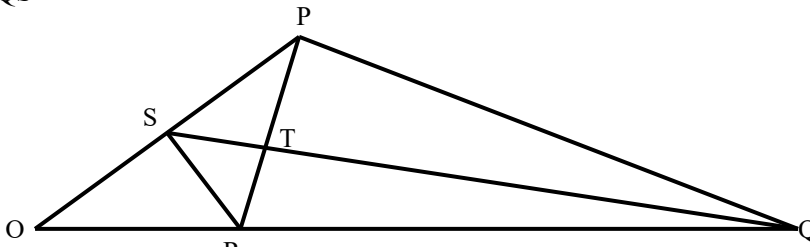| Income (k£ – p.a	Rate (KSh. per £)
1 – 4200	2
4201 – 8000	3
8001 – 12600	5
12601 – 16800	6
16801 and above	7

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 Minutes)
(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 $\overset{R}{=}$ p and OQ = q, express the following vectors in terms of p and q.
     (i) SR   (1 Mark)
     (ii) QS   (2 Marks)
     (iii) PT   (2 Marks)
     (iv) TR   (2 Mark
   (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 ½ 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 ½ 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 030^0 from ship A. Ship C is 700km from ship B on a bearing of 120^0. 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≤x≤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≤x≤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   (1 Mark)
      y = $2x^2$ + 6x – 5 and line y = 7x + 1
   (d) Find the actual of the region bounded by the curve y = $2x^2$ + 6x – 5 and line y = 7x + 1   (4 Marks)
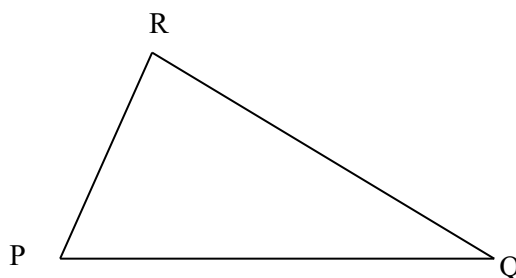
NAKURU CLUSTER
121/1
MATHEMATICS
PAPER 2
SECTION 1 (50 MARKS): ANSWER ALL QUESTIONS IN THE SECTION.

1. Use logarithms to evaluate (4 Marks)

$$\sqrt[3]{\frac{45.3 \times 0.00697}{0.534}}$$

2. Form the quadratic equation whose roots are $x = -\frac{5}{3}$ and $x = 1$ (2 Marks)

3. W varies directly as the cube of x and inversely as y. Find W in terms of x and y given that W = 80 when x = 2 and y = 5. (2 Marks)

4. A cold water tap can fill a bath in 10 minutes while a hot water tap can fill it in 8 minutes. The drainage pipe can empty it in 5 minutes. The cold water and hot water taps are opened for 4 minutes. After four minutes all the three taps are opened. Find how long it takes to fill the bath. (3 Marks)

5. Object A of area 10cm² is mapped onto its image B of area 60cm² by a transformation. Whose matrix is given by
   $p = \begin{pmatrix} x & 4 \\ 3 & x+3 \end{pmatrix}$. Find the positive values of x (3 Marks)

6. Make P the subject of the formula in $L = \frac{2}{3}\sqrt{\frac{x^2 - PT}{y}}$ (3 Marks)

7. (a) Expand the expression $\left(1 + \frac{1}{2}x\right)^5$ in ascending order powers of x, leaving the coefficients as fractions in their simplest form. (2 Marks)

   (b) Use the first three terms of the expansion in (a) above to estimate the value of $(1.05)^5$ (2 Marks)

8. By rounding each number to the nearest tens, approximate the value of $\frac{2454 \times 396}{66}$
   Hence, calculate the percentage error arising from this approximation to 4 significant figures. (3 Marks)

9. Without using a calculator or mathematical tables, express $\frac{\sqrt{3}}{1 - Cos\ 30^0}$ in surd form and simplify (3 Marks)

10. Kasyoka and Kyalo working together can do a piece of work in 6 days. Kasyoka, working alone takes 5 days longer than Kyalo. How many days does it take Kyalo to do the work alone? (3 Marks)

11. The second and fifth terms of a geometric progression are 16 and 2 respectively. Determine the common ratio and the first term. (3 Marks)

12. A particle moves along a straight line AB. Its velocity V metres per second after t seconds is given by
    $v = t^2 - 3t + 5$
    Its distance from A at the time t = 1 is 6 metres.
    Determine its distance from A when t = 3 (3 marks)

13. On the triangle PQR, draw a circle touching PR, QP produced and QR produced. (3 Marks)

R

P   Q

14. Two containers have base area of 750cm² and 120cm² respectively. Calculate the volume of the larger container in litres given that the volume of the smaller container is 400cm³. (3 Marks)

15. Solve for x in the equation
    $2 Sin^2 x - 1 = Cos^2 x + Sin x$, where $0^0 \le x \le 360^0$. (4 Marks)

16. Find the radius and the coordinate of the centre of the circle whose equation is
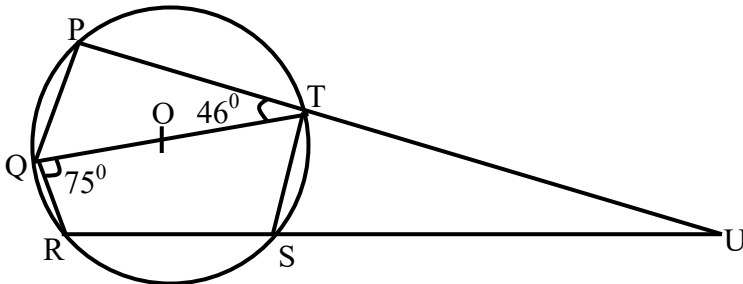 $2x^2 + 2y^2 - 3x + 2y + \frac{1}{2} = 0$ (4 marks)

SECTION II (50 MARKS):
ANSWER FIVE QUESTIONS IN THIS SECTION.
17. A bag contains 5 red, 4 white and 3 blue beads. Two beads are selected at random.
    (a) Draw a tree diagram and list the probability space. (3 Marks)
    (b) Find the probability that
       (i) The last bead selected is red. (2 Marks)
       (ii) The beads selected were of the same colour (2 Marks)
       (iii) At least one of the selected beads is blue (3 Marks)
18. The figure below shows a circle centre O in which line QOT is a diameter. Angle $QTP = 46^0$,
    angle $TQR = 75^0$ and angle $SRT = 38^0$, PTU and RSU are straight lines.

Determine the following, giving reasons in each case:
(a) angle RST (2 Marks)
(b) angle SUT (2 Marks)
(c) angle PST (2 Marks)
(d) obtuse angle ROT (2 Marks)
(e) angle SQT (2 Marks)

19. P, Q and R are three villages such that PQ = 10km, QR = 8km and PR = 4km where PQ, QR and PR are connecting roads.
    (a) Using a scale of 1cm rep 1 km, locate the relative positions of the three villages (2 Marks)
    (b) A water tank T is to be located at a point equidistant from the three villages. By construction locate the water tank T and measure its distance from R. (3 Marks)
    (c) Determine the shortest distance from T to the road PQ by construction (2 Marks)
    (d) Determine the area enclosed by the roads PQ, QR and PR by calculation (3 Marks)
20. For a sample of 100 bulbs, the time taken for each bulb to burn was recorded. The table below shows the result of the measurements.
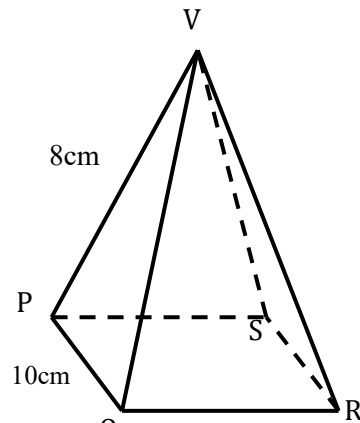
Time (in hours)	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74
Number of bulbs	6	10	9	5	7	11	15	13	8	7	5	4

(a) Using an assumed mean of 42, calculate
   (i) the actual mean of distribution (4 Marks)
   (ii) the standard deviation of the distribution (3 Marks)
(b) Calculate the quartile deviation (3 Marks)
21. A plane leaves an airport P $(10^0S, 62^0E)$ and flies due north at 800km/h.
    (a) Find its position after 2 hours (3 Marks)
    (b) The plane turns and flies at the same speed due west. It reaches longitude Q, 12^0W.
       (i) Find the distance it has traveled in nautical miles. (3 Marks)
       (ii) Find the time it has taken (Take $\pi = \frac{22}{7}$, the radius of the earth to be 6370km and 1 nautical mile to be 1.853km) (2 Marks)
    (c) If the local time at P was 1300 hours when it reached Q, find the local time at Q when it landed at Q (2 Marks)

22. PQRSV is a right pyramid on a horizontal square base of side 10cm. The slant edges are all 8cm long. Calculate

   (a) The height of the pyramid   (2 Marks)
   (b) The angle between
      (i) Line VP and the base PQRS   (2 Marks)
      (ii) Line VP and line RS   (2 Marks)
      (iii) Planes VPQ and the base PQRS   (2 Marks)
   (c) Volume of the pyramid   (2 Marks)

23. Complete the table below for the functions $y = \sin 3\theta$ and $y = 2\cos(\theta + 40^0)$ (2 Marks)

θ^0	0^0	10^0	20^0	30^0	40^0	50^0	60^0	70^0	80^0	90^0
$3 \sin 3\theta$	0	1.50		3.00			0.00			-3.0
$2 \cos(\theta + 40^0)$	1.53	1.29			0.35			-0.69		-1.29

   (a) On the grid provided, draw the graphs of $Y = 3 \sin 3\theta$ and $y = 2\cos(\theta + 40^0)$ on the same axis.
      Take 1 cm to represent 10^0 on the x-axis and 4 cm to represent 2 unit on the y – axis.   (5 marks)
   (b) From the graph find the roots of the equation.
      (i) $-\sin 3\theta = \frac{1}{} \cos(\theta + 40^0)$ (2 Marks)
      (ii) $2 \cos(0 + 40^0) = 0$ in the range $0 \le \theta \le 90^0$ (1 Mark)

24. The gradient function of a curve is given by the expression $2x + 1$. If the curve passes through the point (-4, 6)
   (a) Find:
      (i) The equation of the curve   (3 Marks)
      (ii) The values of x, at which the curve cuts the x-axis   (3 Marks)
   (b) Determine the area enclosed by the curve and the x –axis   (4 Marks)

$= -20\frac{5}{6}$ square units	A1	

KASSU JET EXAMINATIONS
121/1
Mathematics Paper 1

SECTION I 50 MARKS

1. Without using tables, evaluate $\frac{0.51 \times 5700}{6.8 \times 0.0095}$ giving the answer in standard form. (3mks)

2. Find the value of t in the following equation $81^{-1} \times \left(\frac{1}{27}\right)^t = \frac{1}{243^{-1}}$ (3mks)

3. Simplify the expression (3mks)
$$\frac{x^2 - 9y^2}{2x^2 - 7xy + 3y^2}$$

4. Evaluate using tables of reciprocals and cubes only expressing your answer to 4 significant figures
$$\frac{4}{0.2356} + (0.9873)^3$$
(3mks)

5. Simplify; $\quad \dfrac{\frac{2}{3} \text{ of } 5\frac{2}{5} - 2\frac{3}{10}}{\frac{3}{5} \div 4\frac{1}{2} + 1\frac{3}{5}}$ (3mks)

6. Find the equation of a line which passes through the point (2, 3) and is perpendicular to $y = 3x - 1$. Giving your answer in the double intercepts form (3mks)

7. George received 1O,OOO Euros from his brother who stays in France .He sent to his sister who stays in Japan 10,000 Yen .In addition George bought a car worth sh.200,000. Exchange rates :

	Buying	**Selling**
1 Euro	73.4226	73.52953
100 Japanese yen	62.8011	62.8822

   How much was left. (3marks).

8. Write down four inequalities which fully describe the unshaded region R in the figure S below (4mks)
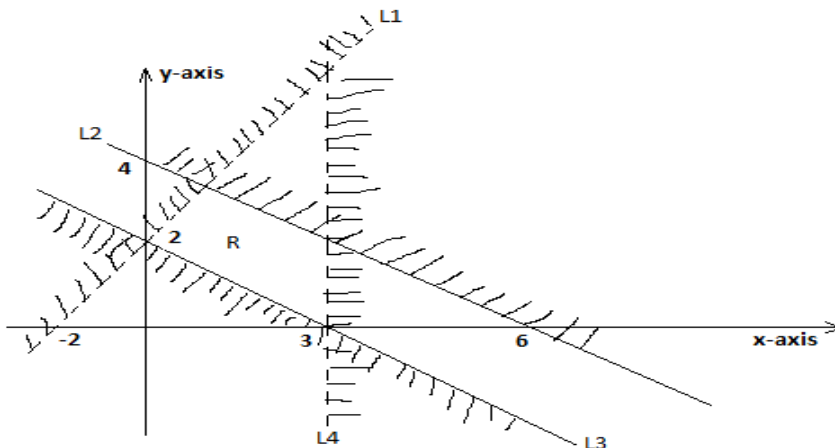

9. A line PQ = 12.5cm. By using another line, divide PQ into nine equal parts. (3mks)
10. The sum of the interior angles of a polygon is 1980^0. Find the number of sides the polygon has. (3mks)
11. The diagram below is a sketch of a rice field (not drawn to scale), use it to generate a surveyor's field book. (All measurements are in metres) (4mks)

XY=150M
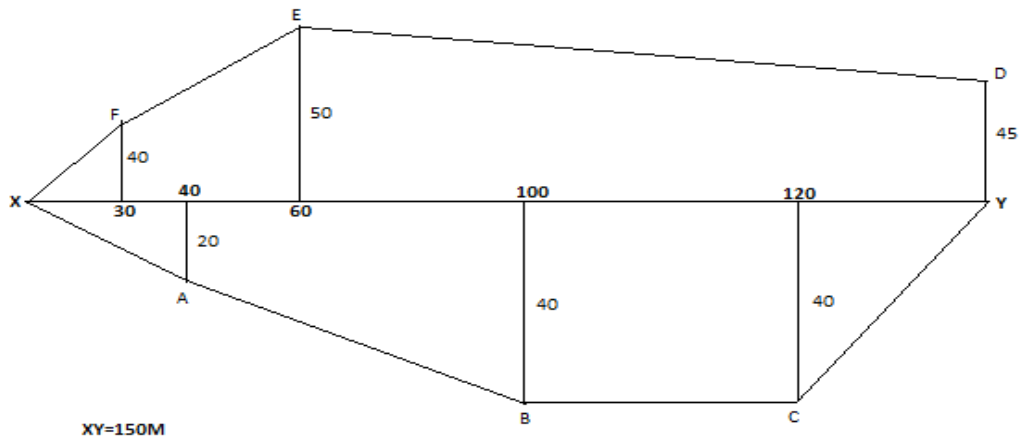
12. A boy walk directly from point Q towards the foot of a vertical flag post 200m away. After conveying a distance of 140m, he observes the angle of elevation of the top of the flag post is 75 . Calculate the angle of depression of point Q from the top of the flag post. (3mks)

13. Two similar blocks have masses of 729g and 216g respectively. If the surface area of the smaller block is 300cm^2, calculate the surface area of the larger block. (3mks)

14. Using trapezoidal rule with 6 ordinates, find the area bounded by the curve y=2x^3 – 5, the x-axis and the lines x=2 and x=8. (3mks)

15. Kassim has a money box containing 100 mixed shs 5 and shs 10 coins with a total value of shs 600. How many of each type of coin does the box contain. (3mks)

16. The figure below shows a regular tetrahedron PQRS of edges 4cm.
Draw its net and measure the length of the straight path of PS through the midpoint T over the edge QR. (3mks)
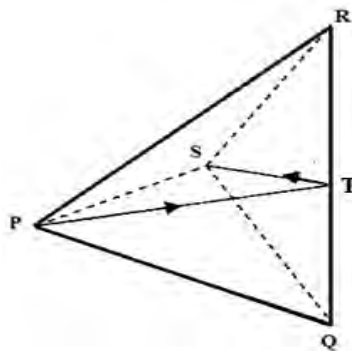
SECTION II (50 MARKS)
(Answer ANY FIVE questions in the spaces provided)

17. Complete the table below for the equation y=2x^2+2x-8 by filling the blank space. (2mks)

x	-5	-4	-3	-2	-1	0	1	2	3	4
y	32			-4		-8			16	

a). On the graph provided below, plot the graph of   y=2x^2+2x-8. (4mks)
(use the scale: y-axis=1unit, x-axis=1unit)
b) Use your graph to solve:
i)   2x^2+2x-8=0 (1mk)
ii)   2x^2+x+2=0 (3mks)

18. a) a bus left Kisumu at 9.30 am towards Nairobi at an average speed of 81km/hr. A matatu left Nairobi for Kisumu at 10.10 a.m at an average speed of 72km/hr. The distance between Kisumu and Nairobi is 360km.
Determine:
(i)   The time taken before the two vehicles met. (3mks)

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(ii)   The distance between two vehicles 40 minutes after meeting.   (2mks)

(iii) A car left Kisumu towards Nairobi at 9.50am at an average speed of 90km/hr. Determine the time the car caught up with the bus.   (3mks)

(b) The figure below shows speed time graph of a journey. If total distance travelled in 80 seconds is 920m. Find the distance travelled in the final 40 seconds.   (2mks)
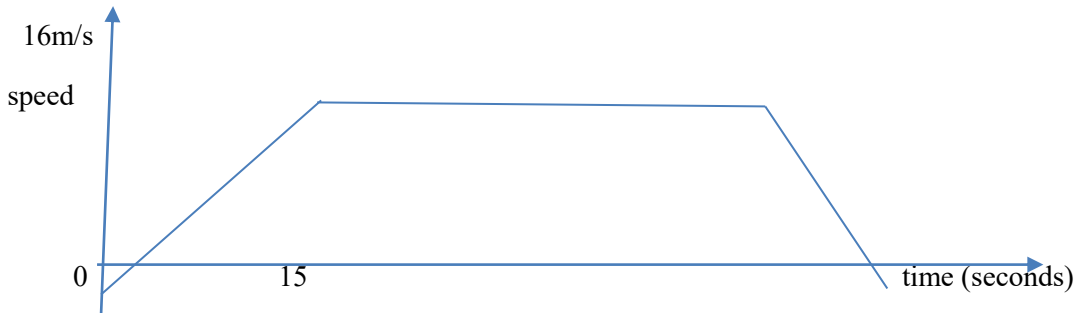
19. The Figure shows a frustum of a right pyramid open container for storing water.
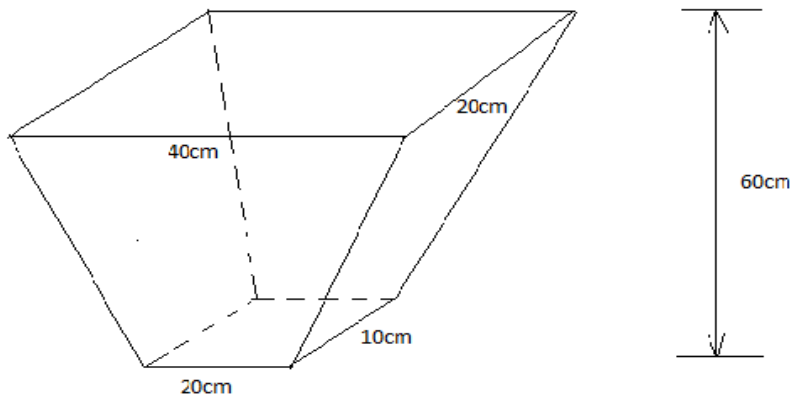
Calculate:
   a)   The height of the pyramid from which the frustum was cut from.   (2mks)
   b)   The surface area of the frustum   (4mks)
   c)   The capacity of the frustum in litres   (4mks)

20. The table below represent marks in percentage scored by 50 students in a class

Marks	Frequency
40-44	6
45-49	4
50-54	7
55-59	6
60-64	12
65-69	4
70-74	5
79-79	3
80-84	3

   a)   State the modal class   (1mk)
   b)   Estimate:
         (i)   The mean mark   (2mks)

(ii) The median   (3mks)

(iii)   On the grid provided draw a frequency polygon to represent the above information.   (4mks)

21. Given that the column vectors

$$p = \begin{pmatrix} -3 \\ 4 \end{pmatrix}, q = \begin{pmatrix} 16 \\ -4 \end{pmatrix}, r = \begin{pmatrix} 9 \\ 6 \end{pmatrix} \text{ and that } a = 2p - \frac{3}{4}q + \frac{2}{3}r$$

Express a as column vector and hence calculate its magnitude   (4mks)

b)   Given that the midpoints of PQ is (-3,1) and Q (7,5), obtain the co-ordinates of P   (3mks)

c) A translation $T\begin{pmatrix} 2 \\ 1 \end{pmatrix}$. maps triangle ABC onto triangle $A^1B^1C^1$. Given the co-ordinates A(2,3) , B(2,5) and
C(4,4). Find the co-ordinates of A^1B^1 and C^1.   (3mks)

22. The coordinates of triangle ABC are A(1, 1), B(3, 1) and C(1, 3).

(a) Plot the triangle ABC.   (1mk)

(b) Triangle ABC undergoes a translation vector $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$. Obtain the image of A'B'C' under the transformation,
write the coordinates of A'B'C.   (2mks)

(c) A'B'C undergoes a reflection along the line X=0, obtain the coordinates and plot on the graph points
A"B"C" under the transformation.   (2mks)

(d) The triangle A"B"C" undergoes an enlargement scale factor -1, centre origin. Obtain the coordinates of the
image A'''B'''C'''.   (2mks)

(e) The triangle A'''B'''C''' undergoes a rotation centre (1, -2) angle 120^0. Obtain the coordinates of the image
A"B"C".   (2mks)

(f) Which triangles are directly congruent?   (1mk)

23. 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 = 8.   (2mks)

(b) The velocity of the particle when t = 10.   (3mks)

(c) The values of t when the particle is momentarily at rest.   (3mks)

24. A pilot intends to fly from A to D through B and C, B is 750km from A and on a bearing of
N50 $E. C$ is on a bearing of N 40 W from B and their distance apart is 600km. D is on a bearing of S 85 W
from C and at a distance of 1050km.

a)   Using the scale of 1cm for 100km, show the flight route.   (4mks)

b)   If the pilot on its way back decides to fly directly from D to A;

i) By use of compass bearing find the direction of A from D   (1mk)

ii) Find the distance from D to A in kilometers.   (1mk)

(iii) The plane flies at 500km/h. If it leaves D at 9.00a.m at what time did it arrive at A.   (2mks)

d)   i)Using your diagram in (a) above, (i) find the distance between A and C   (1mk)

ii) Find the compass bearing of A from point C   (1mk)

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KASSU JET EXAMINATIONS
121/2
Mathematics Paper 2

SECTION I 50 MARKS

1. Solve for x in the equation $-2x^2 + x + 36 = 0$ using completing the square method   (3mks)

2. Simplify by rationalizing the denominator in $\dfrac{4 - \sqrt{2}}{3 + \sqrt{2}}$ leaving your answer an the form $a + b\sqrt{c}$ where a,b and c

    are integers.   (3mks)

3. Find the value of x in the equation $\cos(3x - 180^o) = \dfrac{\sqrt{3}}{2}$ in the range listed below.

    $0^o \le x \le 360^o$ (3mks)

4. Draw a line AB=4cm, P is a variable point in the plane of the paper, above AB, such that angle $ABC = 60^0$ and the area of triangle APB= $6cm^2$. Using a ruler and a pair of compasses only find the locus of P.   (3mks)

5. Expand and simplify the binomial $\left(2 + \dfrac{3}{x}\right)^5$. Hence use the first four terms of your expansion to find the value of $(2.5)^5$ (3mks)

6. The length and breadth of a rectangular floor garden were measured and found to be 4.1m and 2.2m respectively. Find the percentage error in its area.   (3mks)

7. Solve for x in the equation $3(logx)^2 - logx^5 + 2 = 0$ (3mks)

8. Make s the subject of the formulae in the following; $sa = \sqrt{\dfrac{s^2 + q}{t^2}}$ (3mks)

9. Each member of a class take one and only one of the three foreign languages: French, German and Spanish. 15 pupils take French, 9 take German and 6 take Spanish. Two pupils are chosen at random. Represent the information in a tree diagram hence find the probability that both pupils take different subjects.   (3mks)

10. The amount of oil used by a ship travelling at a uniform speed varies jointly with the distance and the square of the speed. If the ship uses 200 barrels of oil in travelling 200 miles at 36 mile per hour, determine how many barrels of oil are used when the ship travels 360 miles at 18 miles per.   (3mks)

11. Use logarithms to evaluate: (4mks)

    $$\sqrt[3]{\dfrac{45.3 \times 0.00697}{0.534}}$$

12. The figure below shows a circle of diameter XY. Chord TZ intersects XY at C. A tangent to the circle at Y meets TZ produced at S.
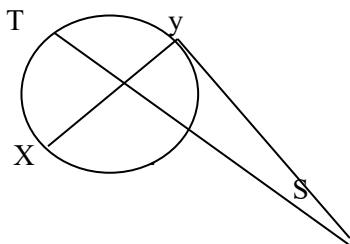
    Given that TC = 14 cm, CY = 4 cm and YS = 7.5 cm. calculate the length of :
    a)   CS   (1mk)
    b)   XC   (2mks)

13. Determine the values of x for which the matrix $\begin{pmatrix} 2x & x^2 \\ 2 & 1 \end{pmatrix}$ has no inverse   (3mks)

14. Mr. Kimbo, a local retailer bought imported rice at sh. 56 per kilogram and local rice at sh. 48 per kilogram. He wants to mix the two types of rice so as to make a profit of 20%. If he sold the mixture at sh.120 per 2 kilogram packet, find the ratio the two types of rice was mixed.   (3mks)

15. The sixth term of a geometric progression is 16 and the third term is 2. Determine the common ratio and the first term.   (3mks)

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

SECTION II
(Answer ANY FIVE questions in the spaces provided)

17. The table alongside shows the rates of taxation in a certain year.

Income in $K£p.a$	Rate (Sh. Per $K£$)
$1 - 3900$	2
$3901 - 7800$	3
$7801 - 11700$	4
$11701 - 15600$	5
$15600 - 19500$	7
$Above$ 19500	9

In that year Mr. Kariuki at teacher at Kangaru High School was earning a basic salary of Ksh. 27 000 per month. In addition he was entitled to other taxable allowances totalling to 11 000 per month and a personal relief of Ksh 1056 per month. He lives in teachers' quarters where he is paying a nominal rent of Ksh. 3 500 per month.

(a) Calculate how much income tax Mr. Kariuki is paid per month. (4 marks)

(b) Mr. Kariuki's other deductions per month were co-operative society contribution of sh 2500 and loan repayment of sh. 3000, calculate his net salary per month. (3 marks)

(c) Later the same year Mr. Kariuki was transferred to another school where he earned hardship allowance equivalent to 30% of his basic salary. On top of the deduction in (b) above, he also had a deduction of sh 2700 per month to KCT. Calculate the percentage change in his net salary per month (3 marks)

18. Given that y=2x°+ cos ½ x°, complete the table below for the missing values of y, correct to 1 decimal place (2mks)

X°	0°	30°	60°	90°	120°	150°	180°	210°	240°	270°	300°	330°	360°
Y=sin 2x+ cos ½ x	1.0	1.8			-0.4	-0.6			0.4	-0.7			-1.0

(b) On the grid provide below, draw the graph of y=sin 2x°+cos ½ x° for 0≤ x ≤360° Take the scale 1cm for 30° on the x-axis. 2 cm for 0.5 units on the y –axis. (4mks)

(c) Use the graph to estimate
   (i) The minimum value of y (1mk)
   (ii) The value of x for which
   $\frac{1}{2}\sin 2x + \frac{1}{2}\cos\frac{1}{2}x \geq 0.25$ (3mks)

19. Quadrilateral **OMNP** is such that **OM = m**, **$OP = p$** and **PN** = $\frac{13}{4}m$. **PN** is produced to Q such that **PN: PQ** = 13:15. T is a point on **MN** such that **MN = 3TN**
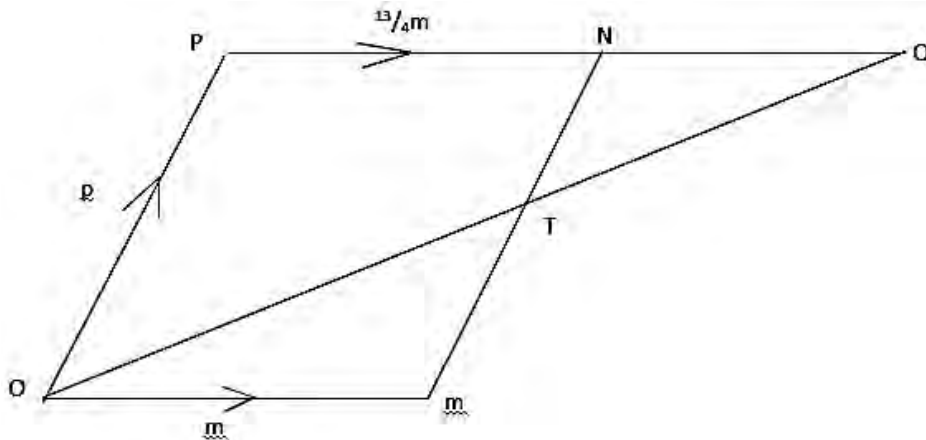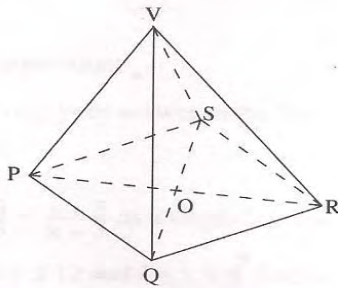

(a) Express in terms of m and p
   (i) OT (2mks)
   (ii) PQ (2mks)
   (iii) OQ (2mks)

(b) Show that O, T and Q are collinear.

(4mks)

20. The figure below represents a right pyramid on a square base PQRS of side 12 cm. O is the centre of the base and VO = 14 cm.

Calculate;
(a) The length of VP to 1 decimal place (3 marks)
(b) The angle which VP makes with the base PQRS (2 marks)
(c) The surface area of the pyramid to 1 decimal place (3 marks)
(d) The volume of the pyramid (2 marks)

21. The table shows the goods (P) produced by a certain factory in time (t) since 2010 is believed to obey a law of the form P=kA^t where k and A are constants and t is time in years.

t	2010	2011	2012	2013	2014	2015	2016
P	5000	6080	7400	9010	10960	13330	16200

a) Express the law P=kA^t where k and A are constants and t is time in years in the linear form $y = mx + c$ and fill the table appropriately. (3mks)
b) Plot a suitable straight line graph (4mks)
c) Use the graph above to find the values of A and k. (3mks)

22. A small scale farmer wishes to buy some sheep and goats for rearing. A sheep costs sh.400 and a goat costs sh.300. The farmer has enough space for only 20 animals and may spend at most sh.6800. The number of goats should not exceed twice the number of sheep.
a) By letting x and y to represent the number of sheep and goats he can buy respectively, write down all inequalities from the above information. (4mks)
b) Represent the inequalities on the grid provided. (4mks)
c) From your graph; find the maximum number of animals he can buy at the lowest cost. (2mks)

23. (a) An aeroplane flies from town $A(20^0N, 60^0N)$ to town$B(20^0N, 20^0E)$. (Taking R= 6400km, $\pi = 3.142$)If it then flies due north from town B to town C, 420km away, calculate correct to the nearest degree, the latitude of town C. (3mks)

(b) Calculate the shortest distance in km between towns $P(60^0N, 40^0W)$ and $Q(60^0N, 30^0E)$ giving your answer to 2 decimal places (2mks)

(c) The local time at town $T(33^0N, 15^0W)$ is 1045hours. What is the local time at $Q(50^0N, 30^0E)$? (2mks)

24. Use Trapezoidal rule to find the area between the curve. y = x^2 + 4x + 4, the x-axis and the ordinates $x = -2$ and $x = 1$ (Use 7 ordinates)

a) Complete the table correct to 2 d.p. (2mks)

x	-2	-1.5	-1	-0.5	0	0.5	1
y							

b) Find the area enclosed by the curve, the x-axis, lines $x = -2$ and $x = 1$. (3mks)
c) Use integration to find the exact area and hence find the percentage error in your approximation. (5mks)

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