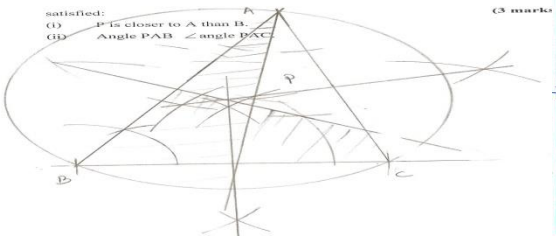
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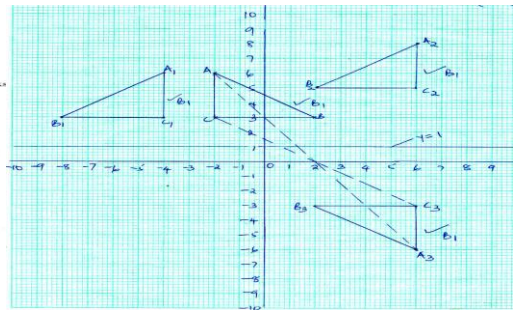
RANDOM SERIES (RDS)

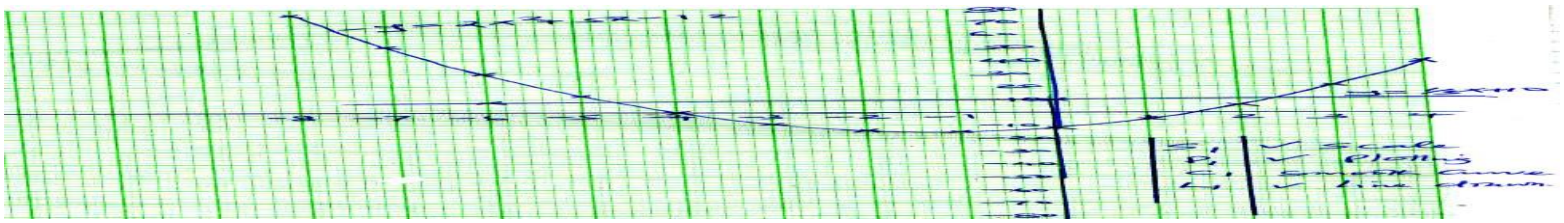
PAPERS

MATHEMATICS PAPER 1

(121/1)







FOR MARKING SCHEME AND OTHER PAPERS CONTACT:

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INSTRUCTIONS TO CANDIDATES

- Write your name and Admission number in the spaces provided at the top of this page.
- This paper consists of two sections: Section I and Section II.
- Answer ALL questions in section 1 and ONLY FIVE questions from section II
- All answers and workings must be written on the question paper in the spaces provided below each question.
- Show all the steps in your calculation, giving your answer at each stage in the spaces below each question.
- Non – Programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.

RDS 1

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate the following; **(3 marks)**

$$\frac{\frac{2}{3} - 1\frac{1}{4} + \frac{5}{6}}{\frac{2}{7} + 3\frac{1}{5}\ of\ \frac{7}{8} \div \frac{6}{11} - \left[5\frac{1}{3} + \frac{9}{10}\right]}$$

2. Use square roots, reciprocal and square tables to evaluate to 4 significant figures the expression;

(4 marks)

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

3. Solve for x in the equation $\frac{1}{2}\log_2 81 + \log_2(x^2 - \frac{x}{3}) = 1$ **(3mks)**

4. The points A, B and C lie on a straight line. The position vectors of A and C are $2\mathbf{i} + 3\mathbf{j} + 9\mathbf{k}$ and $5\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$ respectively; B divides AC internally in the ration 2:1. Find the

   (a) Position vector of B. **(2 marks)**

   (b) Distance of B from the origin. **(1 mark)**

5. Without using tables, evaluate $\frac{0.51 \text{ X } 5700}{6.8 \text{ X } 0.0095}$ giving the answer in standard form

(3 marks)

6. Evaluate $\int_{-1}^{2}(x^2+1)dx$ **(3 marks)**

7. Simplify $\dfrac{p^2-2pq+q^2}{p^3-pq^2+p^2q-q^3}$ **(3 marks)**

8. What is the equation of the circle whose center lies on the line y - 2y + 2 = 0 and which touches the positive axes? **(3 Marks)**

9. Find the value of x in the equation $\cos(3x - 180^o) = \frac{\sqrt{3}}{2}$ in the range listed below.

$0^o \leq x \leq 180^o$ **(3mks)**

10. A farmer has a piece of land measuring 840m by 396m. He divides it into square plots of equal size. Find the maximum area of one plot. **(3 marks)**

11. Give the equation of the normal to the curve $y = x^3 + 2x + 1$ at (1, 4) **(3 marks)**

12. The position of two towns P and Q are given as P(45^oN, 10^oW) and Q(45^oN,170^oE).Calculate the difference in distance (i) Through the North Pole and (ii) along the parallel of latitude in nautical miles.

(3 marks)

13. A liquid spray of mass 384g is packed in a cylindrical container of internal radius 3.2 cm. Given that the density of the liquid is $0.6g/cm^3$, calculate to 2dp the height of the liquid in the container.

(3 marks)

14. (a) Find the inverse of the matrix $\begin{pmatrix} 4 & 3 \\ 3 & 5 \end{pmatrix}$ **(1 mark)**

(b) Hence solve the simultaneous equation using the matrix method **(2 marks)**

$4x + 3y = 6$

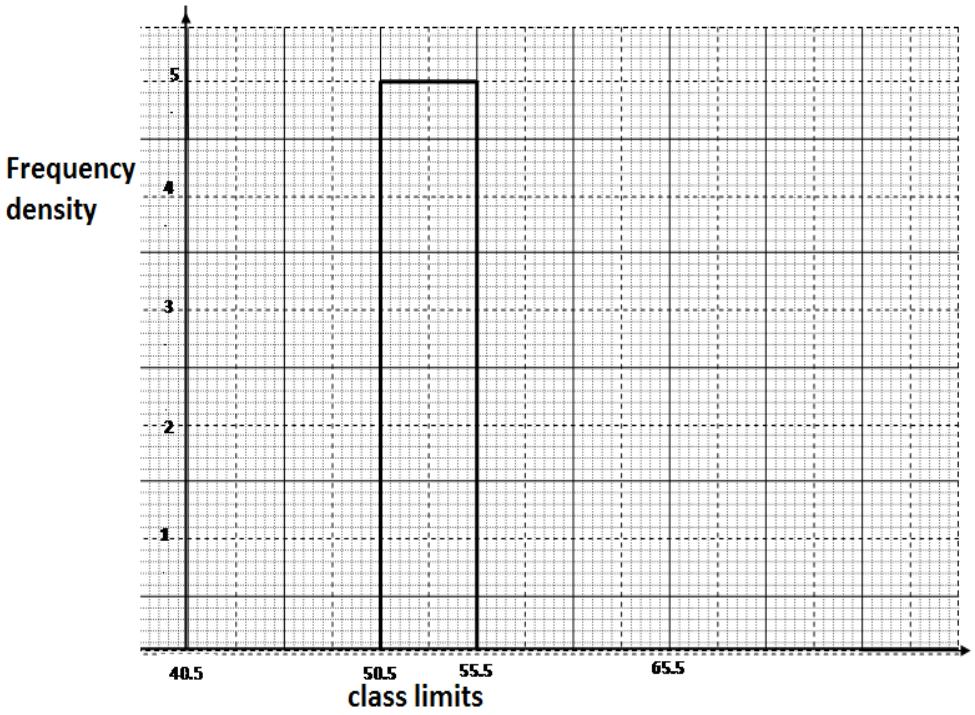
$3x + 5y = 5$

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

16. The following data was obtained from the mass of a certain animal. Complete the table and the histogram below. **(3 marks)**

Mass(kg)	frequency
41-50	20

51-55	
56-65	40



SECTION II (50 MARKS)

Answer any Five Questions in this Section

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

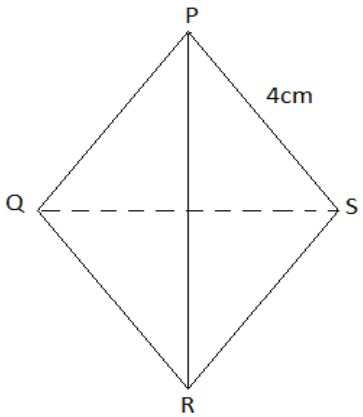
(a) Calculate the total amount of money the businessman paid to clear the loan in 1½ years.

(4 marks)

(b) The average income realized from the matatu per day was Kshs.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 realized by the end of three years. **(4 marks)**

18. PQRS is a regular tetrahedron of side 4cm.



a) Calculate the angle between planes PSR and QRS **(4 marks)**

b) Calculate the volume of the Tetrahedron **(6 marks)**

19. (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. **(2 marks)**

(ii) Given that the sum of the first *n* terms of the AP is 416, find *n*. **(2 marks)**

(b) The third, fifth and eighth terms of another AP form the first three consecutive terms of a Geometric Progression (GP). If the common difference of the AP is 3, find

(i) The first term of the GP; **(4 marks)**

(ii) The sum of the first 9 terms of the GP, to 4 significant figures. **(2 marks)**

20. Using a ruler and compasses only, construct a triangle ABC such that BC = 8cm, angle ABC = 60^0 and angle BAC = 45^0.

(a) On the same diagram, measure the length of : **(5 marks)**

(i) AC

(ii) BC

(b) Draw the circumcircle of the triangle ABC. **(2 marks)**

(c) Construct the locus of a point P within the triangle by shading the unwanted region inside the circumcircle such that the following conditions are satisfied:

(3 marks)

(i) P is closer to A than B.

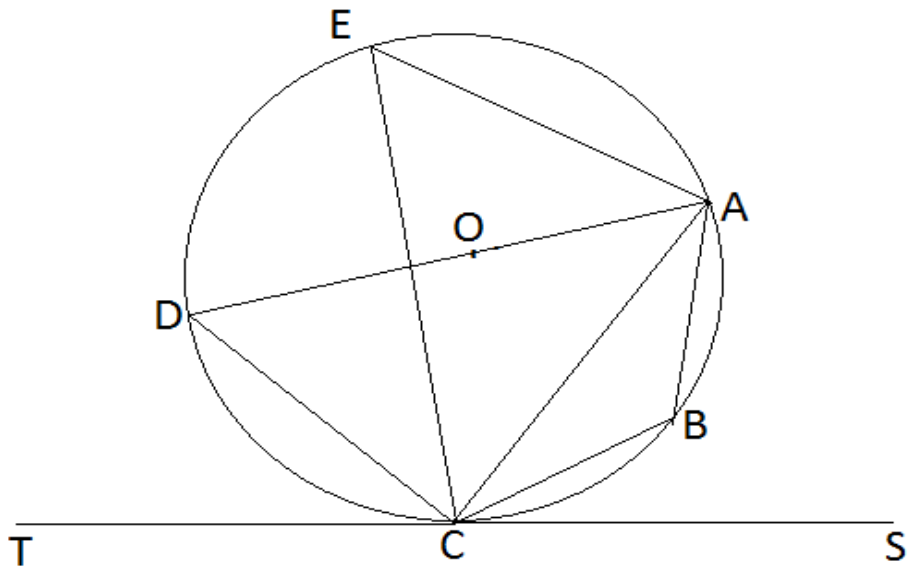
(ii) Angle PAB $\angle$ angle PAC.

21. (i) By calculations show that $y = x^3 - 3x^2 + 2x$ and $y + 3 = 3x$ intersect at x = -1, 1 and 3

(3 marks)

(i) Sketch the curve and the line on the same axis, hence calculate the area enclosed by the curve, lines x = 0 and y + 3 = 3x **(7 marks)**

22. 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) $\angle DCT$ **(2 marks)**

(b) $\angle DEA$ **(2 marks)**

(c) $\angle ACB$ **(2 marks)**

(d) $\angle BDC$ **(2 marks)**

(e) $\angle BOA$ **(2 marks)**

23. The coordinates of a triangle ABC are A(1, 1) B(3, 1) and C (1, 3).

(a) Plot the triangle ABC. **(1 mark)**

(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'. **(2 marks)**

(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 **(2 marks)**

(d) The triangle A" B" C" , undergoes an enlargement scale factor -1, centre origin. Obtain the coordinates of the image A'" B'" C'". **(2 marks)**

(e) The triangle A'" B'" C'" undergoes a rotation centre (1, -2) angle 120^0. Obtain the coordinates of the image A^{iv} B^{iv} C^{iv}. **(2 marks)**

(f) Which triangles are directly congruent. **(1 mark)**

24. A matatu and Nissan left town A for town B 240km away at 8.00a.m travelling at 90km/hr and 120km/hr respectively. After 20 minutes the Nissan had a puncture which took 30 minutes to mend.

a) How far from town A did the Nissan catch up with the matatu? **(6 marks)**

b) At what time did the Nissan catch up with the matatu? **(1 mark)**

c) At what time did the matatu reach town B? **(3 marks)**

RDS 2

SECTION I (50 MARKS)

Answer ALL Questions in this Section

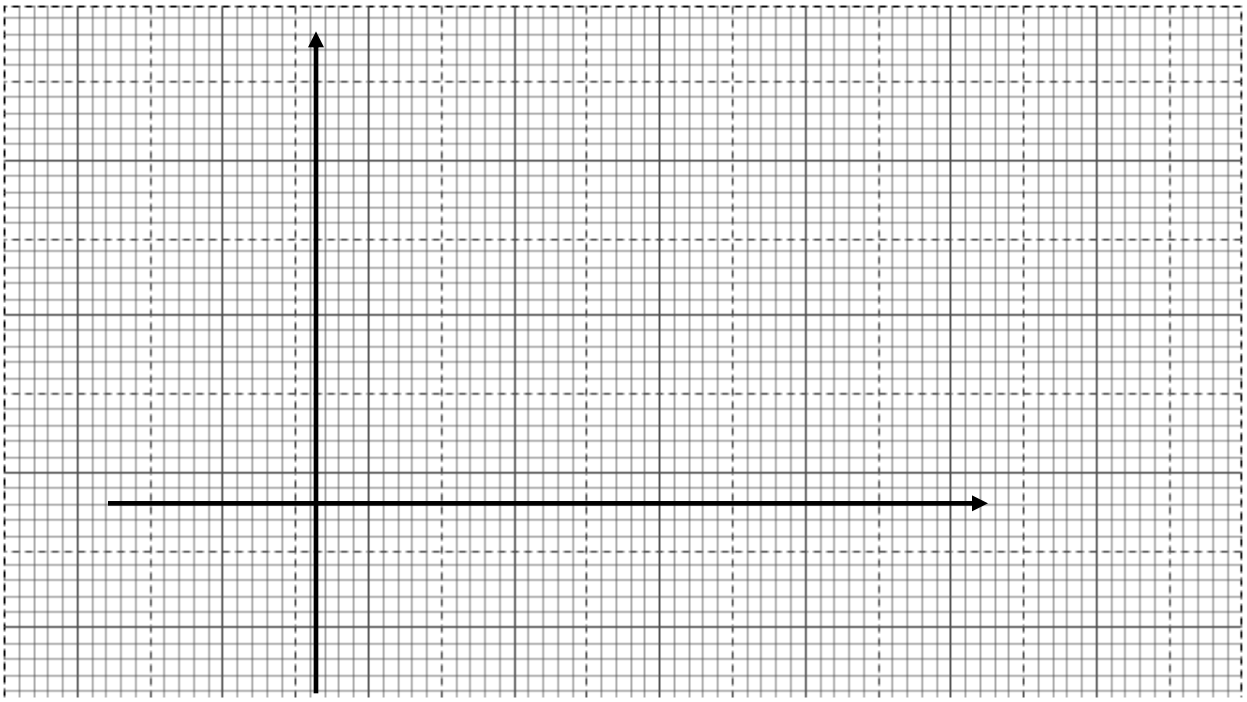
1. Use tables of reciprocal only to evaluate $\frac{1}{0.325}$, hence evaluate ;

   $\frac{\sqrt[3]{0.000125}}{0.325}$ (3 marks)

2. Solve the equation $3x^2 + 4x = 2$ giving the roots correct to two decimal places. (4 marks)

3. The straight line through the points D (6, 3) and E (3, -2) meets the y-axis at the point F. Determine the coordinates of F. (3 marks)

4. Using the grid provided below, draw and shade the unwanted regions to show the region satisfied by R given the following inequalities; $y + x < 5, y - x \leq 1$ and $x + 5y > 5$ (3 marks)



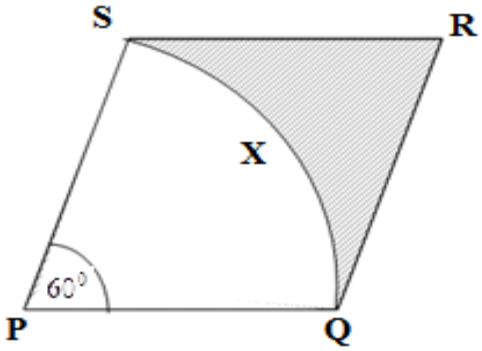
5. Given that $a = -2$, $b = -1$ and $c = 3$, evaluate $\dfrac{2(a+c)^2 - (a-b)(b-c) - 2c}{3(a+b) - 2(b-c)}$ (3 marks)

6. A key cutting factory starts cutting keys at the rate of 500 per hour. The rate of production reduces by 10% every 2 hours. Calculate the numbers of keys cut in the first 6 hours. (2 marks)

7. 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 reminder and the girl got the rest. Find the percentage share of the younger boy to the girl's share. (3 marks)

8. Annette has some money in two denominations only. Fifty shilling notes and twenty shilling coins. She has three times as many fifty shilling notes as twenty shilling coins. If altogether she has sh. 3400, find the number of fifty shilling notes and 20 shilling coins. (3 marks)

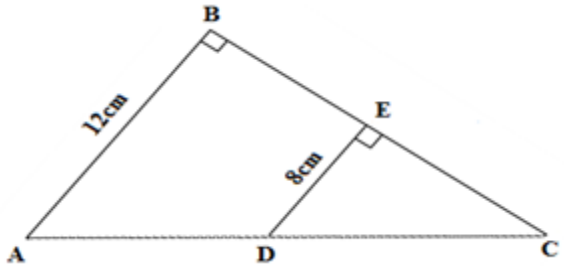
9. The figure below shows a rhombus PQRS with PQ = 9cm and $\angle SPQ=60^0$. SXQ is a circular arc; centre P.



Calculate the area of the shaded region correct to two decimal places. (Take $\pi = \frac{22}{7}$) (4 marks)

10. A particle accelerates uniformly from rest and attains a maximum velocity of 30m/s after 16 seconds. It travels at this constant velocity for the next 20 seconds before decelerating to rest after another 8 seconds. Calculate the total distance covered by the car. (3 marks)

11. The figure below shows a right angled triangle with AB = 12cm. ED is parallel to BA, CE = 6.3cm and ED = 8cm.



Given that the area of EBAD = 31.5cm^2, find the length of BC (4 marks)

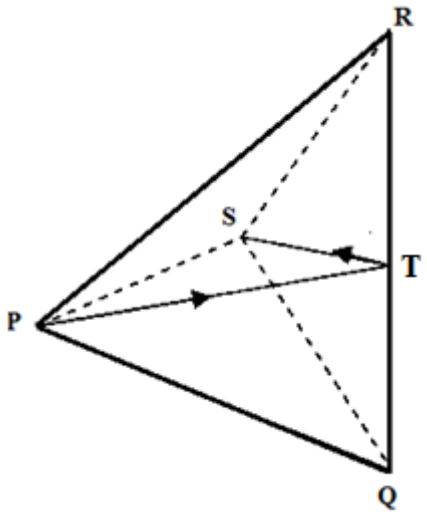
12. Find the value of x in the equation $5^{\frac{x}{4}} = \frac{1}{25}$ (3 marks)

13. Given that $\tan x = 2.4$, evaluate without use of tables and calculators, $\sin x - \cos x$ in the form of $\frac{a}{b}$ where a and b are integers. (4 marks)

14. The difference between the interior and exterior angles at each vertex of a regular polygon is 162^0 . Find the number of sides of the polygon. (2 marks)

15. A number n is such that when it is divided by 27 and 30 or 45, the remainder is always 3. Find the smallest value of n. (2 marks)

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.
(3 marks)



SECTION II (50marks)

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

17. Three business partners, Bela, Joan and Trinity contributed Kshs. 112, 000, Kshs. 128, 000 and Kshs. 210, 000 respectively to start a business. They agreed to share their profits as follows:

    30% to be shared equally

    30% to be shared in the ratio of their contributions

    40% to be retained for the running of the business.

    If at the end of the year, the business realised a profit of Kshs. 1. 35million

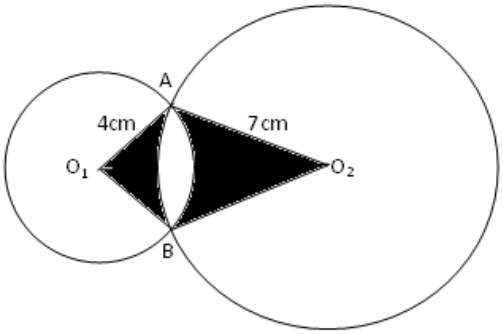
    Calculate:

    (a) the amount of money retained for running the business at the end of the year. (1mark)

    (b) the difference between the amounts received by Trinity and Bela. (6marks)

    (c) Express Joan's share as percentage of the total amount of money shared between the three partners. (3 marks)

18. In the figure below, O_1 and O_2 are the centres of the circles whose radii are 4 cm and 7 cm respectively. The circles intersect at A and B and angle $AO_1O_2 = 60^\circ$



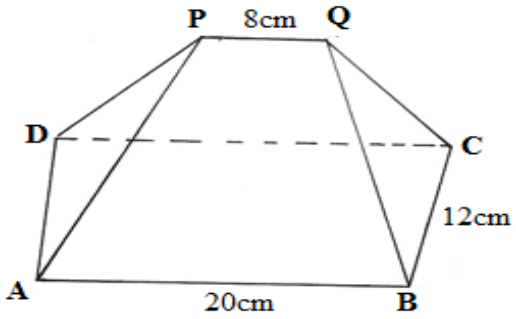
Find by calculation; take $\pi = 3.142$

(a) The angle AO_2O_1 (1 marks

(b) The area of the quadrilateral AO_1BO_2 (4 marks)

(c) The shaded area (5 marks)

19. The figure below shows a plan of a roof with a rectangular base ABCD. AB = 20cm and BC = 12cm. the ridge PQ = 8cm and is centrally placed. The faces ADP and BCQ are equilateral triangles. N is the midpoint of AD



Calculate:

(a) The length of PN (2 marks)

(b) The altitude of P above the base. (3 marks)

(c) The angle between the planes ABQP and ABCD. (2 marks)

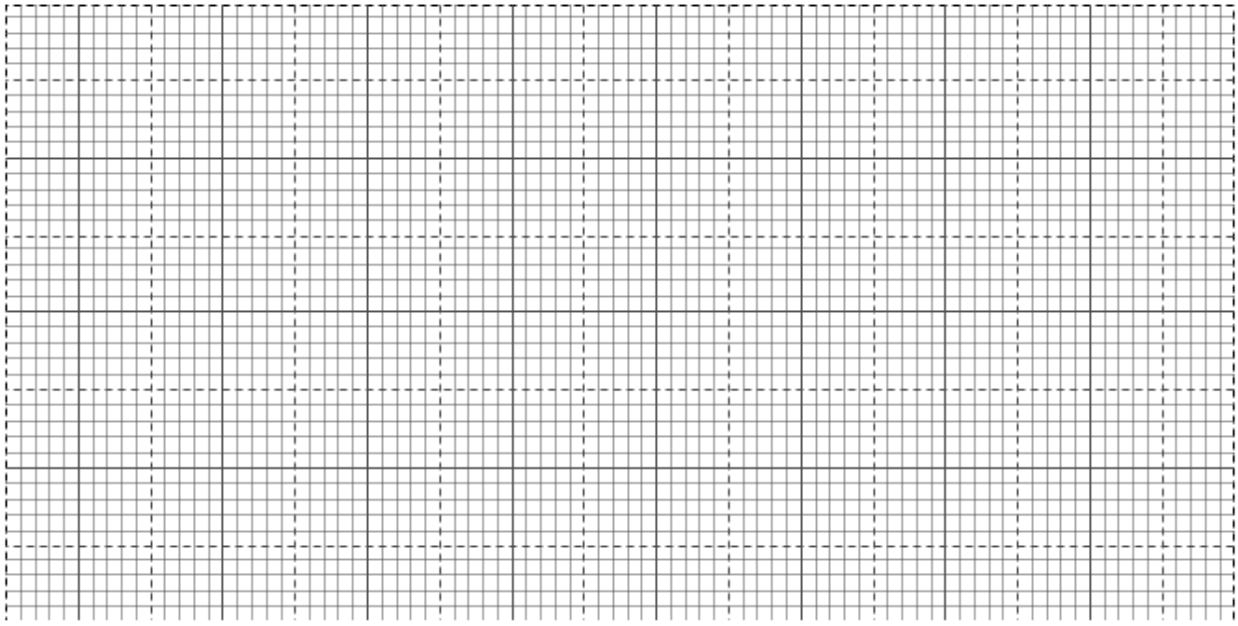
(d) The obtuse angle between the lines PQ and DB (3 marks)

20. Complete the table below for the function $y = x^3 + 6x^2 + 8x$ for $-5 \le x \le 1$ (3 marks)

x	-5	-4	-3	-2	-1	0	1
x^3	-125	-64			-1	0	1
$6x^2$			54		6	0	
$8x$	-40		-24	-16		0	8
y		0	3			0	15

(a) Draw the graph of the function $y = x^3 + 6x^2 + 8x$ *for* $-5 \le \times \le 1$ (3 marks)

(Use a scale of 1cm to represent 1 unit on the x axis. 1 cm to represent 5 units on the y-axis)



(b) Hence use your graph to estimate the roots of the equation

$x^3 + 5x^2 + 4x = -x^2 - 3x - 1$ (4 marks)

21. Three islands P, Q, R and S are on at ocean such that island Q is 400kmon a bearing of 030^0 from island P. Island R is 520kmand on a bearing of $120^0$from island Q. A port S is sighted 750km due south of island Q.

(a) Taking a scale of 1cm to represent 100km, give a scale drawing showing the relative positions of P, Q, R and S. (4 marks)

Use the scale drawing to

(b) Find the bearing of:

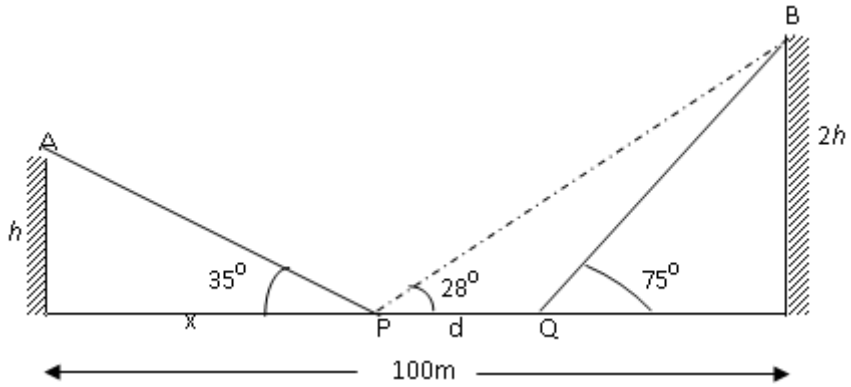
(i) Island R from island P (1 mark)

(ii) Port S from island R (1 mark)

(c) Find the distance between island P and R (2 marks)

(d) A warship T is such that it is equidistant from the islands P, S and R. By construction locate the position of T (2 marks)

22. Two vertical columns A and B of height h and $2h$ respectively stand on level ground and are 100m apart. Two points P and Q are d metres apart, the elevation of the top of A and B from point P are 35^0 and 28^0 respectively and the elevation of top of B from point Q is 75^0

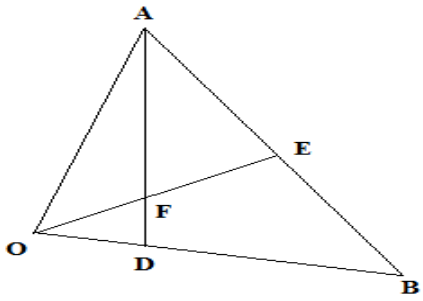


Calculate

(a) The vertical heights of the two columns in metres (7 marks)

(b) The distance PQ in metres (3 marks)

23. In the figure below, E is the midpoint of AB, OD : DB = 2 : 3 and F is the point of intersection of OE and AD



Given that **OA** = **a** and **OB** = **b**,

(a) Express in terms of **a** and **b**

(i) **AD** (1 mark)

(ii) **OE** (2 marks)

(b) Given further that **AF** = *s***AD** and **OF** = ***t*OE**, find the values of *s* and *t* (5 marks)

(c) Show that E, F and O are collinear (2 marks)

24. A swimming pool is 20m by 12m and it slopes gently from a depth of 1m at the shallow end to a depth of 3m at the deep end.

(a) Calculate the volume of water in the swimming pool (in m^3) when it is full. (3marks)

(b) If the swimming pool is to be drained by a pump which removes water at the rate of $2.5m^3$ per minute, how long will it take this pump to drain the swimming pool if it was full? (3marks)

(c) If the sides of the swimming pool and its floor are to be covered with square tiles of side 20cm, find to the nearest 100 the number of tiles required. (4marks)

RDS 3

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate the following:

$$\frac{\frac{1}{2} \text{ of } \frac{2}{5} + \frac{3}{15} + \frac{7}{10} \times \frac{6}{7} - 1\frac{1}{2} \times \frac{1}{3}}{\frac{5}{3} \times \frac{6}{10} \div \frac{5}{4} - \frac{1}{4}}$$

(3 marks)

2. Simplify

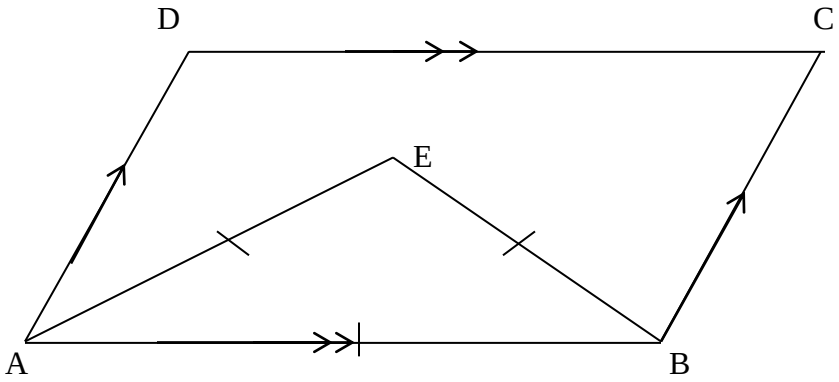
$$\frac{9t^2 - 25a^2}{6t^2 + 19at + 15a^2}$$

(3 marks)

3. The marked price of a pair of shoes is Sh. 2400. A customer buys the shoes and is offered a 10% discount and the seller still makes a profit of 20% on the cost of the shoes. Determine the cost price.

(3 marks)

4. The figure below ABCD is a rhombus and triangle ABE is equilateral. Angle DAE = 18^{o}.



Calculate angle DEC (3 marks)

5. Solve for x in the equation

$9^{1/2x-1} + 25^{11/2} = 8^{21/3}$ (3 marks)

6. The exchange rates are as follows:

1 U.S dollar = Ksh. 87.6094

1 Sterling Pound = U.S dollars 1.6987

Mr. Brown sold a camera to Mr. Njoroge which he had bought at 214 Sterling pounds and at a loss of Ksh. 11847.90. How much did Mr. Njoroge pay in Kenya shillings? (3 marks)

7. The sum of the digits of a two digit number is 11. If the digits are interchanged the value of the number decreases by 63. What is the number? (3 marks)

8. Use tables of cubes, square roots and reciprocals to evaluate to 4 s.f. (3 marks)

$$\frac{1}{\sqrt{3.74}} + \frac{2}{1.782^3}$$

9. Solve the following quadratic equations by completing the square method.

$3x^2 - 7x - 5 = 0$ (3 marks)

10. If Sin x = $^5/_{13}$ and x is an obtuse angle, evaluate

$$\frac{\text{Cos x + tan x}}{\text{Sin x – Cos x}}$$ (3 marks)

11. A point P (-2, 5) is mapped onto P^1 (1, 9) by a translation T_1. If P^1 is mapped onto P^{11} by a translation T_2 given by $\begin{pmatrix} -4 \\ -1 \end{pmatrix}$. Find the coordinates of P^{11} and hence a single transformation which maps P^1 onto P^{11}.
(3 marks)

12. Using the protractor, ruler, pair of compasses and on the line A B shown below, show the locus of a point P such that angle APB = 78^{o}. (3 marks)

A——————————————————————————— B

13. Three towns A, B and C are situated so that AB = 65 km and AC = 115 km. The bearing of B from A is 062^{o} and the bearing of C from A is 278^{o}. Calculate:

a) The distance BC (2 marks)

b) The bearing of B from C (2 marks)

14. Two grades of tea costing sh. 120 and sh. 150 per kilogram are mixed. In what ratio should the two grades be mixed in order to produce a mixture that costs sh. 144 per kilogram?
(3 marks)

15. A straight line Y = mx – 6 passes through the point (3, ˉ2). Find the value of M and the angle the line makes with the x – axis. (3 marks)

16. Using a ruler and a pair of compasses only, construct a triangle ABC such that AB = 6.3cm, BC = 4.5cm and angle ABC = 120^{o}. Measure line AC. (3 marks)

SECTION II

17. A number of people working at a factory decided to raise sh. 72,000 towards a famine relief. Each person was to contribute the same amount. Before the contributions were collected, five of the people retired from working at the factory. This means that the remaining contributors had to pay more to meet the same target.

(a) Taking 'n' as the number of people working in the factory originally, write down an expression for the increase in the contribution per person. (3 marks)

(b) If the increase in the contribution per person was sh. 1200, find the number of people originally. (4 marks)

(c) How much would each person have contributed to the nearest shilling if the five had not retired? (1 mark)

(d) Calculate the percentage increase in the contribution per person caused by retirements giving your answer to the nearest hundredth.

18. On the grid provided and using scale of 1 cm to 1 unit on both axis, draw triangle ABC where A (1, 2), B (5, 1) and C (3, 4), hence use it to answer the following:

(a) (i) Draw the image $A_1B_1C_1$ of ABC under a rotation of 90^o clockwise about the origin and state the coordinates. (2 marks)

(ii) Draw the image $A_2B_2C_2$ of $A_1B_1C_1$ under a reflection in line y = x and state the coordinates of $A_2B_2C_2$. (2 marks)

(b) $A_3B_3C_3$ is the image under a reflection in the line x = 0. Draw the image $A_3B_3C_3$ and state its coordinates. (2 marks)

(c) Describe a single transformation that maps ABC onto $A_3B_3C_3$. (2 marks)

19. A cylindrical storage tank of diameter 14 cm is initially two thirds full of water. The tank is filled by a pipe of internal diameter 10 cm through which water flows at the rate of 56 litres per minute. Water starts flowing into the tank at 10:15 am and the tank is full at 2:55 pm.

(a) Determine the height of the tank. (5 marks)

(b) Starting with the full tank, school uses water from this tank at the rate of 11,550 cm^3 per day. Find how long it takes to consume all the water assuming that no more water is added. (3 marks)

(c) How long does it take for the tap to fill the tank when empty? (2 marks)

20 Points D (0^o 24^oE), E (0^o 21^oW), T (60^oN 170^oW) and G (60^oN 110^oE) are marked on a globe representing the earth with a radius 0.7m. Taking $\prod = {}^{22}/_{7}$:

(a) Find the length of the arc DE (3 marks)

(b) If A is the centre of the latitude 60^oN and B is the centre of latitude 0^o, find:

(i) Length AB (3 marks)

(ii) Area of the major sector ATG (4 marks)

(iii) Calculate the time taken to move from D to E (2 marks)

21. Using a ruler and a pair of compasses only:

(i) Construct a triangle ABC such that AB = 6.5 cm, angle CAB = 60^{o} and angle ABC = 75^{o}.
(3 marks)

(ii) Construct a perpendicular of line AC at C and the perpendicular bisector of line BC and let them meet at pint O. (2 marks)

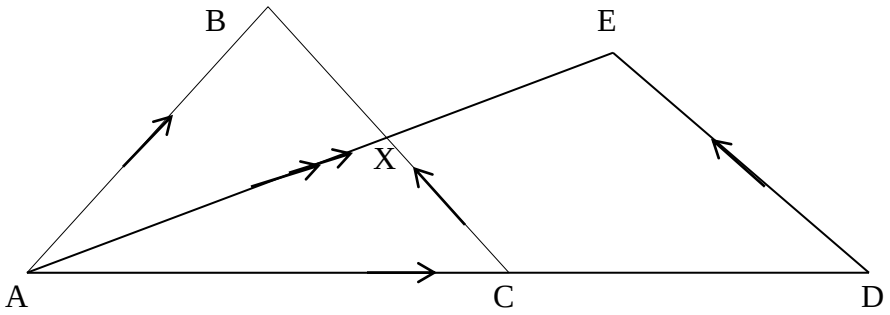
(iii) Draw a circle radius OB and centre O. The line AB extended meets the circle at point O.

(1 mark)

(iv) Construct a line parallel to line AC and passing through point D. This line meets the circle at point E.
(1 mark)

(v) Measure the sizes of lines DE and BC and hence find the area of BDEC. (3 marks)

22. In the figure below AB = ¾ $\underline{a}$ AX = $^2/_3$ $\underline{b}$. BC is parallel to ED such that BX = $^1/_3$ ED. AC: CD = 3:7



(a) Express the vectors BX and ED in terms of $\underline{a}$ and $\underline{b}$ only. (2 marks)

(b) Given that BC = hBX, express AD in terms of a, b and h. (3 marks)

(c) Given that AE = kAX, write an expression for AD in terms of a, b, and k. (2 marks)

(d) Solve for the values of h and k above. (3 marks)

23. The distance between two towns A and B is 460 km. A minibus left town A at 7:15 am and travelled towards B at an average speed of 65 km/h. A car left B at 9:45 am on the same day and travelled towards A at an average speed of 100 km/h.

(a) How far from B did they meet? (4 marks)

(b) At what time did the two vehicles meet? (3 marks)

(c) A motorist started from his home at 8:15 am on the same day and travelled to B at an average speed of 120 km/h. He arrived at the same time as the minibus. Calculate the distance from B to his home.
(3 marks)

24. The motion of a particle P moving a long a straight line is described by the equation

$s = 8t + 10t^2 - t^3$. Where s is the distance in metres and t is time in seconds.

Calculate:

(i) The distance when t = 2.5 sec. (2 marks)

(ii) The maximum velocity of the motion (4 marks)

(iii) The acceleration of motion after 3 seconds (2 marks)

(iv) The time at which the velocity is zero (2 marks)

RDS 4

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Use tables of square roots and reciprocals tables to evaluate to 3 decimal places the problem below.

$$\frac{10}{\sqrt{0.625}} + \frac{4}{\sqrt{164}}$$ (3marks)

2. By letting $P = 4^{-y}$ in the equation $4^{-2y+1} - 3x4^{-y} - 10 = 0$.

a) Write the above equation in terms of P. (1 mark)

b) Hence find the possible values of y. (3 marks)

3. The heights of two similar pails are 12cm and 8cm. The larger pail can hold 2 litres. What is the capacity of the smaller pail? (3 marks)

4. A tourist arrived in Kenya with sterling pound (£) 4680 all of which he exchanged into Kenyan money. He spent Ksh. 52,352 while in Kenya and converted the rest of the money into U.S dollars. Calculate the amount he received in U.S dollars. The exchange rates were as follows. (3 marks)

Currency	Buying	Selling.
US $	65.20	69.10
Sterling Pound (£)	123.40	131.80

5. Find the equation of the perpendicular bisector of the line AB where A is (3, 9) andB is (7, 5) giving your answer in the form ax + by + c = 0. (3 marks)

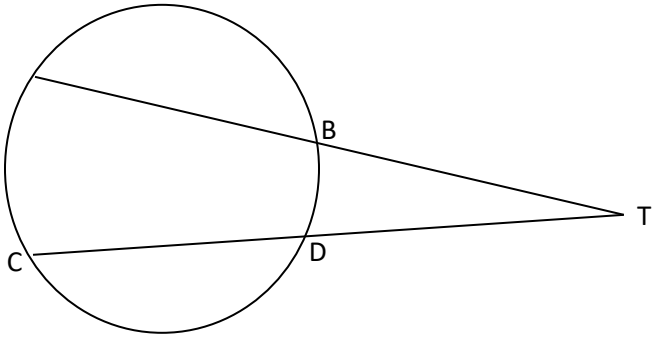
6. Solve the following inequality and show your solution on a number line. (3 marks)

$4x - 3 \leq \frac{1}{2}(x + 8) < x + 5$

7. From a viewing tower 30 metres above the ground, the angle of depression of an object on the ground is 30^0 and the angle of elevation of an aircraft vertically above the object is 42^0. Calculate the height of the aircraft above the ground. (3 marks)

8. Estimate the area bounded by the curve $y = \frac{1}{2}x^2 + 5$, the x- axis, the line x=1, and x=5 using trapezium rule with 4 trapezia. (3 marks)

9. Intersect chords in the figure below CD = 4cm, line DT= 8cm and AB = 6cm. AT and CT meet at point T. Calculate the length BT (3 marks)



10. Find the standard deviation of the data below; (3 marks)

35, 37,37,40,30,34,33,38

11. On the line segment AB below:

i. Construct on one side of AB the locus of P, such that $\angle APB = 90^0$

ii. Measure the length $\frac{AB}{2}$ and hence calculate the area enclosed by the locus P and the line segment AB. (4 marks)

A ——————————————— B

12. A carpenter constructed a closed wooden box with internal measurements 1.5 metres 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 0.6g/cm³.Determine the mass, in kilograms, of the wood used in constructing the box. (Leave your answer to 1 decimal place). (3 marks)

13. The sum of interior angles of a regular polygon is 1440°. Find the number of sides of the polygon. (3 marks)

14. Simplify the expression $\frac{2x^2+5x+3}{x^2-1}$ (3marks)

15. Given that Cos A = $\frac{5}{13}$ and angle A is acute, find the value of $2\tan A+3\sin A$ (2marks)

16. Given that $a = 0.\dot{4}\dot{5}$ and $b = 1.\dot{5}$. Find the percentage error in evaluating $\frac{b}{a}$ given that the values of a and b used are $a = 0.45$ and $b = 1.5$. Give answer correct to 2 d.p (4marks)

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

17. A surveyor recorded the measurements of a field book using XY=400m as the base line as shown below.

	Y	
To E 200	320	
	210	150 To D
To F 250	170	150 To C
	50	225 To B
	X	100 To A

a) Use a scale of 1cm to represent 50m to draw the map of the field. (5mks)

b) Find the area of the field in hectares (5mks)

18. (a). Use graphical methods to solve the simultaneous equations below. (5marks)

$7x = y + 12$

$3x = 2y + 2$

ON a separate graph paper provided

(b). Use matrix method to solve for the values of x and y that will satisfy the simultaneous equations below. (5marks)

$$7x - y = -33$$
$$3x - 2y = -22$$

19. a) Train A leaves a station 45 minutes before train B. Both trains travel in the same direction and their speeds are 36km/h and 48km/h respectively.

i) How long will it take train B to catch up with train A? (3 marks)

ii) How far from the start were the two trains when they met. (2 marks)

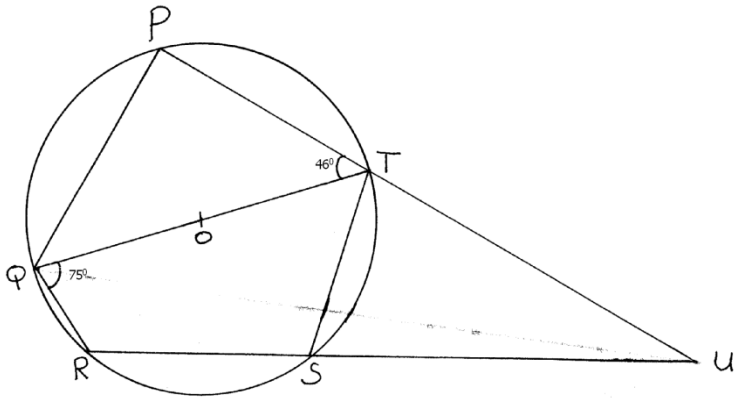
b) A car accelerated from rest to a velocity of 10m/s in 10 seconds. It travelled at this velocity for 20 seconds and then came to a stop in 5 seconds. Find;

i) The initial acceleration. (2 marks)

ii) The distance travelled. (2 marks)

iii) The average velocity. (1 mark)

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



Determine the following, giving reasons in each case:

(a) Angle RST (2marks)

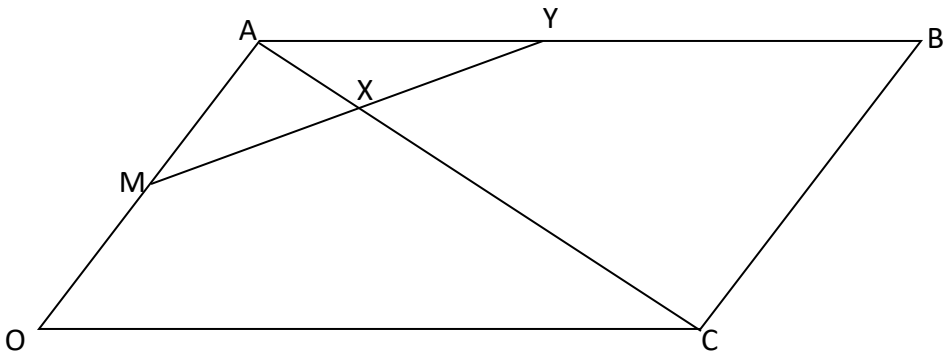
(b) Angle SUT (2marks)

(c) Angle PST (2marks)

(d) Obtuse angle ROT (2marks)

(e) Angle SQT (2marks)

21. OABC is a parallelogram M is the midpoint of **OA** and AX = $^{2}/_{7}$ AC , OA = **a** and OC = **c**



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

i) **AC** (1mark)

ii) **AX** (1mark)

iii) **MX** (2marks)

b) If AY = ***h***AB and MY = ***k***MX. Express **MY** in two different ways hence find the scalars ***h*** and ***k*** (4marks)

c) Find the ration AY: YB (2marks)

22. Four towns **P, R, T** and **S** are such that **R** is on a compass direction S3O^{o}E and 70km from P. The point**T** is on a bearing of 055^{o} from **P** and directly north of **R**. Town **S** is on a bearing of 290^{o} from T at a distance of 50 km.
Using a scale of 1cm to represent 10km, make an accurate scale drawing to show the relative position of the towns. (4marks)

Find:

(a) The distance and the bearing of **R** from **S** (3marks)

(b) The distance and the bearing of **S** from **P** (2marks)

(c) The distance of **P** from **T** (1mark)

23. The following are masses of 25 students in form 4 class.
49, 51, 50, 60, 55,45, 56, 51, 58, 59,40, 54, 44

44, 42, 59, 50, 62, 46, 43, 57, 56, 52, 43, 41,

(a) Prepare a frequency distribution table with a uniform class size starting with the class 40 – 43. (4 marks)

(b) Estimate the median mass (3 marks)

(c) Draw a histogram for the data. (3 marks)

24. A solution whose volume 80 litres is made up of 40% of water and 60% of alcohol. When x litres of water is added the percentage of alcohol drops to 40%.

a) Find the value of x (4marks)

b) Thirty litres of water is added to the new solution. Calculate the percentage of alcohol in the resulting solution. (2 marks)

c) If 5 liters of the solution in (b) above is added to 2 liters of the original solution. Calculate in the simplest form, the ration of water to that of alcohol in the resulting solution. (4 marks)

RDS 5

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate without using a calculator or Mathematical tables leaving your answer in the simplest form. (3mks)

$$\frac{\frac{4}{11} \text{ of } \left(\frac{3}{4} - \frac{1}{20}\right)}{\left(3 + \frac{1}{3}\right) \div \left(1 + \frac{1}{10}\right)}$$

2. A Kenya bank buys and sells foreign currencies as shown.

	Buying (Ksh)	**Selling (Ksh)**
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 shilling at the bank. While in Kenya, he spent a total of Ksh.289850 and then converted the remaining Kenya shilling to Japanese Yens at the bank. Calculate the amount in Japanese Yen that he received. (3mks)

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

4. The curved surface area of a cylindrical container is 1980cm2. If the radius of the container is 21cm, calculate to one decimal place the capacity of the container in litres (3 mks)
(Take $\pi = \frac{22}{7}$).

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

6. Using a pair of compasses and a ruler only construct a triangle ABC such that AB= 4cm, BC = 6cm and ZABC = 135°. (2mks)

(b) Construct the height of triangle ABC in (a) above taking AB as the base, hence calculate the area of triangle ABC. (2 mks)

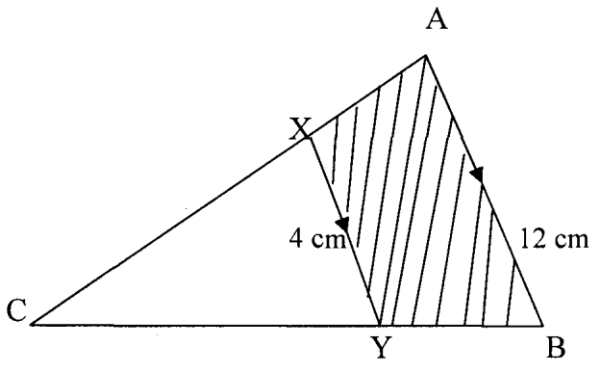
7. One interior angle of a polygon is equal to 800 and each of the other interior angles are 128°. Find the number of sides of the polygon. (3 mks)

8 . Given that tan c = 0.75, without using tables or a calculator find cos (180— ct) (3mks)

9. Simplify: (3 marks)

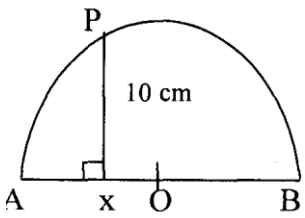
$$\left[\frac{X^3 - XY^2}{X^4 - Y^4}\right]^{-1}$$

10. 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)

11. In the figure below 0 is the centre of the circle diameter AB. <AXP = 900, AX 4cm and PX 10 cm. Calculate the radius of the semi-circle. (3 mks)



12. All prime numbers between ten and twenty are arranged in descending order to form a number.

(i) Write down the number. (1 mk)

(ii) State the total value of the third digit of the number formed in (i) above. (1 mk)

13. Find the value of x in the following equations: (3mks)

$(4)^{-2x} = (1/32)^{3x-4}$

14. The marked price of a car in a dealer's shop was Kshs 450,000. Wekesa 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. (3 mks)

1 5. Use tables of cubes, square roots and reciprocals to evaluate. (3mks)

$$\frac{3}{(0.3375)^3 - \sqrt{337.5}}$$

16. Without using tables or a calculator, evaluate (3mks)

$$\frac{(-2)\,x7 + (-4) \div (-3)}{3x(-2) + 5x(-4)}$$

17. (a) A bus traveling at 99km/hr passes a checkpoint at l0.00am and a matatu travelingati32kmihr in the same direction passes through the check point at 10.l5am. If the bus and the matatu continue at their uniform speeds, find the time the matatu will overtake the bus. (6 mks)

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 100m long. Determine the time in seconds that elapses before the two trains completely pass each other. (4 mks)

18. The vertices of triangle PQR are P(O,O), Q(6, 0) and R(2, 4)
(a)Draw triangle PQR on the grid provided. (lmk)

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 $P^1Q^1R^1$ and plot on the same grid. (2 mks)

c). Draw triangle $P^{11}Q^{11}R^{11}$ the image of triangle $P^1Q^1R^1$ under a positive quarter turn about points (1, 1). (3 mks)

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=l. (2mks)

e). Describe fully a single transformation that maps triangle $P^{111}Q^{111}R^{111}$ onto triangle $P^{/}Q^{/}R^{/}$ (2 mks)

19. 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 mks)

(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 mks)

(c) Calculate the total cost of the posts if one post costs sh 105. (2 mks)

20. The velocity of a particle t seconds after passing a fixed point 0, 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 mks)

(b) Hence find;

i) The values oft when the particle is instantaneously at rest. (2 mks)

ii) The total distance travelled by the particle during the first 4 seconds. (2 mks)

iii) The maximum velocity attained by the particle. (2mks)

21 . 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 he histogram to represent the distribution. (4mks)

iii) State the group in which the median mark lies. (1 mk)

(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.
(2 mks)

22. A frustum of a cone is such that one of its ends is hemispherical with a radius of2lcm and the other top end is circular with a radius of 10.5cm .The perpendicular distance between the centres of the circular parts is 20cm. Find;

(a) The slant length of the original cone. (3 mks)

(b) The slant length of the frustum. (2mks)

(c) The surface area of the frustum. (5 mks)

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

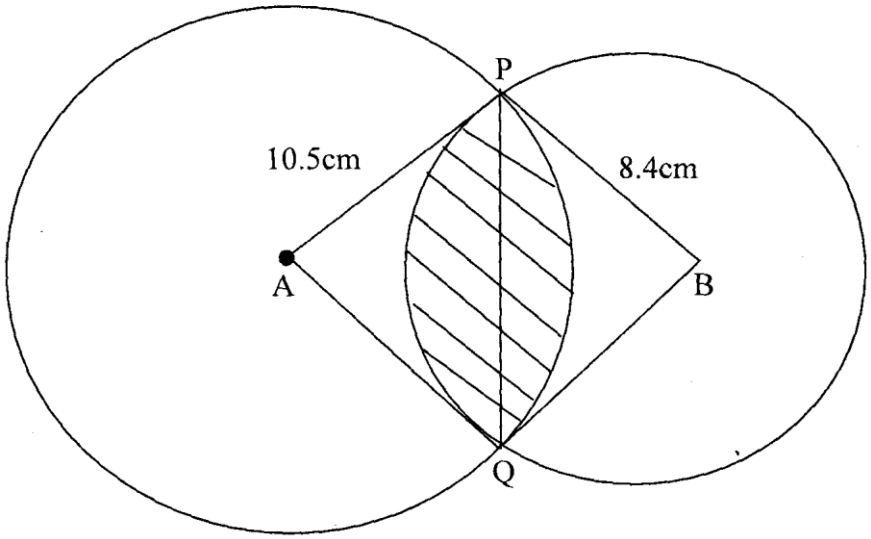
Find:

(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 (lmk)

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



(a) Calculate angle PAQ. (2 mks)

(b) Calculate angle PBQ. (2 mks)

(c) Calculate the area of the shaded part. (6 mks)

RDS 6

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate without using a calculator

$\frac{¼ + {}^{1}/_{5} \div ½ \text{ of } {}^{1}/_{3}}{}$ (3mks)

½ of $({}^{4}/_{5} - ¾ + ½)$

2. Simplify completely.

$\frac{3a^2 + 5ab - 2b^2}{b^2 - 9a^2}$ (3mk)

3. An artisan has 63kg of metal of density 7000kg/m^3. He intends to use it to make a rectangular pipe with external dimensions 12cm by 15cm and internal dimensions 10cm by 12 cm. Calculate the length of the pipe in metres. (3mks)

4. Given that *Sin* $\theta = 2/3$ and θ is an acute angle, find without using tables or calculators

(a) *tan* θ, giving your answer in surd form. (2mks)

(b) *Cos (90 - θ)* (1mk)

5. Four machines give out signals at intervals of 24, 27, 30 and 50 seconds respectively. At 5.00pm all the four machines give out a signal simultaneously. Find the time this will happen again. (3mks)

6. Two pipes **A** and **B** can fill an empty tank in 3hrs and 5hrs respectively. Pipe **C** can empty the full tank in 4 hours. If the three pipes **A**, **B**, and **C** are opened at the same time, find how long it will

take for the tank to be full. (3mks)

7. A tourist arrived in Kenya with sterling pound (£) 4680 all of which he exchanged into Kenyan money. He spent Ksh. 51,790 while in Kenya and converted the rest of the money into U.S dollars. Calculate the amount he received in U.S dollars. The exchange rates were as follows.

	Buying	**Selling.**	
US $	65.20	69.10	
Sterling Pound (£)	123.40	131.80	(4mks)

8. The gradient of a straight line $\mathbf{L_1}$ passing through the points **P** (3, 4) and **Q** (a, b) is $^{-3}/_{2}$. A line $\mathbf{L_2}$ is perpendicular to line $\mathbf{L_1}$ and passes through the points **Q** and **R** (2, -1). Determine the values of **a** and **b.**

(4mks)

9. Determine the quartile deviation of the set of numbers below. (2mks)

8, 2, 3, 7, 5, 11, 2, 6, 9, 4

10. The distance from a fixed point of a particle in motion at any time **t** seconds is given by

$S = t^3 - {}^5/_2 t^2 + 2t + 5$ metres

Find it's;

(a) Acceleration after **t** seconds (1mk)

(b) Velocity when acceleration is zero. (2mks)

11. Without using tables or calculators, find the value of **t** in

$\log (\frac{t}{8} + 5) - \log (t - \frac{3}{8}) = {}^2/_3$ (3mks)

12. Use the tables of cube roots, squares, and reciprocals to evaluate the following correct to 4 s.f

(3mks)

$$\frac{3}{(0.0136)^{1/3}} \quad \frac{2}{(3.72)^2}$$

13. Three years ago John was four times as old as his son Peter. In five years time the sum of their ages will be 56. Find their present ages. (3mks)

14. Find the inverse of the matrix $\begin{pmatrix} 1 & 1 \\ 3 & 1 \end{pmatrix}$. Hence determine the point of intersection of the lines. (4mks)

$y + x = 7$

$3x + y = 15$

15. The volumes of two similar solids are $800cm^3$ and $2700cm^3$. If the surface area of the larger one is $2160cm^2$, find the surface area of the smaller figure. (3mks)

16. Find the number of sides of a regular polygon whose interior angle is five times the exterior angle. (3mks)

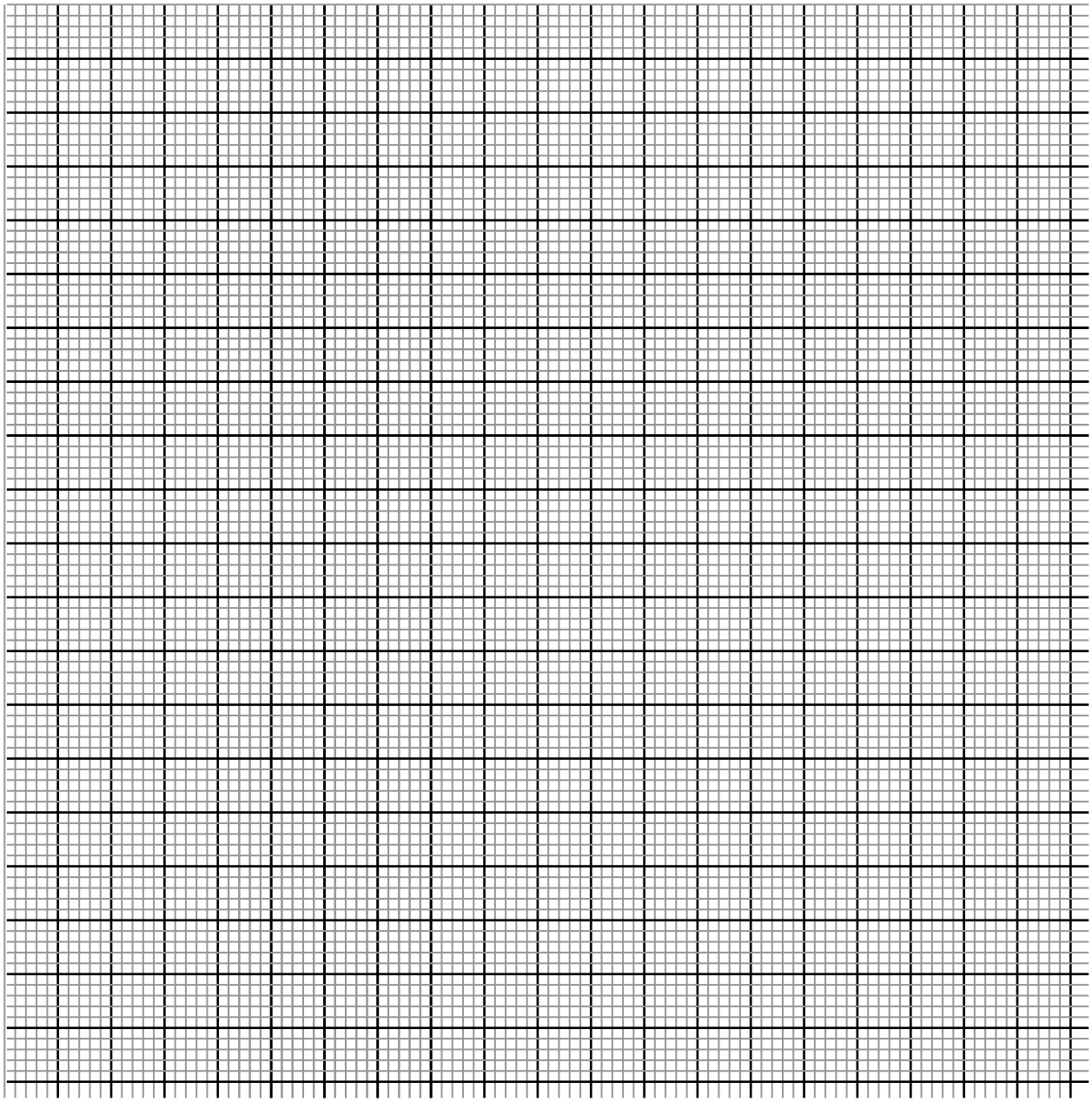
SECTION II (50 MARKS)

Answer any five questions in this section.

17. (a) Complete the table below for the equation $y = x^2 + 3x - 6$ given $-6 \leq x \leq 4$ (2mks)

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

(b) Using a scale of 1cm to represent 2 units in both axes; draw the graph of $y = x^2 + 3x - 6$ (3mks)



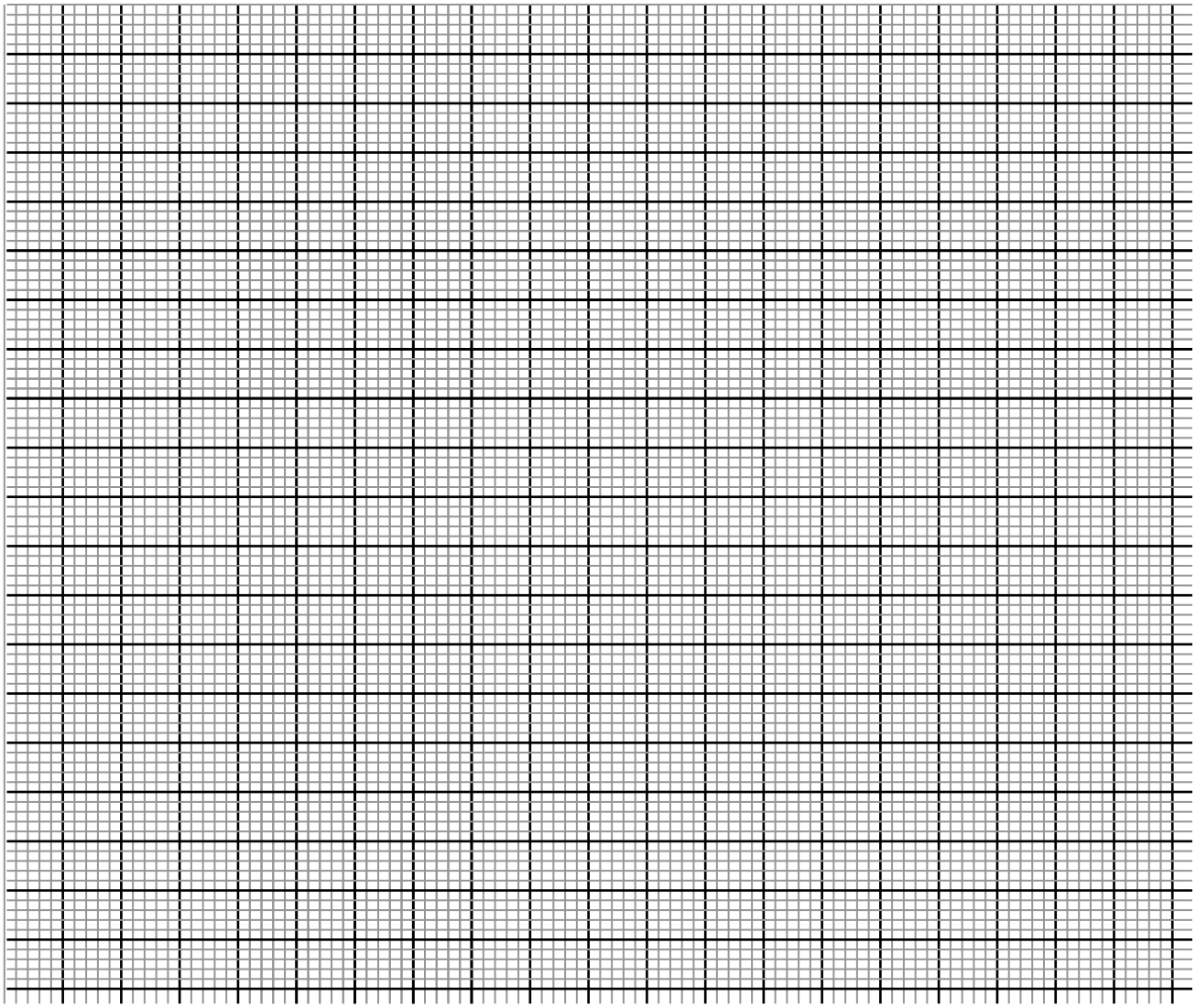
(c) Use your graph to solve the quadratic equations.

(i) $x^2 + 3x - 6 = 0$ (2mks)

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

18. (a) Plot a triangle **ABC** with coordinates **A**(-2,6) **B**(2,3) and **C**(-2, 3) (1mk)

(b) Reflect **ΔABC** in the line *x = -3*. Plot **Δ A^{I}B^{I}C^{1}** the image of **ΔABC** under this transformation.(2mks)



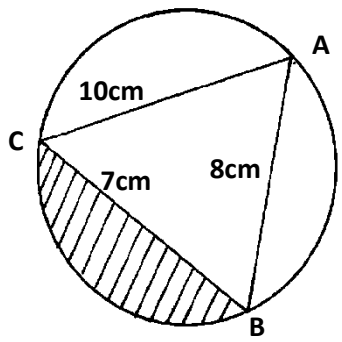
( )

(c) Translate A_I, B_I, C_I through 10 Label the image $A_2B_2C_2$ and write down the coordinates of the points A_2, B_2, C_2 (3mks)

(d) A_3 (6, -6), B_3 (2, -3) and C_3 (6, -3) is the image of A_2 B_2 C_2 after a transformation **P** plot $A_3B_3C_3$ and describe the transformation. (2mks)

(e) Describe fully a single transformation that would have mapped **ABC** to $A_3B_3C_3$. (2mks)

19. The figure below shows a triangle **ABC** inscribed in a circle. **AC** = 10cm, **BC** = 7cm and **AB** = 10cm.

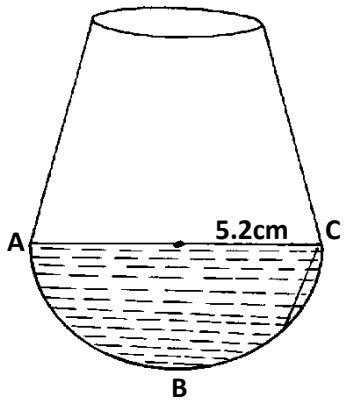


(a) Find the size of angle **BAC**. (2mks)

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

(c) Hence calculate the area of the shaded region. (6mks)

20. The figure below shows a cross-section of a bottle. The lower part **ABC** is a hemisphere of radius 5.2cm and the upper part is a frustrum of a cone. The top radius of the frustrum is one third of the radius of the hemisphere. The hemispherical part is completely filled with water as shown.

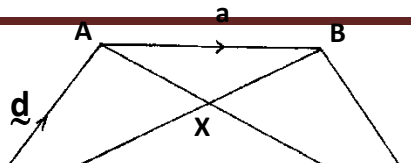


When the container is inverted, the water now completely fills only the frustrum part.

(a) Determine the height of the frustrum. (6mks)

(b) Find the external surface area of the bottle. (4mks)

21. In the figure below, **ABCD** is a trapezium. **AB** is parallel to **DC**, diagonals **AC** and **DB** intersect at **X** and **DC** = 2**AB**, **AB**= **a**, **DA** = **d**, **AX** = **kAC** and $\underset{\sim}{DX} = \underset{\sim}{hDB}$, Where **h** and **k** are constants.



(a) Find in terms of a and d $\tilde{\sim}$

(i) **BC**. (1mk)

(ii) **AX**. (2mks)

(iii) **DX**. (1mk)

(b) Determine

(i) The values of **h** and **k**. (5mks)

(ii) The ratio in which **X** divides **BD**. (1mk)

22. (a) Complete the table below for the function $y = x^2 + 3$ (2mks)

X	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Y	4		7			15.25	19		27		39

(b) Use the mid-ordinate rule with five strips to estimate the area bounded by the curve, the line $x = 1$ and the line $x = 6$. (2mks)

(c) Use integration to find the exact area in (b) above. (3mks)

(d) Calculate the percentage error arising from the use of mid-ordinate rule. (3mks)

23. Four cities **A**, **B,C,** and **D** are such that town **B** is 1500km due East of town **A**. Town **C** is 1800km due North of town **B**. Town **D** is on a bearing of 330^0 from town **A** and on a bearing of 300^0 from **C**.

(a) Use a ruler and compasses only to show the position of town **A, B, C, D**

(Take a scale of 1cm = 300km**)** (5mks)

(b) Determine

(i) The distance **AD**. (2mks)

(ii) The distance **CD** (2mks)

(iii) The bearing of town **D** from town **B**. (1mk)

24. A car leaves town **X** from town **Y** 120km away at an average speed of 70km/h at 8.00am. At the same time a bus leaves town **Y** for town **X** at an average speed of 50km/hr. At 8.15am, a cyclist leaves town **Y** for town **X** at an average speed of 30km/hr.

(a) Calculate the time when the bus meets the car. (3mks)

(b) Calculate the distance between the car and the bus by the time the cyclist meets the car. (4mks)

(c) If the bus upon reaching town **X** rests for 10 minutes then starts its journey back to **Y,** calculate how far from **X** the bus meets the cyclist. (3mks)

RDS 7

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate:

$$\frac{\sqrt{1/4}\ of\ 3\frac{1}{2} + \frac{3}{2}\left(\frac{5}{2} - \frac{2}{3}\right)}{\frac{3}{4}\ of\ 2\frac{1}{2} \div \frac{1}{4}}$$

(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 the same time, find the number of times the slowest runner will have been overlapped by the fastest at the time they all cross the starting point together again.

(3mks)

3. Kamau toured Switerland from Germany. In Switzerland he bought his wife a present worth

72 Deutsche marks. Find the value of the present in

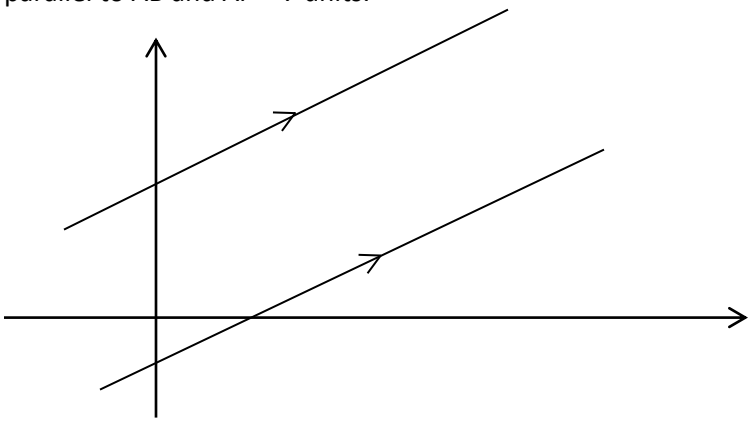
(a) Swiss Francs.

(b) Kenya shillings correct to the nearest sh, if

1 Swiss Franc = 1.25 Deutsche marks

1 Swiss Franc = 48.2 Kenya shillings (3mks)

4. The equation of line AB in the figure below is $y = 3\chi + 5$ and A is the point (0, a). Line PQ is parallel to AB and AP = 7 units.



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

(ii) Write down the equation of PQ. (2mks)

5. Solve the equation $2\chi^2 + 3\chi = 5$ by completing the square method.. (3mks)

6. Given that $\frac{3}{2-\sqrt{18}}+\frac{5}{2+\sqrt{18}}=a+b\sqrt{c}$. Find the values of a, b and c. (3mks)

7. The mean of five numbers is 20. The mean of the first three numbers is 16. The fifth number is greater than the fourth by 8. Find the fifth number. (3mks)

8. Show that the points P(3, 4), Q(4, 3) and R(1, 6) are collinear. (3mks)

9. Solve the inequalities $\chi \leq 2\chi + 7 \leq -\frac{1}{3}\chi + 14$ hence represent the solution on a number line.

(3mks)

10. Use the tables of squares, square roots and reciprocals only to find the value of

$$(0.0546)^{\frac{1}{2}} + \left(\frac{1}{4.327}\right)^2$$ (3mks)

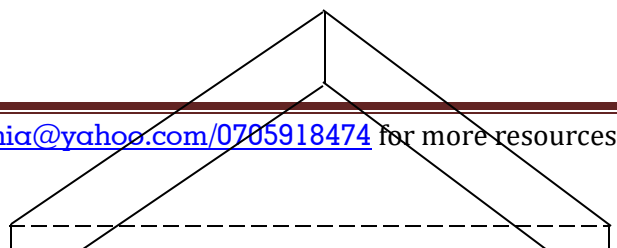
11. A circle of radius 7 units has it's centre at the point of intersection between the lines $\chi + 2y + 1 = 0$ and $2\chi + 3y - 3 = 0$. Find the equation of the circle expressing it in the form $\chi^2 + y^2 + y\chi + fy + c = 0$. (3mks)

12. The gradient of a curve at any point (χ, y) is given by $3\chi^2 + 2\chi$. If the curve passes through

the point (-2, 1). Find its equation. (3mks)

13. A solid metal cylinder with radius 7cm and height 5cm is melted down and recast into a spherical ball. Calculate to 1 decimal place the surface area of this ball. (4mks)

14. Sketch and label the net of the prism shown **below**.



15. The volume of two similar solid spheres are $4752cm^3$ and $1408cm^3$. If the surface area of the small sphere is $352cm^2$, find the surface area of the larger sphere. (3mks)

16. A carpenter constructed a closed wooden box with internal measurements 1.5 metres 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 0.6g/cm³.

Determine the:

(i) volume in cm³ of the wood used in constructing the box. (3mks)

(ii) mass of the box in kilograms correct to 1 decimal place. (1mk)

SECTION II: (50 MARKS)

Answer any **five** questions from this section in the spaces provided:

17. Two aeroplanes, T and S leave an airport A at the same time. S flies on a bearing of 060° at 750km/h while T flies on a bearing of 210° at 900 km/h.

(a) Use a suitable scale, to draw a diagram showing the relative position of the aeroplanes after two hours. (3mks)

(b) Use your diagram to determine:

(i) the distance between the two aeroplanes. (2mks)

(ii) the bearing of T from S. (1mk)

(c) Aeroplane T later flew to the East at the same speed for one hour. Show its final position on the diagram in (a) above.

Determine:

(i) Its final distance from A. (2mks)

(ii) Its final bearing from S. (1mk)

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

Taxable pay per month (Ksh)	Tax rates
1 – 9,680	10%
9,681 – 18,800	15%
18,801 – 27,920	20%
27,921 – 37.040	25%
37,040 and above	30%

That year Kazembe paid net tax of Ksh.5,512 per month. His total monthly taxable allowances amounted to Ksh.15,220 and he was entitled to a monthly personal relief of Ksh.1,162.

Every month the following deductions were made:

- NHIF – Ksh. 320
- Union dues – Ksh.200
- Co-operative shares – Ksh.7,500

(a) Calculate Kazembe's monthly basic salary in Ksh. (7mks)

(b) Calculate his monthly net salary. (3mks)

19. (a) On the grid provided **below**, draw the graph of $y = (\chi + 4)(1 - 2\chi)$ for the range

$-5 \leq \chi \leq 2$. (4mks)

(b) On the same grid draw the line $y + 3\chi = 2$. (2mks)

(c) Use your graph to solve the equations:

(i) $(\chi + 4)(1 - 2\chi) = -5$ (2mks)

(ii) $-2 - 4\chi - 2\chi^2 = 0$ (2mks)

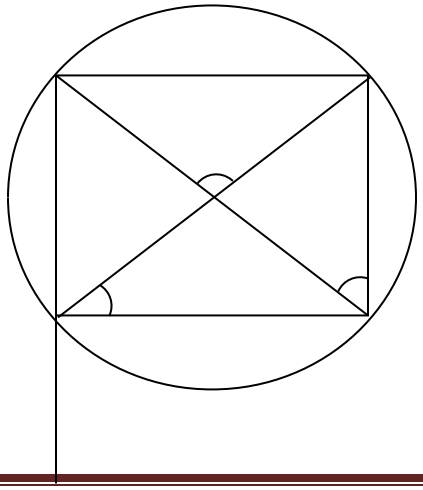
20. A tetrahedron has equilateral triangular base ABC of side 10cm. The vertex V is such that VA = VB = VC = 8cm. Calculate.

(a) The angle between the planes ABC and BCV. (5mks)

(b) The vertical height of the vertex V above the base ABC. (2mks)

(c) Volume of the tetrahedron. (3mks)

21. In the given figure, $\angle CAD = 50°$, $\angle BEC = 75°$ and $\angle BDC = 25°$. BAF is a straight line.



Giving reasons where necessary, calculate the size of:-

(i) $\angle ABC$. (2mks)

(ii) $\angle DEC$. (2mks)

(iii) $\angle ABD$. (3mks)

(iv) $\angle DAF$. (3mks)

22. A bag contains 5 red, 4 white and 3 blue beads. Two beads are selected at random one after another without replacement.

(a) Draw a tree diagram and show the probability space. (2mks)

(b) From the tree diagram, find the probability that:

(i) The last bead selected is red. (3mks)

(ii) The beads selected were of the same colour. (2mks)

(iii) At least one of selected beads is blue. (3mks)

23. A transformation represented by the matrix $\begin{pmatrix} 2 & 1 \\ 1 & -2 \end{pmatrix}$ maps the points A(0, 0), B(2, 0), C(2, 3) and D(0, 3) of the quad ABCD onto $A^1B^1C^1D^1$ respectively.

(a) Draw the quadrilateral ABCD and its image $A^1B^1C^1D^1$. (3mks)

(b) Hence or otherwise determine the area of $A^1B^1C^1D^1$. (2mks)

(c) Another transformation $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$ maps $A^1B^1C^1D^1$ onto $A^{11}B^{11}C^{11}D^{11}$.

Draw the image $A^{11}B^{11}C^{11}D^{11}$. (2mks)

(d) Determine the single matrix which maps $A^{11}B^{11}C^{11}D^{11}$ back to ABCD. (3mks)

24. The distance from town A to town B is 360km. A bus left town A and traveled towards town B at an average speed of 60km/h. After 1½ hours, a car left town A and traveled along the same road at an average speed of 100km/h.

(a) (Determine

(i) The distance of the bus from town A when the car took off. (2mks)

(ii) The distance the car traveled to catch up with the bus. (4mks)

(b) The distance from P to Q is 160km. If an express train was 16km/h slower it would take 20 minutes longer on the journey. Find the average speed of the express train. (4mks)

RDS 8

SECTION I (50 MARKS)

Answer 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 $5.8\dot{1}\dot{1}$ 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 **AB**. (3 Marks)

10. A regular polygon has internal angle of 150^0 and side of length 10cm.

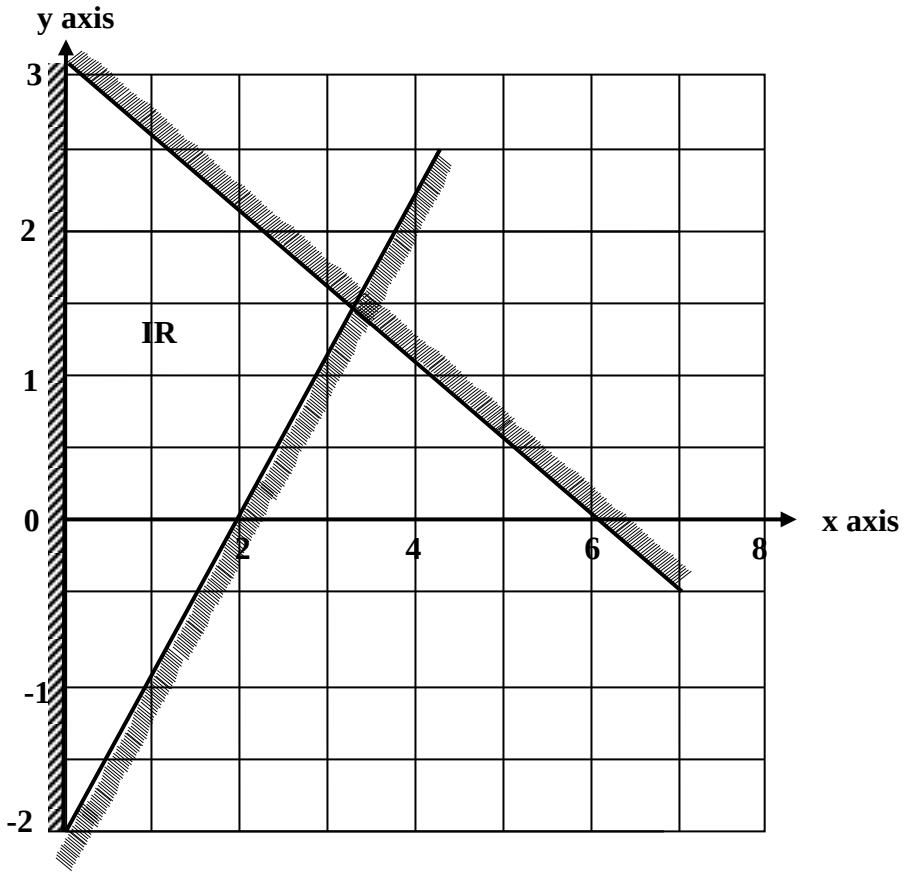
(a) Find the number of sides of the polygon. (2 Marks)

(b) Find the perimeter of the polygon. (2 Marks)

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

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

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.

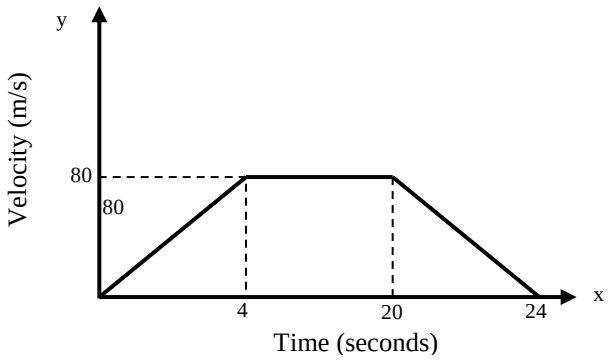
(4 Marks)

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).



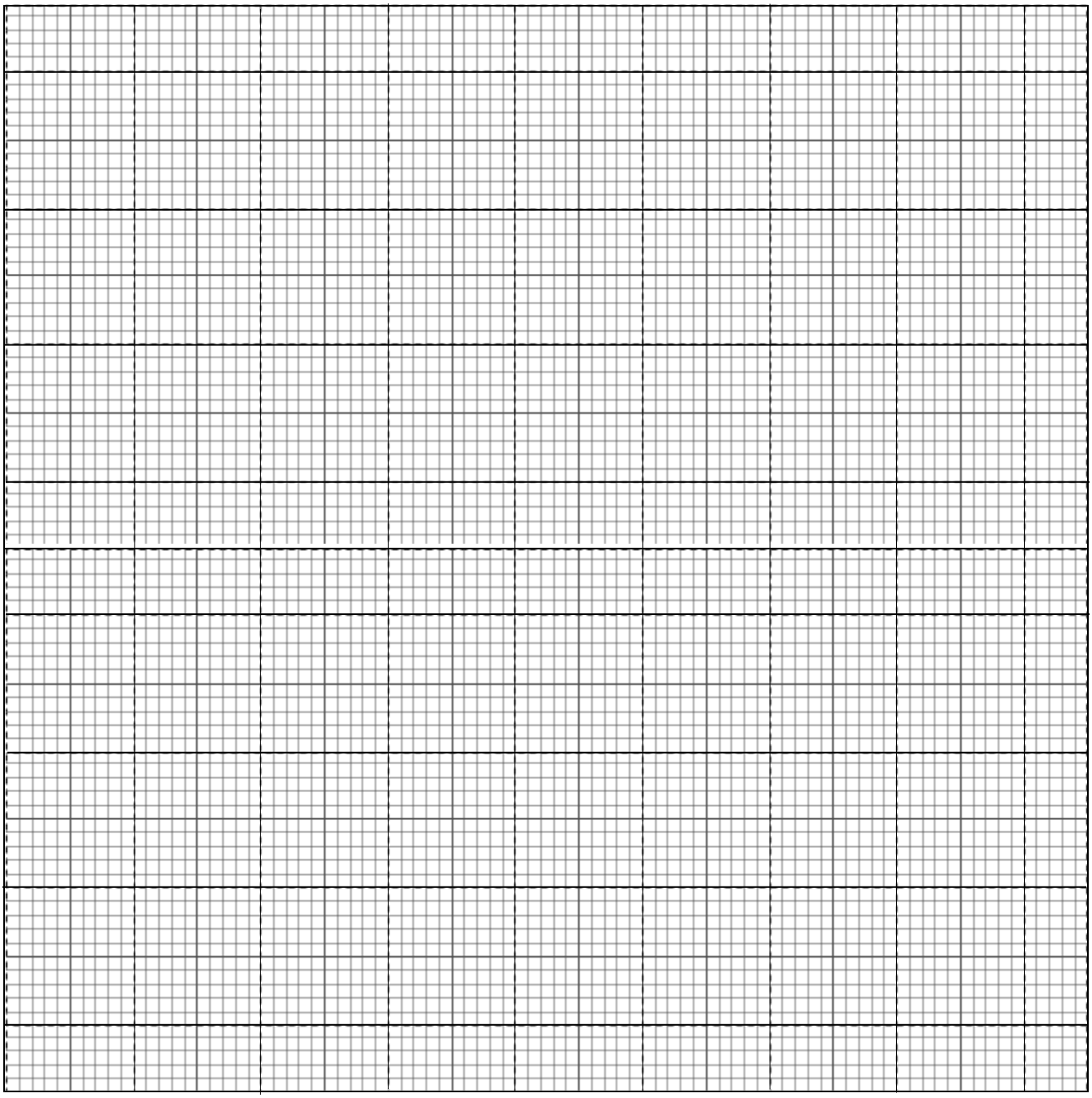
(a) Find the total distance traveled by the car? (2 Metres)

(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.

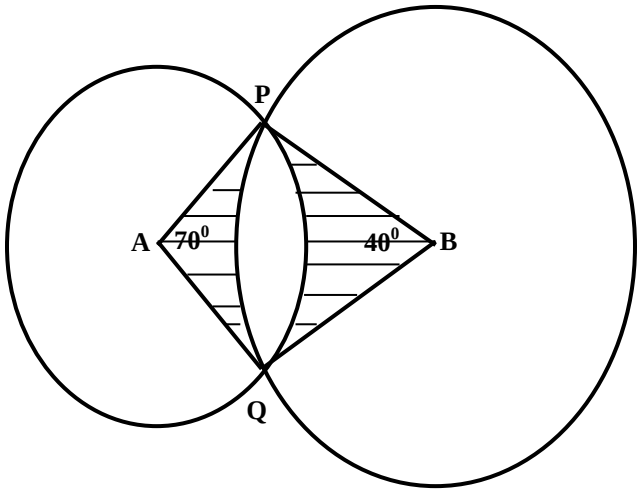
Marks (x)	8≤X<9	9≤X<11	11≤X<13	13≤X<16	16≤X<20	20≤X<21
No. of contents y	2	6	8	3	2	1

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)

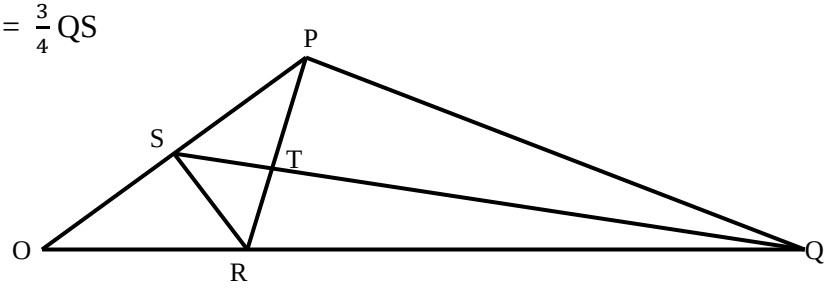
20. A bus and a Nissan left Nairobi for Eldoret, a distance of 340 km at 7.00 a.m. The bus travelled at 100km/h while the Nissan travelled at 120km/h. After 30 minutes, the Nissan had a puncture which took 30 minutes to mend.

(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 = p and OQ = q, express the following vectors in terms of p and q.

(i) SR (1 Mark)

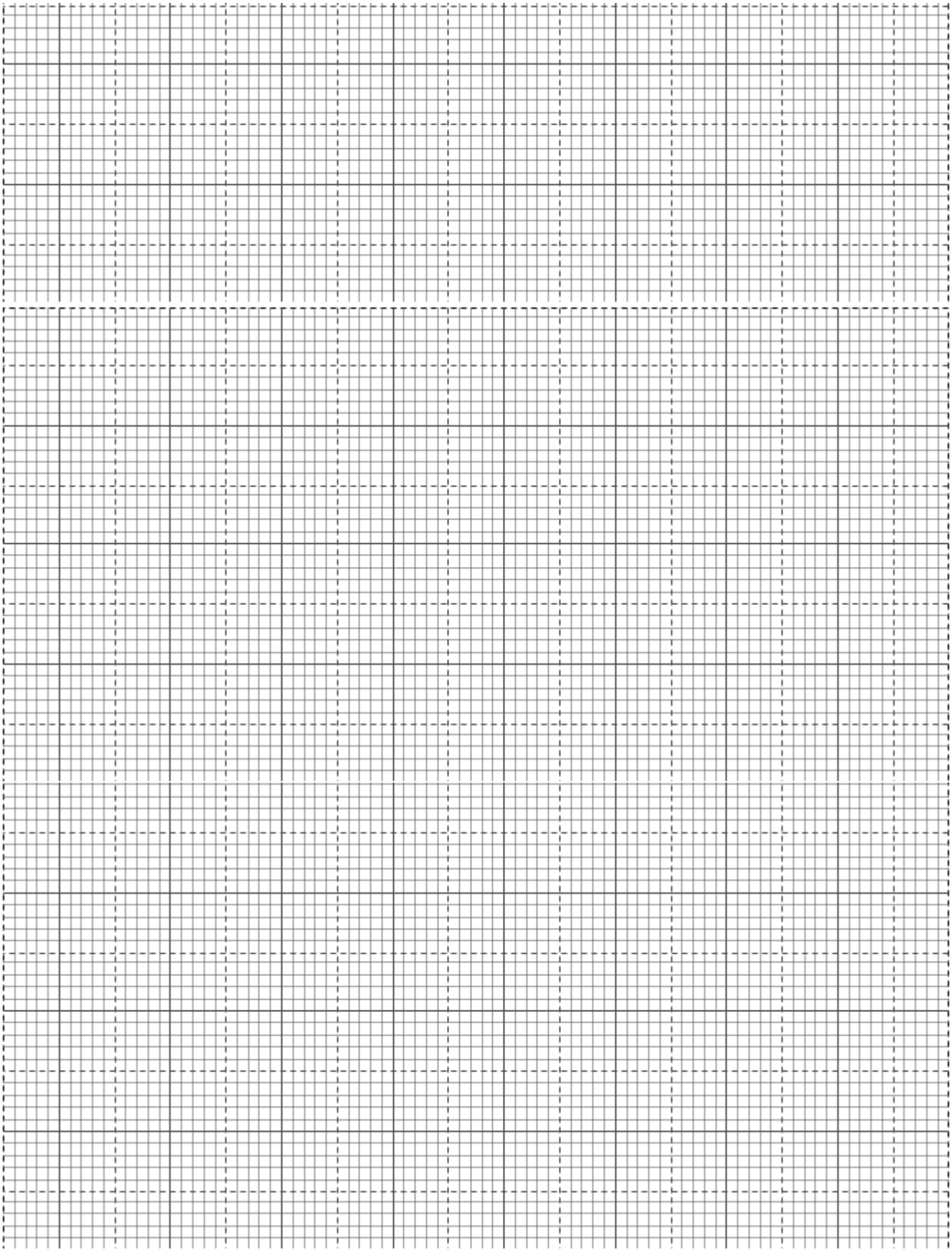
(ii) QS (2 Marks)

(iii) PT (2 Marks)

(iv) TR (2 Marks)

(b) Hence or otherwise show that the points P, T and R are collinear. (3 Marks)

22. On the grid provided below:
    (a) Draw triangle ABC whose coordinates are A (8,6), B(6,10) and C(10,12) and its image A'B'C' after undergoing a reflection in the line y = x. Write the co – ordinates of A' B' C' (4 Marks)



(b) Triangle A'B'C' undergoes an enlargement centre (0,0) scale factor 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)

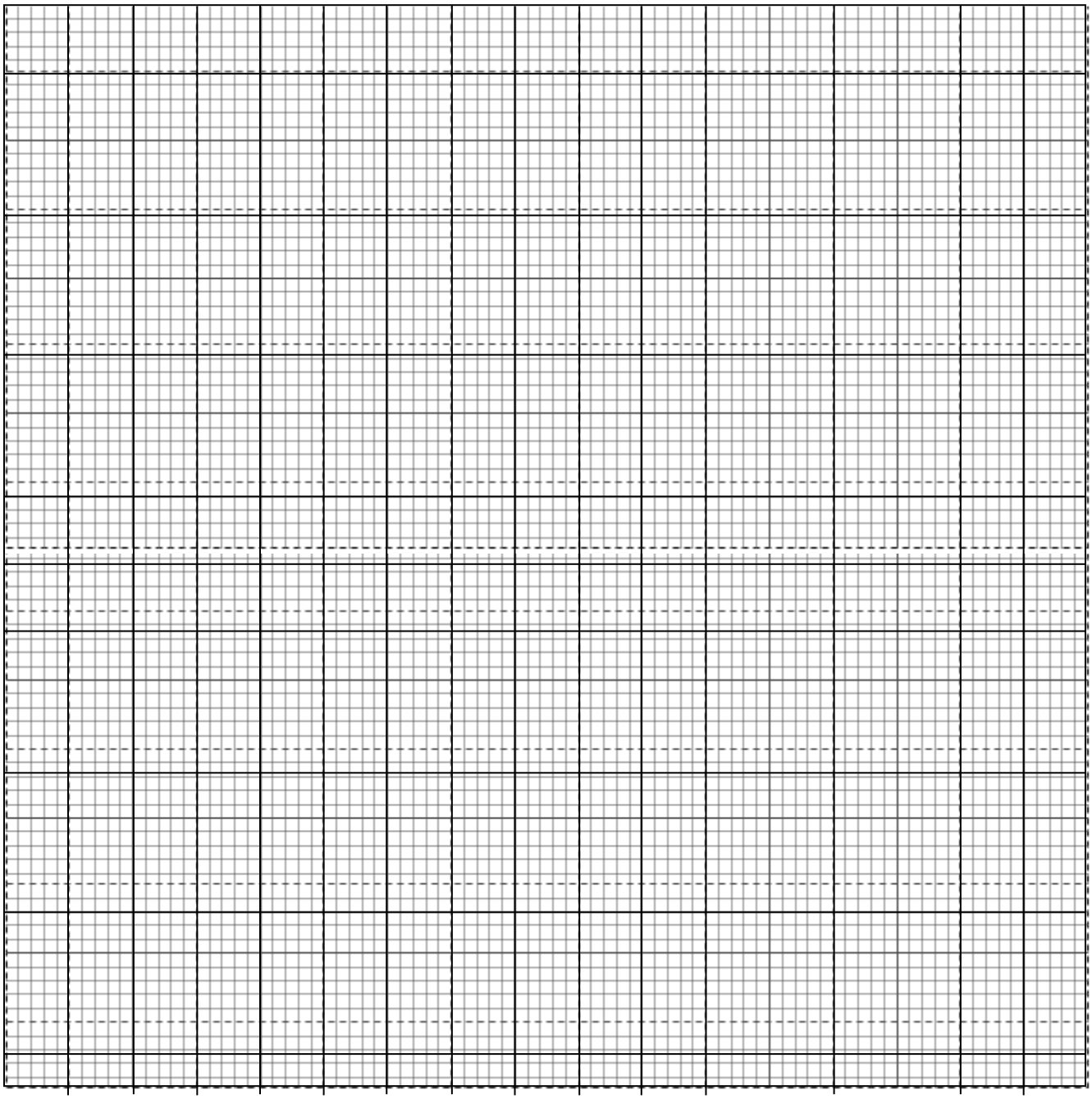
(d) Find the bearing of:
(i) B from C (1 Mark)

(ii) A from C (1 Mark)

24. (a) Fill the table below for the function $y = 2x^2 + 6x - 5$, for $-4 \leq x \leq 3$ (2 Marks)

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

(b) (i) Draw the curve for $y = 2x^2 + 6x - 5$, for $-4 \leq x \leq 3$ on grid given (1 Mark)



(ii) On the same axes, draw line $y = 7x + 1$ (1 Mark)

(c) Determine the values of x at the points of intersection of the curve $y = 2x^2 + 6x - 5$ and line $y = 7x + 1$ (1 Mark)

(d) Find the actual of the region bounded by the curve $y = 2x^2 + 6x - 5$ and line $y = 7x + 1$ (4 Marks)

RDS 9

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Use logarithm tables to evaluate $\sqrt[3]{\dfrac{351.67^2 \times \log 0.2753}{\sin 63^\circ}}$ (4 marks)

2. Given that $px^2 + 12x + 4p + px$ is a perfect square and that p is a constant, determine the value of p (3 marks)

3. Simplify the expression $\frac{x^2-9y^2}{2x^2-7xy+3y^2}$ (2 marks)

4. A small cone of height 8 cm is cut from a larger one to leave a frustum of height 16 cm. If the volume of the smaller cone is 160 cm^3, find the volume of the frustum (3 marks)

5. The data below represents marks scored by 40 students in an exam

72	35	49	37	25	25	70	38
63	42	51	40	39	20	41	35
51	39	27	31	38	63	72	64
23	35	46	48	39	56	69	67
31	28	42	51	55	48	49	37

Draw an appropriate frequency distribution table and use it to Calculate:

a) The mean mark
b) The median mark (4 marks)

6. 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 :

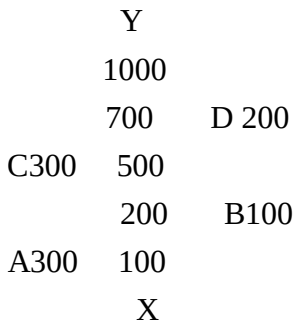
		Buying	Selling
1	Euro	73.4226	73.52953
100	Japanese yen	62.8011	62.8822

How much was left. (3marks).

7. A minibus travelling at an average speed of $17.5m/\sec$ left Nakuru at $1915hrs$. A taxi later left the same place at $2000hrs$ and caught up with the minibus at $2145hrs$. Find the average speed of the taxi. (3 marks).

8. Find the values of h and k if $h(3a-b)=(2-3k)b+ka$ given that the vectors **a** and **b** are neither parallel nor zero. (3marks)

9. Calculate the area in square kilometers of a dam whose measurements are indicated in metres. (4marks)



10. If they work for 8hrs a day 25 men can plant a certain number of trees in a forest plot in 63 days .Calculate the number of days 45 men working for 7 hrs a day would take to Plant the same number of trees (Assume that all the men work at the same rate). (3marks)

11. Determine all the integral values of x which satisfy the following simultaneous inequalities. (3 marks)

$$\frac{3 - 2x}{x} < 1$$

$$\frac{3x - 5}{2x} \leq 1$$

12. Work out $\frac{x}{w} + p$ given that $x = 0.1$, $w = 5.2452$ and $p = 0.6331$ (3 marks)

13. Use tables of reciprocals only to evaluate $\frac{(\,^{168}/_{56}\,)}{0.6735} + \frac{(\,^{728}/_{56}\,)}{0.156}$ (2marks)

14. During a rescue mission, four soldiers B, C,Q and D positioned themselves such that: B is 42km due south-west of Q, C is 50km on a bearing of S60^{0}E from Q while D is equidistant from B, Q and C. By using a scale of 1cm represent 10 km, construct a diagram to show the positions of the soldiers.

(4 marks)

15. Calculate the external surface area of a model of storage tank made up of conical top, a hemispherical bottom and cylindrical middle part shown below.

(4 marks)

16. From a point on a cliff, the angle of elevation to the top of a tower is 18° and that of depression to the foot of the tower is 15°. If the tower is 50 m away from the foot of the cliff, how high is the tower? Give your answer to 4 sf

(3 marks)

SECTION II (50 MARKS)

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

17. The boundaries PQ, QR, RS and SP of a piece of land are straight lines such that Q is 16 km on a bearing of 040 from P, R is directly south of Q and east of P and S is 12 km on a bearing of 120 from R.

a) Using a scale of 1:200000, represent the above information in a scale drawing (3 marks)

b) Calculate

i. The distance in km of the point P from S (3marks)

ii. The bearing of Q from S (1mark)

iii. The area of the piece of land PQRS in hectares (3 marks)

iv.

18. The table below shows taxation rates for income earned in a certain year

Monthly taxable income in Ksh.	Rate (Ksh/£)
1 – 10164	2
10165 – 19760	3
19761 – 29316	4
29317 – 38892	5
Over 38892	6

Mwangi is entitled to a personal tax relief of 1162. If his gross monthly tax was sh. 7803,

a) Calculate

i. Hisannual net tax that year (2marks)

ii. His annual taxable income in K£ (6marks)

b) If the ratio of Mwangi's basic salary to the allowances is 7:3, determine his basic monthly salary in Ksh (2marks)

19. Members of a certain group decided to raise sh. 225,000 to buy a plot of land, with each contributing the same amount. Before the due date for collection of the contribution, ten of the members withdrew from the project.

a) Letting n represent the original membership of the group, show that the increase in contribution per member was $\frac{2250000}{n(n-10)}$ (4marks)

b) If the increase in contribution per person was sh. 1125, what was the original number of members in the group (4 marks)

c) Calculate the percentage increase in the contribution per person caused by the withdrawal of the members. (2 marks)

20. If three cards are chosen from a pack without replacement ,

(i) Draw a tree diagram showing the outcome (3 marks)

(ii) What is the probability of getting at least two spades. (4 marks).

(iii) The probability of getting two consecutive spades out of three cards

(3 marks).

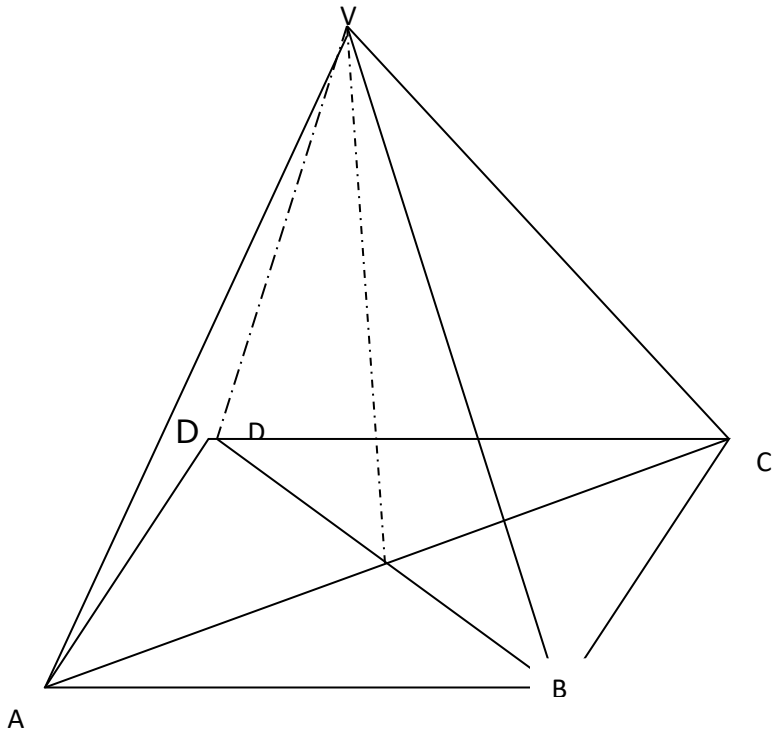
21. The diagram below shows a right pyramid with a horizontal rectangular base ABCD and vertex V .The area of the base is $60cm^2$ and the volume of the pyramid is $280cm^3$.

(a) Calculate the height of the pyramid (2 marks).

(b) Calculate the slant edge given that the ratio of the sides AB:BC of the base of the pyramid is 3:5

(5marks).

(c) Calculate the angle between the planes VCB and ABCD. (3 marks).



22. The table below shows values of t and some values of s for the curve $3t^2 + 12 = -4t - s + t^3$ in the range $-4 \leq t \leq 2$.

(a) Complete the table by filling the missing values of s. (2 marks)

t	-4.0	-3.5	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0
s		-4.1		1.1		-2.6		-9.4		-13.1		-7.9	

(b) On the grid provided draw the graph of $3t^2 + 12 = -4t - s + t^3$ for $-4 \leq t \leq 2$. Use the scale: horizontal axis 2cm for 1 unit and vertical axis 2 cm for 5 units. (3 marks)

(c) By drawing a suitable straight line, on the same grid as (b) above, solve the equation

(i) $3t^2 + 12 = -4t + t^3$ (2marks)

(ii) $-5t + 3t^2 = 6 - t^3$. (3marks)

23. Two variables p and q are believed to obey a law of the form

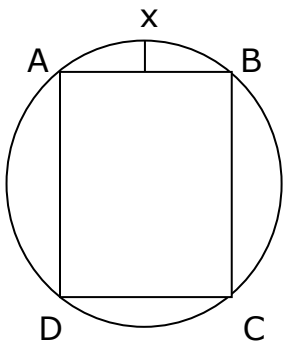
$$P = \frac{x}{\sqrt{q}} + y\sqrt{q}$$

The table below shows the results obtained from an experiment involving p and q.

q	2	5	8	11	14
p	5.2	10.3	14.0	17.2	19.8

By plotting a suitable straight line graph on the grid provided, determine the values of x and y. (10 marks).

24. The figure below is a circle centre o with rectangle ABCD inscribed in it. Chord AB = 24 cm. Perpendicular distance from point x to chord AB is 4 cm.



Find :

a) The length of chord AD. (2 marks)

b) The angle subtended by chord DC at the centre of the circle. (2marks)

c) The probability that if a point is chosen randomly inside the circle, it will be found in one of the shaded regions. (6 marks).

RDS 10

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate without using a calculator (2 Marks)

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

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

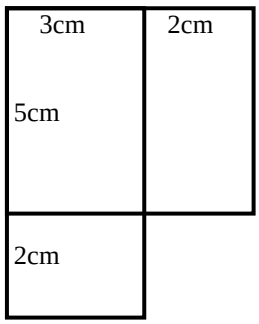
A tourist travelling from Britain arrives in Kenya with 5000 Euros. He converts all the Euros to Kenya shillings at the bank. While in Kenya he spends a total of KSh. 289,850 and then converts the remaining Kenya shillings to US dollars at the bank. Calculate (to nearest dollar) the amount he receives?

(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)

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

8. 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)

9. 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)

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

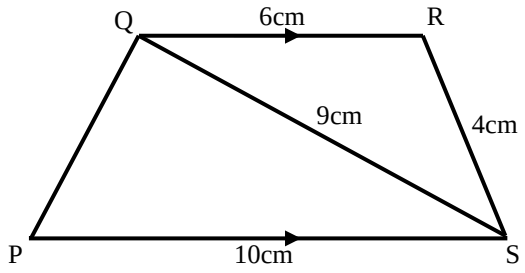
11. Three pens and four exercise books cost Sh. 87. Two pens and five exercise books cost Sh. 93. Find the cost of one pen and one exercise book. (4 Marks)

12. 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)

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

14. 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)

15. 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)

16. 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

17. 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

18. 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)

19. 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

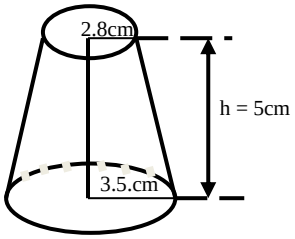
(a) (i) The modal class (1 Mark)

(ii) The median class (2 Marks)

(b) (i) The mean of the seedlings (4 Marks)

(ii) The median of the seedlings (3 Marks)

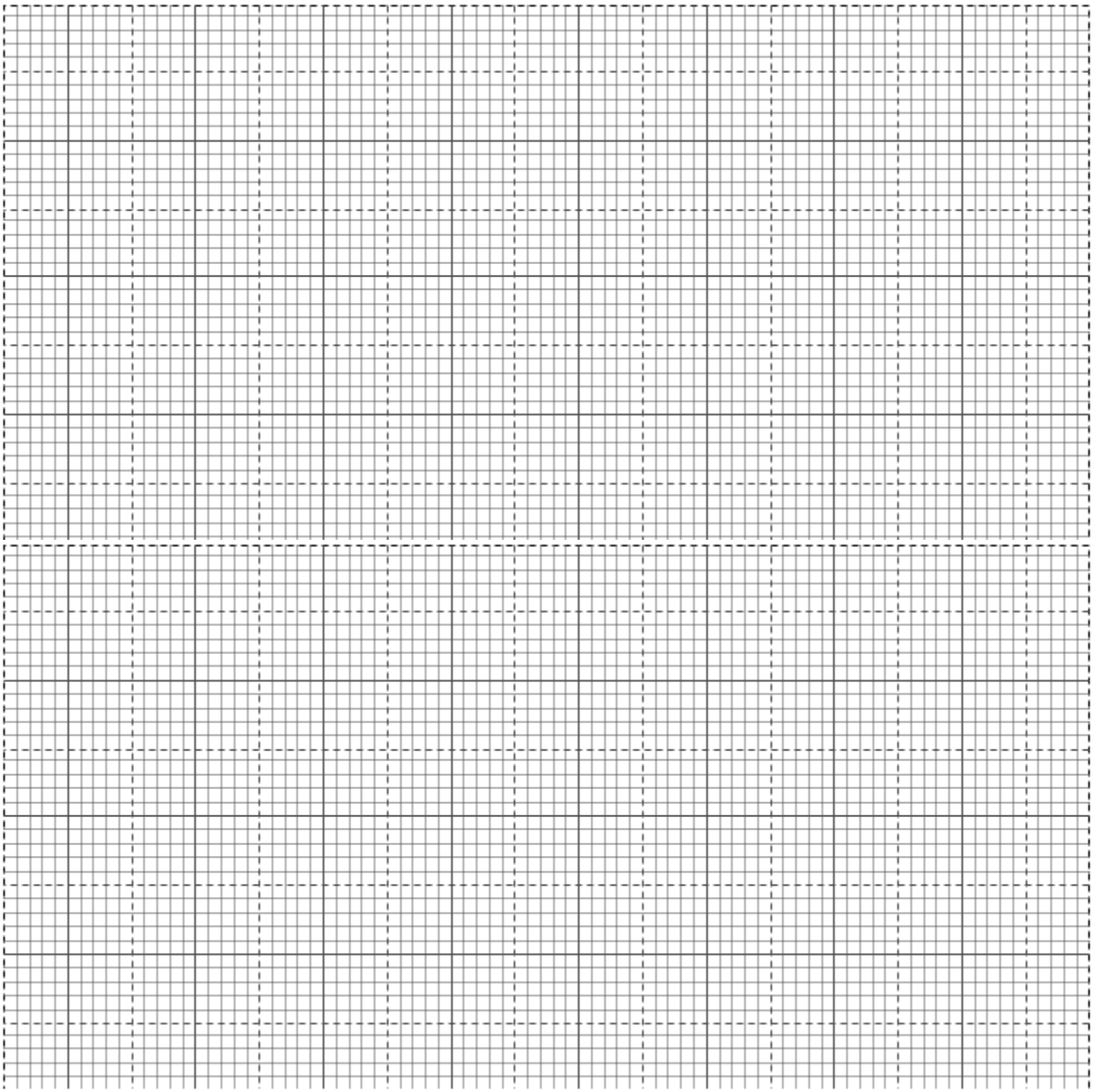
20. Find



(a) The surface area of the frustrum (5 Marks)

(b) The volume of frustrum shown. (5 Marks)

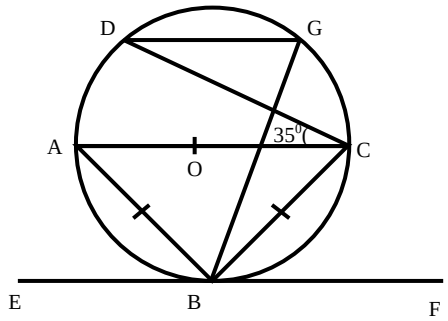
21. Triangle ABC vertices A (-2, 6), B (2, 3) and C (-2, 3) is reflected in the line x = -3 to give the image $A_1B_1C_1$. $A_1B_1C_1$ is translated by the vector $\begin{pmatrix}10\\2\end{pmatrix}$to give image $A_2B_2C_2$. $A_3B_3C_3$ with coordinates A_3 (6,-6) B_3 (2,-3) and C_3 (6,-3) is the image of $A_2B_2C_2$ after transformation.
Plot all the triangles in the grid provided and determine



(i) The transformation that maps $A_2B_2C_2$ onto $A3B_3C_3$ (2 Marks)

(ii) The simple transformation that maps ABC onto $A_3B_3C_3$ (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

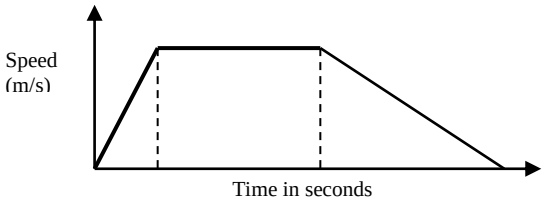
(i) $\angle BAD$ (3 Marks)

(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)

RDS 11

SECTION I (50 MARKS)

Answer ALL Questions in this Section

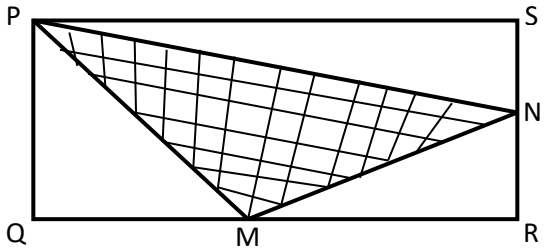
1. Evaluate: $\frac{\frac{1}{2} of\ 18 \div -3 + 2\frac{1}{2} x \frac{3}{-5}}{\frac{1}{2} + 3\frac{3}{4} \div \frac{3}{4}}$ (3 marks)

2. A line L passes through point (3, 1) and is perpendicular to the line $2y = 4x + 5$. Determine the equation of L (3 marks)

3. Solve the following inequalities and represent the solution on a number line and hence state the integral values of x

   $7x - 4 \leq 9x + 2 < 3x + 14$ (4 marks)

4. In the figure below PQRS is a rectangle in which PS = 10Kcm and PQ = 6Kcm M and N are midpoints of QR and RS respectively. Find the area of the shaded part. (4 marks)



5. A seven sided polygon has three of its angles equal to θ and the other angles are (2θ - 30), (θ + 28), 3(θ - 4) and (126 - θ). Calculate the value of θ (3 marks)

6. Solve for x in the equation. (3 marks)

$\frac{81^{2x} \, x \, 27^{x}}{9^{x}} = 729$

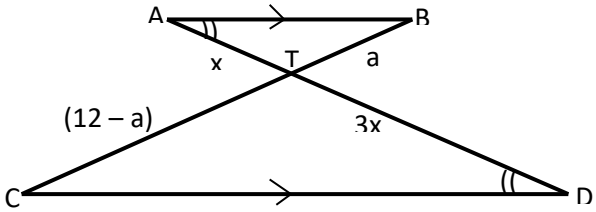
7. The GCD and LCM of three numbers are 3 and 1008 respectively. If two of the numbers are 48 and 72, find the least possible value of the third number. (3 marks)

8. Mr. Waweru needs to import a car from Japan where cost is USD 5000 outside Kenya. He intends to buy the car through an agent who deals in Japanese yen. The agent will charge him 20% commission on the price of the car and further 80,325 Japanese yen for shipment of the car. How many Kenya shillings will he need to send to the agent to obtain the car given that?
1USD = 105.00 yen and 1USD = KSh. 63.00

(3 marks)

9. 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)

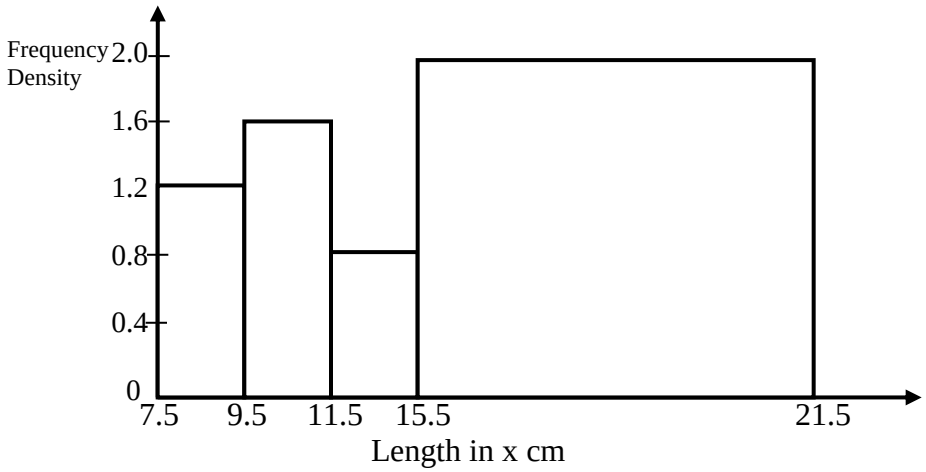
10. The figure below AB//CD, AD and BC intersect at T. Given that AT:TD = 1:3 and CB = 12cm. Calculate the length of TB. (3 marks)



11. Use a calculator to work out. (3 marks)

$$\left(\frac{34^3 - 257}{97\ x\ 1243}\right)^{\frac{1}{4}}$$

12. The figure below shows a histogram.



Fill in the table below the missing frequencies.

Length in x cm	Frequency
7.5≤ x ≤ 9.5	12
9.5≤ x ≤ 11.5	
11.5≤ x ≤ 15.5	
15.5≤ x ≤ 21.5	

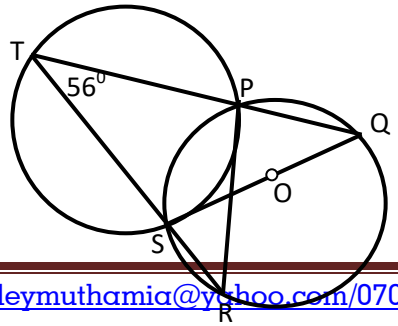
13. Solve for x: $(Log_2\ x)^2\ Log_2\ x^3 = 4$ (4 marks)

14. Mutua bought 8 pairs of trousers and six shirts at Sh. 4160. Had he bought twice as many shirts and half as many trousers, he would have saved Sh. 160. Find the cost of each item. (3 marks)

15. Simplify the following expression. (3 marks)

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

16. In the figure below O is the centre of circle PQRS. $\angle PTS = 56^0$ and $\angle PQS = 28^0$ and TPQ is a straight line.



Find: (a) ∠TSP (1mark)

(b) ∠PRQ (1 mark)

SECTION II (50 marks)

17. Three partners Mutua, Muthoka and Mwikali 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 passengers with each paying Sh. 250. The matatu makes two round trips each day and ever full. Each day Sh. 6000 is used to cover running costs and wages.

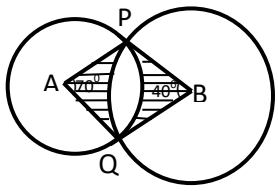
(a) Calculate their net profit per day. (2 marks)

(b) The matatu works for 25 days per month and is serviced every month at a cost of KSh.10, 000. Calculate their monthly profit in June. (1 mark)

(c) The three partners agreed to save 40% of the profit, 24% to be shared in the ratio of their contribution. Calculate Muthoka's share in the month of July (4 marks)

(d) The matatu developed mechanical problems and they decided to sell it through an agent who charged a commission of 5% on selling price. Each partner received KSh. 475,000 from the agent after he had taken his commission. Determine the price at which the agent sold the matatu. (3 marks)

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



Use the diagram to calculate to two d.p

(a) The length PQ (2 marks)

(b) The length PB (2 marks)

(c) Area of minor segment of circle centre A (2 marks)

(d) Area of minor segment of circle centre B (2 marks)

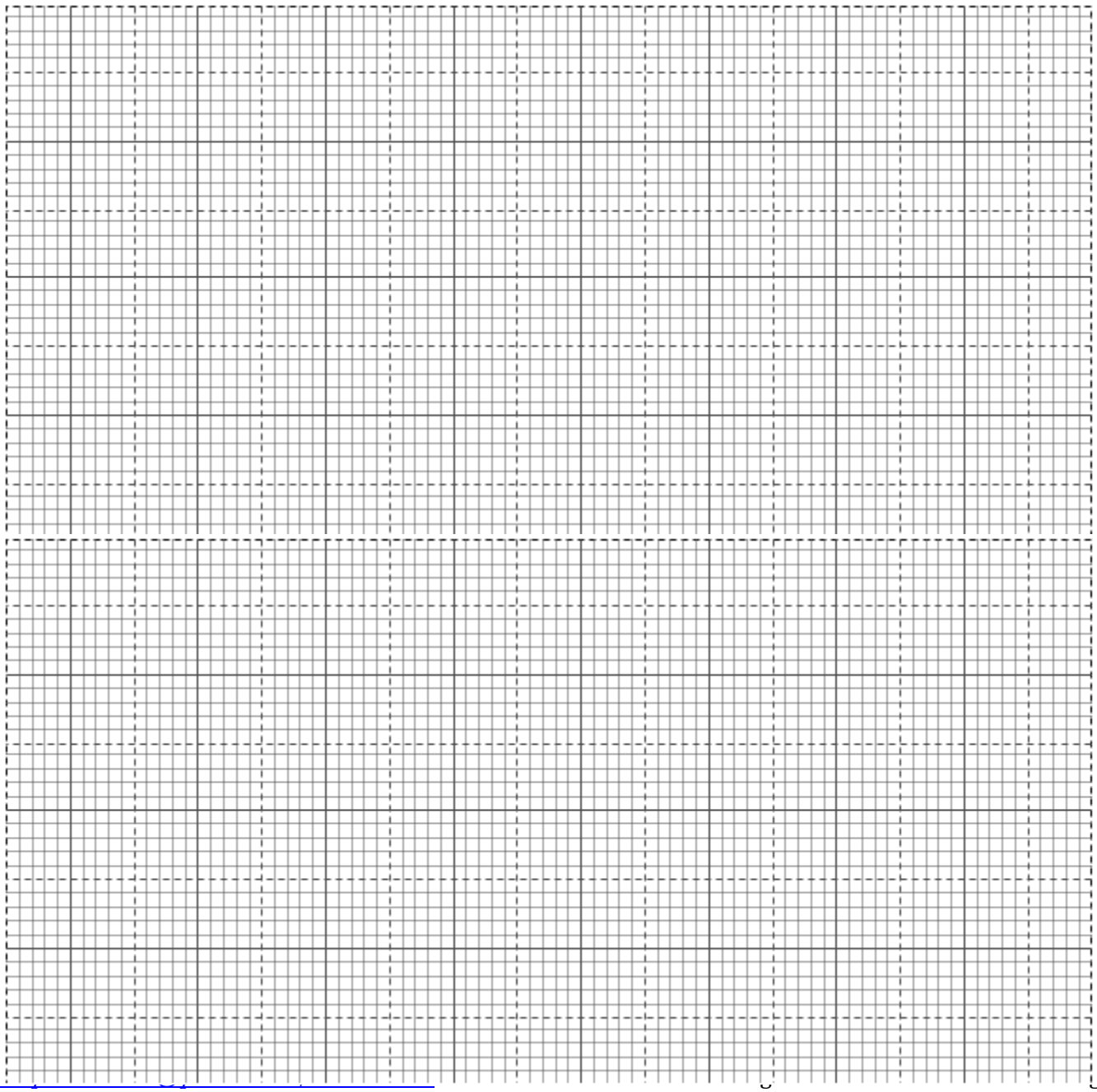
(e) The area of shaded region. (2 marks)

19. (a) (i) Fill the table below for the function.

$y = 2x^2 + 5x - 12$ for $-8 \leq x \leq 4$ (2 marks)

x	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4
$2x^2$	128					18				2			32
5x	-40					-15				5			20
-12	-12					-12				-12			-12
y	76					-9				-5			40

(ii) Using the table, draw the graph of the function $y = 2x^2 + 5x - 12$. Use the scale 1cm to 1 unit on the x-axis and 1cm for 10 units for the y – axis (4 marks)



(b) Use the graph drawn above to solve the following equations.

(i) $2x^2 + 5x - 12 = 0$ (2 marks)

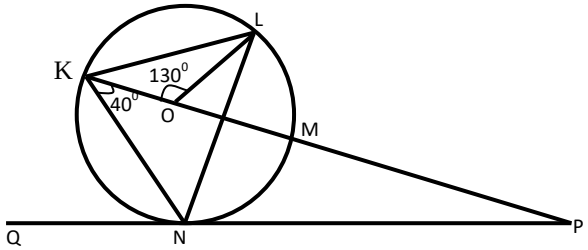
(ii) $3 - 7x - 3x^2 = 0$ (2 marks)

20. A country bus left Emali at 11.45 a.m. and travelled towards Mombasa at an average speed of 80km/hr. A Nissan matatu left Emali at 1.15 p.m on the same day and travelled along the same road at an average speed of 120km/hr. The distance between Emali and Mombasa is 400km.

(a) Determine the time of the day when the Nissan matatu overtook the bus. (5 marks)

(b) Both vehicles continue towards Mombasa at their original speeds. Find how long the matatu had to wait at Mombasa before the bus arrived. (5 marks)

21. In the figure below, K,L,M and N are points on the circumference of the circle centre O. The points K, O, M and P are on a straight line. PN is tangent to the circle at N. $\angle KOL = 130^0$ and $\angle MKN = 40^0$.



Stating the reason in each case, find the values of the following angles,

(a) MLN (2 marks)

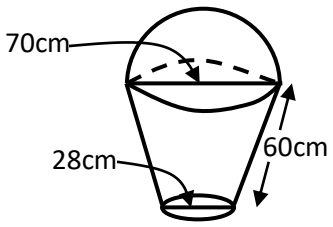
(b) OLN (2 marks)

(c) LNP (2 marks)

(d) MPN (2 marks)

(e) KNQ (2 marks)

22. The figure below shows a model of a solid in the shape of a frustum of a cone with a hemispherical top.



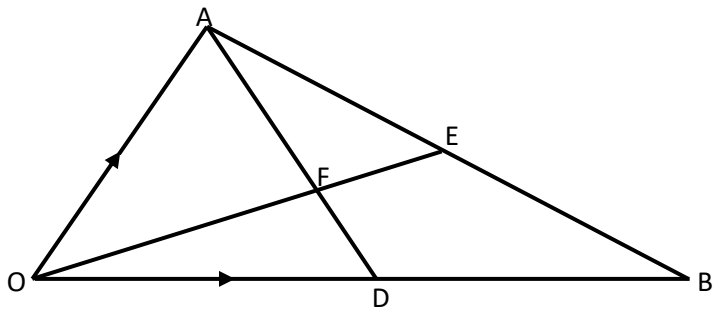
The diameter of the hemispherical top is 70cm and is equal to the diameter of the top of the frustum. The frustum has a base diameter of 28cm and a slant height of 60cm.

(a) Calculate the area of the hemispherical surface. (1mark)

(b) Calculate the slant height of the cone from which the frustum was cut. (4marks)

(c) Calculate the total surface area of the model (5 marks)

23. In the figure, E is the midpoint of AB and OD:OB = 2:5 and F is the point of intersection of OE and AD.



Given that OA = $\underset{\sim}{a}$ and CB = $\underset{\sim}{b}$ Express in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$

(a) (i) $\overrightarrow{OE}$ (1 mark)

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

(b) Given further that AF = tAD and OF = hOE where t and h are scalars, find the values of t and h (5 marks)

(c) Show that the points O, F and E are colliner (3 marks)

24. The displacement S metres of a body moving along a straight line after t seconds is given by

$S = -2t^3 + \frac{3}{2}t^2 + 3t$

(a) Find its initial acceleration. (3 marks)

(b) Calculate:-

(i) The time when the body was momentarily at rest. (3 marks)

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

(c) Calculate the maximum velocity attained (2 marks)

RDS 12

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate $\dfrac{\frac{3}{5}\text{ of }60-2\frac{2}{3}\text{ X }1\frac{1}{2}}{5\frac{5}{8}\text{ x }1\frac{7}{9}-\frac{5}{4}\text{ of }4\frac{4}{5}+2\frac{4}{5}\div\frac{7}{10}}$ (3mks)

2. Simplify the expression (3mks)

$$\frac{18x^2-8}{6x^2-x-2}$$

3. A line passing through the points A (-1,3x) and B (x,3) is parallel to the line whose equation is 2y = 9-3x. write down the co-ordinates of A and B (3mks)

4. A British tourist left UK for Kenya with UK £ 4000. He converted the whole amount into Kenya shillings. While in Kenya, he spent Sh. 250,000. After one week, he left Kenya for Belgium and converted the money he had to Euros. Using the conversion table below, calculate the amount he got to the nearest Euro. (4mks)

	Euros		UK £
Buying (Kshs)	107.91	132.50	
Selling (kshs)	108.54	132.77	

5. A man who has crossing a bridge 80m long had covered 30m on it. At that point, he saw an approaching truck 150M a head and he decided to run back at a speed of 3m/s. The man and the truck arrived at the end point of

the bridge at the same time. Calculate the speed of the truck in km/h
(3mks)

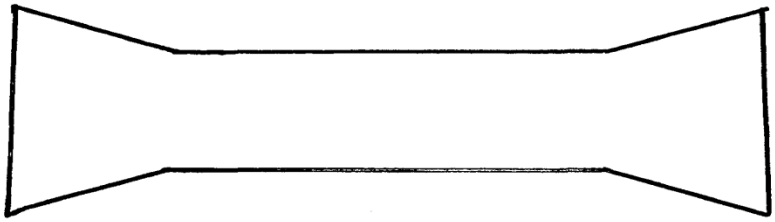
6. Solve for x in the equation $\left(\frac{1}{2}\right)^{x} x\left(\frac{1}{8}\right)^{1-x} = 32$ (3mks)

7. Determine the inverse of the matrix $t = \begin{pmatrix} 1 & 2 \\ 1 & -2 \end{pmatrix}$, hence find the co-ordinates of the point at which the two lines x + 2y = 7 and x – 2y = 1 intersect (4mks)

8. Using a pair of compasses and a ruler only, construct trapezium ABCD in which AB= 8cm, BC = 5cm , CD = 4.1cm and angle ABC = 60^{o} and AB is parallel to DC. Determine through construction, the height of the trapezium. (3mks)

9. A piece of wood whose volume is $90cm^3$ weighs 81 grams. Calculate the mass in kilograms of one cubic meter of the same wood. (3mks)

10. Find the calculation the sum of the interior angles if figure below (2mks)



11. Find the value of x that satisfy the equation log (5x – 4 = log (x+1) + 1 (3mks)

12. Given that tan θ = 0.75, find without using mathematical table or calculators. (3mks)

$$\frac{2 \sin \theta + \cos \theta}{}$$

13. The frequency distribution table below represents the number of kilogram of meat sold in a butchery.

Mass in Kg	1- 15	6-10	11-15	16 – 20	21-25	26-30	31-35
Frequency	1- 2	3	6	Y	3	2	1

(a) Find the value of y if the mean K was 16.4 2mks)

(b) Calculate the median Mass (2mks)

14. Two numbers are in the ratio 5: 7. When 15 is added to each number, the ratio changes to 5: 6.

Find the two numbers. (3mks)

15. In a triangle ABC, AB=6cm, BC = 5cm and AC = 7cm. find the are of the triangle. (2mks)

16. Two boys and a girls shared some money. The younger boy 5/8 of it. The elder boy got 7/12 of the remainder and the girl got the rest. Find the percentage share of the younger boy to the girl's share (2mks)

SECTION II

Answer only five questions from this section

17. A slaughter house bought a number of sheep at sh. 1,200 each and a number of oxen at sh. 15,000 each. They paid a total amount of shs. 135,000. If they had bought twice as many as many sheep and three oxen less, they would have saved sh. 15,000

(a) Find the number of each type of animals they bought. (6mks)

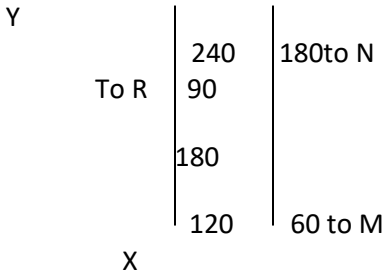
(b) The slaughter house sold all the animals at a profit of 30% per sheets and 35% per oxen. Determine the total profit they made. (4mks)

18. IN a map, the location of church, mosque, borehole, cattle d.p and a village polytechnic are given as follows. The mosque is 52km from the church on a bearing of 200°. the borehole is 75km on a bearing of 075°from the mosque. The cattle dip is 86km due west of the borehole and the village polytechnic is due North of the cattle dip a distance of 90km

(a) Locate by scale drawing the relative position of the station. Use a scale of 1cm to represent 10km
(5mks)

(b) Find the distance and bearing of the village polytechnique from the borehole (2mks)

(c) From a survey carried out, the following information was entered in a field book



If XY = 360m, determine the area of the field in hectares showing clearly the sketch of the map.

(3mks)

19. (a) (i) Draw the quadrilateral A (-6,-1), B (-6,-4), C (-3.-7) and D (-3,-2)

On the same grid draw the image

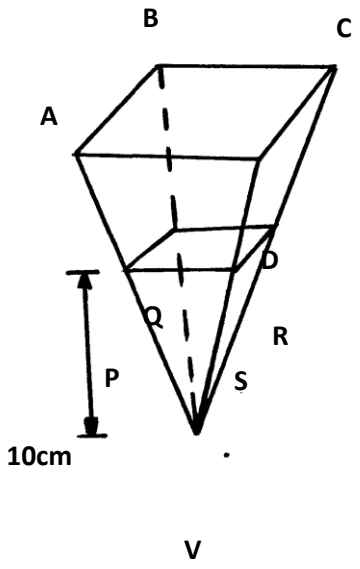
(ii) A'B'C'D' of ABCD under an enlargement centre(-1,-1) and scale factor Y. (2mks)

(b) A''B''C''D'' of image A'B'C'D' under a rotation centre (0,0) through 90^{o} (2mks)

(c) A'''B'''C'''D''' the image of A''B''C''D'' under a reflection in the line y = x – 2 (2mks)

(d) A''''B''''C''''D'''' the image of A'''B'''C'''D''' under a translation $\begin{pmatrix} 2 \\ 8 \end{pmatrix}$ and write down the co-ordiantes of the final image. (2mks)

20. The diagram below represents squared base pyramid standing rertically. AB = 12cm, PQ = 4cm and the height of pyramid PQSV is 10cm.



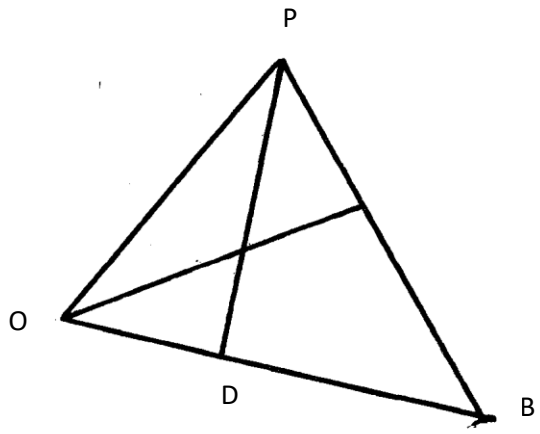
(a) If PQRSV is a solid, find the volume of material used to make it. (2mks)

(b) Find the (i) height of the frustrum ABCDPQRS (2mks)

(ii) Volume of the frustrum (3mks)

(c) The liquid from a hemisphere is poured into PQRS. Find radius of the hemisphere if the liquid from hemisphere filled the solid completely. (3mks)

21. In the figure E is the mid point of Ab, OD: OB = 2: 3 and F is the point of intersection of OE and AD



(a) Given that OA= **a** and OB= **b**. express the following OE and AD s in terms of a and q

(2mks)

(b) Given further that $\underset{\sim}{AF}=t\,\underset{\sim}{AD}$ and $\underset{\sim}{OF}=s\,\underset{\sim}{OE}$. Find the values of s and t. (5mks)

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

22. Sketch the curve $y = (x-3)(2x^2 - 3x+1)$

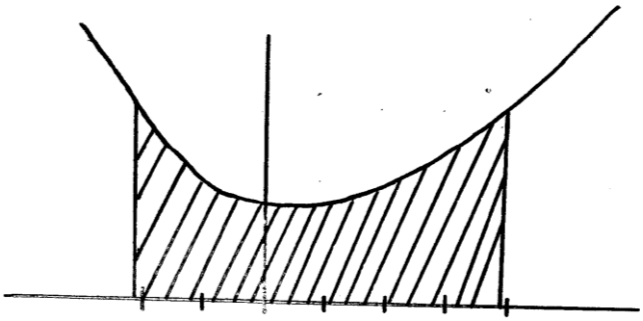
The equation of a curve is given by $y = 6x^2 - 12x - 18$

(a) Find the turning point of the curve. (3mks)

(b) Find the x-intercept and y –intercept . (5mks)

(c) Sketch the curve showing clearly the turning points and the intercepts. (3mks)

23. Given is a sketch of area bounded by the curve y = x2 + 3 and lines = -2 , x = 4 and y = 0



$y=x^2+3$

-2 -1 0 1 2 3 4

(a) Use the mid - ordinate rule with 6 strips to estimate the shaded area. (3mks)

(b) Determine the exact area in (a) above.

(c) Find the percentage error in the estimated area above

24. One day, Mr. Ortone bought some oranges worth Ksh. 45. On another day of the same week. Mrs Ortone spent the same amount of money but bought the oranges at a disconut of 75cents per orange.

(a) If Mr. Ortone bought an orange at Kshx, write down a simplified expression for the total number of oranges bought by the family in a week. (3mks)

(b) If Mrs. Ortone bought 2 oranges more than her husband, find how much she spent on an orange. (5mks)

(c) Find the number of oranges bought for the family in that week. (2mks)

RDS 13

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate without using tables or calculators (3marks)

$$\frac{\sqrt{45}\times(2.04)^2}{2.89\times\sqrt{0.05}}$$

2. Momanyi spent one eight of his February Salary on farming, half on school fees and two thirds of the remainder on food. Calculate his February salary and the amount he spend on school fees if he spent sh. 3200 on food. (3marks)

3. Makau, Wanjiru and Kemboi start a race at 9.03 a.m in the same direction to run round a circular course. Makau makes the circuit in 252 seconds, Wanjiru in 308 seconds and Kemboi in 198 seconds. If they start from the same point, at what time will they next be all at the starting point together?
(3marks)

4. Use squares square roots and reciprocal tables to evaluate (3marks)

$$3.045^2 + \frac{1}{\sqrt{49.24}}$$

5. Simplify the expression

$$\frac{9t^2 - 25a^2}{6t^2 + 19at + 15a^2}$$ (3marks)

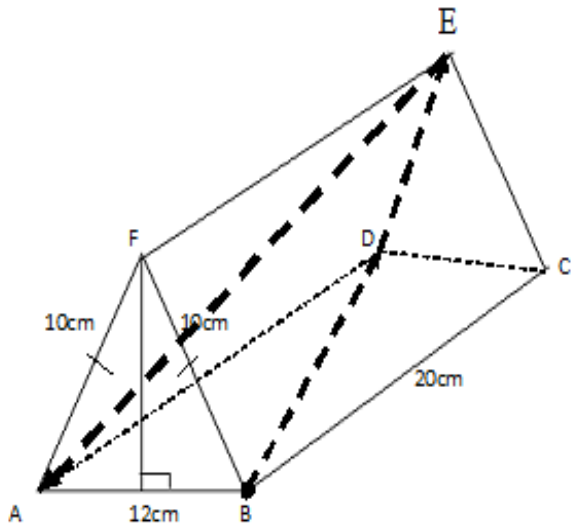
6. A square based brass plate is 2mm high and has a mass of 1.05kg. The density of the brass is 8.4g/cm^3. Calculate the length of the plate in centimeters. (3 marks)

7. The currency exchange rates of a given bank in Kenya are as follows;

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

A tourist arrived in Kenya with 5,000 US dollars which he converted to Kenya shillings upon arrival. He spent ksh.214, 500 and converted the remaining to sterling pounds. How many pounds did he receive? (3marks)

8. The figure below shows a simple tent.AF=FB=10cm, AB=12cm and BC=FE=AD=20cm. On the tent, a tight rope is tied as shown on the diagram from BD, DE and EA. Draw the net of the tent and show the path of the rope on the net using the scale $1cm$ rep. $5cm$ (3marks)



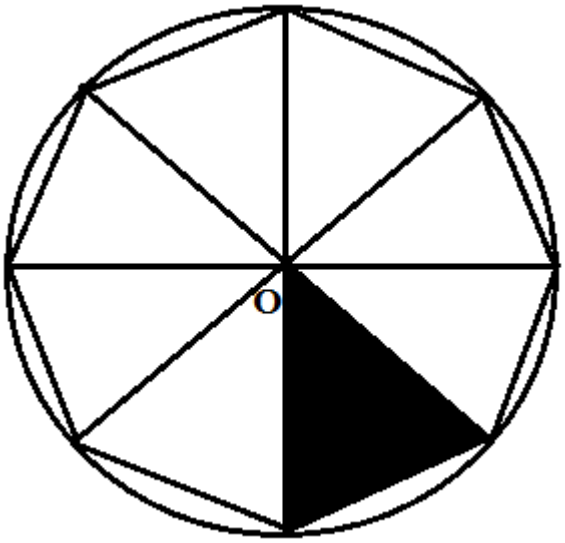
9. Mrs Wekesa paid shs 12500 for a wrist watch after the shopkeeper gave her a discount of 2%. If the shopkeeper made a profit of 20%.calculate the price the shopkeeper bought from the manufacturer.

(3marks)

10. Solve for x in $\left(\frac{4}{9}\right)^{x} \times (8)^{1-x} = 486$ (4marks)

11. Find the equation of a perpendicular bisector of line PQ if the coordinates of P and Q are (-2,6) and (4,-2) respectively, in the form $y = mx + c$ (3marks)

12. Complete the figure below by adding the correct missing features if it has a rotational symmetry of order 4 about O. (3marks)



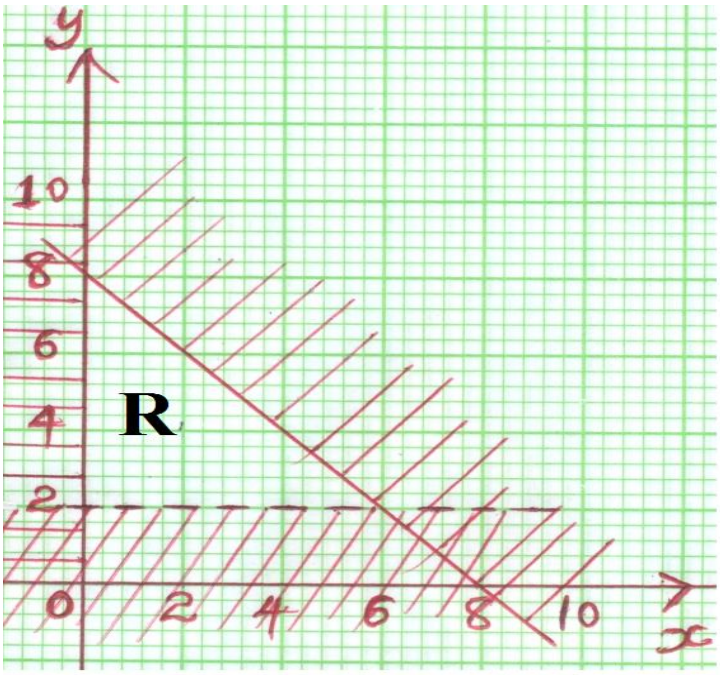
13. The volumes of two similar cylindrical containers are $27cm^3$ and $125\ cm^3$ respectively. Given that the height of the smaller container is 12cm, find the height of the larger container.

(3marks)

14. Without using calculator or mathematical tables, simplify (4marks)

$$\frac{\cos 30 - \sin 45}{\sin^2 30 + \tan^2 45}$$

15. Form three inequalities that satisfy the unshaded region R. (3marks)



16**.** A railway line and a road are parallel to each other on a flat and level section of land. A 5 metre long car moving at a speed of 110kmh^{-1} starts overtaking a train which is 495 metres and moving at 80kmh^{-1} .How long will it take the car to completely overtake the train?

(3marks)

SECTION II (50 Marks)

Answers only **five** questions from this section in the spaces provided.

17. The vertices of a parallelogram are O (0,0), A(5,0),B(8,3) and C(3,3)

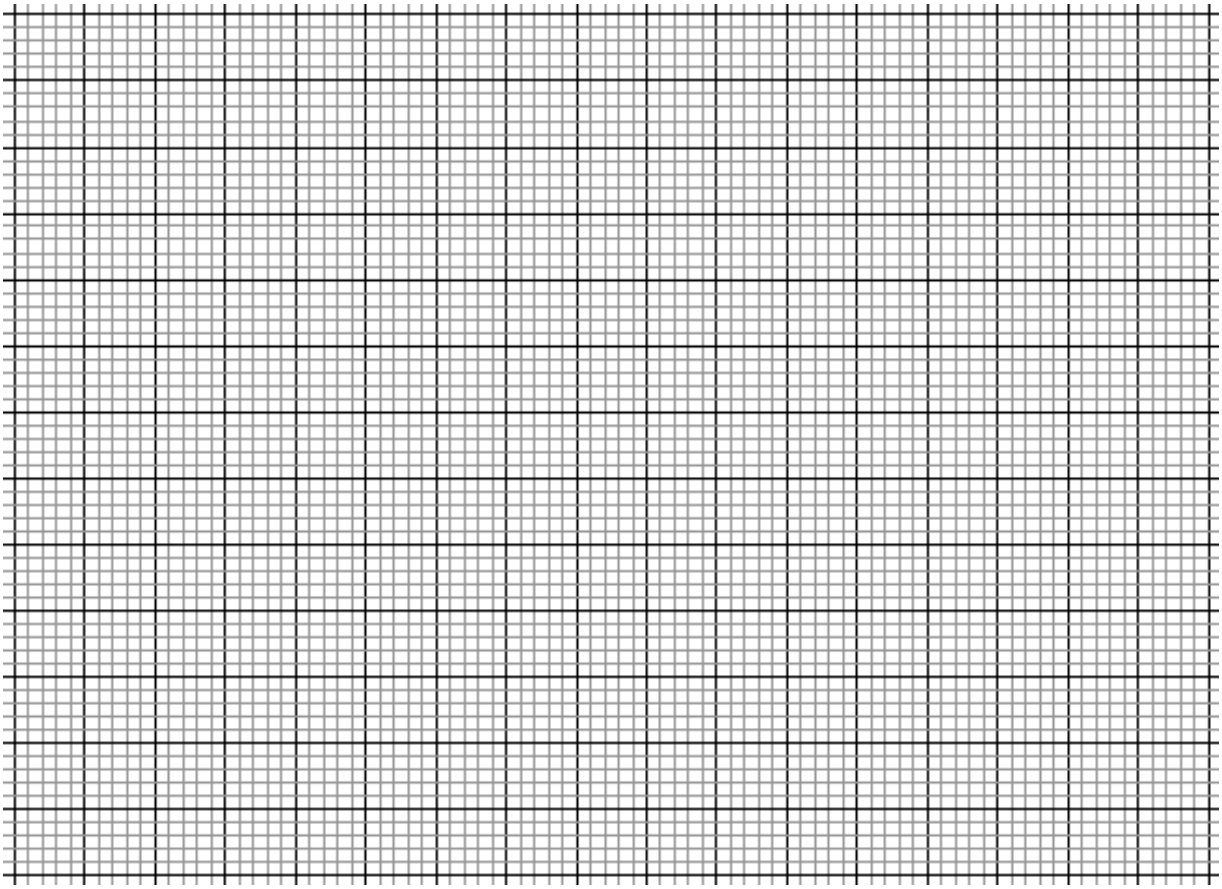
Plot on the same axes

i) Parallelogram O'A'B'C', the image of OABC under reflection in the line x=4 (4marks)

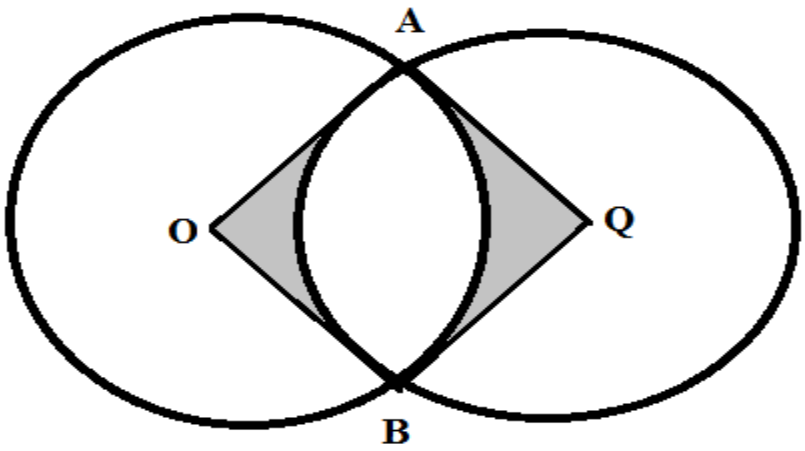
ii) Parallelogram O''A''B''C'' the image of O'A'B'C' under a transformation described by the matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.

Describe the transformation. (4marks)

iii) Parallelogram O'''A'''B'''C''', the image of O''A''B''C'' under the enlargement, centre (0,0) and scale factor $\frac{1}{2}$ (2marks)



18. Two circles with centres O and Q and radii 8cm intersect at points A and B as shown below.



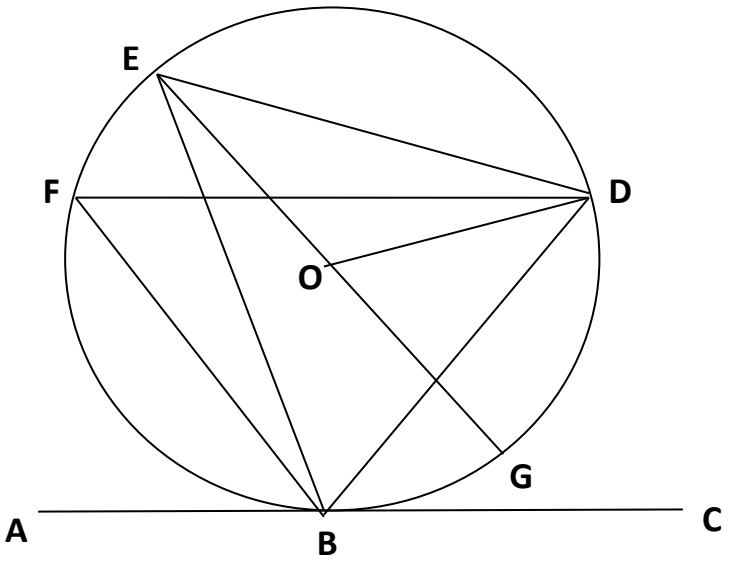
Given that the distance between O and Q is 12cm and that the line AB meets OQ at X, find:

(a) the length of the chord AB. (3marks)

(b) the reflex angle AOB. (3marks)

(c) the area of the shaded region. $\pi = 3.142$ (4marks)

20. In the figure below, EG is the diameter of the circle centre O. Points B, G, D, E and F are on the circumference of the circle. $\angle BFD = 50^0$, $\angle BEO = 25^0$ and line ABC is a tangent to the circle at B



Giving reasons, calculate the size of

(a) $\angle CBD$ (2marks)

(b) $\angle BED$ (2marks)

(c) The reflex angle BOD (2marks)

(d) $\angle EBA$ (2marks)

(e) $\angle BGD$ (2marks)

20. OAB is a triangle in which **OA= a, OB= b**, M is a point on OA such that OM:MA=2:3 and N is another point on AB such that AN:NB = 1:2. Lines ON and MB intersect at X.

a) Express the following vectors in terms of **a** and **b**

i) **AB** (1mark)

ii) **ON** (1mark)

iii) **BM** (1mark)

b) If **OX**=k **ON** and **BX**=h **BM**, express **ON** in two different ways. Hence or otherwise find the value of h and k

(6marks)

c) Determine the ratio OX: XN (1mark)

21. Every Sunday Alex drives a distance of 80km on a bearing of 074^0 to pick up his brother John to go to church. The church is 75km from John's house on a bearing of **S**50^0**E**. After church they drive a distance of 100km on a bearing of 260^0 to check on their father before Alex drives to John's home to drop him off then proceeds to his house.

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

(4 marks)

(b) Use your diagram to determine:

(i) the true bearing of Alex's home from their father's house. (1 mark)

(ii) the compass bearing of the father's home from John's home. (1 mark)

(iii) the distance between John's home and the father's home. (2 marks)

(iv) the total distance Alex travels every Sunday. (2 marks)

22. The data below shows the sample of age distribution of some of the people who reside in a Yoruba village in years.

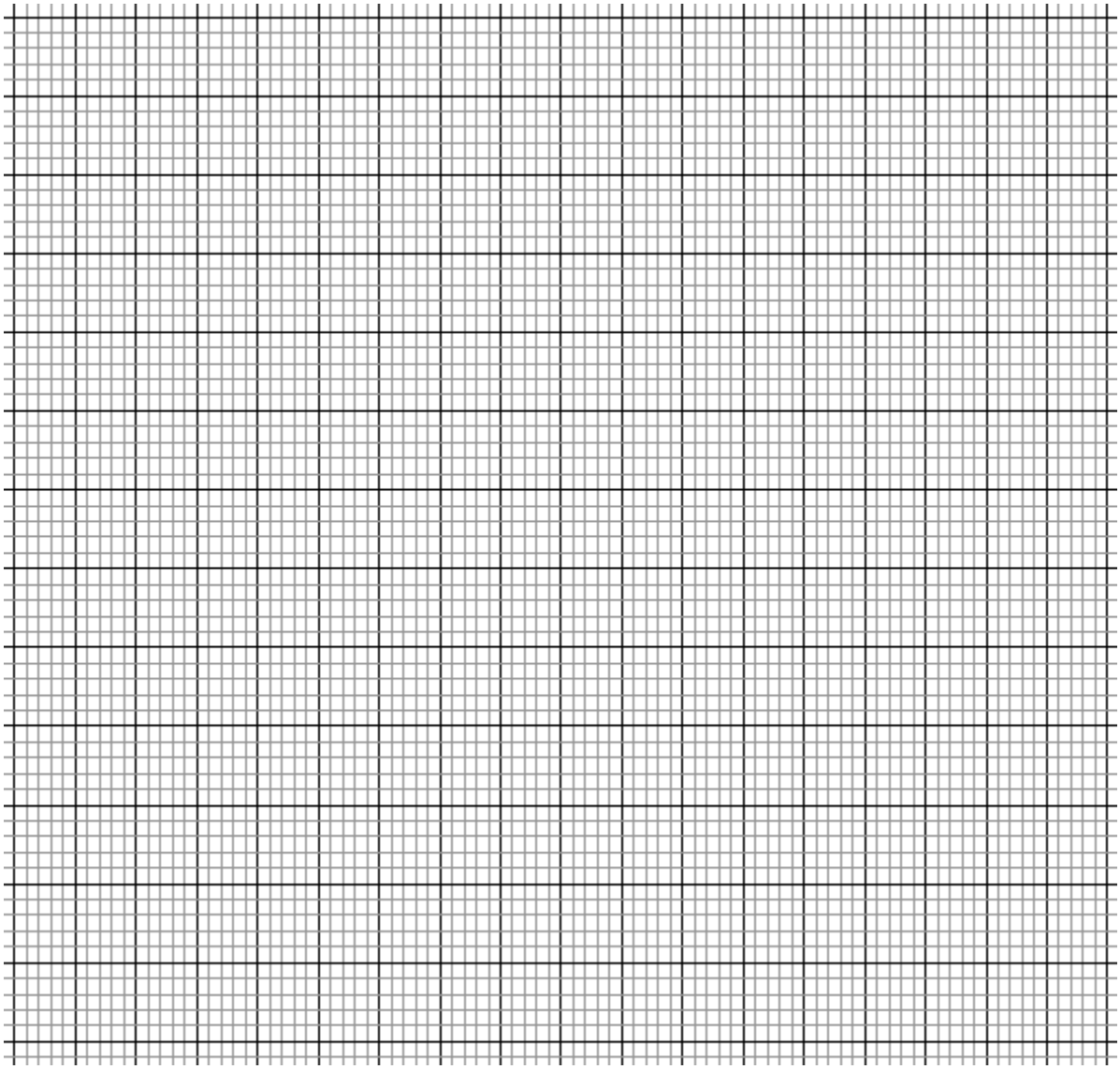
Age group	Number of persons in age group
1 - 5	4
6 - 10	12
11 - 20	9
21 - 30	6
31 - 50	18
51 - 55	4
56 - 65	2

(a) Complete the frequency distribution table above and hence

(i) Calculate the mean. (3marks)

(ii) Calculate the median. (2marks)

(b) Draw a frequency polygon from the given data on the grid below (5marks)

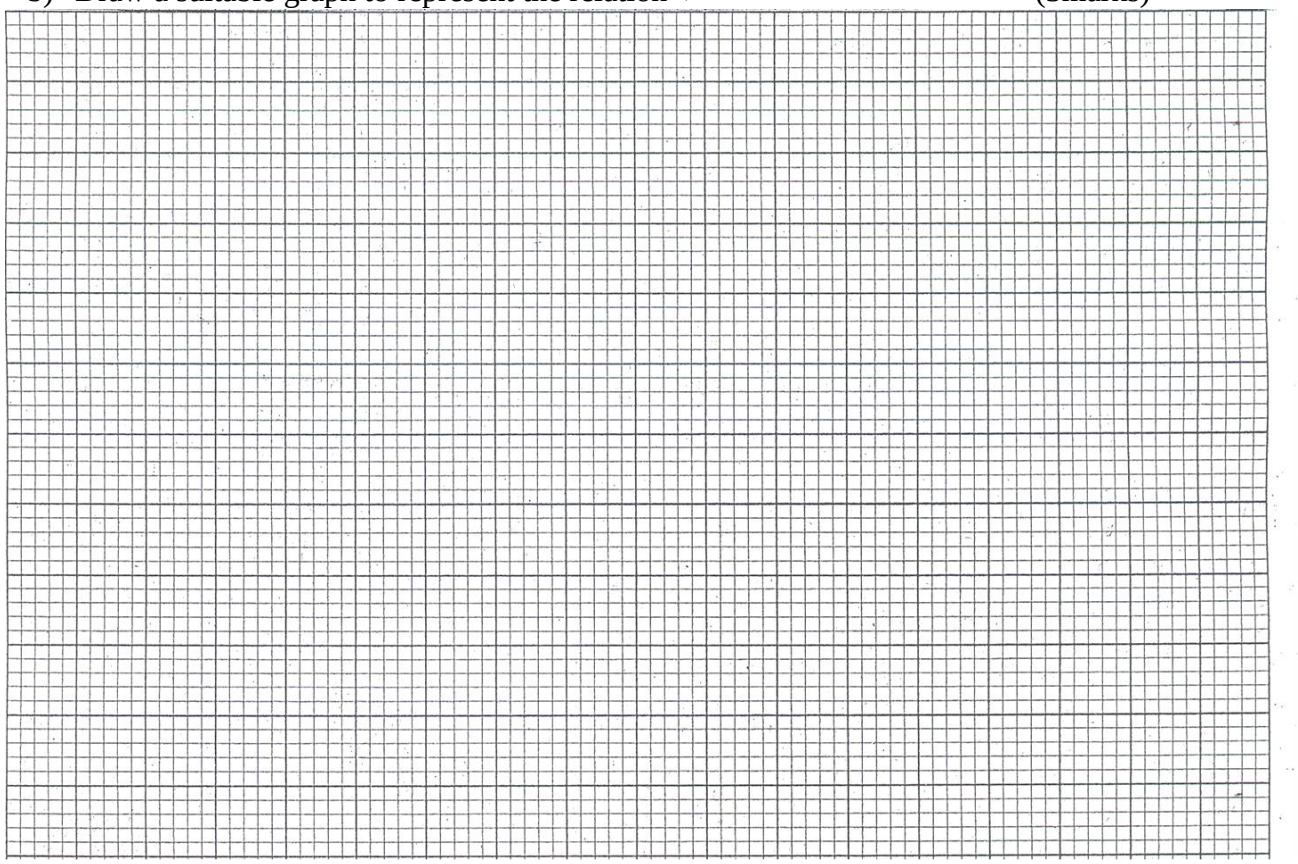


23. Two variables x and V are known to satisfy the relation $V = Kx^n$ where k and n are constants. The table below shows data collected from an experiment.

x	3.01	3.98	5.01	6.02	7.08	8.94
V	10.5	101	989	9600	95000	854000

a) Write down the function $V = Kx^n$ in linear form and make a suitable table of values correct to one decimal place. (3marks)

b) Draw a suitable graph to represent the relation $V = Kx^n$ (3marks)



c) Use your graph to determine the values of *k* and *n* (4marks)

24. A particle moves in a straight line. It passes through point O at $t = 0$ with velocity $V = -4m/s$. The acceleration $a\ m/s^2$ of the particle at time *t* seconds after passing through O is given by $a = 10t + 1$

(a) Express the velocity V of the particle at time *t* seconds in terms of *t*. (3marks)

b) Find V when $t = 3$ (1mark)

c) Determine the value of t when the particle is momentarily at rest (3marks)

d) Calculate the distance covered by the particle between $t = 2$ and $t = 4$ (3marks)

RDS 14

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Without using tables or calculators evaluate (3mrks)

$$\sqrt{5184}$$
$$5\frac{5}{8} \times 1\frac{7}{9} - 5/4 \text{ of } 4\frac{4}{5} + 2\frac{4}{5} \div \frac{7}{10}$$

2. Factories completely: $28x^2 + 3xy - y^2$ (2mrks)

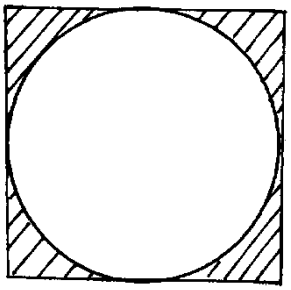
3. A man walks directly from point **A** towards the foot of a tall building 240m away . After covering 180m, he observes that the angles of elevation of the top of the building is $\mathbf{45^0}$.Determine the angle of elevation of the top of the building from **A**. (4mrks)

4. Solve for x in the equation (3mrks)

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

5. A perpendicular is drawn from the point **T** (3,5) to the line $2y + x = 3$. Find the equation of the perpendicular. (3mrks)

6. Acircle is inscribed in a square as shown below.

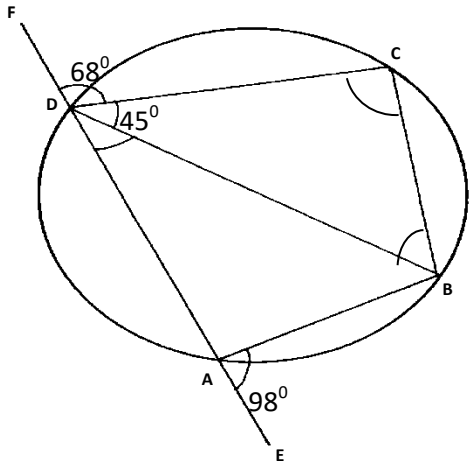


What percentage of the square to 2dp is not covered by the circle? (3mrks)

7 Food aid 369,880 French Franc was donated to the Turkana drought stricken area. The food was purchased from United states of America (USA) and paid for in US dollars. Calculate the exact value ofthe food aid in dollars if:

1 French Franc = ksh 12.70 and 1 Us dollars = ksh 84.50 (3mrks)

8. In the figure below, **EADF** is a straight line, $\angle$**CDF** = 68^0 , $\angle$ **BDC** =45^0 and $\angle$ **BAE** = 98^0



To be drawn again

Calculate the size of

(a) $\angle ABD$ (2mrks)

(b) $\angle CBD$ (2mrks)

9. (a) Use a ruler and apair compasses only to construct triangle **ABC** in which **AB** = 6cm, **BC** =8cm and angle **ABC** $=60^0$. (2mrks)

(b) Determine the distance from **A** to the ortho-centre of the triangle in (a) above. (2mrks)

10. Simplify the expression $\frac{4t^2 - 25a^2}{6t^2 + 9at - 15a^2}$ (3mrks)

11. A cyndrical piece of wood of radius 3.5cm and length 130cm is cut lengthwise into two equal pieces.

Calculate the surface of one piece. (Takeπ = 22/7) (3mrks)

12. The gradient of a curve is given by $(1 - x)^2$ and the curve cuts x - axis at x=3. Determine the equation of the curve. (3mrks)

13. Simplify $25^{3/4} \times 0.9^2 \times 2^2$ in the form **A/B** where **A** and **B** are integers. (3mrks)

$$\frac{}{5^{3/2} \times 3^3}$$

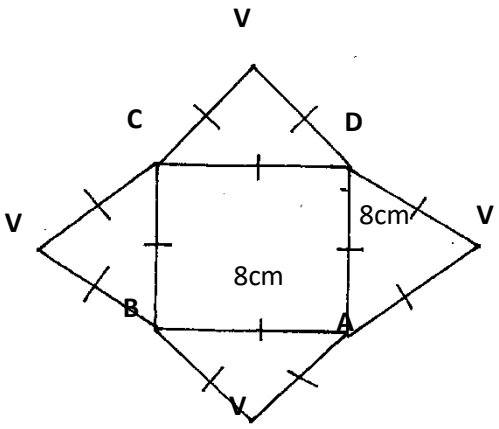
14. Given that $\sin (x + 30)^0 = \text{Cos } 2x^0$ for $0^0 \leq x \leq 90^0$

(a) Find the value of **x** (2mrks)

(b) Hence find the value of $\text{Cos}^2 3x^0$. (2mrks)

15. Find the range of x if $2 \leq 3 - x < 5$. (2mrks)

16. The diagram below shows the net of a solid.



(a) Sketch the solid. (2mrks)

(b) State the order of rotational symmetry of the solid. (1mrk)

SECTION 11 (50MRKS)

Answer only FIVE questions from this section

17 Chemelil Sugar Academy hall has 200seats. During the District Drama Festival, tickets were sold atsh 150 for a dults and sh 75 for students.

(a) On day one of the festival 80% of the seats in the hall were occupied and twenty of the seats were occupied by students. Calculate the total money collected from the sale of tickets this day.
(3mrks)

(b) On the last day of the festival, **x** students occupied the seats and all seats were occupied. The money collected from the tickets sales was sh 25,350.

(i) Write down an equation of **x**. (2mrks)

(ii) Calculate the value of **x**. (2mrks)

(c) The money collected from the sale of tickets during the festival was divided among cost of hosting,allowances for adjudicators and electricity bill in the ration 7: 3: 2. If the allowances amounted to sh 126,000 calculate the

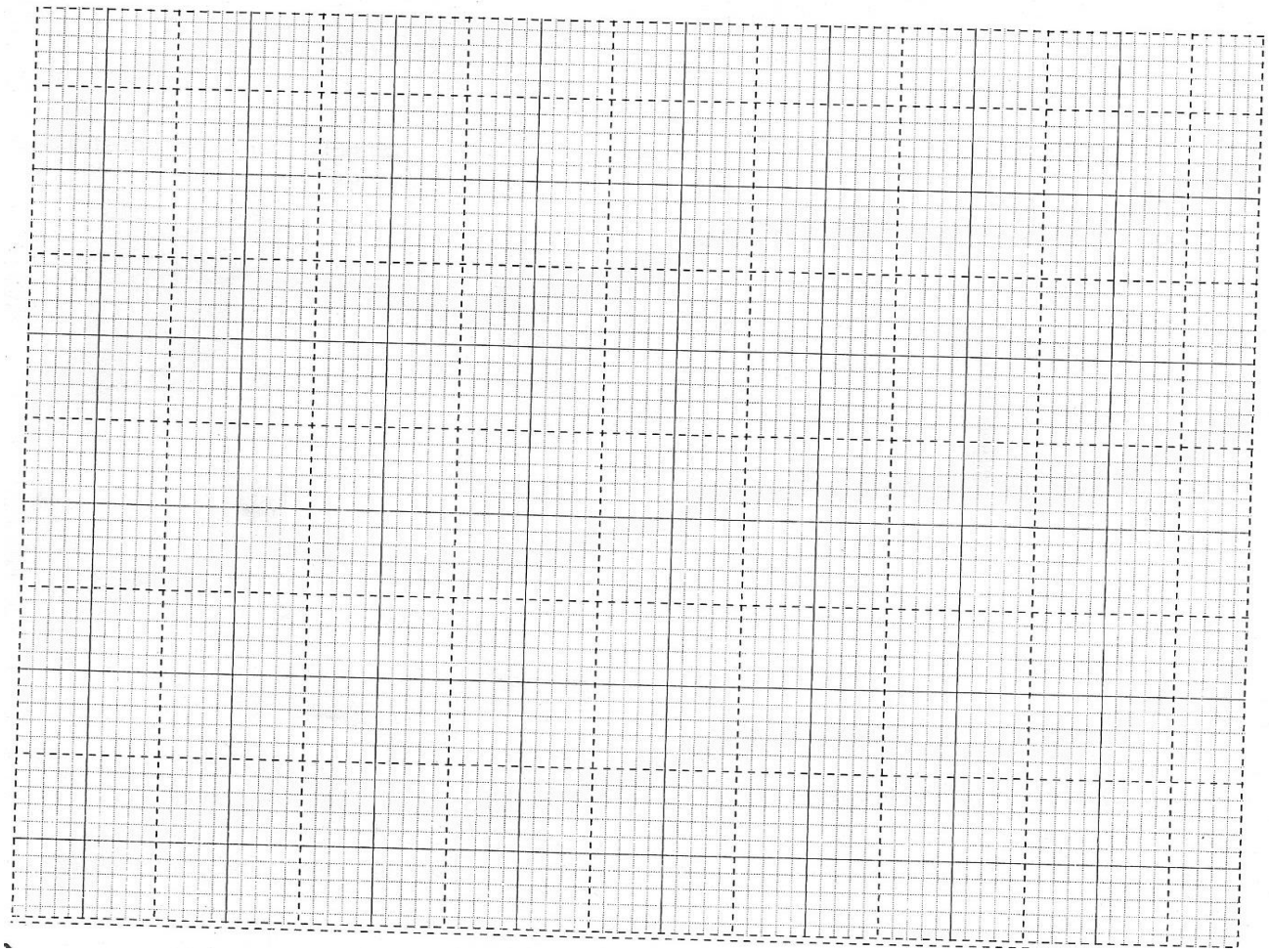
(i) Amount collected during the festival. (3mrks)

(ii) The cost of electricity bill during the festival. (1mrk)

18. (a) Complete the table below for the function $y = 2x^2 + 6x - 5$ for $-4 \leq x \leq 3$ (2mrks)

x	-4	-3	-2	-1	0	1	2	3
$2x^2$			8		0	2		
6x	-24		-12		0			18
-5	-5	-5	-5	-5	-5	-5	-5	-5
y			-9		-5			

(b) Draw the graph of $y = 2x^2 + 6x - 5$ for $0 - 4 \leq x \leq 3$ in the grid provided below. (3mrks)



(c) Use your graph in (b) above to solve the equations

(i) $2x^2 + 6x - 5 = 0$ (2mrks)

(ii) $2x^2 = x + 6$. (3mrks)

19. The frequency table below shows the marks scored by the 40 pupils in a mathematics test.

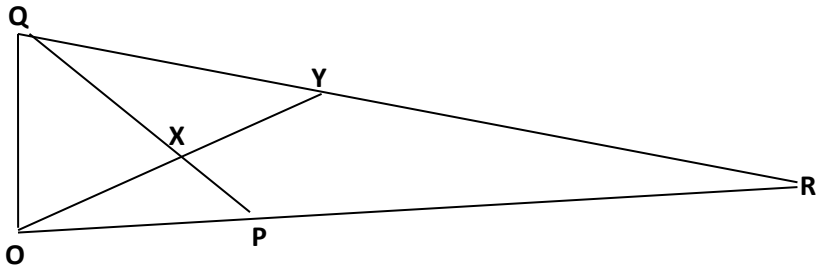
Marks	30 - 39	40 - 49	50 - 59	60 - 69	70 - 79	80 - 89	90 - 99
Number of pupils	2	3	10	12	8	3	2

(a) State the modal mark. (1mrk)

(b) Calculate the mean mark. (5mrks)

(c) Calculate the median mark. (4mrks)

20. In the figure below $\underset{\sim}{OP} = \underset{\sim}{p}$ and $\underset{\sim}{OQ} = \underset{\sim}{q}$



(a) Express $\underset{\sim}{QP}$ in terms of P and q (1mrk)

(b) If **X** is the mid point of **QP**, find $\underset{\sim}{OX}$ in terms of P and q. (1mrk)

(c) Given that $\underset{\sim}{OR} = 3\underset{\sim}{p}$, express $\underset{\sim}{QR}$ in the terms of P and q (2mrks)

(d) Given that $\overset{\sim}{QY} = m\overset{\sim}{QR}$ and $\overset{\sim}{OY} = n\overset{\sim}{OX}$, where m and n are scalars. Express

(i) OY in terms of m, p and q. (2mrk)

(ii) $\overset{\sim}{OY}$ in terms of n, p and q. (1mrk)

(e) Use the results in (d) (i) and (ii) above to find the values of m and n. (3mrks)

21. A triangular plot **ABC** is such that the length of the side **AB** is two thirds that of **BC**. The ratio of the lengths **AB: AC** = 4:9 and angle at **B** is obtuse. If the perimeter of the plot is 38m calculate:

(a) The length of the side **BC** (4mrks)

(b) (i) The area of the plot to 2dp. (4mrks)

(ii) the size of angle **ABC** to 2dp (2mrks)

22. (a) Triangle **PQR** has vertices at **P**(3,-1), **Q**(5, 2) and **R**(2, 3). Plot and draw **P′QR′** on the grid provided. (1mrk)

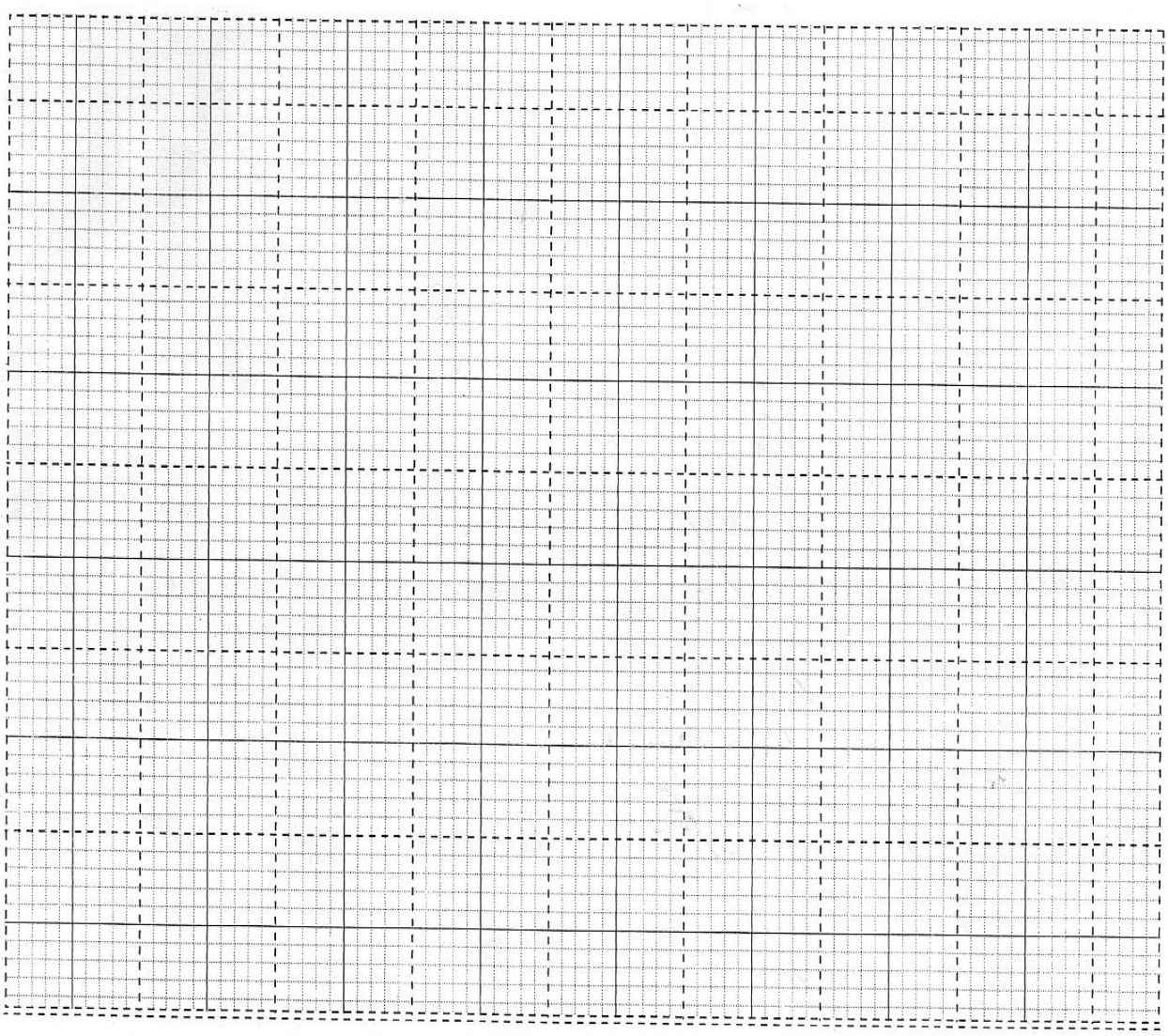
(b) Given that triangle **P′ Q′ R′** is the image of **PQR** under positive quarter turn about the origin, plot and draw P′Q′R′ on the same axes as PQR (3mrks)

(c) **P″Q″R″**is the image of **P′Q′R′** after reflection in the line y+x =0. Plot and draw **P″Q″R″** on the same axes as **PQR**and **P′Q′R′** above. (3mrks)

(d) State the pairs of triangles above that are:

(i) oppositely congruent (2mrks)

(ii) directly congruent (1mrk)



23. Two planes, **P** and **Q** leaves Kisumu international Airport at 8.00a.m. Plane p flies in the direction 320^0 at a speed of 180km/h while plane **Q** flies in the direction 088^0 at a speed of 210km/h.

(a) Use scale drawing to show the relative positions of the Airport plane, plane **P** and **Q** at 9.40a.m. .
(5mrks)

(b) Use the scale drawing above find

(i) The distance between the planes at 9.40 a.m. (2mrks)

(ii) The compass direction of the airport from plane **P** at 9.40a.am. (1mrk)

(iii) The shortest distance from the airport to the joining the two planes at 9.40a.am. (2mrks)

24. The velocity, V m/s, of the particles projected into space is given by the formula: $V = 5t^2 - 2t^2 + 9$

where t is time in seconds elapsed since projection,

Determine:

(a) The acceleration of the particle when t = 4 (3mrks)

(b) The value of t which minimizes the acceleration. (2mrks)

(c) The velocity of the particle when acceleration is minimum. (2mrks)

(d) The total distance moved by the particle between t = 1 to t= 4 seconds. (3mrks)

RDS 15

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Without using mathematical tables or a calculator evaluate

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

Leaving the answer as a decimal (3 marks)

2. Two straight highways cross at a right angle at point **X**. The first highway and the second meet a straight by-pass at point **Y** and **Z** respectively. If **YZ** is 150km and **XZ** is 70km. Find **XY**, to one decimal place. (3 marks)

3. Factorize $4PK - 9 + 13p^2k^2$ (2marks)

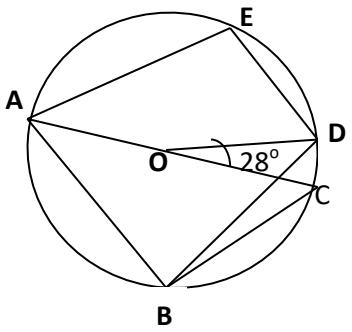
4. The marked price of a revision textbook in a certain bookshop is Kshs, 850. Wilson bought two dozens of the revision books at a discount of 15%. He sold all of them on the streets making a profit of 25%. Determine the total sales. (3 marks)

5. The size of each interior angle of a regular polygon is one and a half times the size of the exterior angle. Find the number of sides of the polygon. (3 marks)

6. In the figure below AOC is a diameter of a circle centre O. ABDE is a cyclic quadrilateral and angle COD = 28^o.

Determine the size of

(a) Angle AED (2 marks)



(b) Angle CAD (2 marks)

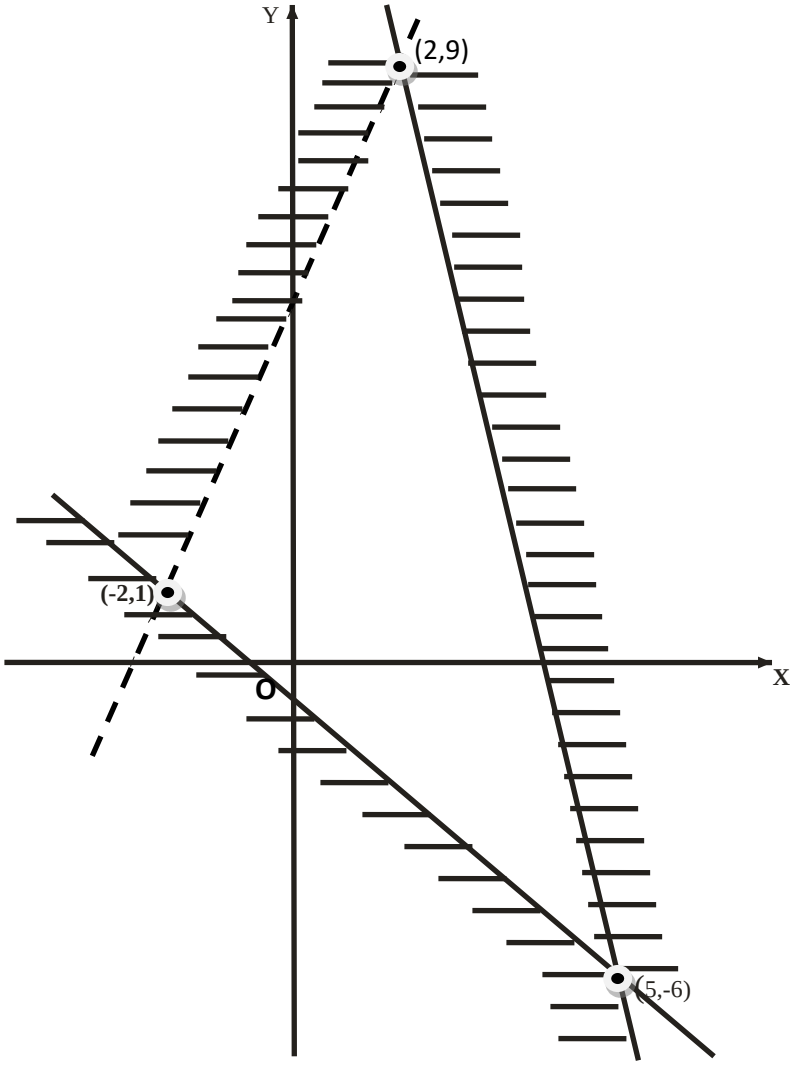
7. Given that θ^o is an acute angle and tan θ^o = 1⅓, find without using tables or a calculator

   cos (90-θ)^o (2 marks)

8. Solve for y (4marks)

   $2^{2y+1} - 6\,(2^{y-1}) + 1 = 0$.

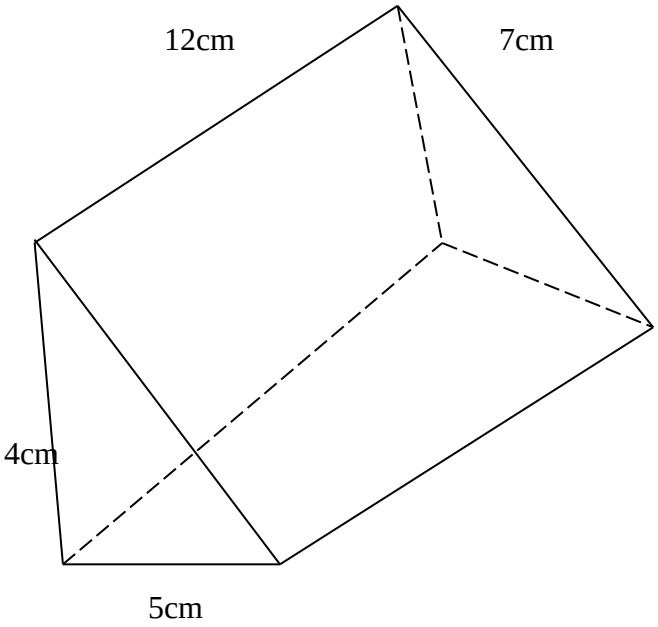
9. State the inequalities that represent the unshaped region (3 mark)



10. The position vector of A and B are a = $4i + 2j - 5k$ and b = $2i + j - k$ respectively.
Find the magnitude of AB (3 marks)

11. A straight line L_1, has its equation as $2x + 3y = 6$. Find the equation of a line L_2 through point (-4,5) and parallel to L_1, in the form $y = mx + c$ (3 marks)

12. The figure below show a prism 12cm long. The cross-section is a triangle of sides 4cm, 5cm and 7cm .



Calculate the surface area of the prism (3marks)

13. In a period of two years Kamau paid a simple interest of Kshs.3500 for kshs.5000 borrowed from Tumaini Bank while Otieno paid a simple interest of Kshs.5600 for Kshs.8000 borrowed from the

same bank. For the same period Kamau paid a simple interest of Kshs.1440 for Kshs.3000 borrowed from Endelea Bank, while Otieno paid a simple interest of Kshs.2400 for Kshs.5000 borrowed from the same Bank.

Determine t he rate of interest charged by each Bank. (4 marks)

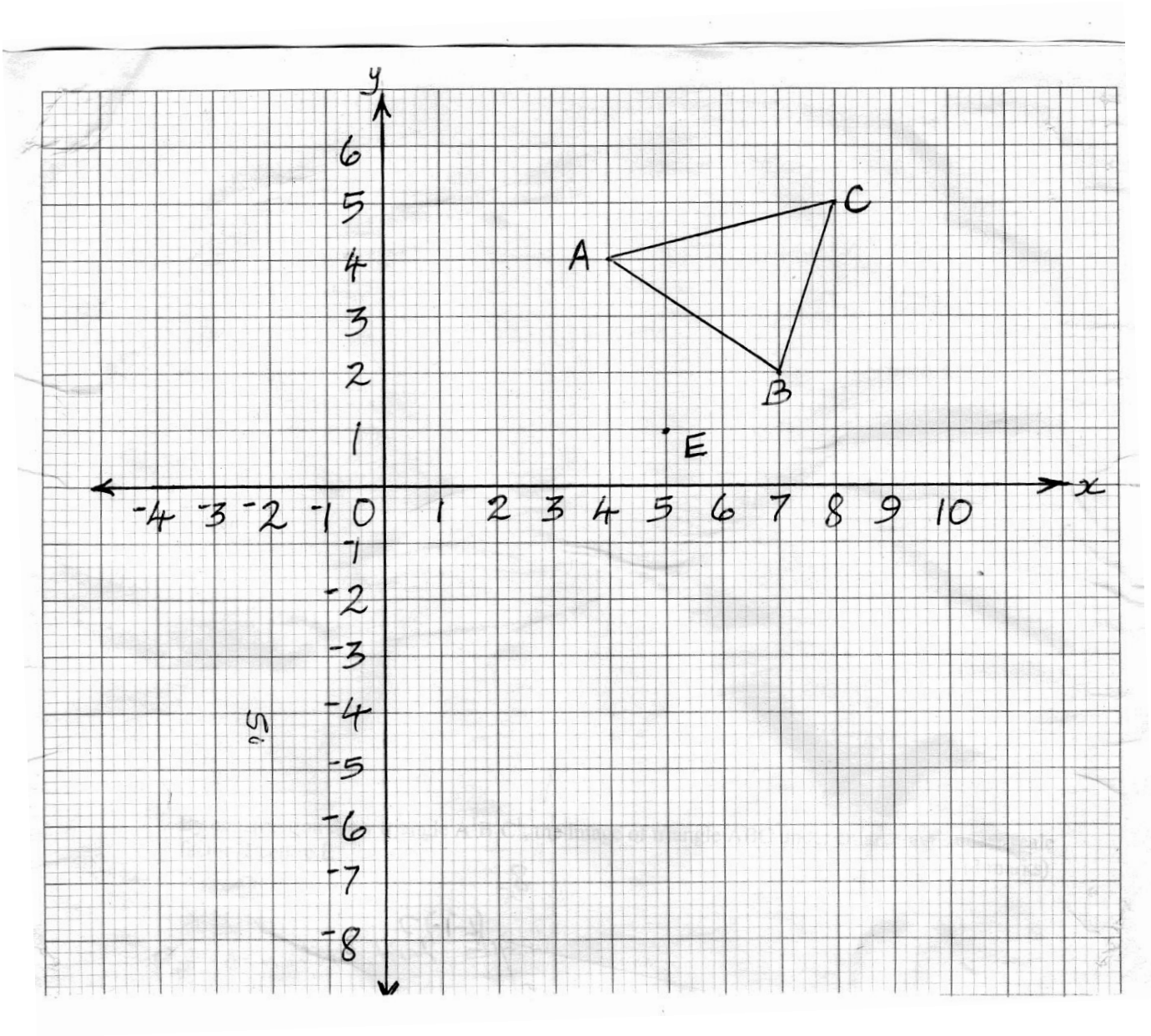
14. During a P.E. lesson Sheila stood 50m east of Edna. Both were facing the teacher who was on a bearing of 045^{o} from Sheila and 065^{o} from Edna. Determine Sheila's distance from the teacher to 2 decimal places. (4 marks)

15 The following data represents the enrolment of students in 12 colleges

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

Find the quartile deviation (3 marks)

16. The diagram below shows triangle ABC with vertices A (4, 4), B (7, 2) and C (8, 5)



By construction draw triangle $A^1B^1C^1$, the image of triangle ABC under enlargement linear scale factor $^-2$ centre E (3 marks)

SECTION II (50 MARKS) ANSWER FIVE QUESTIONS ONLY IN THIS SECTION

17 Four businesswomen decided to buy a building. An agent was selling the building at Kshs.3,800,000 on behalf of the owner, plus a facilitation fee of 10% of the value of the building to be paid by the buyers. The agreement was that the buyer would first pay a deposit of 55% of the total cost and the balance to be paid in one month's time.

(a) Find,

(i) The amount of deposit paid (3 marks)

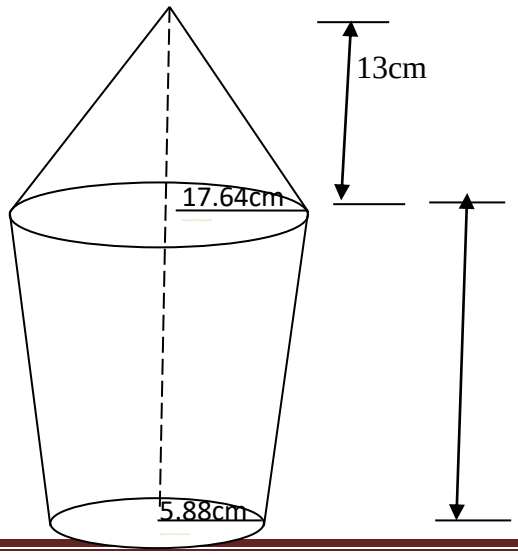
(ii) The balance to be paid in one month's time (2 marks)

(b) The balance was paid in the ratio 1:2:3:5. Calculate:

(i) The money paid by the second highest contributor (2 marks)

(ii) The difference between the money paid by the highest and lowest contributors (3 marks)

18. The figure below shows a solid made up of a conical frustum and a conical top. The dimensions are as indicated in the figure.



20cm

Find

(a) The curved surface area of the conical top (2 marks)

(b) The curved surface area of the frustum (4 marks)

(c) The volume of the solid (4 marks)

19.(a) Complete the following table for the equation $Y= x^3 + 2x^2 – 3x - 3$ (2 marks)

x	-4	-3	-2	-1	0	1	2	3
x^3	64			-1	0	1	8	27
$2x^2$	32	18	8	2	0	2	8	18
-3x		9		3	0	-3		-9
-3	-3	-3	-3	-3	-3	-3	-3	-3
y		-3	3			-3	7	

(b) On the grid provided draw the graph of $y= x^3 + 2x^2 - 3x - 3$ for $-4 \leq x \leq 3$. Use 2cm to represent I unit on the x-axis and 1cm to represent 5 units on the Y-axis. (3 marks)

(c) (i) Use the graph to estimate the roots of the equations $x^3 + 2x^2 - 3x - 3 = 0$ (2 marks)

(ii) By drawing a suitable line use the graph in (b) above to obtain the roots of the equation

$-x^3 - 2x^2 + 5x + 8 = 0$ (3 marks)

20 Sally bought some mangoes worth Kshs.60, while Peris spent kshs.60, but bought them at a discount of 50cents per mango.

(a) If Sally bought a mango at sh. X. write down a simplified expression for the total number of mangoes bought by

(i) Sally (1 mark)

(ii) Peris (1 mark)

(b) If Peris bought **3** more mangoes than Sally. Find how much each spent on a Mango (to the nearest cents) (5 marks)

(c) Find the total number of mangoes bought by Sally and Peris (to the nearest whole number) (3 marks)

21 A plastic model of a tank, open at the top is in the shape of a cylinder. The internal radius of its base is **r** cm and its internal height is **h** cm. The total internal surface area of the tank is

1386 cm^2.

(a) Write an expression for the total internal surface area of the tank (1 mark)

(b) Express in terms of **r**

(i) The internal height of the tank (2 marks)

(ii) The internal volume of the tank (1mark)

(c) Determine

(i) The value of **r** for which the internal volume, **V** is maximum (4 marks)

(ii) The maximum internal volume of the tank (2 marks)

22 A plane **P** is 16500 km on a bearing of **N** 30^{o} E from an international airport. Another plane **Q** is 9,900km on a bearing of **S** 60^{o}**E** from plane **P**. Plane **R** is 23,000km due south of the airport.

(a) Using a scale of 1cm to represent 3000km, show the relative positions of **P, Q R** and the airport. (3 marks)

(b) Find the distance and bearing of **R** from **Q** (3 marks)

(c) If **Q** and **P** are both travelling at 4000km/hr towards the airport. Calculate the difference in the time taken to reach the airport by the two planes, to the nearest hour. (4 marks)

23 The frequency distribution table below shows the K.C.P.E. marks obtained by peoples in a certain school.

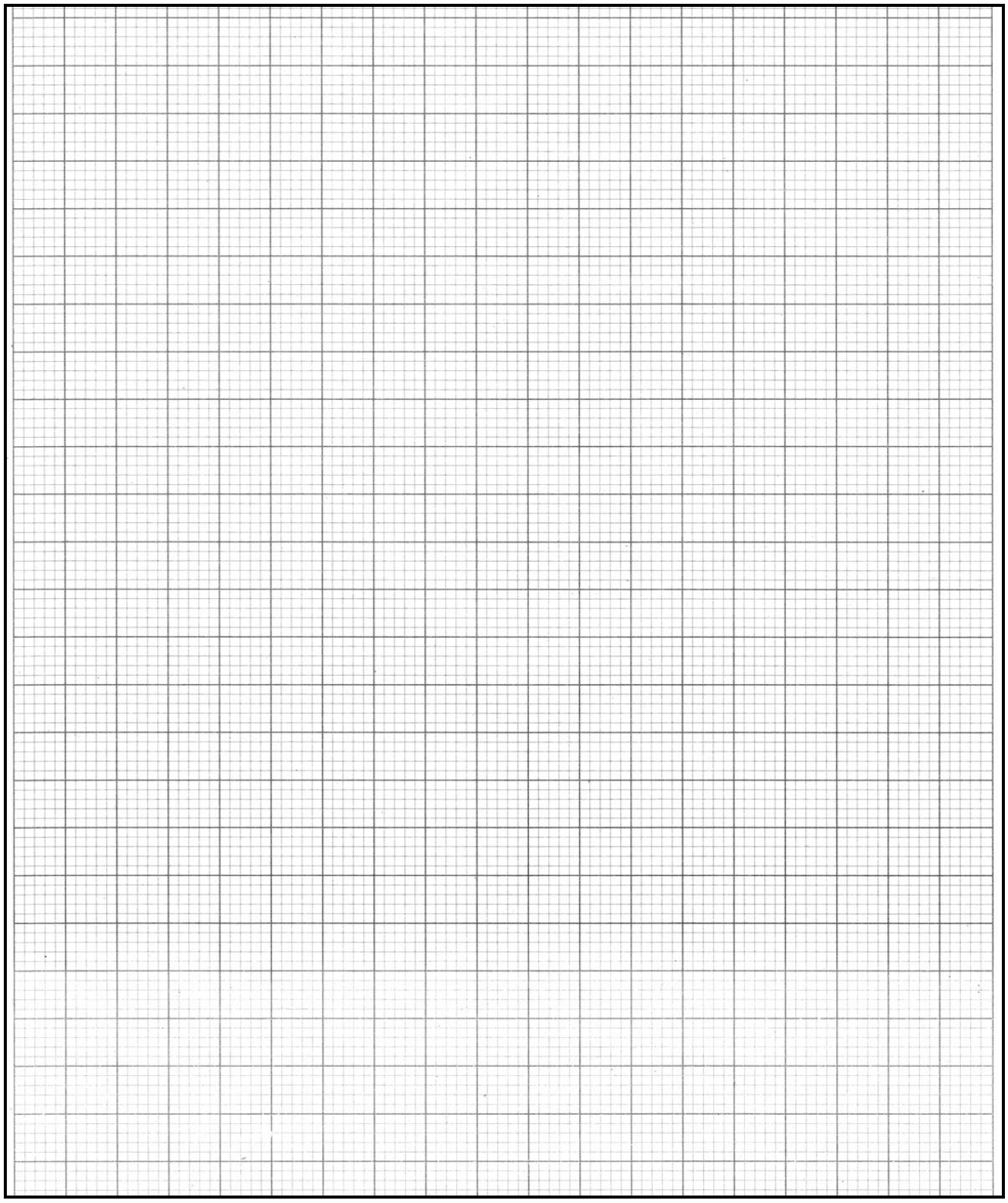
Marks	number of peoples
$200 \leq x \leq 220$	6
$220 \leq x \leq 240$	14
$240 \leq x \leq 280$	12
$280 \leq x \leq 320$	8
$320 \leq x \leq 340$	5

(a) Estimate the mean marks of the peoples (4 marks)

(b)(i) On the grid provided, draw a histogram to represent the information above (3 marks)

(c))i) State group in which the median mark lies (1mark)

(ii) A vertical line drawn through the median mark divides the total area of the histogram into two equal parts. Using this information or otherwise, estimate the median mark (2 marks)



24. Triangle ABC has the vertices A (3, 1), B (2, 2) and C (3, 4).

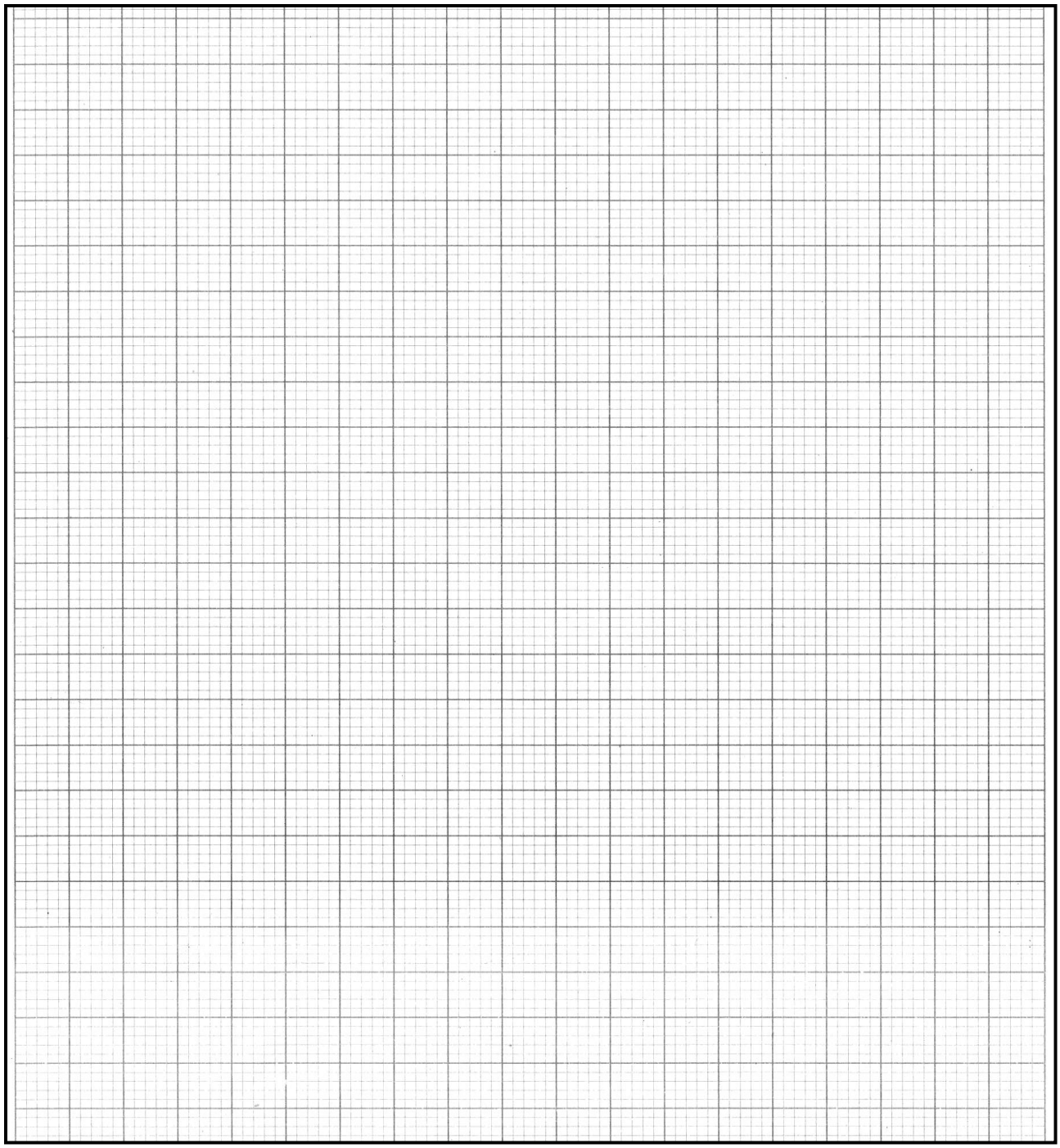
(a) On the grid provided draw triangle ABC and its image $A^1B^1C^1$ under a rotation of negative quarter turn about the point (0,0) (3 marks)

(b) (i) Draw triangle $A^{11}B^{11}C^{11}$ the image of Δ $A^1B^1C^1$ under a reflection in the line y = -x 2 marks)

(ii) Describe fully the transformation that maps Δ$A^{11}B^{11}C^{11}$ onto ΔABC (2 marks)

(c) (i) On the same axes draw triangle $A^{111}B^{111}C^{111}$ the image of Δ $A^{11}B^{11}C^{11}$ under a translation given by translation Vector $\begin{bmatrix} -6 \\ 1 \end{bmatrix}$ (2 marks)

(iii) State the co ordinates of Δ$A^{111}B^{111}C^{111}$ (1 mark)



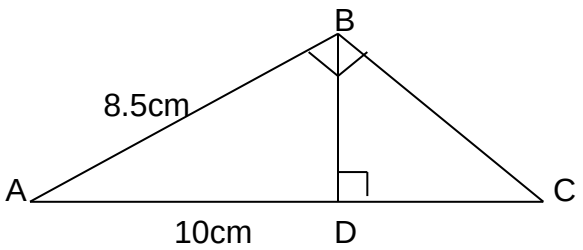
RDS 16

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate: (3mks)
   $2\{(¾ + 1\frac{5}{7} \div \frac{4}{7} \text{ of } 2\frac{1}{3}) \div (1\frac{3}{7} - \frac{5}{8}) \text{ of } \frac{2}{3}\}$

2. In the triangle, AB = 8.5cm, AC = 10cm and ABC = BDC = 90^0. (3mks)



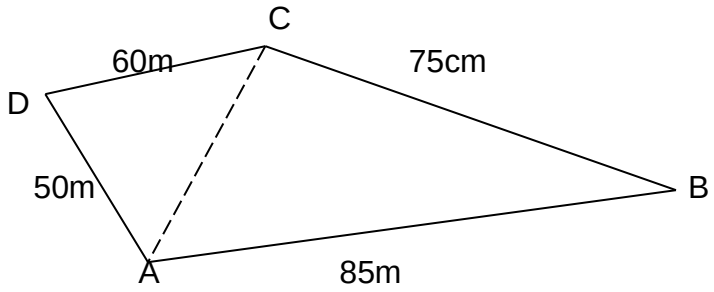
   Calculate:
   (i) The length of BC. (1mk)

   (ii) The length of BD. (2mks)

3. A minibus covered a distance of 200km at an average speed of 100km/hr. It traveled at a speed of 80km/hr for $\frac{3}{5}$ of its journey. At what speed did it travel the remaining part

of the journey. (3mks)

4. The figure below represents a plot of land ABCD such that AB=85m, BC=75m, CD=60m, DA=50m and angle ACB = 90^0. (Not drawn to scale).



Determine the area of the plot, in hectares, correct to two decimal places. (4mks)

5. Solve the equation $8x^2 + 2x - 3 = 0$ hence solve the equation $8\cos^2 y + 2\cos y - 3 = 0$ for the range $0^0 < y < 180^0$. (4mks)

6. Simplify the expression: $\frac{3x^2 - 4xy^2 + y}{9x^2 - y^2}$ (3mks)

7. A rectangular tank has a hole in it such that $11cm^3$ of water leaks out every 5 seconds. Using π as 3.142. Calculate:-

   (i) The capacity of the water lost from the tank every hour. (2mks)

   (ii) The time it takes to till a cylindrical tank of radius 30cm and height 30cm into which the leaking water drains; in hours to 4 significant figures. (2mks)

8. Factorise the expression: $2s^2t^2 - 5st - 12$. (2mks)

9. Use ruler and pair of compasses only to draw a parallelogram PQRS in which PQ = 8cm, QR = 6cm and angle QPS = 75^0. By construction, determine the perpendicular distance between PQ and RS. (3mks)

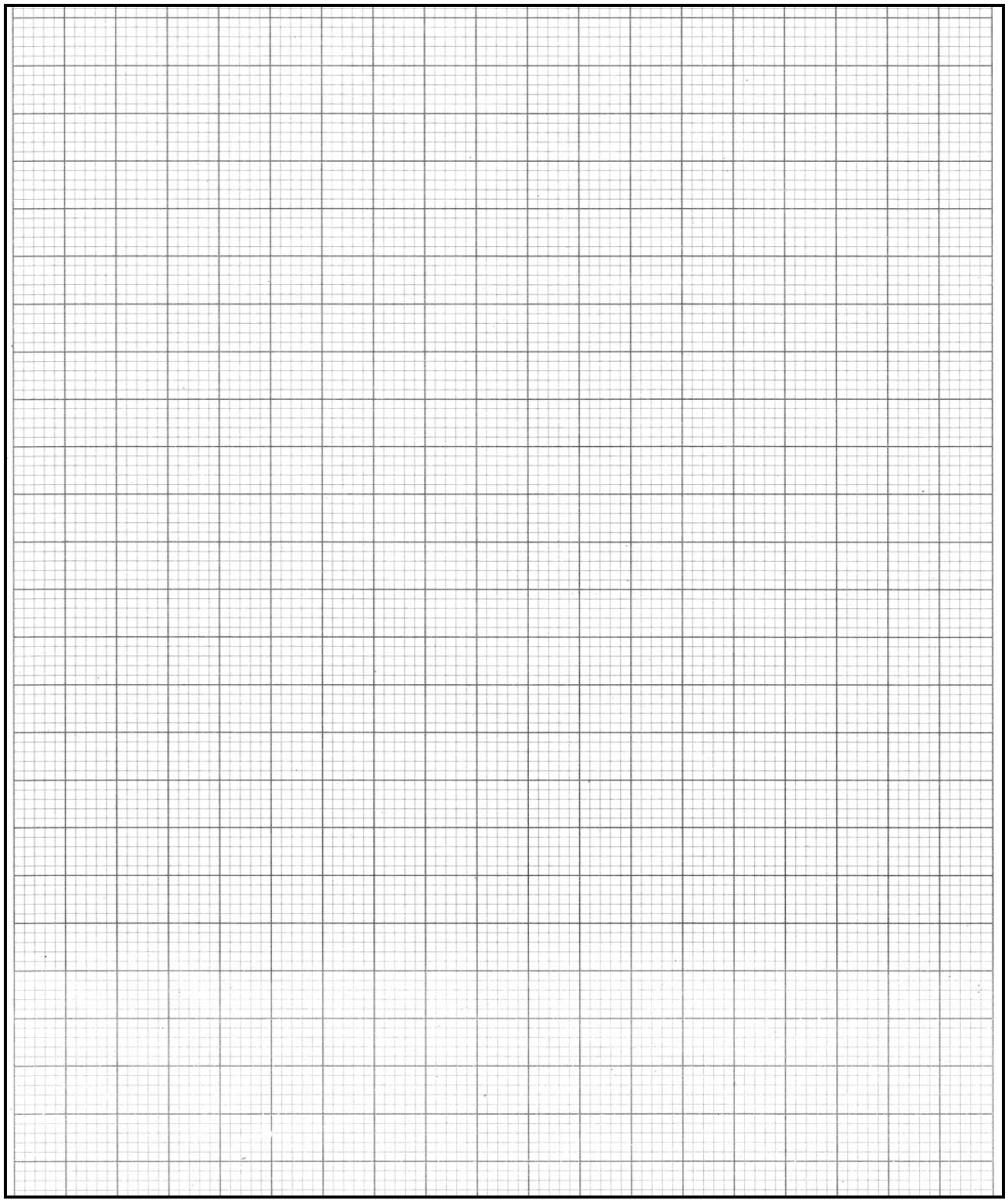
10. The table below shows marks scored by 40 students in a mathematics test.

Marks	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79
No. of students	2	9	14	7	8

Calculate the median mark. (2mks)

11. Mr. Kirui earns a basic salary of sh. 12,000 per month. In addition he is also paid a commission of 2½ % for sales above sh. 15,000. In a certain month, he sold goods worth sh. 140,000 at a discount of 5%. Calculate his total earning that month. (3mks)

12. Three vertices of a parallelogram PQRS are P(-1,2), Q(8,-5) and R(5,0).
    (i) On the grid provided below, draw the parallelogram PQRS. (1mk)



(ii) Determine the length of the diagonal QS. (2mks)

13. Three people Felix, Evans and Eunice contributed money to start a business. Felix contributed a quarter of the total amount and Evans two fifths of the remainder. Eunice's contribution was one and a half times that of Felix. They borrowed the rest of the money from the bank which was Kshs. 60,000 less than Eunice's contribution. Find the total amount required to start the business. (3mks)

14. All prime numbers between ten and twenty are arranged in descending order to form a number.

    (i) Write down the number. (1mk)

    (ii) State the total value of the third digit of the number formed in (i) above. (1mk)

15. A solid object is formed by a cylinder and a cone such that the cone of base radius 1.5 and slant height 4.8m is attached to the cylinder whose height is 12.6m. Using π=3.142, calculate the total surface area of the solid, leaving your answer to 2 decimal places.

16. Mrs. Tabut bought 4 spoons and 6 plates for Kshs. 660 and Mrs. Koross bought 2 spoons and 1 plate less than Mrs. Tabut for Kshs. 510.

    (i) Find the price of each item. (2mks)

(ii) Mrs. Lagat spent Kshs. 2280 to buy the same type of spoons and plates. If the number of plates she bought were 4 more than the number of spoons, find the number of spoons bought by Mrs. Lagat. (1mk)

SECTION II (50 MARKS)

Answer any five questions in this section

17. The table below shows how income tax was charged on income earned in a certain year.

Taxable income per year (Kenya Pounds)	Rate (Shilling per Kenya Pound)
1 – 3630	2
3631 – 7260	3
7261 – 10890	4
10891 – 14520	5

Mr. Gideon is an employee of a certain company and earns a salary of Ksh. 15,200 per month. He is housed by the company and pays a nominal rent of Ksh. 1050 per month. He is married and is entitled to a family relief of Kshs. 450 per month.

(i) Calculate his taxable income in k£ p.a. (2mks)

(ii) Calculate his gross tax per month. (4mks)

(iii) Calculate his net tax per month. (2mks)

(iv) Calculate his net salary per month. (2mks)

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

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

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

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

(iv) How far Coast Bus is from Mombasa when Lamu bus arrives in Nairobi. (3mks)

19. (a) Find the inverse of the matrix: (1mk)

$$A = \begin{pmatrix} 4 & 3 \\ 3 & 2 \end{pmatrix}$$

(b) Rose bought 20 bags of oranges and 15 bags of mangoes for a total of sh. 9,500. Chumo bought 30 bags of oranges and 20 bags of mangoes for a total of sh. 13,500. If he price

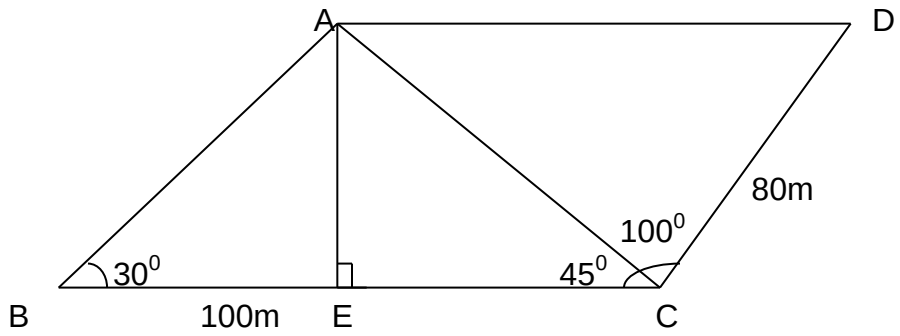
of a bag of oranges is X and that of mangoes is y:

(i) Form two equations to represent the information above. (2mks)

(ii) Hence use the matrix A^{-1} above to find the price of one bag of each item. (3mks)

(c) The price of each bag of oranges was increased by 10% and that of mangoes reduced by 10%. The businesswomen (Rose and Chumo) bought as many oranges and as many mangoes as they bought earlier. Find by matrix method the total cost of oranges and mangoes that the businesswomen bought after the percentage change. (4mks)

20. The figure below represents a quadrilateral piece of land ABCD divided into three triangular plots. The lengths BE and CD are 100m and 80m respectively. Angle ABE = 30^0, ACE = 45^0 and ACD = 100^0.



(a) Find to four significant figures:

(i) The length of AE. (2mks)

(ii) The length of AD. (2mks)

(iii) The perimeter of the piece of land. (3mks)

(b) The plots are to be fenced with five strands of barbed wire leaving an entrance of 2.8m wide to each plot. The type of barbed wire to be used is sold in rolls of lengths 480m. Calculate the number of rolls of barbed wire that must be bought to complete the

fencing of the plots. (3mks)

21. (a) Sketch the graph of the function: $y = 4x^3 + 2x^2 - 5$ (2mks)

(b) Find the area under the graph of the function: $y= 4x^3 + 2x^2 - 5$ between lines $y = 0$, $x = 1$ and $x = 3$ by:

(i) Using the trapezium method taking intervals of 0.5 of a unit. (3mks)

(ii) Integration. (3mks)

(c) Express the error in (b) (i) above as a percentage of the area obtained in (b) (ii) above. (2mks)

22. A particle starts from rest and moves with an acceleration, a, given by $a = (10-t)\ m/s^2$. Given that velocity, Vm/s is 2m/s; when time, t seconds is 1 sec.

(a) Express in terms of t;

(i) Its velocity after t seconds. (3mks)

(ii) Its displacement after t seconds. (2mks)

(b) Calculate its velocity when t = 3 seconds. (2mks)

(c) Calculate the maximum velocity attained. (3mks)

23. Two points P and Q are found on the earth's surface. The position of P is (52^0S, 66^0W) and Q (52^0S, 114^0E). Using earth's radius = 6370km:

(a) Find the difference in longitude between two points P and Q. (1mk)

(b) Calculate the shortest distance between points P and Q along:-

(i) The Latitude in km (to 1 whole number). (2mks)

(ii) The Longitude in km (to one whole number). (3mks)

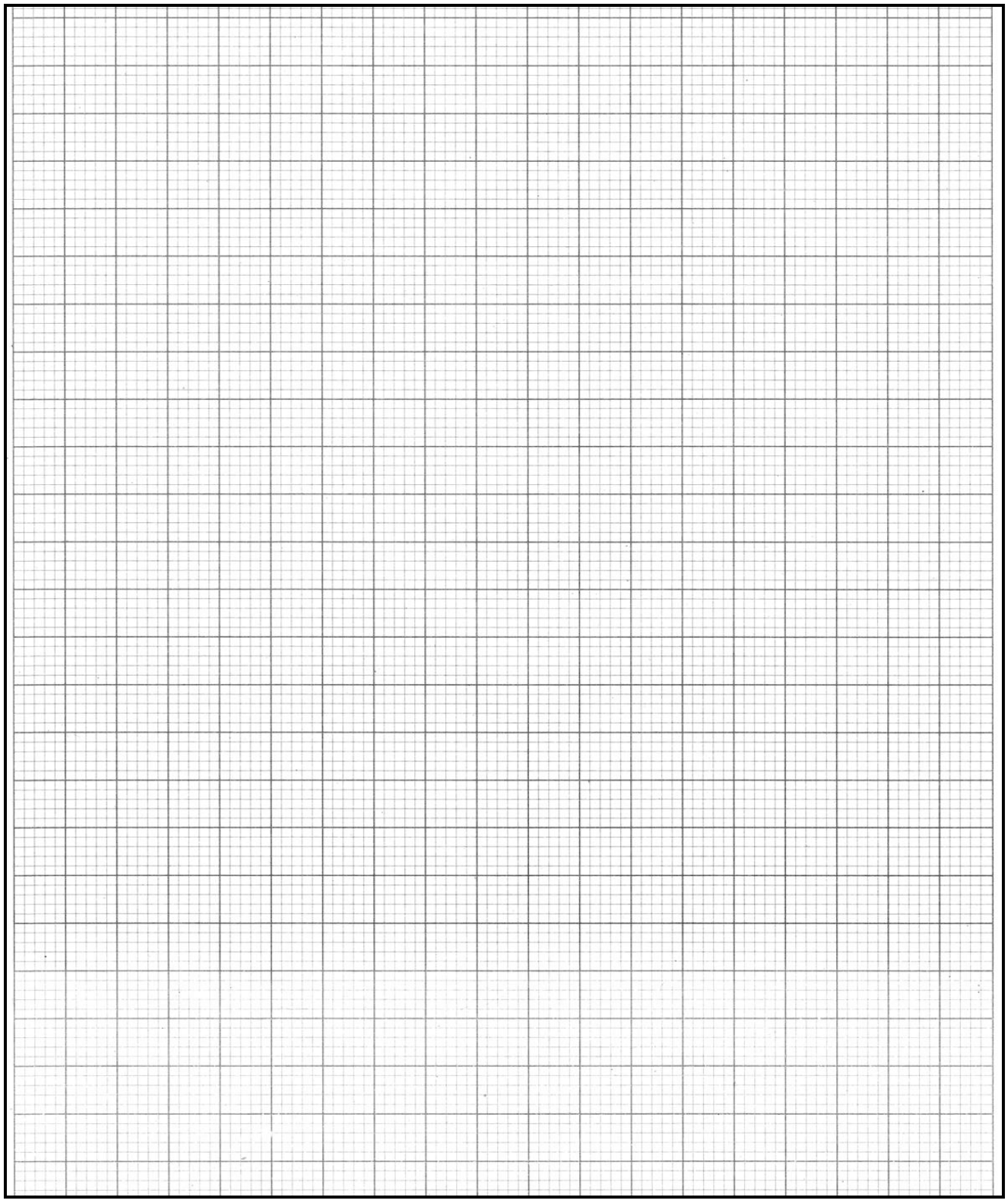
(c) A plane travelling at 800km/hr leaves point P at 10.00am and sails through South Pole to point Q. Find the local time the plane arrives at point Q to the nearest minutes. (4mks)

24. 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			180		
Height of rectangle			6		

(a) (i) Complete the table. (4mks)

(ii) On the grid provided below, draw he histogram to represent the distribution. (2mks)



(i) State the group in which the median mark lies. (1mk)

(ii) 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. (3mks)

RDS 17

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate using logarithm (4mks)

$$\sqrt{\frac{4.283x(0.009478)^2}{\log 9.814}}$$

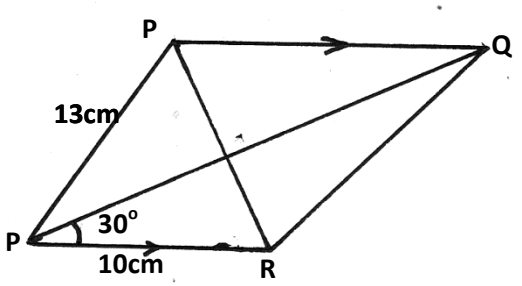
2. The volumes of two similar cylinders are 4752cm3 and 1408cm3. If the area of the curved surface of the smaller cylinder is 352cm2, find the area of the curved surface of the larger cylinder (3mks)

3. The radius of a cone is given as 4.2cm while its height is given as 9.7cm. find the percentage error in the estimation of the volume of the cone (4mks)

4. A line Ax +3y-6=0 is perpendicular to the line 5x+7y-k=0. If 5x+7y-k=0 passes through the point (4,3). Determine the values of A and K (4mks)

5. Factorise $90x^2 - 40y^2$ (2mks)

6. In the figure below PS=PR PS=13cm, RS=10cm and $\angle QSR=30^{o}$. Find the length of QS (3mks)



7. Solve for x and y in the simulataneous equations given below (3mks)

21x-12y=-29

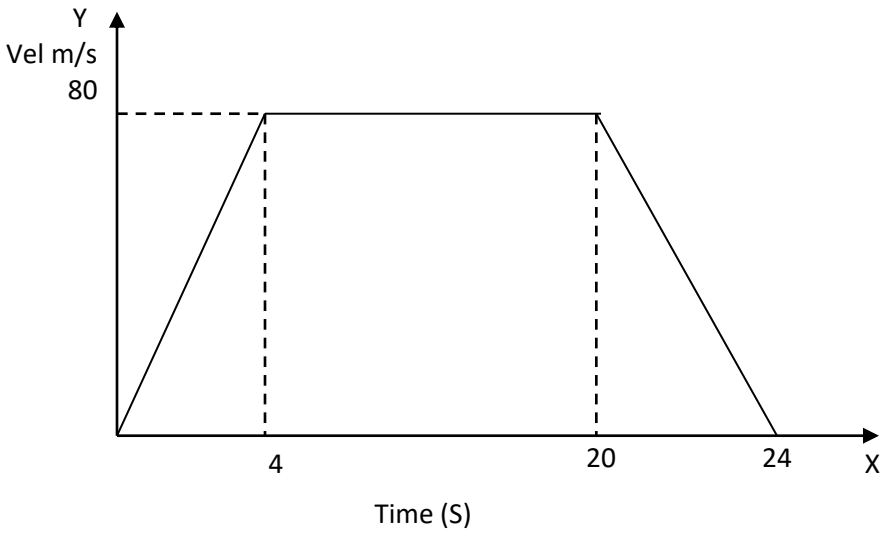
12x+5y=19

8. The resistance to the motion of a car is partly constant and partly varies as the square of the speed. At 40km/h^{-1} the resistance and at 60kmh^{-1} it is 730N. what will be the resistance at 70kmh^{-1} (4mks)

9. Without using a calculator or mathematical tables find the value of $\frac{0.0060x2.4x0.3^2}{0.9x0.00015x160}$ (3mks)

10. 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 had been done. How many more workers did he require to finish the work in time (3mks)

11. The figure below is a velocity time graph of a car



(a)Find the total distance travelled by the car (1mk)

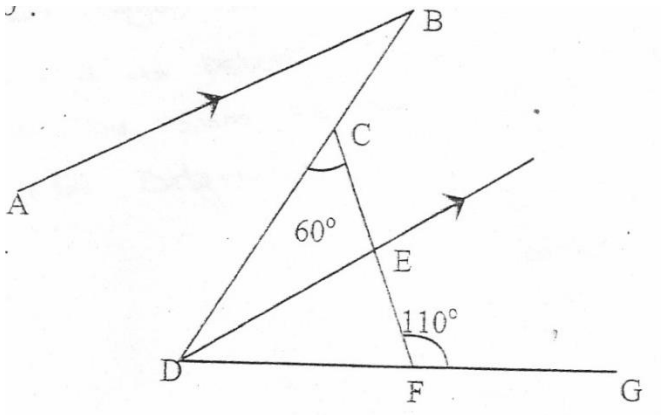
(b) Calculate the deceleration of the car (2mks)

12. Find the range values that satisfy the inequality (2mks)

$x - 4 \leq 3x + 2 \subset 2(x + 5)$

13. 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 trader paid for the shirt (2mks)

14. In the figure below, AB is parallel to DE, DE bisects angle BDG, angle DCF=60° angle CFG=110°



Find

(a) $\angle CDF$ (2mks)

(b) $\angle ABD$ (2mks)

Give reasons for your answers

15. Three years ago, James was three times as old as his Peter. In five years time, the sum of their ages will be 76. Determine their present ages (3mks)

16. Given that OA= $\underset{\sim}{i} + \underset{\sim}{2j}$ and OB= $2\underset{\sim}{i} - 3\underset{\sim}{j}$. Find the magnitude of AB to three significant figures (3mks)

SECTION B (50 MARKS)

Answer ONLY FIVE questions in this section in the spaces provided

17. A cold water tap can fill a bath in 3 minutes while a hot tap can fill in 5 minutes. The drain pipe can empty the bath in 3 ¾ minutes. The two taps and the drain pipe are fully open for 2 minutes, after which the drain pipe is closed.

(a) What fraction of the bath is filled after the first two minutes (3mks)

(b) How many seconds are required for the bath to be completely filled? (3mks)

(c) Given that the cold water tap delivers water at the rate of 200cm^3/s

Determine

I. The capacity of the bath in litres (2mks)

II. The rate of flow of the hot water tap (2mks)

18. Four towns A,B,C and D are such that B is on a bearing of 247^{o} and 6km from A. C is due SSE and 4.8km from B. D is to the south of A and the bearing of C from D is S44^{o}W

(a) Make a scale drawing showing the relative positions of A,B,C and D using the scale 1cm represents 1km (4mks)

(b) Use your drawing to determine

(i) The bearing of A from C (1mk)

(ii) The distance between C and D (1mk)

(iii) How far D is east of B (1mk)

(c) The average speed of a cyclist from C to A if he takes 30 minuets between A and D and 20 minutes between D and A (3mks)

19. A passenger train travelling at 25km/hr is moving in the same direction as the truck travelling at 30km/hr. the railway line runs parallel to the road and the track takes 1 ½ to overtake the train completely

(a) Given that the truck is 5 metres long determine the length of the train in metres (6mks)

(b) The track and the train continue moving parallel to each other at the original speeds. Calculate the distance between them after 4 minutes and 4 seconds after the track overtake the train (2mks)

(c) The track stopped 45 minutes after overtaking the train. How long did the train take to catch up with the truck (2mks)

20. The probability of Onyancha, Nyamusi and Jemima hitting the bull's eye are $\frac{1}{5}, \frac{3}{10} and \frac{2}{3}$ respectively.

(a) Draw a probability tree diagram showing this possible outcomes (2mks)

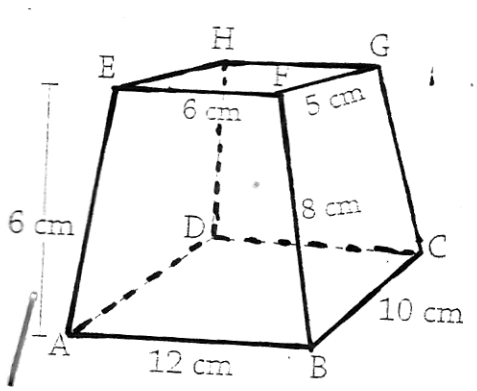
(b) Find the probability that;

(i) All hit the bulls eye (2mks)

(ii) Only one of them hit the bull's eye (3mks)

(iii) At most one misses the bull's eye (3mks)

21. The figure below is a solid frustrum of a rectangular based pryramid AB=12cm, BC=10cm, EF=6cm FG=5cm, FB=8cm and vertical height 6cm.

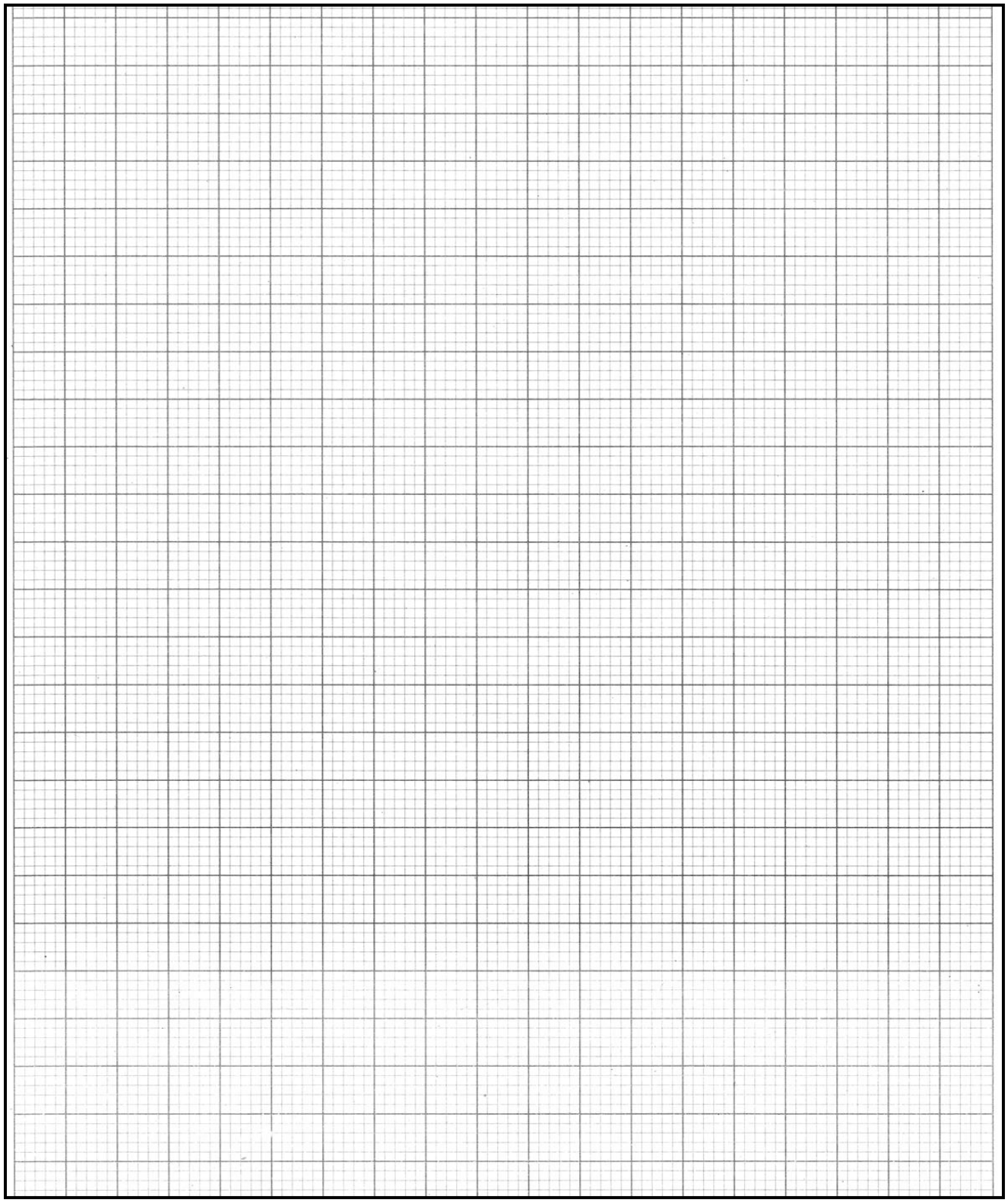


(a) Calculate the volume of the frustrum (5mks)

(b) Calculate the surface area of the frustrum (5mks)

22. The points P(1,5) Q(2,2) R(1,1) and S(4,2) are vertices of a quadrilateral PQRS

(a) On the grid provided, draw the quadrilateral PQRS (2mks)



(b) On the same grid draw P1Q1R1S1 the image of PQRS under a rotation of positive quarter turn about the origin. State the co-ordinates of P1Q1R1 and S1 (3mks)

(c) The point P11Q11R11S11 are the images of P1Q1R1S1 under a reflection in the x-axis. On

the same grid draw quadrilateral P11Q11R11S11 and state its co-ordinates (3mks)

(d) Quadrilateral P11Q11R11S11 is the image of PQRS under a certain reflection. On your graph draw the mirror line LL for the reflection and state its equation (2mks)

23. (a) Complete the table below by filling in the blank spaces for the functions

y=sin(x+30) and y= cos ½ x and draw their graphs on the same axes (7mks)

x	0	30	60	90	120	150	180	210
Y= sin (x+30o)	0.5		1		0.5			-0.87
Y= cos ½ x	1.00			0.71			-0.50	

(b) Use your graph to solve

(i) Sin (x+30)-cos ½ x=0 (1mk)

(ii) Sin (x+30)=0 (1mk)

(iii) Cos ½ x=-0.25 (1mk)

24. Points A,B,C have the co-ordinates (3,1)(8,2) and (2,6) respectively

(a) Find the mid points of AB and AC (3mks)

(b) Determine the equations of the perpendicular bisector of AB and AC (3mks)

(c) Hence or otherwise determine the equation of a circle which passes through the points A, B and C

(4mks)

RDS 18

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate $\dfrac{\frac{3}{4}+1\frac{5}{7}\div\frac{4}{7}of\,2\frac{1}{3}}{\left(1\frac{3}{7}-\frac{5}{8}\right)x\frac{2}{3}}$ (3mks)

2. A fruit juice dealer sell the juice in pacjket of 300ml, 500ml and 750ml. find the size of the smallest container that can fill each of the packets and leave a remainder of 200ml. (3mks)

3. Without using table or calculators, evaluate $\sqrt{\frac{0.0032+0.0608}{1.44x0.4}}$

4. Simplify the following quadratic expression. $\frac{8b^2-50a}{(2b+5a)^2}^2$ (2mks)

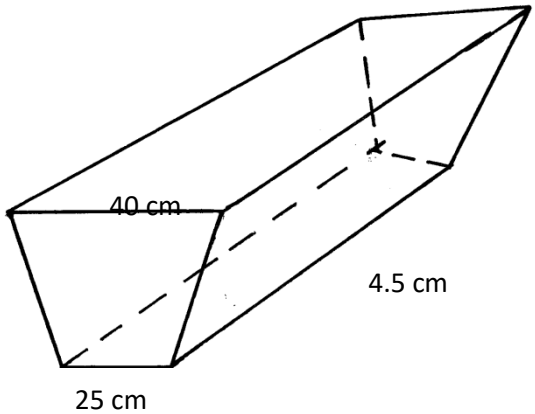
5. In a fundraising committee of 45 people, the ratio of men to women is 7:2. Find the number of women required to join the existing committee so that the ratio of men to women is changed to 5: 4.

(3mks)

6. A student expanded (x + y)2 incorrectly as x 2+ y 2 calculate the percentage error in the answer if x = 4 and y = 6

(3mks)

7. The figure below shows a trough which is 40 cm wide at he top and 25 cm wide at the bottom. The trough is 20cm deep and 4.5 m long. Calculate the capacity of the trough in litres. (3mks)



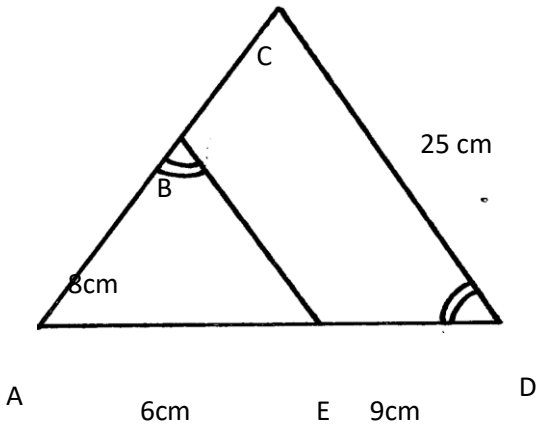
8. Jemima's team entered a contest where teams of students compete by answering questions that earn either 3 points of 5 points. Jemima's team scored 44 points after answering 12 questions correctly. How many five-points questions did the team answer correctly. (3mks)

9. Using compass and ruler only construct a triangle Arc such that AB= 6cm ,BC = 5cm and angle ABC = 67.5o measure the length of AC (4mks)

10. Use table of reciprocals only to work out : $\frac{13}{0.156} - \frac{3}{0.6735}$ (3mks)

11. In the figure below, angle ABE is equal to angle ADC AE = 6cm, Ed = 9cm and AB = 8cm,

calculate the length of BC (3mks)



12. Simplify the expression below leaving your answer in rationalized surd form of a + b$\sqrt{c}$

$\frac{1+\tan 120^o}{1+Cos\ 330^o}$ (4mks)

13. The two sides of a triangle are given 6 cm and 5 cm. the angle between them is 130o. calculate the are of the triangle (giving your answer to 2 decimal places) (3mks)

14. Given that Km + hn = r and that m = $\begin{pmatrix}-3\\-2\end{pmatrix}$ n = $\begin{pmatrix}0\\4\end{pmatrix}$ and r = $\begin{pmatrix}-6\\0\end{pmatrix}$. Find the scalars k and h (3mks)

15. Give the matrices A = $\begin{pmatrix} 3 & 2 \\ 4 & 1 \end{pmatrix}$ and B = $\begin{pmatrix} 1 & -1 \\ 2 & 3 \end{pmatrix}$ and that C = Ab, find the inverse of C . (3mks)

16. The length of a rectangular mat is 1.5 M longer that its width, Find the length of the mat if its area is 6.5 m^2 (give your answer to 4 significant figures) (3mks)

SECTION II

Answer only five questions from this section

17. Five towns V,W,X,UY and Z are situated such that W is 200km east of V. X is 300km from W on a bearing of 150^{o}. Y is 350km on a bearing of 240o X. Z is 150o from V but 200^{o} from X.

    Draw the diagram representing the position of the towns. (use a scale of 1cm to represent 50km) .

    (5mks)

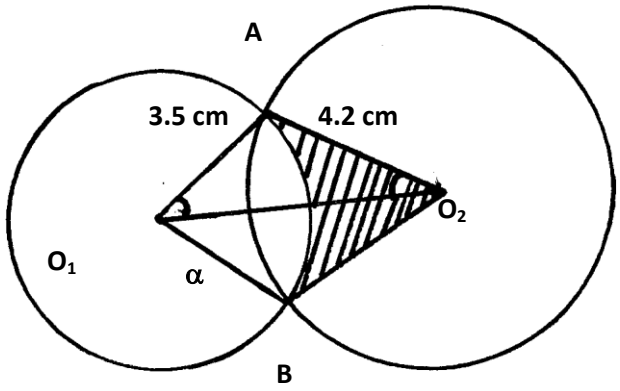
(b) From the diagram determine

(i) the distance in km of V from Z (1mk)

(ii) The bearing of Y from W (1mk)

(c) A plane heading to town X takes off from town y and flies upwards of a constant angle which is less than 90^o. After flying a distance of 350^okm in the air it sees town x at an angle of depression of 50^o. calculate the distance of the plane from x at this point to the nearest km. (3mks)

18. Two circles of radii 3.5 and 4.2 cm with centres O_1 and O_2 respectively intersect at points A and B as shown in the figure below. The distance between the two centres is 6 cm.



Calculate

(a) The size of $\angle$AO1B (to the nearest degree) (3mks)

(b) The size of $\angle$ A O2 B (to the nearest degree) (3mks)

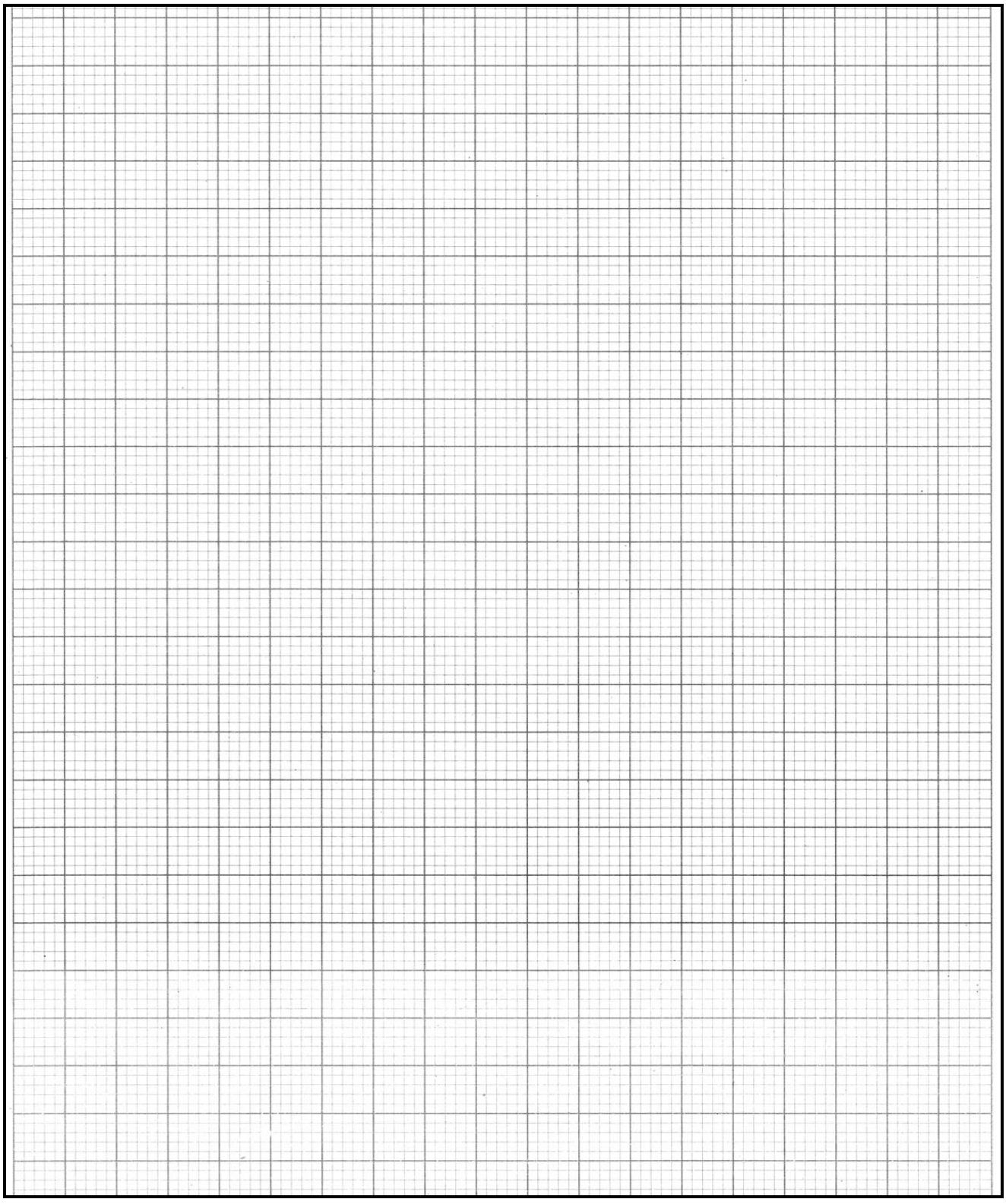
(c) The area of quadrilateral O1AO2B, correct to 2 decimal places. (2mks)

(d) The shaded area correct to two significant figures. (take $\pi\ ^{22}/_{7}$) (2mks)

19 (a) complete the table below for the function y = 2 x 2 + 4 X -3

X	-4	-3	-2	-1	0	1	2
2x2	32		8	2	0	2	
4x-3			-11		-3		
Y			-3			3	13

(b) Draw the graph of the function y = 2x3 + 4 4x – 3 on the grid provided. (3mks)



(c) Use your graph to estimate the roots of the equation $2x2 + 4x – 3 = 0$ (1mk)

(d) Use your graph to obtain the roots of the equation $2x2 + x – 5 = 0$ to 1 decimal place. (3mks)

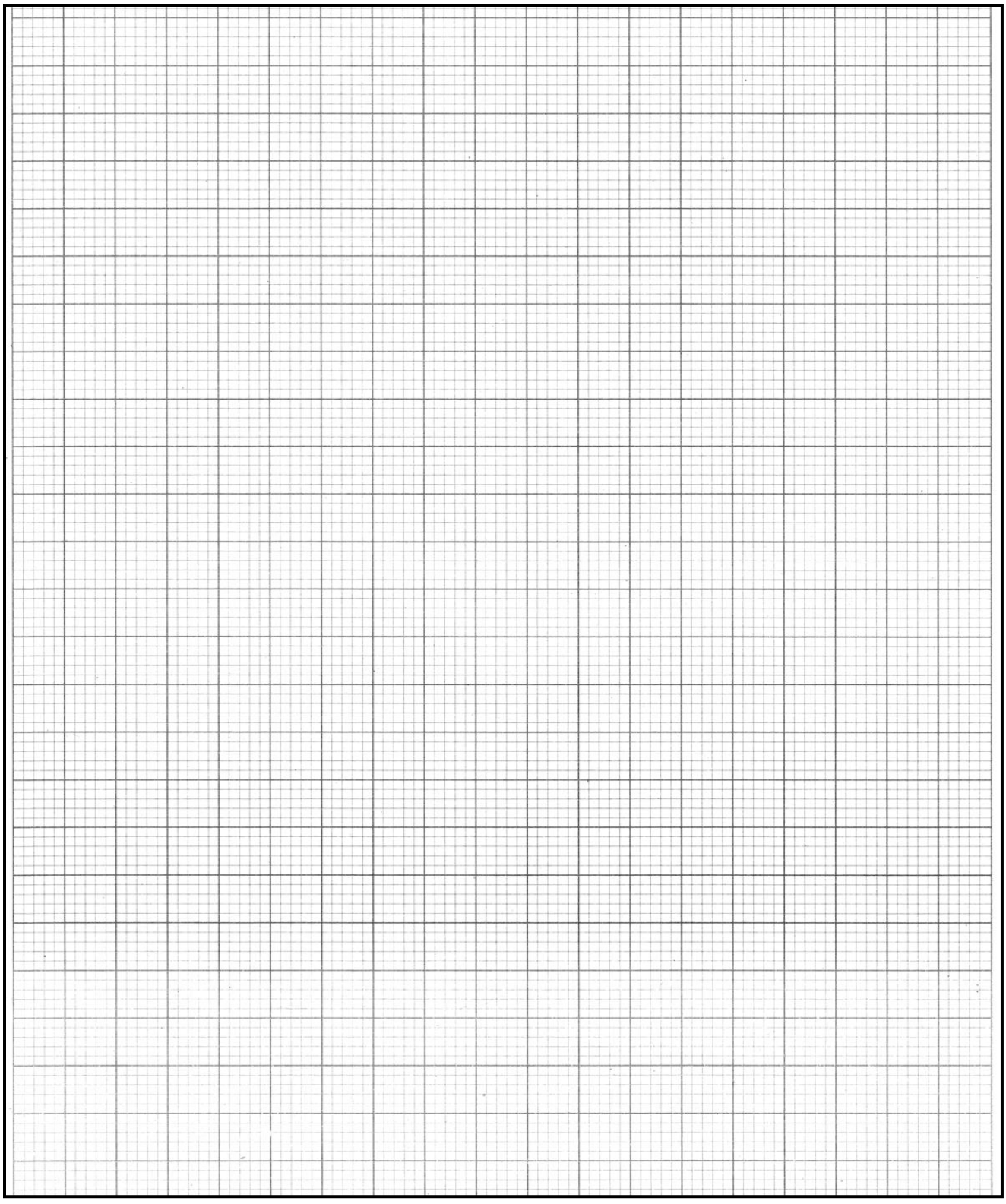
(e) Draw the line of symmetry to pass through the turning point of this curve. (1mk)

20 The table below shows patients who attend a clinic in one week and were grouped by age as shown in the table below.

Age x years	$0 \leq x < 5$	$5 \leq x < 15$	$15 \leq x < 25$	$25 \leq x < 45$	$45 \leq x < 75$
Number of patients	14	41	59	70	15

(a) Estimate the mean age (4mks)

(b) On the grid provided draw a histogram to represent the distribution. (3mks)
Use the scales: 1cm to represent 5 units on the horizontal axis 2 cm to represent 5 units on the vertical axis.



(c) (i) State the group in which the median mark lies (1mk)

(ii) A vertical line drawn through the median mark divides the total area of the histogram into two equal. Using this information estimate the median mark. (2mks)

21. (a) Show by shading the unwanted region, the region which satisfies the following inequalities (8mks)

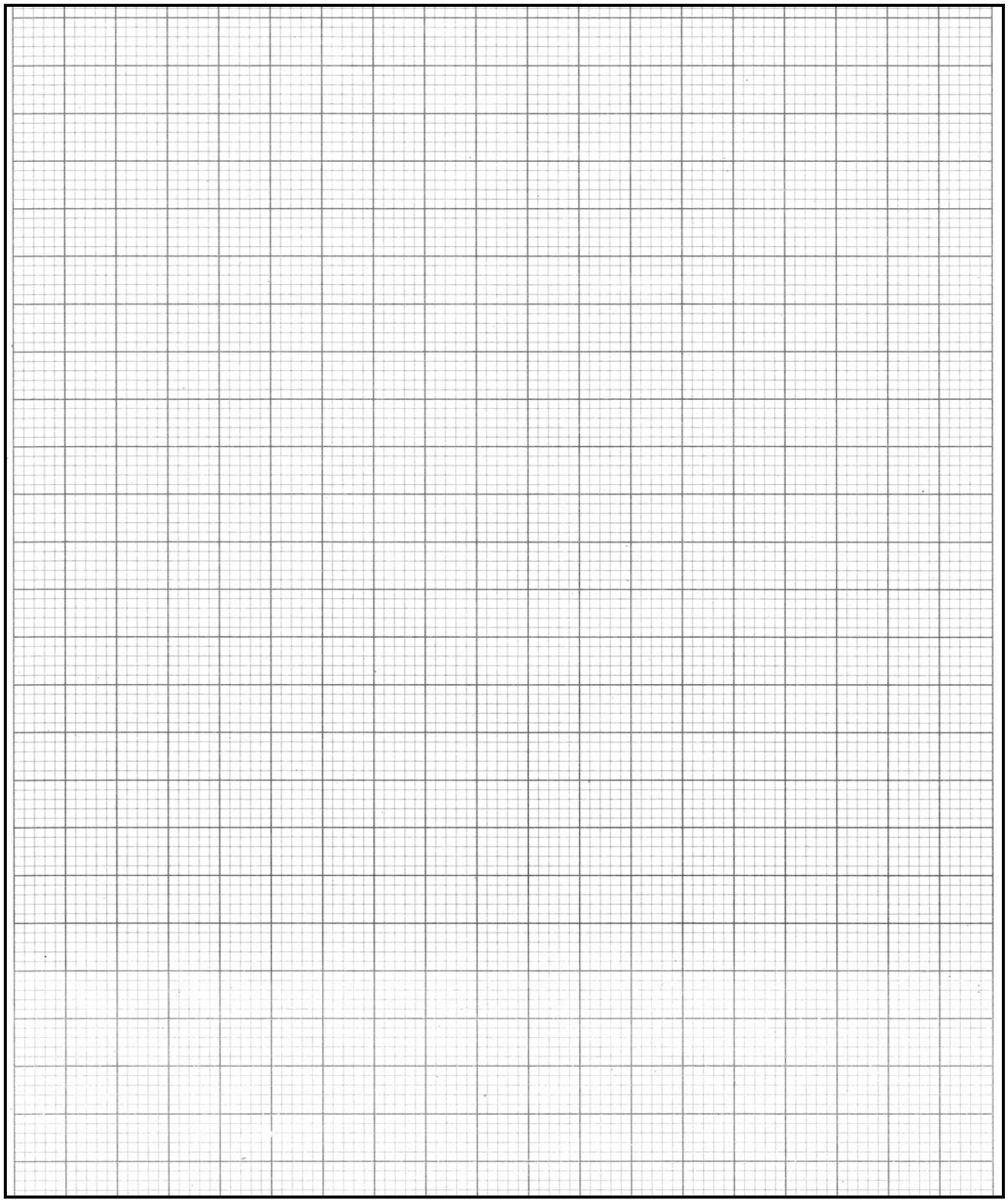
$Y > -3$

$4y \leq 5x + 20$

$2y < -5x + 10$

$4y \leq -3\ 3x - 12$

(b) calculate the area of this region in a square units (2mks)

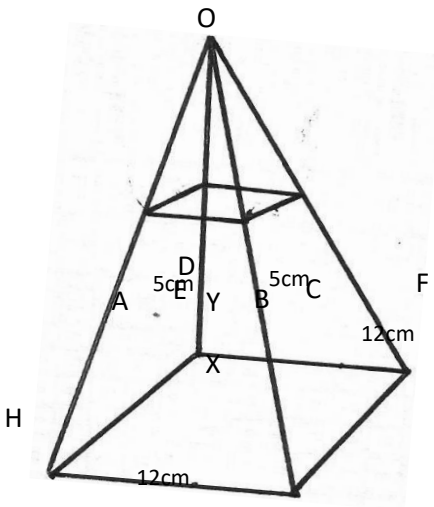


22. (a) Use trapezium rule with 8 strip to find the are bounded by the curve y = x 2 + 2 and the x – axis,

x = 2 and x = 2 (5mks)

(b) Calculate the actual area in (a) above Hence find the percentage error in the area. (5mks)

23.



The diagram shows a frustum ABCDEF GH formed from a smaller pyramid ABCDO. The base the top of the frustums are squares of sides 12cm and 5 cm respectively. If Ob = 6cm and each of the slant edges of the frustum is 15 cm long. Calculate to 1 decimal place:

(a) the height OY of the small pyramid (3mks)

(b) the vertical height X Y of the frustum (4mks)

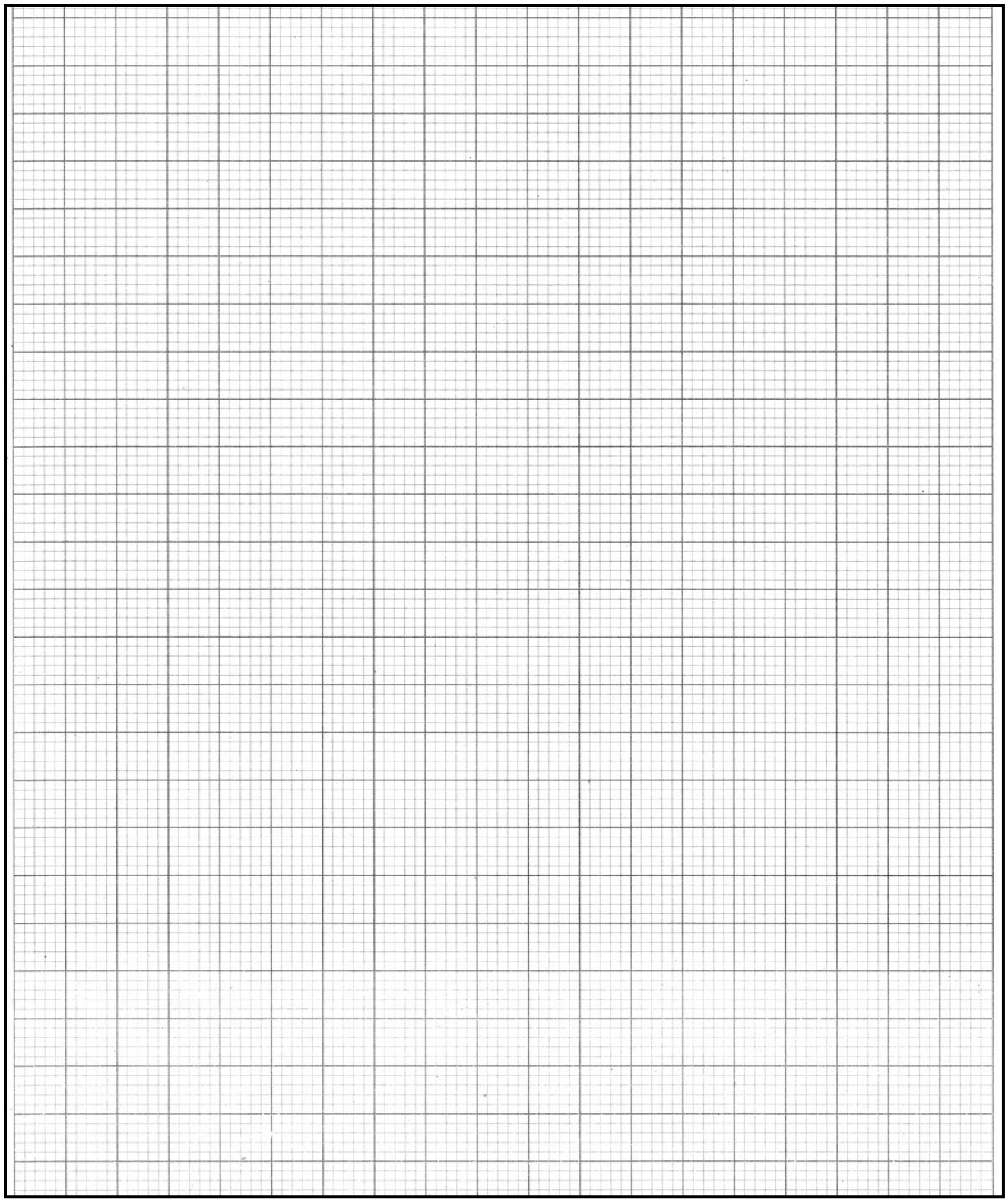
(c) the volume of the frustum (3mks)

24. Complete the table below. (2mks)

X	-180^o	-150^o	-120^o	-90^o	-60^o	-30^o	0^o	30^o	60^o	90^o	120^o	150^o	180^o
$3\sin\left(\frac{x}{2}+15\right)$	-2.90			-1.50						2.60		3.0	
Cos (2x + 30)^o	0.87		-0.87		0			0			0	0.87	

(b) On the same set of axes draw the graph of y = 3 sin $\left(x/2+15\right)$ and y = Cos (2x + 30) for

$-180 \le x \le 180^o$ (5mks)



(c) (i)Use the graph in (b) above to solve 3 sin $\left(x/2 + 15\right)$ Cos (2x + 30) = 0 (1mk)

(ii) State the period and the amplitude of 3 sin $\left(x/2 + 15\right)$ (2mk)

RDS 19

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Simplify and express your answer as a mixed number.

$$\frac{{}^{2}/_{5} \div {}^{1}/_{6} \text{ of } 1\,{}^{3}/_{25} - ½}{(1\,¼ + {}^{2}/_{3}) \div 5\,{}^{1}/_{9} - {}^{1}/_{7}}$$

(3 marks)

2. The centre of a circle is a point C (3, 7). A tangent to the circle passes through point A (5, 3) lying on the circle. Find the equation of the tangent . (3 marks)

3. If the roots of the equation $2x^2 - px + 8 = 0$ are equal, find the value of P.

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

5. Use the reciprocal tables only, to find the value of x (3 marks)

$$\frac{2}{x} = \frac{3}{10.3} + \frac{2}{15.5}$$

6. Given that $\log_{10} 2 = 0.3010$ and $\log_{10} 3 = 0.4771$, Evaluate $\log_{10} 15$ (3 marks)

7. A is a point (3, 4) and C is (8, 2). O is the origin and P is a point given that $\underset{\sim}{OP} = \underset{\sim}{OA} + \frac{1}{2}\underset{\sim}{AC}$. Find the coordinates of $\underset{\sim}{P}$ (3 marks)

8. Simplify (3 marks)

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

9. The total surface area of two metallic spheres is 116π cm^2 and their radii differ by 3cm. Find the radius of each sphere. (3 marks)

10. Rationalise the denominators and simplify the answer completely.

$$\frac{\tan 60^0}{1 + \dfrac{1}{\text{Cos}45^0}} + \frac{2 + 5\tan 60^0}{\tan 60^0 - \dfrac{1}{\text{Sin}45^0}}$$

(3 marks)

11. List down all the integral values of the following inequalities and represent the solutions on a number line.

$$\frac{y}{2} - 1 < \frac{y}{5}$$

$$\frac{3}{8} + \frac{y}{3} \geq \frac{y}{4}$$

(3 marks)

12. A trader bought three kinds of rice as shs. 80 per Kg, sh. 120 per kg and sh.150 per kg. He mixed them in the ratio 3:5:4 respectively and sold the mixture to make a profit of 25%. At what price per kg did he sell the mixture? (3 marks)

13. Three towns A, B and C are situated so that AB = 65km and AC = 115km. The bearing of B from A is 062^0 and the bearing of C from A is 278^0 calculate.

a. The distance BC (2 marks)

b. The bearing of B from C (2 marks)

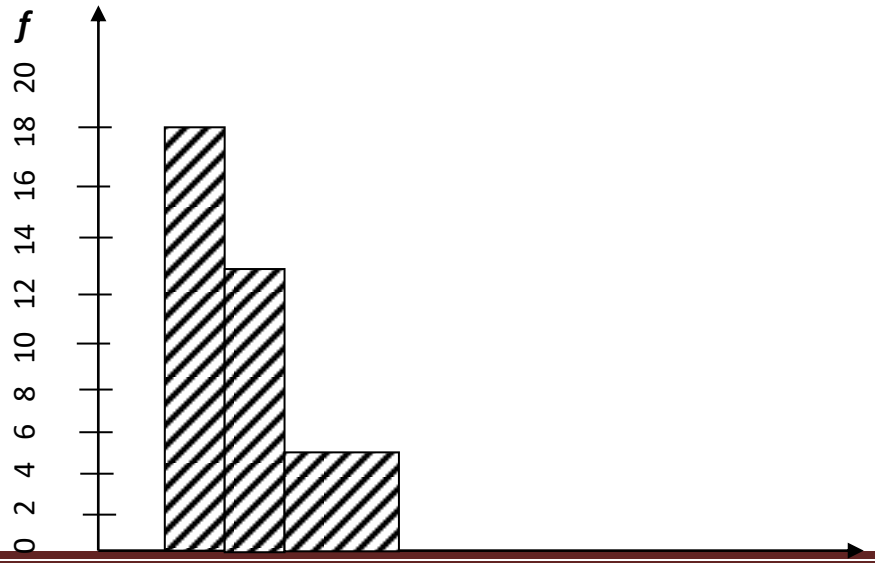
14. Use the trapezium rule to estimate the area under the curve $y = x^2 + x - 6$ over the interval $0 \leq x \leq 8$ using 8 trapezia. (4 marks)

15. Without using a calculator, evaluate (4 marks)

$$\frac{27^{2/3} \times (1/3)^{-2} \times 729^{-5/6}}{2^{1/2} \times (1/162)^{-1/4} \times 72^{-1/4}}$$

16. The unfinished table and histogram give information about the survival times of a group of elephants in the Nairobi National Park.

Time (t hours)	Frequency
$0 \leq t < 0.5$	10
$0.5 \leq t < 1$	
$1 \leq t < 2$	13
$2 \leq t < 4$	
$4 \leq t < 6$	8



a. Use the histogram to complete the table (2 marks)

b. Use the table to complete the histogram

SECTION II (50 MARKS)
Attempt ANY FIVE questions

17. (a) Three men, Maina, Koech and Maundu form a business partnership. Maina invested shs. 80,000 for 2 years, Koech shs. 50,000 for three years and Maundu invested his money for four years. They agreed that the profits should be shared in proportion to the amount invested and time for which it was invested. How much did Maundu invest if Maina's share of the profit of shs. 129,000 was sh. 48,000?
(5 marks)

b) A nurse buys a fridge for sh. 40,000 paying sh. 16,000.00 down payment and the remainder in installments of shs. 8000, paid at the end of each of the first three quarters, together with a final payment at the end of the fourth quarter to clear the debt. Interest at 3% per quarter, reckoned on the amount of owing at the beginning of each quarter, is added at the end of each quarter. Calculate the amount of the final payment to clear the debt giving your answer to the nearest shilling. (5 marks)

18. In triangle AOB , $O\underset{\sim}{A} = \underset{\sim}{a}$, $O\underset{\sim}{B} = \underset{\sim}{b}$. M is the mid-point of AB and N is a point on OB such that ON : NB = 1 : 2. AN and OM intersect at P

a. Express $A\underset{\sim}{B}$, $O\underset{\sim}{M}$ and $A\underset{\sim}{N}$ in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$ (3 marks)

b. If OP = sOM and AP = t AN, express $O\underset{\sim}{P}$ in two different ways (3 marks)

c. Using your results in (b) above, find the value of s and t (3 marks)

d. Hence state the ratio AN : PN (1mark)

19. O and P are points on a line. A particle moves along the line in such a way that t seconds after leaving O, its velocity is vm/s where $v = kt - t^2$ where K is a constant. At the time when t = 6 seconds the particle is momentarily at rest at P.

Find:

a. The value of K (2 marks)

b. The distance OP (3 marks)

c. The average speed of the particle between O and P (3 marks)

d. The acceleration of the particle when it is at P (2 marks)

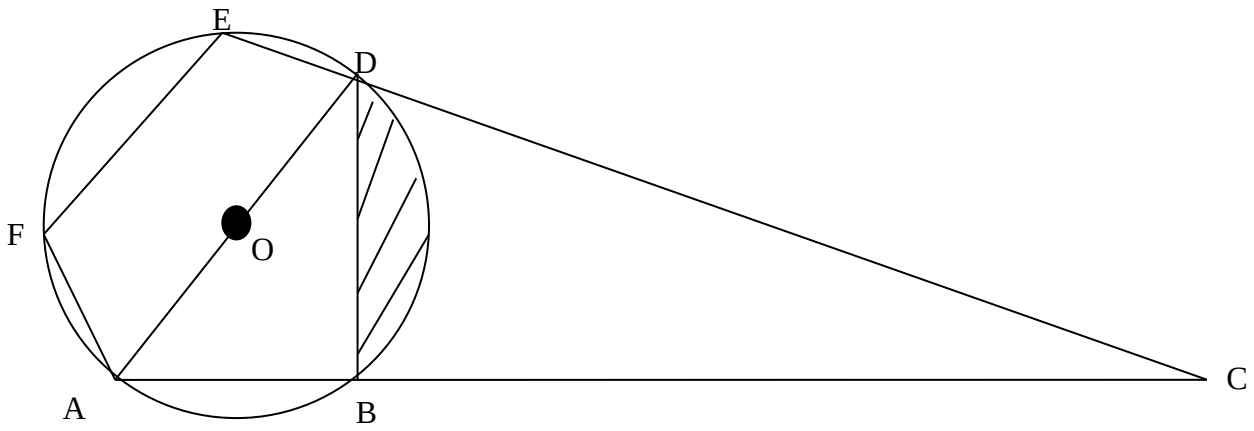
20. A shop keeper stocks two brands of drinks called Kula and Kunywa which are produced in cans of the same size. He needs to order fresh supplies and has room for upto 1000 cans. Kunywa is more popular and he decides to order at least twice as many cans of Kunywa and Kula. He wishes however, to have at least 100 cans of Kula and not more than 800 cans of Kunywa. Taking x and y to be the number of cans of Kula and Kunywa respectively.

a. Write down 4 inequalities involving x and y which satisfy these conditions. (4 marks)

b. Using a scale of 1 cm to represent 100cans on each axis, draw a graph of the above inequalities.
(4 marks)

c. The profit of a can of Kula in shs. 3 and on a can of Kunywa is sh. 2. Use your graph to determine the number of cans of each drink that the shopkeeper showed order to give the maximum profit. (2 marks)

21. In the figure below AD is a diameter of a circle centre O. angle FAD = 64^0, angle EFD = 30^0, angle ADB = 50^0 and length AD = 7cm.



a. Giving reasons determine the size of the angles.

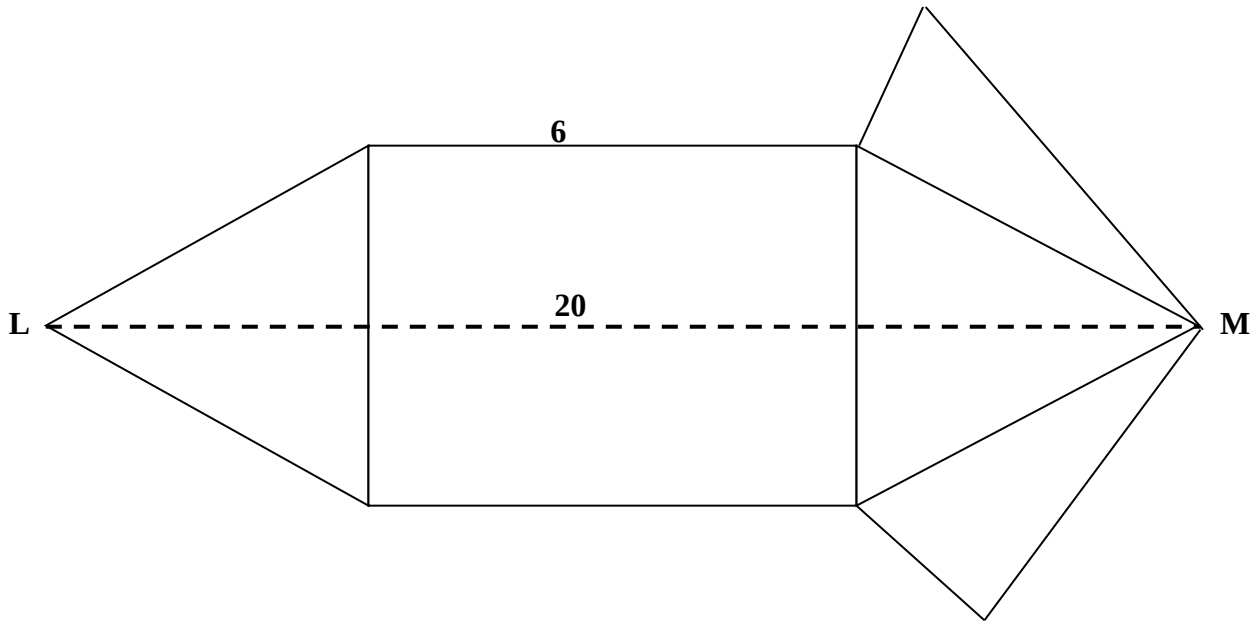
i) FED (2 marks)

ii) DCB (3 marks)

iii) Reflex E O B (2 marks)

b. Determine the area of the shaded region (3 marks)

22.



The figure above (not to scale) consists of a square of side 6 cm and four congruent isosceles triangles. It represents the net of a pyramid on a square base. The distance LM is 20cm. calculate;

a) The total surface area of the pyramid. (3 marks)

b) The perpendicular height of the pyramid formed when the net is folded. (2 marks)

c) The angle of inclination of a triangular face to the base of the pyramid. (3 marks)

d) The angle between a slanting edge of the base. (2 marks)

23. (a) Construct a parallelogram ABCD in which AB=9cm AD=5cm and angle BAD = 60^0 (2 marks)
(b) Measure the length AC (1mark)
(c) Show the locus of a point P which moves so that it is equidistant from A to C (1mark)
(d) The locus of a point Q which moves so that angle BQD = 90^0 (2 marks)
(e) The position of a point X so that AX $\geq$ XC and angle BXD = 90^0 (2 marks)
(f) Shade the region inside the parallelogram such that A X $\geq$ XC and angle BXD $\geq 90^0$ (2 marks)

24. The heights of 100 millet plants were measured to the nearest centimeter. The results were recorded in a grouped frequency distribution table as shown below.

Height x (cm)	**Frequency**	**D**	**D^2**	**Fd**	**Fd^2**	**Cf**
25-29	5			-15		5
30-34	12			-24		17
35-39	18	-1	1	-18		35
40-44	30	0	0	0		65
45-49	17	1	1			
50-54	11	2				
55-59	7	3				

a) Complete the table (2 marks)
b) Calculate to two decimal places
a. The mean (2 marks)

b. The standard deviation (2 marks)

c. Using the data above plot an ogive and use it to find the quartile deviation. (4 marks)

RDS 20

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Without using a calculator ,evaluate

$$\frac{3/4 + 1\,5/7 \div 4/7 \text{ of } 2\,1/3}{(1\,3/7 - 5/8) \times 2/3}$$ Giving your answer as mixed fraction (3mks)

2. Two boys and a girl shared some money. The younger boy got $5/18$ of it; the elder boy got $7/12$ of the remainder and the girl got the rest. Find the percentage share of the younger boy to the girl's share. (4mks)

3. Three numbers,1400, 1960 and **n** have a G.C.D and L.C.M of 70 and 2^2 X 5^2 x 7^2 x 11 respectively. Find the least possible value of **n** (3mks)

4. A bus starts off from Kitale at 9. a.m and travels towards Kakamega at a speed of 60km/hr. At 9.50 a.m, a matatu leaves Kakamega and travels towards Kitale at a speed of 60Km/h. How far from Kitale will the two vehicles meet. (3mks)

5. Find the equation of a straight line which is equidistant from the points **A**(2,3) and **B** (6,1) (3mks)

6. Simplify the expression completely (3mks)

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

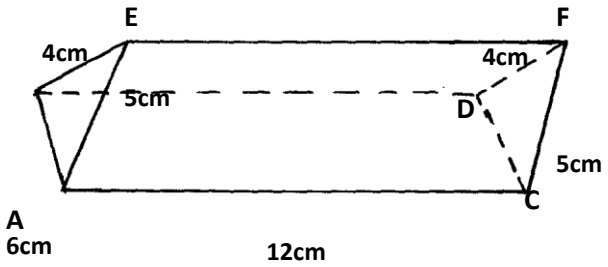
7. Given that $\sin \theta = \frac{2}{3}$ and θ is an a cute angle, find without using tables $\tan^2 \theta + \cos^2 \theta$. Give your answer as a mixed fraction. (3mks)

8. Solve for ***y*** in the equation below. (4mks)

$8(2^2)^y = 6(2^y) - 1$

9. Using a ruler, a pair of compasses only and (proportional) a set square, construct on the upper side division of line **BC**, a line **BD** such that $\angle$ **DBC** = 37.5^o. Use the line **BD** to divide **BC** into 4 equal portions.
(3mks)

10. Sketch the net of the solid below. (2mks)

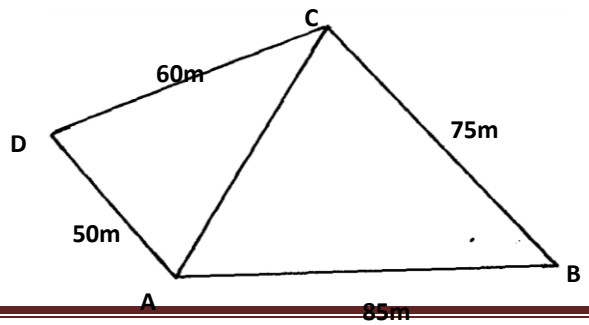


11. In a regular polygon, each interior angle is x^o and each exterior angle is $\left(\frac{x-36}{3}\right)^o$

(i) Find angle X^o (1mk)

(ii) Find the number of sides of the polygon (2mks)

12. The figure below represents a plot of land **ABCD** such that **AB**= 85m, **BC** 75m **CD**= 60m **DA** = 50m and angle **ACB** = 90^o. (not drawn to scale)



Determine the area of the plot, in hectares correct to two decimal places. (4mks)

13. An open rectangular box measures externally 32cm long , 27cm wide and 15cm deep. The box is made up of metal 1cm thick. If it has a mass of 1.5kg, what is the density of the box to 4 significant figures? (3mks)

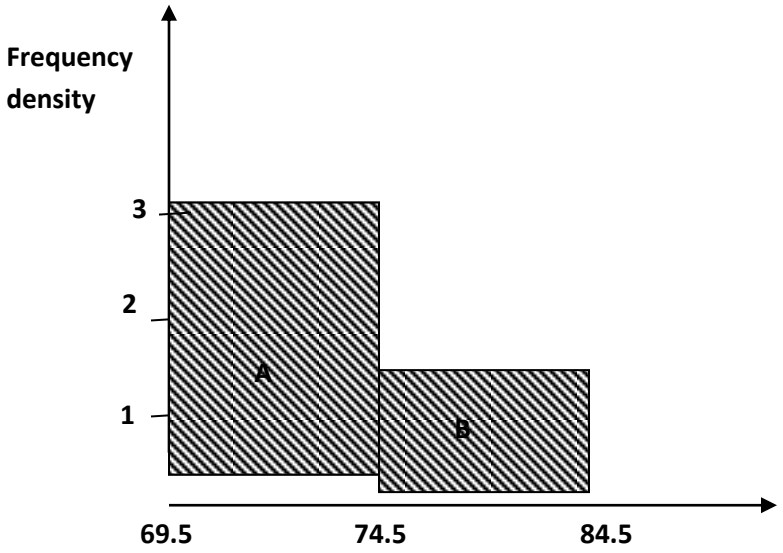
14. Find the integral values of *x* which satisfy the following inequalities;
2x + 3 > 5x – 3 > -8 (3mks)

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

	Buying Ksh	Selling Ksh
1 US dollar ($)	63.00	63.20
1 UK pound (£)	125.00	125.95

A tourist arrived in Kenya with £ 9600 which he converted into Kshs at a commission of 5%. He later used ¾ of the money before changing the balance of dollars at no commission calculate ; to the nearest dollar, the amount he received. (3mks)

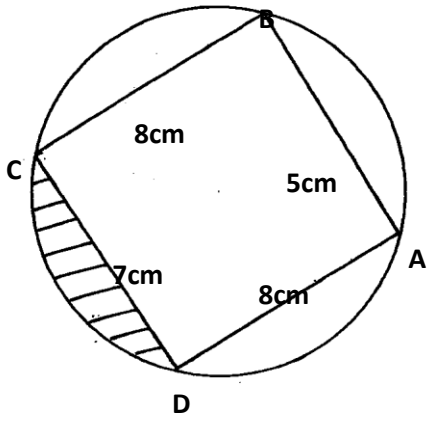
16. The histogram shown below represents the distribution of marks obtained in attest. The bar marked A has a height of 3.2 units while **B** has a height 1.2 units. If the frequency of the class represented by **B** is 6, find the frequency of the bar represented by **A**. (3mks)



SECTION II (50 MARKS)

Answer any five questions in this sections in the spaces provided.

17. The figure below (not drawn to scale) shows a quadrilateral **ABCD** inscribed in a circle. **AB** = 5cm, **BC** = 8cm,**CD** = 7cm and **AD** = 8cm. **AC** is one of the diagonals of length 10cm.



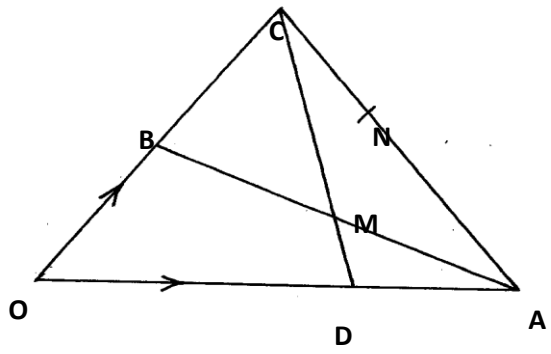
(a) Find the size of angle **ABC**. (3mks)

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

(c) Hence, calculate the area of the shaded region. (5mks)

18. In the figure below $\overrightarrow{OB} = \underset{\sim}{b}$, $\overrightarrow{OC} = 3\overrightarrow{OB}$ and $\overrightarrow{OA} = \underset{\sim}{a}$

(a) Given that $\overrightarrow{OD} = 1/3\ \overrightarrow{OA}$ and $\overrightarrow{AN} = ½\ \overrightarrow{AC}$, $\overrightarrow{CD}$ and $\overrightarrow{AB}$ meet at **M**. Determine in terms of **a** and **b**



(i) **AB** (1mk)

(ii) **CD** (1mk)

(b) Given that **CM** = **k CD** and **AM** = **h AB** determine the values of the scalars **k** and **h** (5mks)

(c) Show that **O**, **M** and **N** are collinear. (3mks)

19. The table below shows the analysis of examination marks scored by 160 candidates.

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	6	15	22	36	34	20	15	6	4

(a) Using an assumed mean of 45.5 , calculate

(i) The mean (3mks)

(ii) The standard deviation (4mks)

(b) Calculate the minimum mark for grade **A** if 40 students got grade **A-** (3mks)

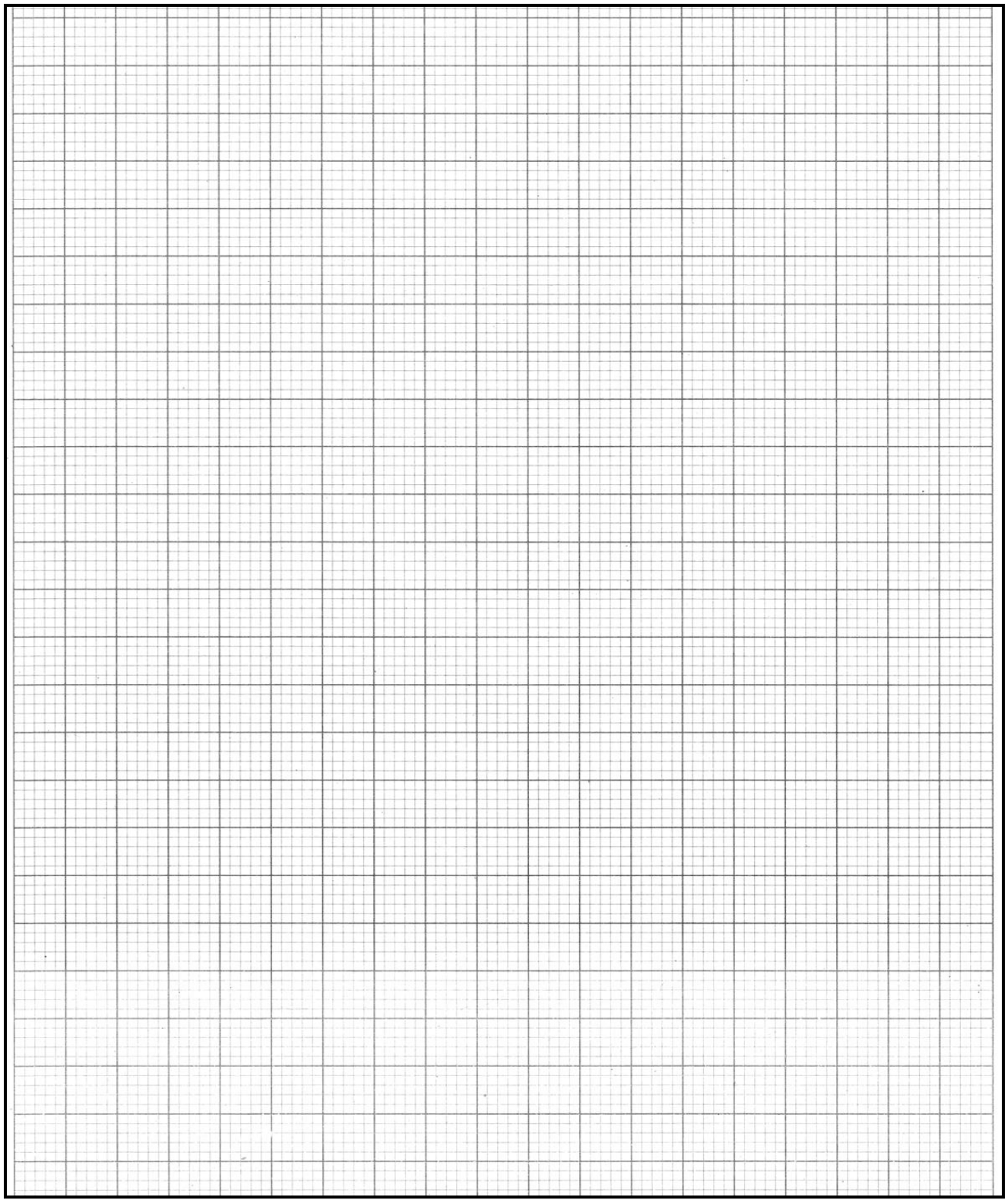
20. **ABCD is** a quadrilateral with vertices as follows: **A**(3,1), **B** (2,4) **C** (4,3) and **D** (5,1)

(a) (i) On the grid provided draw the quadritoral **ABCD** and the image **A'B'C'D'** under a transformation with matrix $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$. Find the co-ordinates of **A'B'C'D'** (3mks)

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

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

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



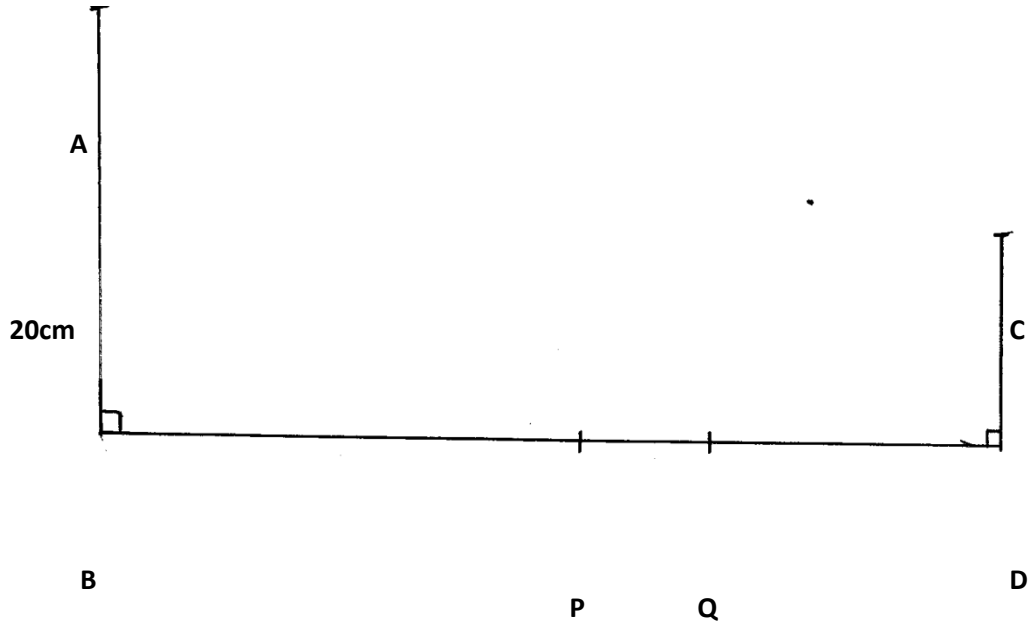
21. Four towns **P,Q, R** and S are such that **Q** is 1500 km due east of town **P**. Town R is 1080 km due North of town **Q**. Town S is on a bearing of 330^{o} from P and on a bearing of 300^{o} from **R**.
    (a) Use a ruler and a pair of compasses and show the positions of town **P, Q,R** and **S.** (take a scale of 1cm = 3000km) (5mks)

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

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

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

22. The diagram below represents two vertical watch – towers **AB** and **CD** on a level ground. **P** and **Q** are two points on a straight road **BD**. The height of the tower **AB** is 20m and road **BD** is 200m



(a) A car moves from **B** towards **D**. At point **P,** the angle of depression of the car from points **A** is 11.3^{o} Calculate the distance **BP** to 4 significant figures. (2mks)

(b) If the car takes 5 second to move from **P** to **Q** at an average speed of 36km/hr, calculate the angle of depression of **Q** from **A** to 2 decimal places. (3mks)

(c) Given that **QC** = 50.9 cm, calculate

(i) The height of **CD** in meters to 2 decimal places; (2mks)

(ii) The angle of elevation of **A** from **C** to the nearest degree. (3mks)

23. The parents of a certain mixed secondary school decided to buy a school van worth Ksh. 900,000. Each student was to contribute the same amount of money. 50 students were transferred from the school; as a results each f the remaining students had to pay Ksh. 600 more.

(a) Find the original number of the students in the school. (5mks)

(b) Find the percentage change in contributions per student. (3mks)

(c) If the ratio of boys to girl in the school was 11: 7 find the amount money contributed by boys alone.

(2mks)

24. The distance **S** metres from a fixed point ,covered by a particle after **t** seconds is given y the equation;
$S = t^3 - 6t^2 + 9t + 5$

(a) Calculate the gradient tot the curve at **t** = 0.5 seconds. (3mks)

(b) Determine the values of **S** at the maximum turning points of the curve. (4mks)

(c) On the space provided, sketch the curve of $S = t^3 - 6t^2 + 9t + 5$ (3mks)

RDS 21

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Without using a calculator evaluate (3marks)

$$\frac{1/2 \text{ of } 3\,1/2 + \frac{3}{2}\left(5/2 - \frac{2}{3}\right)}{\frac{3}{4} \text{of } 2\,1/2 \div \frac{1}{4}}$$

2. Find the possible values of X in the equation $9^{X^2} = 27^{(2X+12)}$ (3marks)

3. Use square roots, reciprocal and square tables to evaluate to 4 significant figures the expression;
(4 marks)

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

4. Given that $\frac{2x+3y}{3x+4y} = 5$, find the ratio of y:x (3marks)

5. Two similar solids have surface areas 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)

6. A Kenyan tourist left Germany for Kenya through Switzerland. While in Switzerland he bought a watch worth 52 Deutsche marks. Find the value of the watch in:-

   (a) Swiss Francs

   (b) Kenya shillings (3 marks)

   Use the exchange rates below

   1 Swiss Franc = 1.28 Deutsche marks

   1 Swiss Franc = 45.21 Kenya shillings

7. The lines 4ax = 3y +12 and 7bx – 2 = 3y are parallel .Find the ratio a:b (3mks)

8. In a Mathematical experiment it was derived that Tan $144^0 = 1 - \sqrt{3}$, determine the value Of Tan 54^0 from this results leaving your answer in the form $\frac{a + \sqrt{c}}{b}$ where a, b and c are integers.
(3 marks)

9. Simplify $\frac{p^2 - 2pq + q^2}{p^3 - pq^2 + p^2q - q^3}$ (3mks)

10. (a) Find the inverse of the matrix $\begin{pmatrix} 4 & 3 \\ 3 & 5 \end{pmatrix}$ **(1 mark)**

(b) Hence solve the simultaneous equation using the matrix method **(2 marks)**

$4x + 3y = 6$

$3x + 5y = 5$

11. Use the inequality below to find the integral values of x that satisfy the inequality and show the solution on the number line. (4marks) $3x + 1 \leq 4x + 5 \leq x + 13$

12. The points A, B and C lie on a straight line. The position vectors of A and C are $2\mathbf{i} + 3\mathbf{j} + 9\mathbf{k}$ and $5\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$ respectively; B divides AC internally in the ration 2:1. Find the

(c) Position vector of B. **(2 marks)**

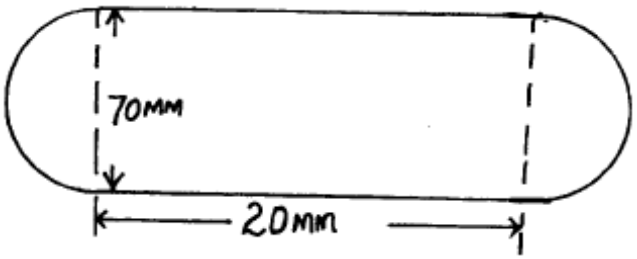
(d) Distance of B from the origin. **(1 mark)**

13. Simplify without using tables (2 marks)

$$\frac{\text{Log } 125 - \log 25}{\text{Log } 25 + \log 5}$$

14. The L.C.M of three numbers is 7920 and their G.C.D is 12. Two of the numbers are 48 and 264. Using factor notation find the third number if one of its factors is 9. (3mark)

15. The figure below (not drawn to scale) shows the cross-section of a metal bar of length 3 metres. They are equal semi-circles.



Determine the mass of the metal bas in kilograms if the density of the metal is 8.87g/cm^3. (3marks)

16. A regular polygon has an internal angle of 150^0 and a side length 10cm.

a) Find the number of sides of the polygon. (2marks)

b) Find the perimeter of the polygon. (2marks)

SECTION II

17. A frequency distribution of marks obtained by 120 candidates is to be represented in a histogram. The table below shows the grouped marks, frequencies for all the groups and also the area and height of the rectangle for the group 30-60 marks. SCALE: x Axis: 1cm to represent to represent 10 units y – axis: 1cm to represent 1 unit

Marks	0 – 10	10 -30	30 -60	60 -70	70 -100
Frequency	12	40	36	8	24
Area of rectangle			180		
Height of rectangle			6		

i) Complete the table (4mks)

ii) On the grid provided below, draw a histogram (2mks)

(a) i) State the group in which the median mark lies(1mk)

ii) A vertical line drawn through the median mark divides the total area of the histogram into two equal parts. Using this information or otherwise estimate the median (3mks)

18. (a) Complete the table below for the function $y = 3x^2 – 2x – 1$ for $-3 \leq x \leq 4$. (2 marks)

X	-3	-2	-1	0	1	2	3	4
$3x^2$			3				27	
-2x	6							-8
-1								
Y		15				7		

(b) Draw the graph of $y = 3x^2 – 2x – 1$. (3 marks)

(c) Draw the line $y = 3x + 1$ on the same axis hence find the values of x for which $y = 3x + 1$ and $y = 3x^2 – 2x – 1$ are equal. (3 marks)

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

Your answer in the form, $\frac{x}{a} + \frac{y}{b} = 1$ where a and b are constants. (4marks)

b) State the coordinates of point A and B, at which the line in (a) above crosses the x-axis and y-axis respectively. (2marks)

c) Using the information in (a) and (b) above, find the area of triangle AOB, where O is the origin. (2marks)

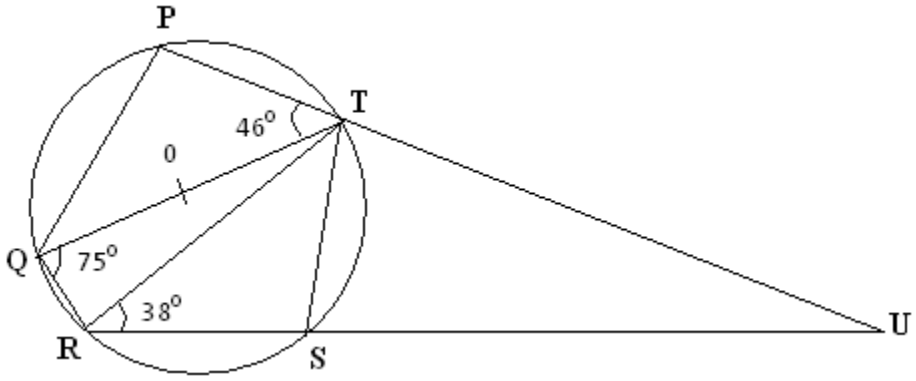
d) Find the acute angle the line in (a) above makes with the x-axis. (2marks)

20. **a) Using** a ruler and a pair of compasses only construct a line PQ, 8cm long. On the line construct triangle PQR such that $\angle$ QPR = 75^0 and line PR = 7cm. measure line QR (4marks)

b) Construct a circum circle of triangle PQR and measure its radius. (3marks)

c) Calculate the difference in area between the circle and triangle PQR. (3marks)

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



Determine the following, giving reason in each case.

a) Angle RST (2marks)

b) Angle SUT (2marks)

c) Angle PST (2marks)

d) Obtuse angle ROT (2marks)

e) Angle SQT (2marks)

22. The boundaries **PQ**, **QR**, **RS** and **SP** of a ranch are straight lines such that: **Q** is 16 km on a bearing of 040^0 from **P**; **R** is directly south of **Q** and east of **P** and **S** is 12 km on a bearing of 120^0 from **R**.

a) Using a scale km to represent 2 km, show the above information in a scale drawing. (3marks)

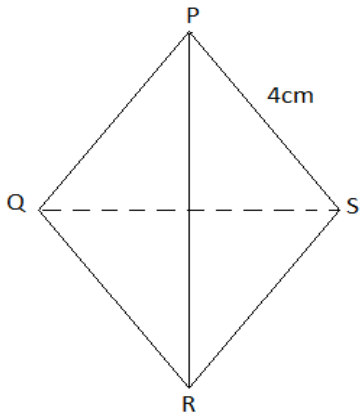
(b) From the scale drawing determines:

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)

23. PQRS is a regular tetrahedron of side 4cm.



c) Calculate the angle between planes PSR and QRS **(4 marks)**

d) Calculate the volume of the Tetrahedron **(6 marks)**

24. A matatu and Nissan left town A for town B 240km away at 8.00a.m travelling at 90km/hr and 120km/hr respectively. After 20 minutes the Nissan had a puncture which took 30 minutes to mend.

a) How far from town A did the Nissan catch up with the matatu? **(6 marks)**

b) At what time did the Nissan catch up with the matatu? **(1 mark)**

c) At what time did the matatu reach town B? **(3 marks)**

RDS 22

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Use logarithms to evaluate (4mks)

$$\frac{16.92^2 \ x \ \sqrt{0.6318}}{327.5}$$

2. Solve the equation (3mks)

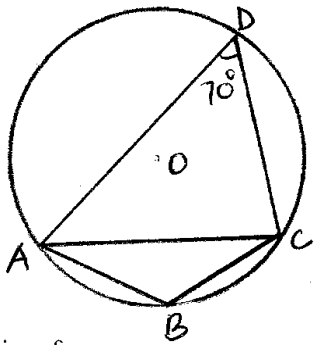
$$6^{2x+1} = 2^{3X+1}$$

3. Evaluate using tables of reciprocals, squares and cubes. (4mks)

$$\frac{\sqrt[3]{0.0008}}{0.375} - \frac{10}{37.5^2}$$

4. A student requires $x = {}^{5}/_{9}$ and $y = {}^{5}/_{3}$ in decimal form. He truncates the values to 3 significant figures. Determine the percentage error in the quotient ${}^{y}/_{x}$ using the truncated values.
(4mks)

5. In the figure below O is the centre of circle ABCD. <ADC = 70°. AD = AC.



Find the size of

i) <ABC (1mk)

ii) <DAO (2mks)

6. If tan θ = $\frac{24}{25}$, find without using tables or calculator, the value of

$$\frac{Tan\ \theta - Cos\ \theta}{Cos\ \theta + Sin\ \theta}$$ (2mks)

7. Point $P^1(5,6)$ is the image of point P $(-1,-4)$ under a rotation of 180° about point Q(x,y). Find the co-ordinates (x,y) (2mks)

8. Find the area of Δ ABC with sides 8cm, 9cm, and 10cm (3mks)

9. Simplify $\frac{15x^2 + xy - 6y^2 - (3x+2y)(2x-y)}{2y-3x}$ (3 mks)

10. A scale on a map is 1:2000. A circular piece of land for growing maize has a radius of 7cm on the map. Calculate the actual area in hectares of this piece of land. (Take $\Pi = \frac{22}{7}$) (3mks)

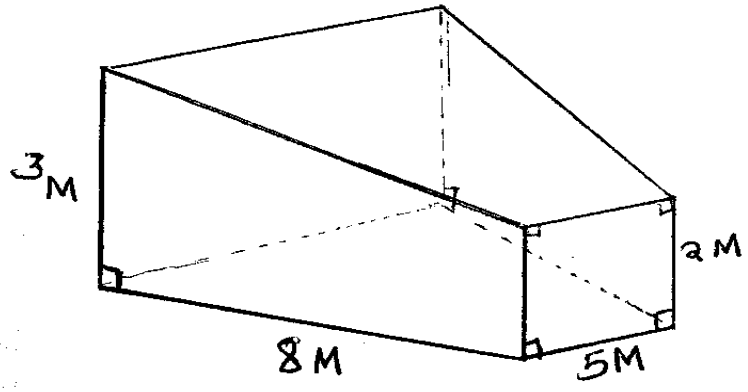
11. The internal and external radii of spherical shell are 6 cm and 9 cm respectively. Calculate the volume of the material of the shell. (4 mks)

12. The masses of two similar bars of soap are 343 g and 1331 g. If the surface area of the smaller bar is 196 cm^2. Calculate the surface area of the larger bar (3mks)

13. A perpendicular line is draw from point P(3,4) so that it meets line 3 y = 2x + 12 at point Q. Find the exact co-ordinates of point Q (3mks)

14. Two tractors A and B travel between two towns 120km apart. Tractor A has an average speed of 10km/h more than tractor B and takes 1 hour less than tractor B. Find the respective speeds of the two tractors. (3mks)

15. Find the surface area of the figure given below, which is completely closed. (3mks)



16. Vector **r** has a magnitude of 14 and is parallel to vector **s**. Given that **s** = 6**i** – 2**j** + 3**k**, express vector **r** in terms of **i, j** and **k** (3mks)

SECTION 11 (50MKS)

17. (i) A particle moves in a straight line in such a way that its distance, S meters after t seconds is given by the equation

$S = \frac{t^3}{3} - 3t^2 + 5t$, find the times when:

a) the particle is stationery (3mks)

b) Its velocity is 5 m/s (2mks)

c) Its acceleration is 10 m/s^2 (2mks)

(ii) Find the equations of the tangent and normal to the curve $y = 2x^2 + 1$ at the point where x = 2 (3mks)

18. A triangle whose vertices are A(1,4) B(2,1) and C(5,2) is given the following transformations.
    i) A reflection along the line y = x to $A^1B^1C^1$
    ii) $A^1B^1C^1$ is given a rotation of a positive quarter turn about the origin $A^{11}B^{11}C^{11}$
    iii) $A^{11}B^{11}C^{11}$ is given an enlargement of linear scale factor -2 about (1,2) to $A^{111}B^{111}C^{111}$

    a) Using the grid provided, plot the triangle ABC and its image $A^1B^1C^1$ (3mks)

    b) Locate the image $A^{11}B^{11}C^{11}$ from the grid hence state its co-ordinates. (3mks)

    c) Find the co-ordinates of $A^{111}B^{111}C^{111}$ hence plot it on the grid (4mks)

19. Three machines A, B, and C are set to work together. A working alone takes 6hrs to complete the work, B takes 8hrs while C takes 12 hrs.

a) Find the time taken by A, B &C to complete the work while working together(3mks)

b) All the three machines started working at the same time, 40 mins later machine A broke down B and C continued for another 1 hr before B ran out of fuel and therefore stopped working for 20 mins while C continued. If B resumed working after 20mins
Find

i) The function of work left after machine A broke down. (2mks)

ii) The fraction of work done by C working alone for 20 mins. (2mks)

iii) The total time taken for the work to be completed. (3mks)

20. In a Δ 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 (2mks)

i) BM

ii) AN

b) Taking BX $=$ tBM an AX $=$ LAN where t and h are scalars, find two Expressions of OX (4mks)

c) Find the values of t and h (4mks)

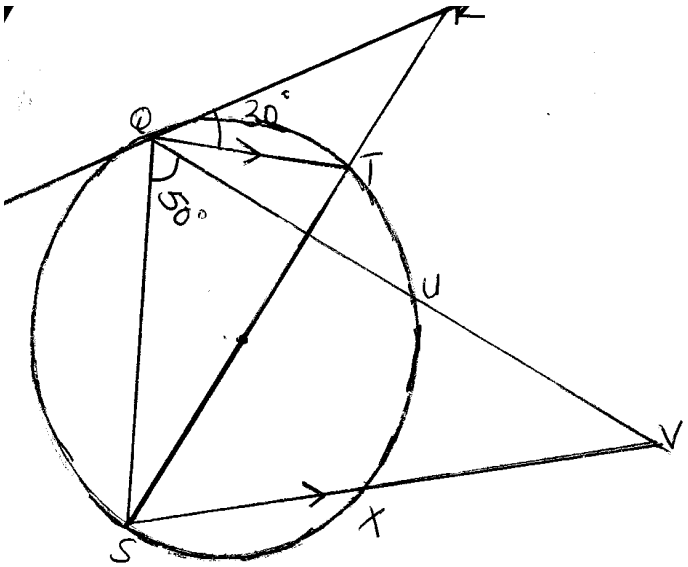
21. Two variables quantities p and Q are connected by the equation $p = KQ^n$ where K and n are constants. The following table gives the values of p and Q.

P	2.29	3.16	3.98	4.57	5.01	6.31	8.71
Q	2.0	3.16	3.98	5.25	6.31	8.32	12.59

(a) Find a linear equation connecting P and Q.

(b) Using a graph, draw a straight line and use it to estimate the values of K and n.
(8 mks)

22.



In the figure above PQR is a tangent to the circle at Q. ST is a diameter and STR and QUV are straight line QT is parallel to SV. Angle TQR = 30^0 and angle SQV = 50^0. Find the following angle, giving reasons for each answer.

(a) QST (2 mks)

(b) QRT (2 mks)

(c) QVS (2 mks)

(d) USV (2mks)

(e) QTS (2 mks)

23. Two points A and B lie on the circumference of the circle, of the circle of centre O and radius 8 cm, where $<AOB = 80^0$. Calculate:

(a) The length of the minor arc AB. (2 mks)

(b) The length of the chord AB. (2 mks)

(c) The area of the sector AOB (2 mks)

(d) The area of triangle AOB. (2 mks)

(e) The area of the minor segment of circle cut off by AB. (2 mks)

24. The table below shows the distributions of marks scored in a test by form 4 students in a certain school.

Marks	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
No of students	1	5	10	10	19	20	20	8	4	3

(a) Using 62 as a working mean, calculate the actual mean mark. (4 mks)

(b) Calculate the variance of the data above. (4 mks)

Calculate the standard deviation.

RDS 23

SECTION I (50 MARKS)

Answer ALL Questions in this Section

1. Evaluate: $\frac{3}{8}$ of $\left\{ 7\frac{3}{5} - \frac{1}{3}\left[1\frac{1}{4} + 3\frac{1}{3} \right] \times 2\frac{2}{5} \right\}$ (2mks)

2. Solve the simultaneous equations

$xy = 4$

$x + y = 5$ (4mks)

3. 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 1½ years. (3mks)

4. Given that position vectors of points A and B are $\underset{\sim}{a} = \begin{pmatrix} -3 \\ \end{pmatrix}$ and $\underset{\sim}{b} = \begin{pmatrix} 2 \\ \end{pmatrix}$ and C is a point on AB such that AC : CB = 1 : 2. Find the coordinates of the point C. (3mks)

5. The table below shows the number of goals scored in 40 soccer matches during a certain season.

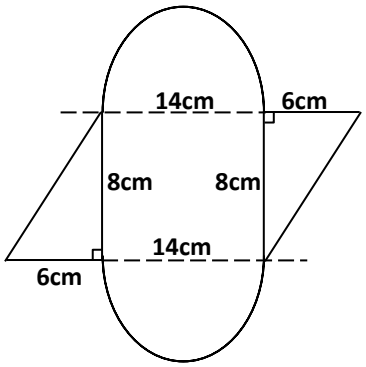
No. of goals	0	1	2	3	4	5	6	7
No. of matches	3	9	6	8	5	5	2	1

Calculate the mean number of goals scored per match. (3mks)

6. Simplify: $\frac{\chi^2 - \chi y}{(\chi + y)^2} \div \frac{(\chi - y)^2}{\chi^2 y - y^3}$ (3mks)

7. From a point 20m away on a level ground the angle of elevation to the lower window line is 25° and the angle of elevation to the top line of the window is 34°. Calculate the height of the window. (3mks)

8. Find the distance round the figure given below. (Take $\Pi = \frac{22}{7}$) (2mks)

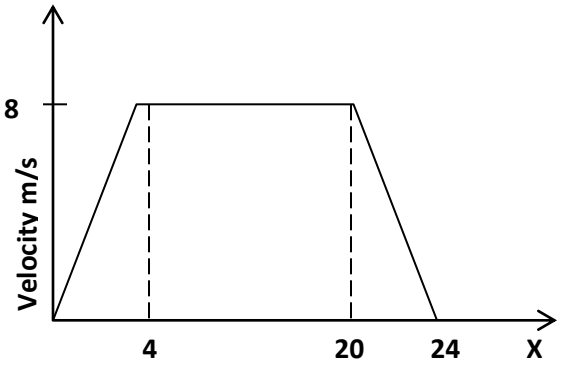


9. Find all the integral values of χ which satisfy the inequalities. (3mks)

$$\chi + 8 > 4\chi - 6 \geq 3(4 - \chi)$$

10. Agnes paid rent which was 1/10 of her net salary. She used ½ of the remaining amount to make a down payment for a plot. She gave her mother Kshs. 2,500 and did shopping worth Kshs. 7,500 for herself. She saved the remainder which was Ksh. 12,500. How much was the down payment that she made. (4mks)

11. The figure **below** is a velocity time graph for a car.



(a) Find the total distance traveled by the car. (2mks)

(b) Calculate the deceleration of the car. (2mks)

12. A chord **PQ** of length 15cm subtends an angle of 65º at the circumference centre **O**. Find the radius of the circle. (3mks)

13. The interior angles of a hexagon are 2x + 5, 4x - 5, 4x + 5, 3x, 4x - 20 and 2x.

Find the value of **x**. (3mks)

14. A line passes through the point (-1, 2) and has gradient -½. Write down its equation in the form ***ax + by = c*** (3mks)

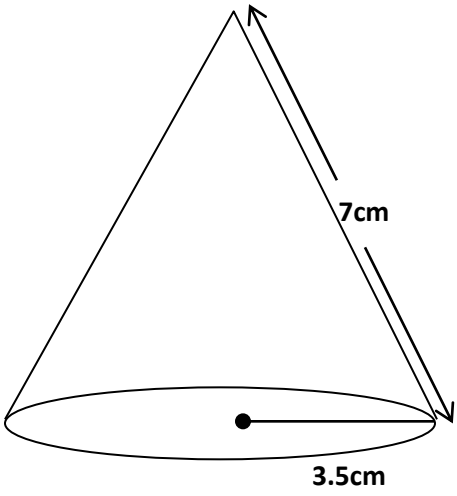
15. A Kenya company received US Dollars M. The money was converted into Kenya Shillings in a bank which buys and sells foreign currencies.

	Buying (in Ksh)	Selling (in (Ksh)
1 Sterling Pound	125.78	126.64
1 Us Dollar	75.66	75.86

(a) If the company received Ksh.15, 132,000, calculate the amount, M received in US Dollar. (2mks)

(b) The company exchanged the above Kenya shillings into Sterling pounds to buy a car in Britain. Calculate the cost of the car to the nearest Sterling pound. (2mks)

16. The figure below is a cone whose base radius is 3.5cm and slant height 7cm. The net of the cone is a sector of a circle.



(a) Find the angle subtended at the centre of the sector. (2mks)

(b) Draw the net of the solid. (1mk)

SECTION II (50 MARKS)

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

17. A straight line L_1 has a gradient $^{-}½$ and passes through point P (-1, 3). Another line L_2 passes through the points Q (1, -3) and R (4, 5). Find.

(a) The equation of L_1. (2mks)

(b) The gradient of L_2. (1mk)

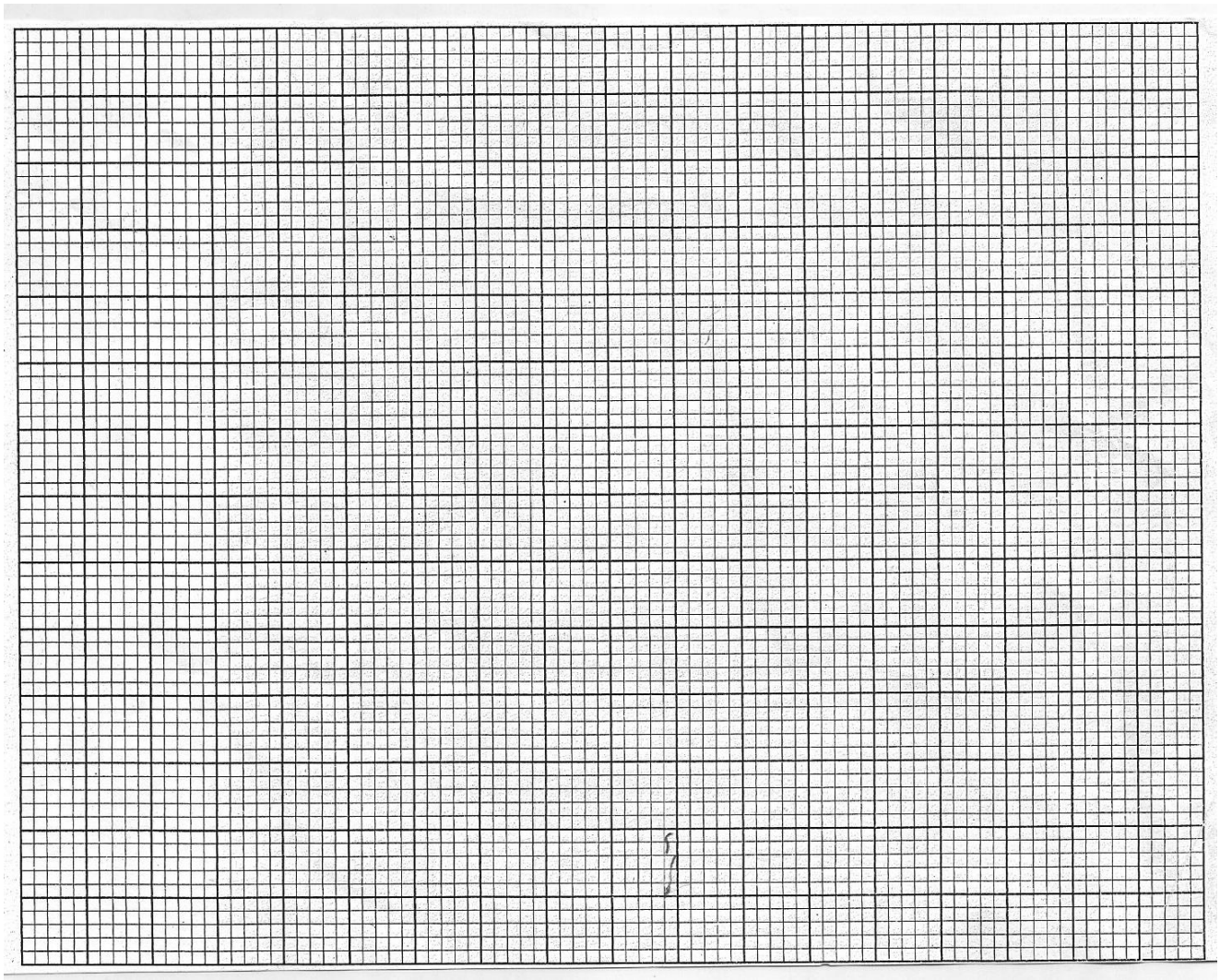
(c) The equation of L_2. (2mks)

(d) The equation of a line passing through a point S (0, 5) and is perpendicular to L_2. (3mks)

(e) The equation of a line through R parallel to L_1. (2mks)

18. (a) Given that $y = 7 + 3\chi - \chi^2$, complete the table **below**. (2mks)

χ	-3	-2	-1	0	1	2	3	4	5	6
y	-11			7						-11



(b) On the grid provided and using a suitable scale draw the graph of

$y = 7 + 3\chi - \chi^2$. (2mks)

(c) On the same grid draw the straight line and use your graph to solve the equation

$\chi^2 - 4\chi - 3 = 0$. (3mks)

(d) Determine the coordinates of the turning point of the curve. (2mks)

.19. From a reservoir, water flows through a cylindrical pipe of diameter 0.2m at a rate of 0.35m per second.

(a) Determine the number of liters of water discharged from reservoir in one hour. (4mks)

(b) The water flows from the reservoir for 18 hours per day for 25 days per month and serves a population of 2500 families. Determine the average consumption of water per family per month giving your answer to the nearest 100 litres. (4mks)

(c) The water is charged at the rate of sh.4.50 per 100 litres. Calculate the average water bill per family per month. (2mks)

20. A bus left Nairobi at 7.00 am and traveled towards Eldoret at an average speed of 80Km/hr. At 7.45 a.m a car left Eldoret towards Nairobi at an average speed of 120Km/hr. The distance between Nairobi and Eldoret is 300 km. Calculate:

(a) The time the bus arrived at Eldoret. (2mks)

(b) The time of the day the two met. (4mks)

(c) The distance of the bus from Eldoret when the car arrived in Nairobi. (2mks)

(d) The distance from Nairobi when the two met.

(2mks)

21. A number of people are asked to cut 20cm lengths of string without measuring. Later 100 pieces are collected and measured correct to the nearest 1/10cm. the data below was collected.

Length, L(cm)	18.0-18.4	18.5-18.9	19.0-19.4	19.5-19.9	20.0-20.4	20.5-20.9	21.0-21.4	21.5-21.9
Frequency	5	8	30	13	10	20	10	4

Using 19.7 as a working mean calculate:

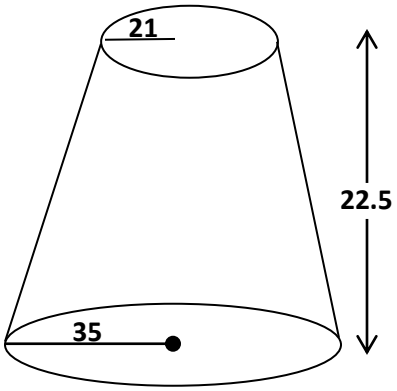
(a) Mean (4mks)

(b) Standard deviation (5mks)

(c) State the modal class (1mk)

22.

.0



(a) The diagram represents a solid frustum with base radius of 35cm and top radius of 21cm.The frustum is 22.5cm high and is made of a metal whose density is 4g/cm³.
Taking $\pi = {}^{22}/_{7}$, calculate

(i) The volume of the metal that makes the frustum. (6mks)

(ii) The mass of the frustum. (2mks)

(b) The frustum is melted in down and recast into a solid cube in the process 20% of the metal is lost. Calculate to 2d.p the length of each side of the cube. (2mks)

23. Four points **B, C, Q** and **D** lie on the same plane. Point B is 42km due southwest point **Q**. Point **C** is 50 km on a bearing of S60^{o}E from **Q**. Point **D** is equidistant from **B, Q** and **C**.

(a) Using the scale: 1cm represents 10km, construct a diagram showing the positions of **B, C, Q** and **D.**

(5mks)

(b) Determine the

(i) Distance between **B** and **C** (1mk)

(ii) Bearing of **D** from **B** (2mks)

(c) Find the distance and bearing of **D** from **C**. (2mks)

24. (a) A small field was surveyed and the measurements recorded in a surveyor's field book as in the table below.

		100	0	**F**
		65	40	**D**
E	30	50		
		30	25	**B**
C	20	20		
A	0	0		

(i) Using a scale of 1cm to 10m make an accurate drawing of the map of the field. (4mks)

(ii) Find the area of the field. (3mks)

(iii) Assuming that the baseline in (a) runs in a northern direction give the position of **D** relative to A using bearing and distance. (3mks)

1. Evaluate without using a calculator or Mathematical tables leaving your answer in the simplest form.

$$\frac{\frac{4}{11}\ of\ \left(\frac{3}{4}-\frac{1}{20}\right)}{\left(3+\frac{1}{3}\right)\div\left(1+\frac{1}{10}\right)}$$

(2 marks)

2. Three similar 21 inch television sets and five similar 17 inch television cost Ksh.129,250. The difference between the cost of two 21 inch television sets and four 17 inch television sets is Ksh.22,000. Calculate the price of a 21- inch television set and that of 17-inch television set. (3 marks)

3. Find the value of χ which satisfies the equation.

$16^{\chi^2} = 8^{4\chi - 3}$ (3 marks)

4. A Kenya bank buys and sells foreign currencies as shown.

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

A Japanese traveling from France to Kenya had 5000 Euros. He converted all the 5000 Euros to Kenya shilling at the bank. While in Kenya, he spent a total of Ksh.289850 and then converted the remaining Kenya shilling to Japanese Yens at the bank.

Calculate the amount in Japanese Yen that he received. (3 marks)

5. Use tables of cubes, square roots and reciprocals to evaluate.

$$\frac{3}{(0.3375)^3 - \sqrt{337.5}}$$

(4 marks)

6. Line L_1 passes through the points (1, -2) and (3, -4). Find the equation of line L_2 which is a perpendicular bisector of L_1 leaving the answer in the form $a\chi + by + c = 0$. (4 marks)

7. Fifteen men working eight hours a day can complete a certain job in exactly 24 days. For how many hours a day must sixteen men work in order to complete the same job in exactly 20 days. (2 marks)

8. The curved surface area of a cylindrical container is 1980cm². If the radius of the container is 21cm, calculate to one decimal place the capacity of the container in litres (Take $\pi = \frac{22}{7}$).(4 marks)

9. Calculate the value of $\int_{-2}^{2}\left(\frac{3\chi^2 + 2\chi^3}{\chi^2}\right)d\chi$. (4 marks)

10. The following were marks scored by a student in eight subjects: 36, 22, 48, 56, 32, 50, 43, 51.

Find the quartile deviation. (3 marks)

11. State all the integral values of **a** which satisfy the inequality.

$$\frac{3a+2}{4} \leq \frac{2a+3}{5} \leq \frac{4a+15}{6}$$

(3 marks)

12. The coordinates of P and Q are P(5, 1) and Q(11, 4) point M divides line PQ in the ratio 2 : 1.

Find the magnitude of vector OM. (3 marks)

13. (a) Using a pair of compasses and a ruler only construct a triangle ABC such that AB = 6cm, BC = 8cm and $\angle ABC = 135°$. (2 marks)

(b) Construct the height of triangle ABC in (a) above taking BC as the base and measure the height. (2 marks)

14. One interior angle of a polygon is equal to 80° and each of the other interior angles are 128°.

Find the number of sides of the polygon. (3 marks)

15. The sum of the first 16 terms of an A.P is 2000. The sum of the next four terms is 900.

Calculate the first term and the common difference. (3 marks)

16. Solve the equation: Sin $\frac{5}{2}\theta = \frac{1}{2}$ for $0° \leq \theta \leq 180°$. (3 marks)

SECTION II: (50 MARKS)

Attempt **ONLY FIVE** questions from this section.

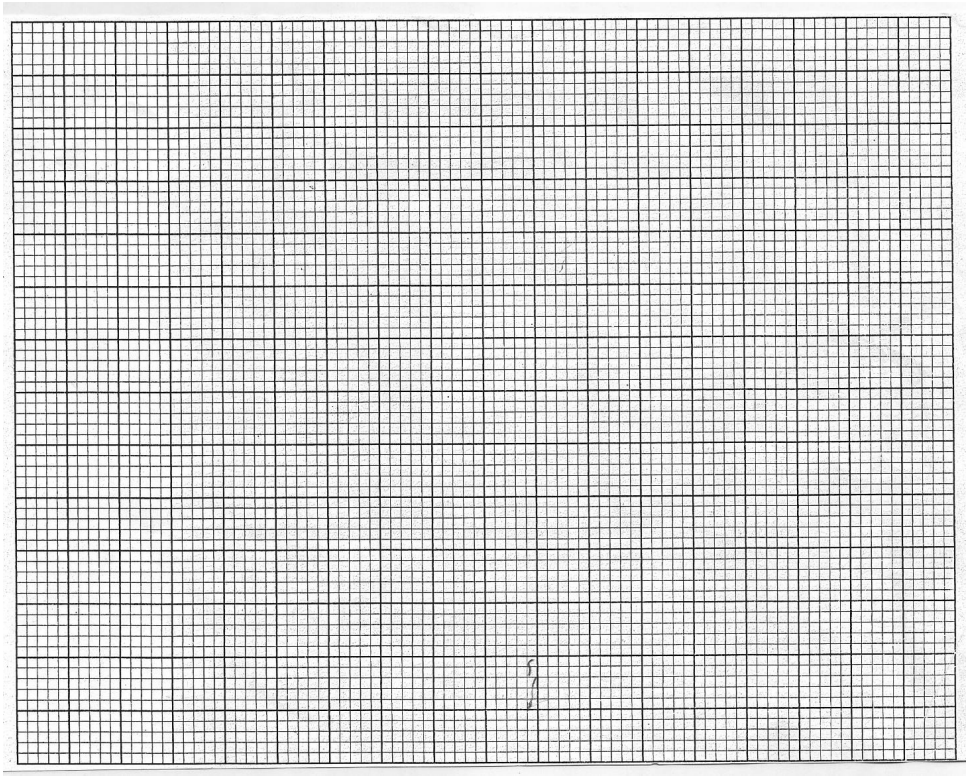
17. (a) A matatu traveling at 99km/hr passes a checkpoint at 9.00am. A police patrol car traveling at 132km/hr in the same direction passes through the police check point at 9.15am. If the matatu and the police patrol car continue at their uniform speeds, calculate at what time the police car will overtake the matatu. (6 marks)

(b) Two passenger trains A and B which are 240m apart and travelling 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 100m long. Determine the time in seconds that elapses before the two trains completely pass each other. (4 marks)

18. Complete the table **below** for $y = 2\chi^3 + \chi^2 - 5\chi + 2$ for the interval $-3 \leq \chi \leq 3$. (2 marks)

χ	-3	-2	-1	0	0.5	1	2	3
$2\chi^3$	-54		-2		0.25		16	
χ^2	9	4			0.25	1		
-5χ			5	0	-2.5	-5	-10	
+2	2	2	2	2	2	2	2	2
y			6		0			50

(b) Draw the graph of $y = 2\chi^3 + \chi^2 - 5\chi + 2$ for the interval $-3 \leq \chi \leq 3$. (3 marks)

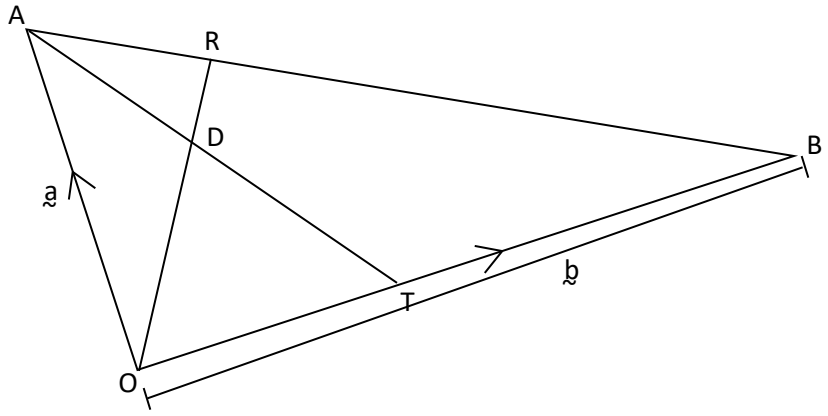


(c) Use your graph to solve equation $y = 2\chi^3 + \chi^2 - 5\chi + 2$. (1 mark)

(d) Use your graph to solve equation $y = 2\chi^3 + \chi^2 - 11\chi - 10$. (2 marks)

(e) Find the gradient of the curve at $\chi = 2$. (2 marks)

19. The figure **below** is a triangle OAB where $\overrightarrow{OA} = \underset{\sim}{a}$ and $\overrightarrow{OB} = \underset{\sim}{b}$. A point R divides AB in the ratio 2: 5 and a point T divides OB in the ratio 1: 3. OR and AT intersect at D.



(a) Find in terms of a and b.

(a) $\overrightarrow{BT}$. (1 mark)

(ii) $\overrightarrow{OR}$ (2 marks)

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

(b) Given that AD – KAT and RD = hRO where K and h are scalars. Find the values of K and h. Hence express AD in term of a and b. (5 marks)

20. The following measurements were recorded in a field book using XY as the base line. XY = 400m.

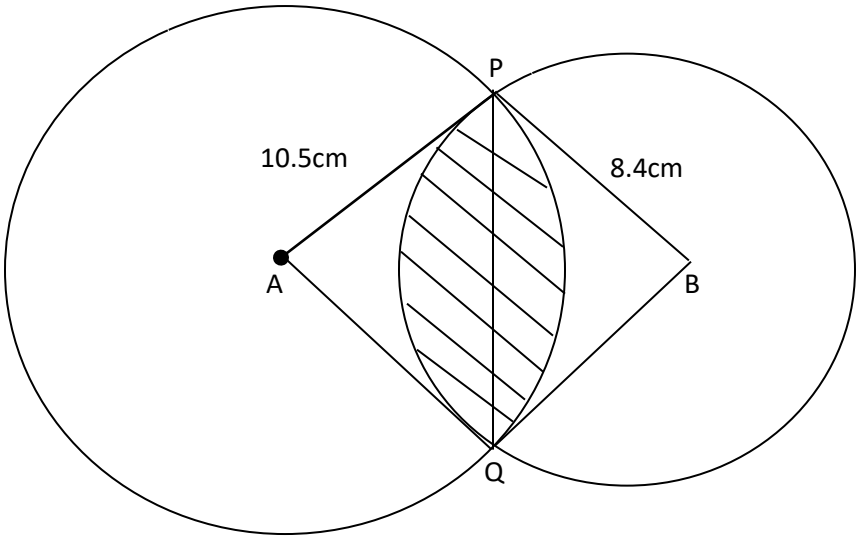
		Y		
C	60	340		
		300	120	D
		240	160	E
		220	160	F
B	100	140		
A	120	80		
		X		

(a) Using a scale of 1: 4000, draw an accurate map of the farm. (4 marks)

(b) Determine the actual area of the farm in hectares. (4 marks)

(c) If the farm is on sale at sh.80000 per hectare, find how much the farm costs. (2 marks)

21. The figure **below** shows two circles of radii 10.5 and 8.4cm and with centres A and B respectively. The common chord PQ = 9cm.



(a) Calculate angle PAQ. (2 marks)

(b) Calculate angle PBQ. (2 marks)

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

22. (a) A curve whose equation is in the form $y = m\chi^3 - n\chi$ where m and n are constants passes through the point (1, 2). Its gradient at the given point is 10. Find the values of m and n.

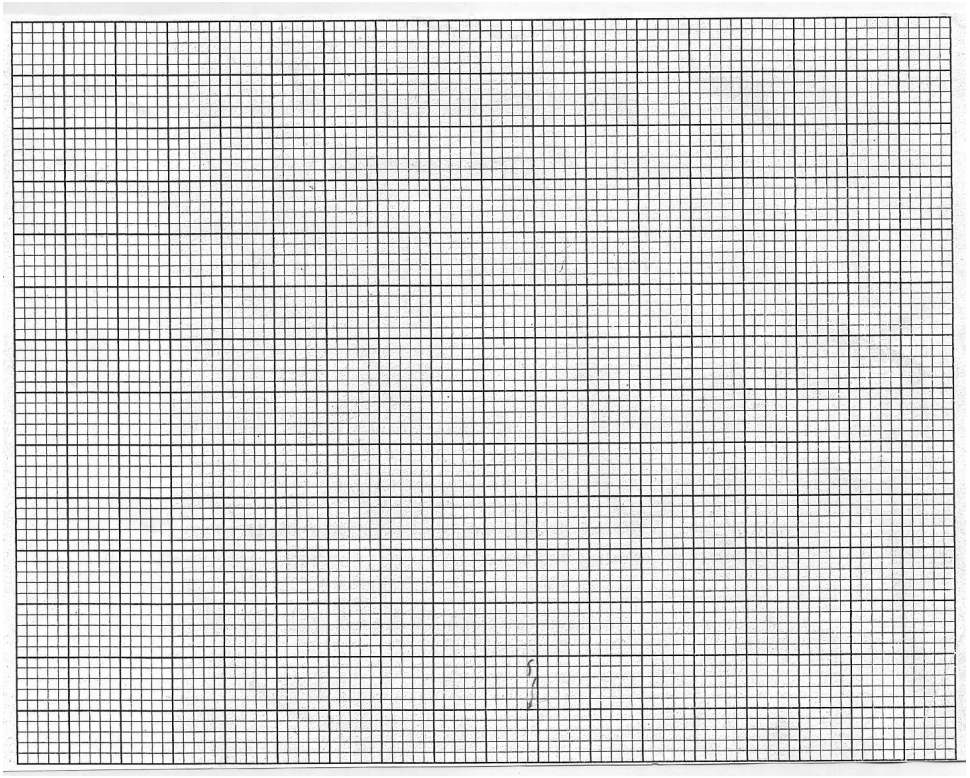
(3 marks)

(b) Use the trapezium rule to find the area bounded by the curve $y = \chi^2 + 4$, the χ-axis and the lines $\chi = 0$ and $\chi = 4$. Use five ordinates. (3 marks)

(c) Calculate the exact area bounded by the curve, $y = \chi^2 + 4$, the χ-axis and the lines $\chi = 0$ and $\chi = 4$. Hence find the percentage error in (b) above. (4 marks)

23. The vertices of triangle PQR are P(0,0), Q(6, 0) and R(2, 4)

(a) Draw triangle PQR on the grid provided. (1 mark)



(b) Triangle $P^1Q^1R^1$ is the image of a triangle PQR under an enlargement scale factor $\frac{1}{2}$ and centre (2, 2). Write down the coordinates of triangle $P^1Q^1R^1$ and plot on the same grid.

(2 marks)

(c) Draw triangle $P^{11}Q^{11}R^{11}$ the image of triangle $P^1Q^1R^1$ under a positive quarter turn about points (1, 1). (3 marks)

(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. (2 marks)

(e) Describe fully a single transformation triangle $P^{111}Q^{111}R^{111}$ onto triangle

$P^1Q^1R^1$. (2 marks)

24. The taxation rates for income earned in a certain year were as follows.

Income K£ p.a	Tax Rate Ksh. per £
1 - 4512	2
4513 - 9024	3
9025 - 13536	4
13537 - 18048	5
18049 - 22560	6
Over 22560	6.5

After a personal relief of Ksh.1056 per month Mrs. Wanjiru Njau paid tax amounting to Ksh.18152 that year.

(a) How much tax would she have paid if she did not have the personal relief. (2 marks)

(b) Find her taxable income in K£ that year. (5 marks)

(c) If Mrs. Wanjiru Njau receives allowances amounting to 18% of the taxable income, calculate his monthly basic salary to the nearest. (3 marks)