depreciated at 4% p.a. during the first year of investment. In the next 3 years, the value of the shares appreciated at the rate of 6% every four months

a) Calculate the amount Halima invested in shares. (3mks)
b) Calculate the value of Halima's shares.
   (i) At the end of the first year; (2mks)
   (ii) At the end of the fourth year, to the nearest shilling. (3mks)
c) Calculate Halima's gain from the share as a percentage. (2mks)
   (ii) Find the values of x and y. (5mks)
   (iii) Calculate the time taken before the policemen were unable to communicate. (2mks)

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

a) Complete the table by filling in the missing values of y.

X	-4	-3.5	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2.0
Y		-4.1		-1.1			-9.4	-9.0		-13.1		-7.9	

b) On the grid provided, draw the graph $y=x^3 + 3x^{2+} -4x - 12$ for $-4 \leq x \leq 2$. Use the scale. Horizontal axis 2cm for I unit and vertical axis 2cm for 5 units. (3mks)

c) By drawing a suitable straight line on the same grid as the curve, solve the equation $x^3+3x^2-5x-6=0$ (5mks)

K C S E 2009

MATHEMATICS

SECTION I (50 mks)

PAPER 1

Answer all the questions in this section in the spaces provided

1.

Without using mathematical tables or calculator, evaluate

$$\frac{\sqrt{5184}}{6 \times 18 \div 9 + (5-3)}$$

(3 mks)

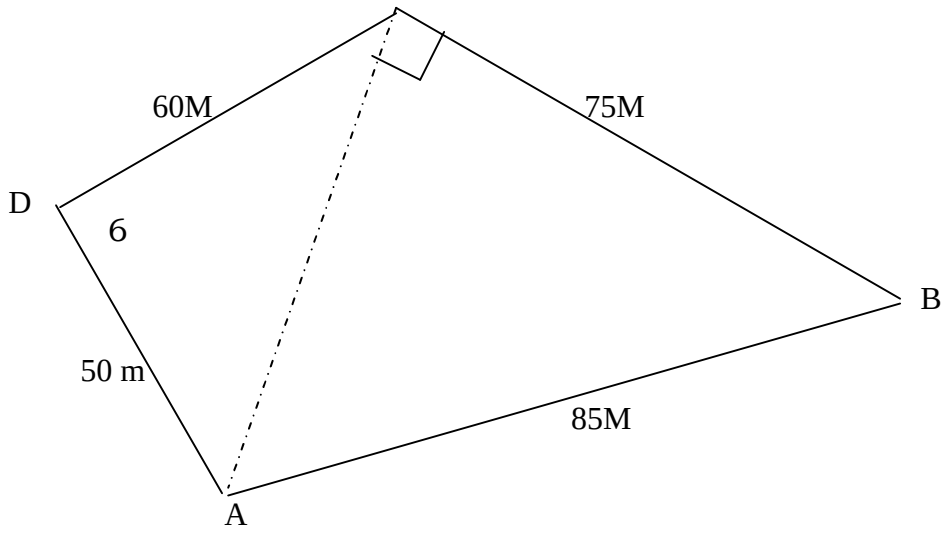
2. Without using a calculator, evaluate, $\frac{2\frac{1}{4} + \frac{3}{5} \div 5/6 \text{ of } 2\frac{2}{5}}{1\frac{7}{10}}$ leaving the answer as a fraction in its simplest form (3 mks)

3. Given that the ratio x: y = 2:3, find the ratio (5x-2y) : (x+y) (3 mk)

4. A bus traveling at an average speed of 63 km/h left a station at 8.15 a.m. find the average speed of the car. (3 mks)

5. Without using Logarithm tables or calculators, evaluate, $\frac{64\ ½ \times 27000^{2/3}}{2^4 \times 3^0 \times 5^2}$ (4 mks)

6. The figure below represents a plot of land ABCD such that AB = 85 m, BC =75 m , CD = 60 m DA = 50m and angle ABC = 90^0



Determine the area of the plot in hectares correct to two decimal places. (4 mks)

7. A watch which loses a half-minute every hour was set to read the correct time at 05 45h on Monday. Determine the time in the 12- hour system, the watch will show on the following Friday at 19 45h

(3 mks)

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

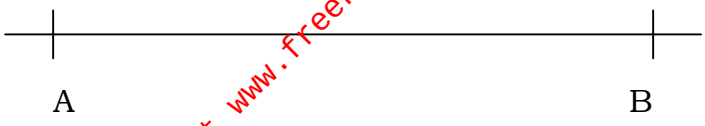
9. A line which joins the points a (3, k) and B (-2, 5) is parallel to another line whose equation is 5y + 2x = 10

Find the value of k. (3 mks)

10. The size of an interior angle of a regular polygon is 6 ½ times that of its exterior angle determine the number of sides of the polygon. (3 mks)

11. Line AB shown below is a side of a trapezium ABCD in which angle ABC in which angle ABC= 105^0, BC = 4 cm,

CD = 5 cm and CD is parallel to AB.

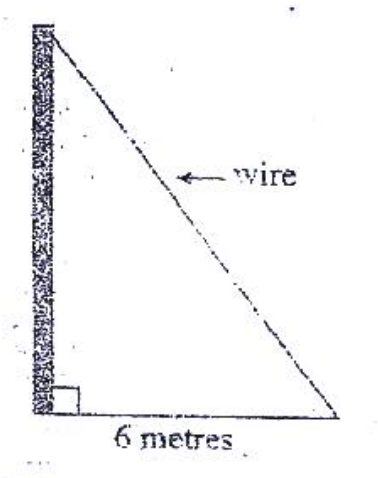


Using a ruler and a pair of compasses only:

a) Complete the trapezium; (3 mks)

b) Locate point t on line AB such that angle ATD = 90^0 (1 mk)

12. An electric pole is supported t stand vertically on a level ground by a tight wire. The wire is pegged at a distance of 6 metres from the foot of the pole as shown.



The angle which the wire makes with the ground is three times the angle it makes with the pole.

Calculate the length of the wire to the nearest centimeter. (3 mks)

13. Give the equation: $\sin(3x + 30^0) = \sqrt{3}$, for $0^0 \leq x \leq 90^0$ (4 mks)

14. The diagonals of a rhombus PQRS intersect at T. Given that p(2,2), Q(3, 6) and

R(-1, 5):

a) Draw the rhombus PQRS on the grid provided; (1 mk)

b) State the coordinates of T. (1 mk)

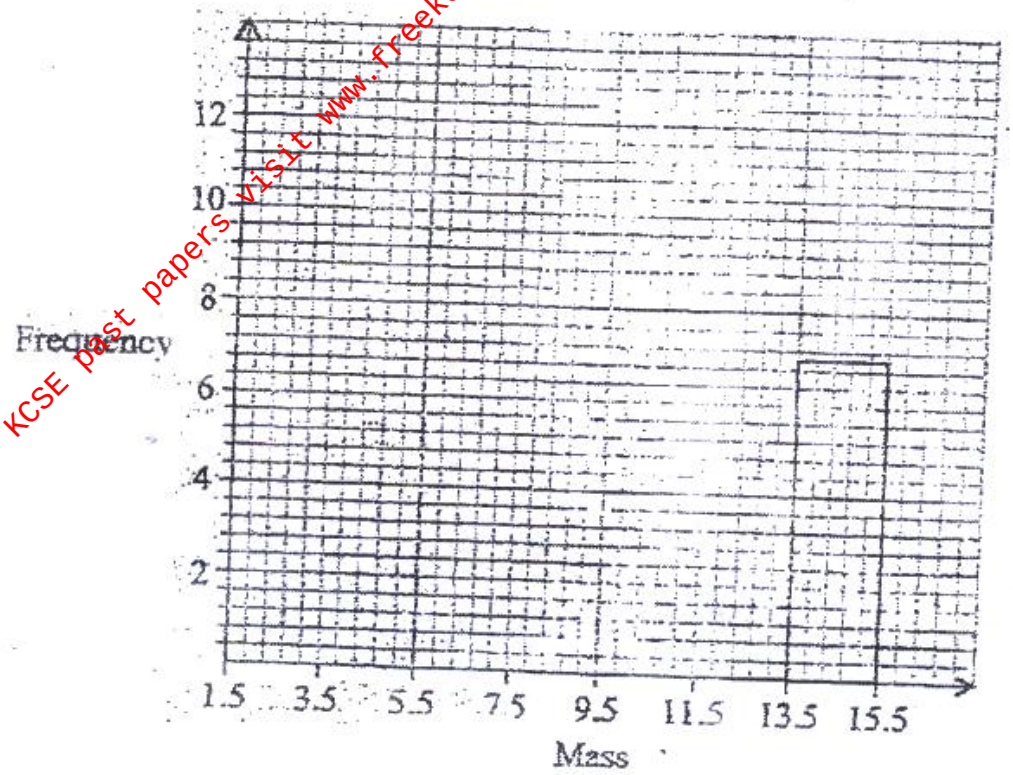
15 Abdi sold a radio costing Kshs 3 800 at a profit of 20%. He earned a commission of 22 ½ 5 on the profit. Find the amount he earned.

(2 mks)

16. The following data was obtained for the masses of certain animals.

Mass (x kg)	**Frequency**
$1.5 \leq x < 5.5$	16
$5.5 \leq x < 7.5$	20
$7.5 \leq x < 13.5$	18
$13.5 \leq x < 155$	14

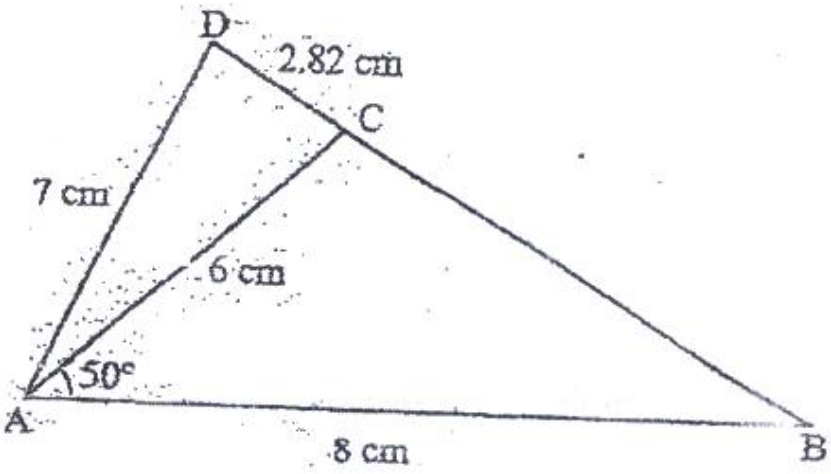
Complete the histogram on the grid provided (3 mks)



SECTION II (50 MARKS)

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

17 In the figure below (not drawn to scale), AB = 8cm, AC= 6cm, AD= 7cm, CD= 2.82 cm and angle CAB =50^0



Calculate, to 2 decimal places

a) The length BC, (2 mks)

b) The size of angle ABC, (3 mks)

c) The size of angle CAD, (3 mks)

d) The area of triangle ACD (2 mks)

b) Express vector NM in terms of OB (1 mk)

c) Point P maps onto P by a translation $\begin{pmatrix} -5 \\ 8 \end{pmatrix}$ given that

OP = OM + 2 MN, find the coordinates of P. (3 mks)

18. The marks scored by a group of pupils in a mathematics test were as recorded in the table below

Marks	Frequency

0 -9	1
10-19	2
20-29	4
30-39	7
40-49	10
50-59	16
60-69	20
70-79	6
80-89	3
90-99	1

a) i) State the modal class (1 mk)

ii) Determine the class in which the median mark lies (2 mks)

b) Using an assumed mean of 54.4, calculate the mean mark (7 mks)

19.

A school planned to buy x calculators for a total cost of Kshs 16 200. The supplier agreed to offer a discount of Kshs 60 per calculator. The school was then able to get three extra calculators for the same amount of money.

a) Write an expression in terms of x, for the:

i) Original price of each calculator. (1 mk)

ii) Price of each calculator after the discount (1 mk)

b) Form an equation in x and hence determine the number of calculators the

School bought. (5 mks)

c) Calculate the discount offered to the school as a percentage (3 mks)

20. The position vectors of points A and B with respect to the origin O, are

$\begin{pmatrix} -8 \\ 5 \end{pmatrix}$ and $\begin{pmatrix} -12 \\ -5 \end{pmatrix}$ respectively

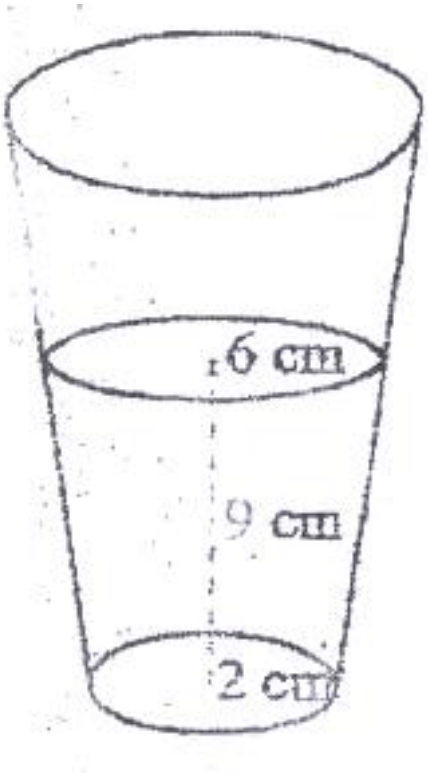
a) Find:

i) The coordinates of N and M; (3 mks)

ii) The magnitude of Nm (3 mks)

21. A glass, in the form of a frustum of a cone, is represented by the diagram below.

The glass contains water to a height of 9 cm,. The bottom of the glass is a circle of radius 2 cm while the surface of the water is a circle of radius 6 cm.



a) Calculate the volume of the water in the glass (3 mks)

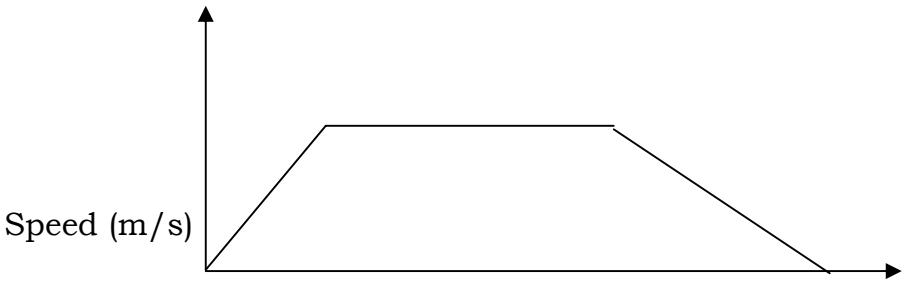
b) When a spherical marble is submerged into the water in the glass, the water level rises by 1 cm.

Calculate:

i) The volume of the marble; (4 mks)

ii) The radius of the marble (3 mks)

22. The diagram below shows the speed-time graph for a train traveling between two stations. The train starts from rest and accelerates uniformly for 150 seconds. It then travels at a constant speed for 300 seconds and finally decelerates uniformly for 200 seconds.



Given that the distance between the two stations is 10 450 m, calculate the:

a) Maximum speed, in Km/h, the train attained; (3 mks)

b) Acceleration, (2 mks)

c) Distance the train traveled during the last 100 seconds; (2 mks)

d) Time the train takes to travel the first half of the journey. (3mks)

23. Three points P, Q and R are on a level ground. Q is 240 m from P on a bearing of 230^0 . R is 120 m to the east of P

a) Using a scale of 1 cm to represent 40 m, draw a diagram to show the positions of P, Q and R in the space provided below. (2 mks)

b) Determine

i) The distance of R from Q (2 mks)

ii) The bearing of R from Q (2 mks)

c) A vertical post stands at P and another one at Q. A bird takes 18 seconds

to fly directly from the top of the post at q to the top of the post at P.

Given that the angle of depression of the top of the post at P from the top of the post at Q is 9^0,

Calculate:

i) The distance to the nearest metre, the bird covers; (2 mks)

ii)The speed of the bird in Km/h (2 mks)

24. a) On the grid provided, draw a graph of the function

$Y = \frac{1}{2} x^2 - x + 3$ for $0 \leq x \leq 6$ (3 mks)

b) Calculate the mid-ordinates for 5 strips between x= 1 and x=6, and hence

Use the mid-ordinate rule to approximate the area under the curve between x= 1, x=6 and the x-axis. (3 mks)

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

THE YEAR 2009

MATHEMATICS PAPER 2

SECTION (50 MKS)

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

1. A farmer feed every two cows on 480 Kg of hay for four days. The farmer has 20 160 Kg of hay which is just enough to feed his cows for 6 weeks. Find the number of cows in the farm. (3 mks)

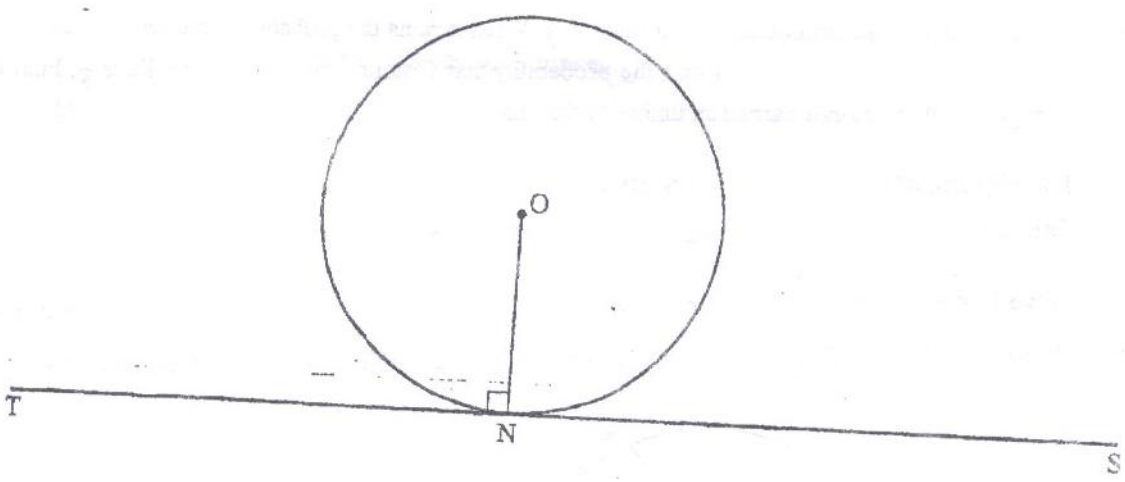
2. find a quadratic equation whose roots are $1.5 + \sqrt{2}$ and $1.5 - \sqrt{2}$, expressing it in the form $ax^2 + bx + c = 0$, where a, b and c are integers

(3 mks)

3. The mass of a wire m grams (g) is partly a constant and partly varies as the square of its thickness t mm. when t= 2 mm, m= 40g and when t=3 mm, m = 65g

Determine the value of m when t = 4 mm. (4 mks)

4. In the figure below, O is the centre of the circle and radius ON is perpendicular to the line TS at N.



Using a ruler and a pair o compasses only, construct a triangle ABC to inscribe the circle, given that angle ABC = 60^0, BC = 12 cm and points B and C are on the line TS(4 mks)

5. a solution was gently heated, its temperature readings taken at intervals of 1 minute and recorded as shown in the table below .

Time(Min)	0	1	2	3	4	5
Temperature (^{0}C)	4	5.2	8.4	14.3	16.3	17.5

a) Draw the time-temperature graph on the grid provided (2 mks)

b) Use the graph to find the average rate of change in temperature Between t= 1.8 and t= 3.4 (2 mks)

6. Vector OA $= \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ and OB $\begin{pmatrix} 6 \\ -3 \end{pmatrix}$ c is on OB such that CB = 2 OC and

Point D is on AB such that AD = 3 DB.

Express CD as a column vector. (3mks)

7. In a certain commercial bank, customer may withdraw cash through one of the two tellers at the counter. On average, one teller takes 3 minutes while the other teller takes 5 minutes to serve a customer. If the two tellers start to serve the customers at the same time, find the shortest time it takes to serve 200 customers. (3 mks)

8. a) Expand and simplify the binomial expression $(2 - x)^7$ in ascending

powers of x. (2mks)

b) Use the expansion up to the fourth term to evaluate $(1.97)^7$ correct to 4 decimal places (2 mks)

9. The area of triangle FGH is 21 cm^2. The triangle FGH is transformed using the matrix

$$\begin{pmatrix} 4 & 5 \\ 1 & 2 \end{pmatrix}$$

Calculate the area of the image of triangle FGH (2 mks)

10. Simplify $\frac{\sqrt{3}}{\sqrt{3}-\sqrt{2}}$ (2 mks)

11. A circle whose equation is $(x-1)^2 + (y-k)^2 = 10$ passes through the point (2,5). Find the coordinates of the two possible centres of the circle. (3 mks)

12. On a certain day, the probability that it rains is 1/7 . When it rains the probability that Omondi carries an umbrella is 2/3. When it does not rain the probability that Omondi carries an umbrella is 1/6. Find the Probability that Omondi carried an umbrella that day.

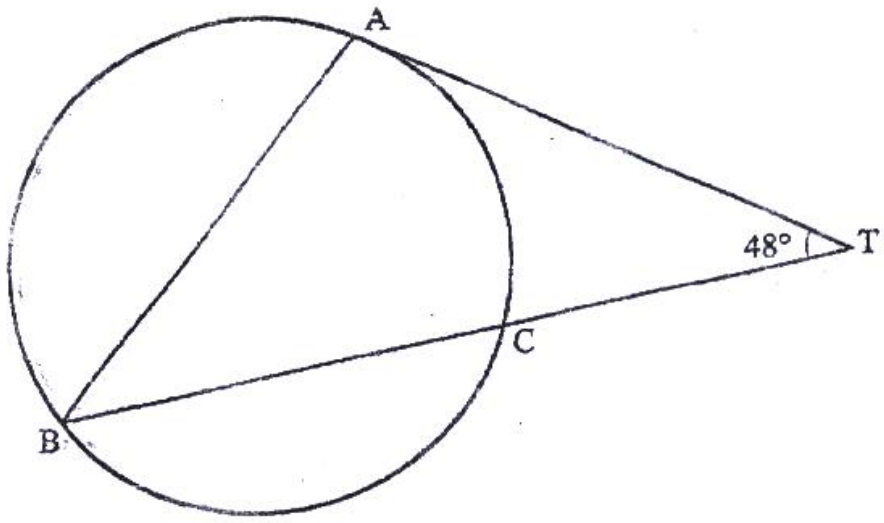
(2 mks)

13. Point P (40^0S, 45^0E) and point Q (40^0S, 60^0W) are on the surface of the Earth. Calculate the shortest distance along a circle of latitude between the two points.

(3 mks)

14. Solve $4 - 4\cos^2\cos^2\alpha = -1$ for $0^0 \leq \alpha \leq 360^0$ (4 mks)

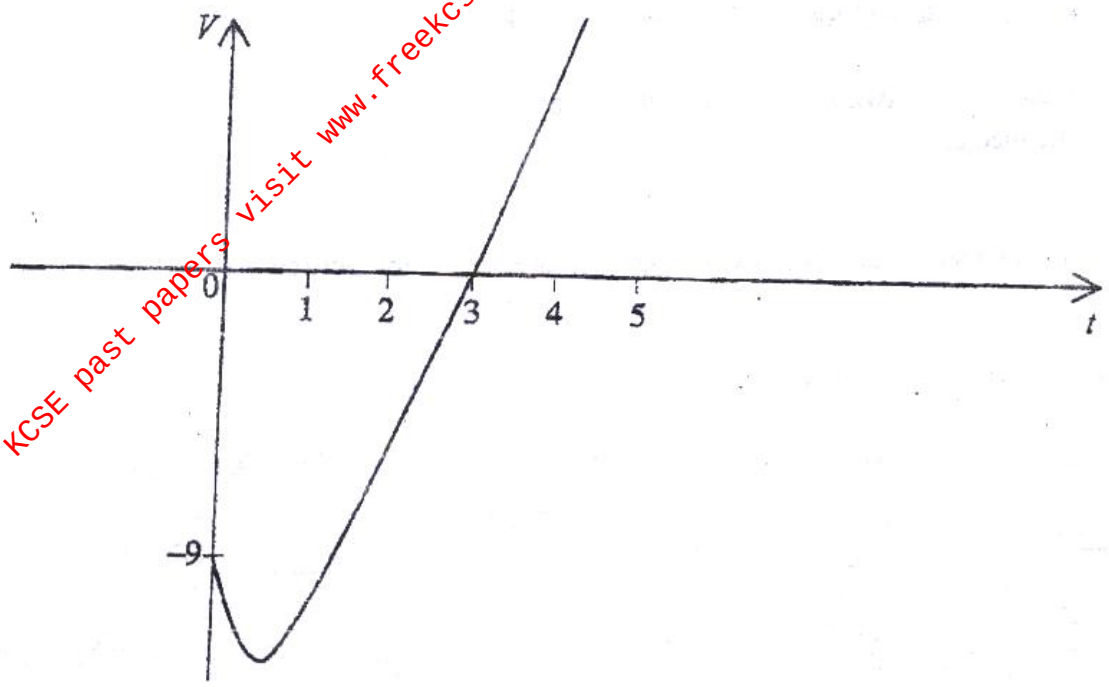
15. In the figure below, AT is a tangent to the circle at A TB = 48^0, BC = 5 cm and CT = 4 cm.



Calculate the length AT. (2 mks)

16. A particle moves in a straight line with a velocity V ms^{-1}. Its velocity after t seconds is given by $V = 3t^2 - 6t - 9$.

The figure below is a sketch of the velocity-time graph of the particle



Calculate the distance the particle moves between t = 1 and t = 4

(4 mks)

SECTION II (50 MKS)

Answer only five questions in this section in the spaces provided

17. A water vendor has a tank of capacity 18900 litres. The tank is being filled with water from two pipe A and B which are closed immediately when the tank is full. Water flows at the rate of

a) If the tank is empty and the two pipes are opened at the same time, calculate the time it takes to fill the tank. (3 mks)

b) On a certain day the vendor opened the two pipes A and B to fill the empty tank. After 25 minutes he opened the outlet to supply water to his customers at an average rate of 20 Liters per minute

i) Calculate the time it took to fill the tank on that day. (3 mks)

ii) The vendor supplied a total of 542 jerricans, each containing 25 litres of water , on the day. If the water that remained in the tank was 6 300 litres, calculate, in litres, the amount of water that was wasted. (3 mks)

18. At the beginning of the year 1998, Kanyingi bought two houses, one in Thika and the other one Nairobi, each at Ksh 1 240 000. The value of the house in Thika appreciated at the rate of 12% p.a

a) Calculate the value of the house in thirika after 9 years, to the nearest shilling. (2 mks)

b) After n years, the value of the house in Thika was Kshs 2 741 245 while the value of the house in Nairobi was Kshs 2 917 231.

(4 mks)

i) Find n

ii) Find the annual rate of appreciation of the house in Nairobi.

(4 mks)

19. The table below shows the number of goals scored in handball matches during a tournament.

Number of goal	0-9	10-19	20-29	30-39	40-49
Number of matches	2	14	24	12	8

Draw a cumulative frequency curve on the grid provided (5 mks)

b) Using the curve drawn in (a) above determine;

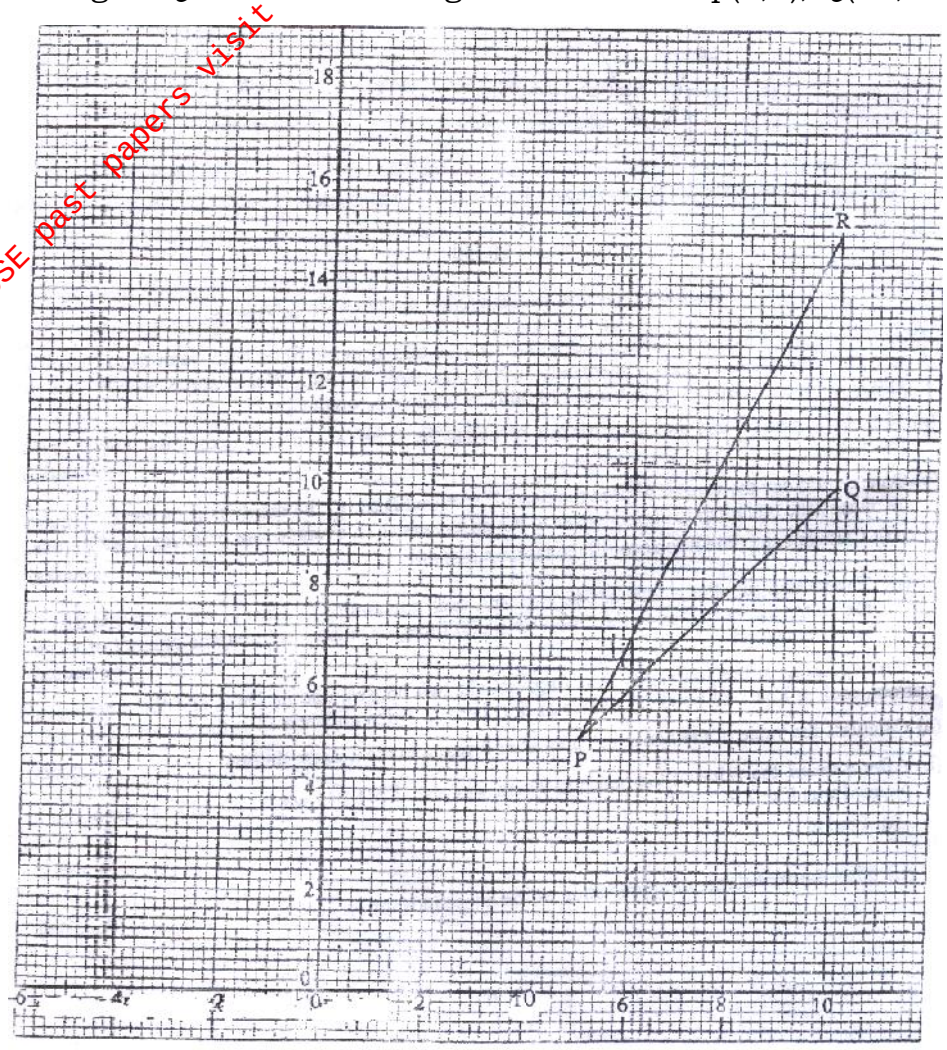
i) The median; (1 mk)

ii) The number of matches in which goals scored were not more than 37;

(1 mk)

iii) The inter-quartile range (3 mks)

20. Triangle PQR shown on the grid has vertices p(5,5), Q(10, 10) and R(10,15)



a) Find the coordinates of the points p', Q' and R' and the images of P, Q and R respectively under transformation M whose matrix is

(2 mks)

$$\begin{pmatrix} -0.6 & 0.8 \\ 0.8 & 0.6 \end{pmatrix}$$

b) Given that M is a reflection;

i) draw triangle P'Q'R' and the mirror line of the reflection; (1 mk)

ii) Determine the equation of the mirror line of the reflection (1 mk)

c) Triangle P" Q" R" is the image of triangle P'Q'R' under reflection N is a reflection in the y-axis.

i) draw triangle P"Q"R"

ii) Determine a 2 x2 matrix equivalent to the transformation NM (2 mks)

iii) Describe fully a single transformation that maps triangle PQR onto

triangle P"Q"R" (2 mks)

21. The table below shows income tax rates.

Monthly income in Kenya shillings (Kshs)	Tax rate percentage (%) In each shilling
Up to 9 680	10
From 9681 to 18 800	15
From 18 801 to 27 920	20
From 27 921 to 37 040	25

From 37 041 and above	30

In certain year, Robi's monthly taxable earnings amounted to Kshs. 24 200.

a) Calculate the tax charged on Robi's monthly earnings. (4 mks)

b) Robi was entitled to the following tax reliefs:

I: monthly personal relief of Ksh 1 056;

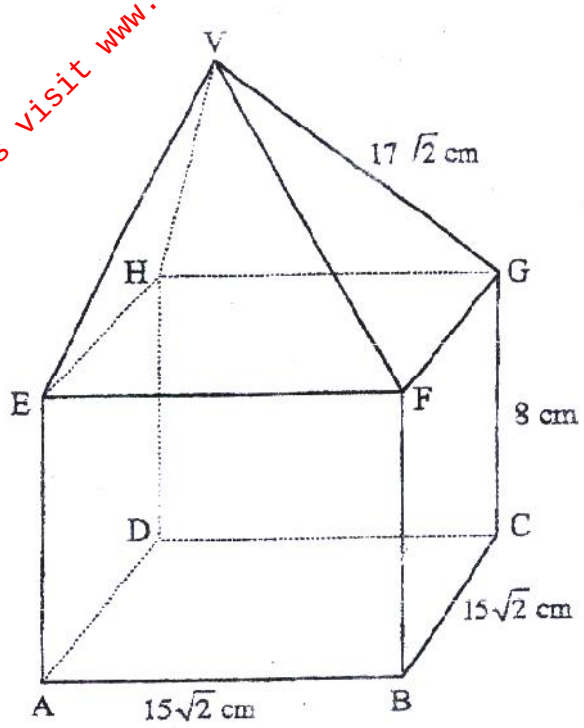
II: Monthly insurance relief at the rate of 15% of the premium paid.

Calculate the tax paid by Robi each month, if she paid a monthly premium of Kshs 2 400 towards her life insurance policy. (2 mks)

C) During a certain month, Robi received additional earnings which were taxed at 20% in each shilling. Given that she paid 36.3% more tax that month, calculate the percentage increase in her earnings.

(4 mks)

22. The figure below shows a right pyramid mounted onto a cuboid. AB=BC= $15\sqrt{2}$ cm, CG= and VG = $17\sqrt{2}$ cm.



Calculate:

a) The length of AC;

b) The angle between the line AG and the plane ABCD;

c) The vertical height of point V from the plane ABCD;

d) The angle between the planes EFV and ABCD.

23. 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 mks)

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

b) The 3rd, 5th and 8th terms of another AP form the first three terms of a Geometric Progression (GP)

If the common difference of the AP is 3, find:

i) The first term of the GP; (4 mks)

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

24. Amina carried out an experiment to determine the average volume of a ball bearing. He started by submerging three ball bearings in water contained in a measuring cylinder. She then added one ball a time into the cylinder until the balls were nine..

The corresponding readings were recorded as shown in the table below

Number of ball bearings(x)	3	4	5	6	7	8	9
Measuring cylinger reading (y)	98.0	105.0	123.0	130.5	145.6	156.9	170.0