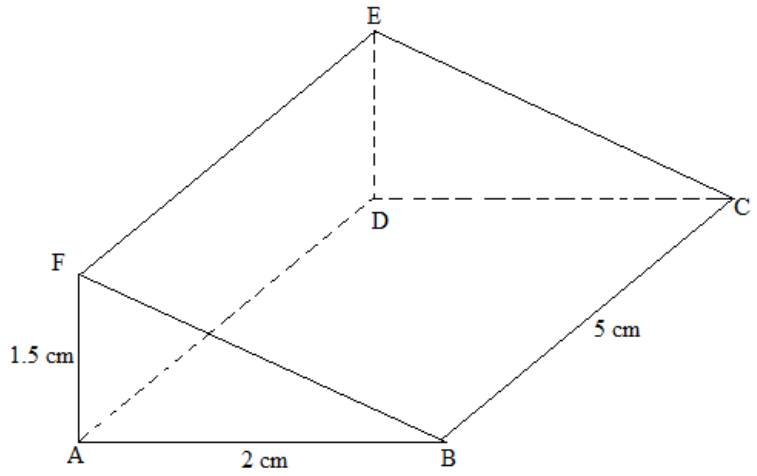
BUURI EAST STANDARDS
121/1
MATHEMATICS
JULY, 2019
PAPER 1
SECTION I (50 MARKS):

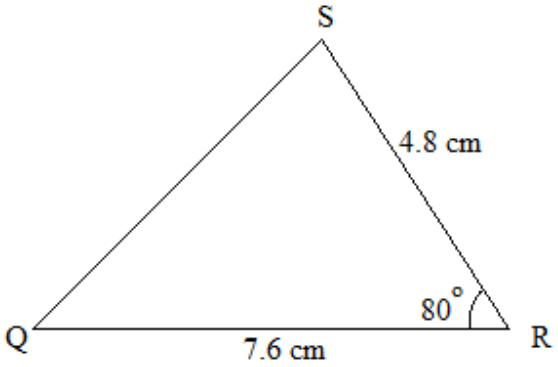
Answer all the questions in this section in the spaces provided.

1. Evaluate without using tables or a calculator the value of $\frac{1.33\times0.15}{0.19\times0.0017}$ (3marks)
2. When a certain number is divided by 48, 72 or 100 the remainder is 3 in each case. Find the number. (3marks)
3. Using logarithm table evaluate $\sqrt[3]{\frac{849.6\times2.41}{3941}}$. (4marks)
4. A 890kg culvert is made of a hollow cylindrical material with outer radius of 76cm and an inner radius of 62cm. It crosses a road of width 3m. Determine the density of the material used in its construction in Kg/m^3 correct to one decimal place. (3marks)
5. Evaluate the value of *x* in$81^{x+1} + 3^{4x} = 246$ (3marks)
6. Simplify the equation $\frac{4x^2-9}{2x^2+5x+3}$. (3marks)
7. The diagram below represents a prism whose Cross-section is a right angled triangle. Draw the net of the solid. (3marks)



8. During an annual general meeting at Elimu Mixed Day, goats and chicken were slaughtered. The number of heads for both chicken and goats were 45. The total number of legs were 100. Determine the exact number of goats and chicken slaughtered. (3marks)
9. In a mixed school there are 900 students, out of these 600 are girls.
   (a) Find the ratio of boys to girls. (2marks)
   (b) What is the percentage of boys in this school? (1mark)
10. Find the value of t in the equation$\frac{t-1}{3} - \frac{4+t}{4} = 0$ (3marks)
11. The sum of interior angles of a polygon is 1980^0. Find the number of sides of the polygon and name the polygon. (3marks)
12. Using trapezoid rule, estimate the area under the curve $y = \frac{1}{2}x^2 - 2$ bounded by lines, x =2 and x=8 and x –axis use six strips. (3marks)
13. Lines K whose equation is $2y - 6 = 4x$ is perpendicular to another line Q. Find the equation of line Q if it passes through point. (-2,7). (3 marks)

14. The figure below is not drawn to scale.



Find correct to 1 decimal place;

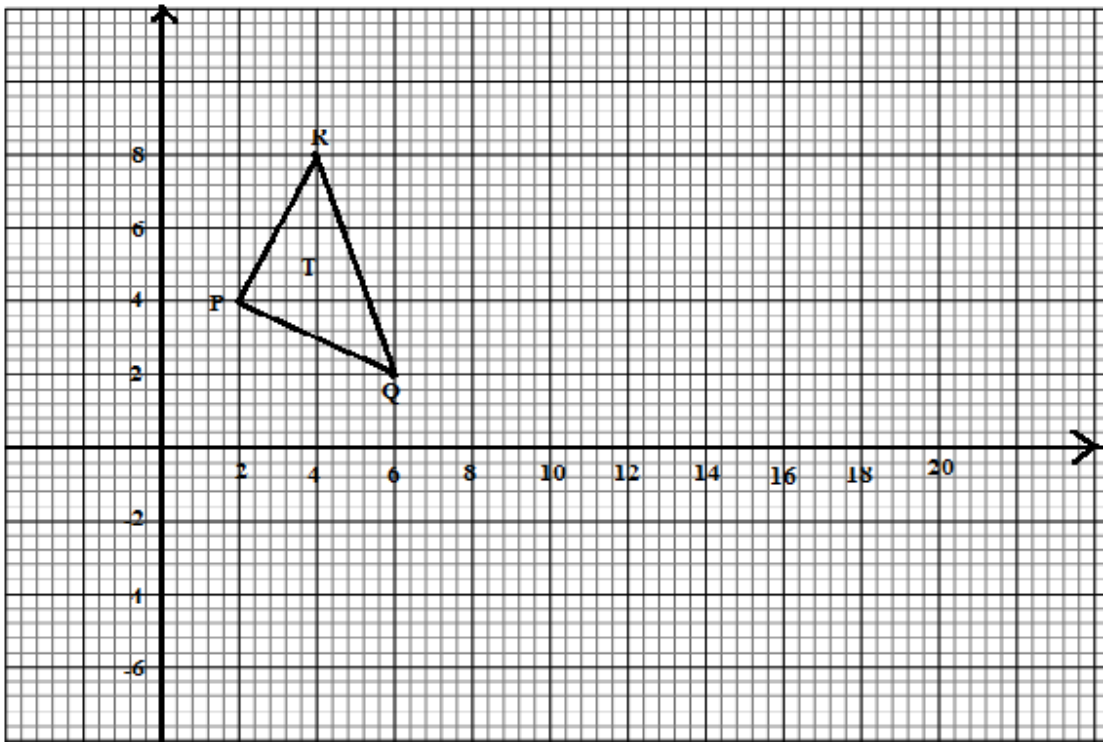
(a) Length PQ. (2 marks)

(b) Angle ABC (2 marks)

15. The marked price of a car ina dealers shop was Ksh.450 000. Kawira 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 to the nearest shillings. (3marks)

16. The figure below shows triangle T with vertices P(2,4), Q(6,2) and R(4,8). It is mapped onto triangle $T^{/}$ with vertices $P^{/}(10,0)$, $Q^{/}(8,-4)$ and $R^{/}(14, -2)$ by a rotation.

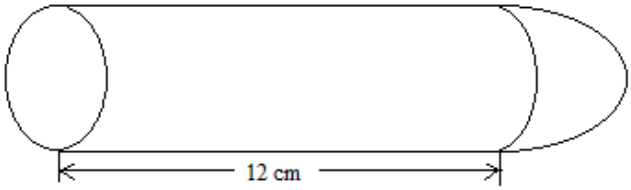
(a) Draw on the same axis $T^{/}$ the image of triangle T. (1 mark)



(b) Determine the center and angle of rotation. (2marks)

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

17. The diagram below shows a solid made of a hemisphere and a cylinder. The radius of both the cylinder and the hemisphere is 3cm. The length of the cylinder is 12cm.



a) i) Calculate the volume of the solid. (3marks)

ii) The solid fits in a box in the shape of a cuboid 15 cm by 6cmby 6cm. Calculate the volume of the box not occupied by the solid correct to four significant figures. (2marks)

b) i) Calculate the total surface area of the solid correct to four significant figures. (3marks)

ii) The surface of the solid is to be painted. One millilitre of paint covers an area of $8cm^2$.The cost of paint is Ksh 900 per litre. Calculate the cost of the paint required. (2marks)

18. The table below shows the age groups and number of people who are HIV/ AIDSpositive, in a certain sub county in Kenya.

Age group	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79
No. of people	12	15	16	25	18	10	4

a) State the modal age group. (1mark)

b) Calculate the mean age of the people who are HIV/AIDS Positive. (3marks)

c) Calculate the median of the age group. (3marks)

d) Draw on the grid provided a histogram to represent the above information. (3marks)

19. A trader bought 2 cows and 9 goats for a total of Ksh. 98,200. If she had bought 3 cows and 4 goats, she would have spent Ksh. 2, 200 less.

(a) Form two equations to represents the above information. (2marks)

(b) Use the matrix method to determine the cost of a cow and that of a goat. (4marks)

(c) The trader later sold the animals she had bought making a profit of 30% per cow and 40% per goats.

i) Calculate the total amount of money she received. (2marks)

ii) Determine corrects to 4 significant figures the percentage profit the trader made from the sale of animals. (2marks)

20. Two towns, Meru and Maua are 80km a part, Kimathi started cycling from Meru to Maua at 10:00 30a.m at an average speed of 40km/h. Mutuma started his journey from Maua to Meru at 10:30 a.m and travelled by car at an average speed of 60km/h.

(a) Calculate:

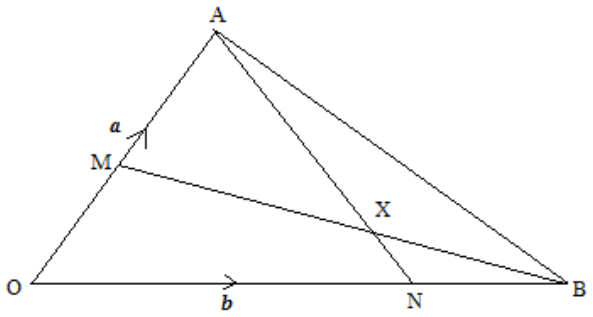
i) The time taken by Kimathi and Mutuma to meet. (3marks)

ii) The distance from Meru when Kimathi and Mutuma met. (2marks)

iii) The time of the day when the two met. (2marks)

(b) Murianki cycled from his home to a school 6km away in 20minutes. He stopped at the school for 5 minutes, before taking a motorbike to a town 40 km away. The motorbike travelled at 75km/h. On the grid provided, draw a distance time graph to represent Murianki's journey. (3marks)

21. In the figure below OAB is a triangle in which M divides OA in the ratio 2:3 and N divides OB in the ratio 4:1. AN and BM intersects at X.



a) Given that $\boldsymbol{OA} = \boldsymbol{a}$ and $\boldsymbol{OB} = \boldsymbol{b}$ express in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$.

i) **AN** (1 mark)

ii) **BM** (1mark)

iii) **AB** (1mark)

b) If **AX**= s**AN** and **BX** = t**BM**wheres and t are constants.

i) Write two expressing for **OX** in terms of ***a***, ***b***, s and t. (2marks)

ii) Find the value of s and t, and hence express **OX** in terms of ***a*** and ***b***. (5marks)

22. A particle moving in a straight line is such that its distance from a fixed point O is given by

$S = \frac{1}{3}t^3 - \frac{1}{2}t^2 = 10.$ Where t is the time in seconds after the particle passes O.

(a) Find :

i) An expression for velocity. (1mark)

ii) The time when the particle is at rest. (3marks)

(b) Calculate the velocity when t= 3 seconds. (2marks)

(c)

i) Find an expression for acceleration. (1mark)

ii) Calculate the acceleration when t=2 seconds and t=6 seconds. (3 marks)

23. Using a pair of compass and ruler only construct.

(a) Triangle PQR in which PQ =5cm∠QPR = 30^0 and ∠PQR=105^0. (3marks)

(b) A circle that passes through the vertices of the triangle PQR. Measure its radius. (3marks)

(c) The height of triangles PQR with PQ as the base. Measure the height. (2marks)

(d) Determine the area of the circle that has outsides the triangle correct to 2 decimal places (2marks)

24. Members of a group decides to raise k£ 100 towards a charity. Five of them were unable to contribute. Each of the rest had therefore to pay k£ 1 more, inorder to raise the same amount.

a) If the original number of member was *x*, writes downs :

i) An expression of how much each was originally to contribute. (1mark)

ii) Two distinct expressions of how much each contributed after the five pulled out. (2marks)

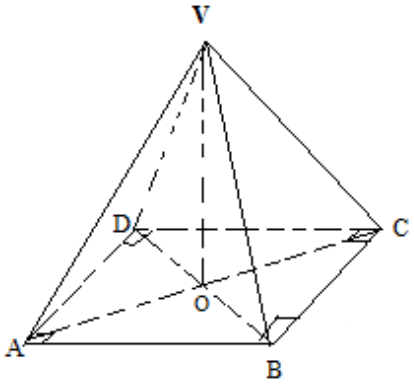
b) Calculate the value of *x*. (3marks)

c) Solve the equation $\frac{y+3}{24} = \frac{1}{y-2}$ (3 marks)

BUURI EAST STANDARDS
121/2
MATHEMATICS
JULY, 2019
PAPER 2

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

1. Given that $8 \leq y \leq 12$ and $1 \leq x \leq 6$, find the maximum possible value of;
$\frac{y+x}{y-x}$ (3 marks)
2. Simplify $\frac{4}{\sqrt{5}+\sqrt{2}} - \frac{3}{\sqrt{5}-\sqrt{2}}$ (3marks)
3. Make A the subject of the formula $T = \frac{2m}{n}\sqrt{\frac{L-A}{3k}}$. (3marks)
4. The fifth term of an arithmetic progression is 11 and the twenty fifth term is 51. Calculate the first term and the common difference of the progression. (3marks)
5. Solve for *x* in the equation. $2cos\ (3x + 60°) = 3$for $0 \leq x \leq 180°$. (3marks)
6. The length of a rectangle is $(x + 1)$ cm. its width is 3cm shorter than its length. Given that the area of the rectangle is 22cm, find its length using completing the square method. (3marks)
7. Given that $\boldsymbol{p} = 2\boldsymbol{i} - 3\boldsymbol{j} + \boldsymbol{k}$ and $\boldsymbol{q} = 3\boldsymbol{i} - 4\boldsymbol{j} - 3\boldsymbol{k}$find:
   i) $\boldsymbol{r} = 3\boldsymbol{p} + 2\boldsymbol{q}$ (2 marks)
   ii) $|\boldsymbol{r}|$ (2marks)
8. The figure below is a square based right pyramid with vertex V. Point O is the intersection of diagonals AC and BD. VA=VB=VC=VD=12cm and AB=BC=4cm.

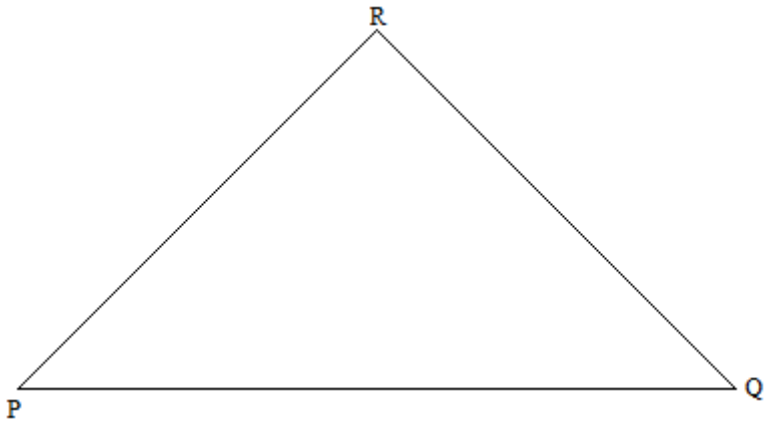


   (a) Name the projection of line VA on plane ABCD. (1mark)
   (b) Find the angle between line VB and the plane ABCD. (2 marks)
9. Find the value of *x* that satisfies the equation. $Log(x + 5) = log4 - log(x + 2)$. (3marks)
10. The table below is part of tax table for monthly income for the year 2006.

Monthly taxable income (ksh)	Tax rate %
0 – 9680	10
9681 – 18800	15
18801 – 27920	20

In the year 2006, the tax on Jane's monthly income was Ksh. 1, 916. Calculate Jane's monthly income. (3marks)

11. Mr. Mwenda wishes to take students from his mixed secondary school for a tour. The total number of students to be taken should not exceed 60. Each girl must contribute ksh. 10,000 and each boy Ksh. 15,000 and the total money contributed should not exceed ksh. 120,000. If this trip is to be successful the number of boys should be greater than the number of girls. Write down all the inequalities to represent this information taking the number of girls and boys to be y and x respectively. (4marks)
12. Evaluate $\int_{-3}^{-2}(x-3)\,(x+2)\,(x-2)dx$. (3 marks)
13. Below is a triangle PQR. Draw locus L_1 of points equidistant from P and Q. Draw L2 locus of points equidistant from line PR and PQ to meet L1 at M. Measure PQ. (3marks)



14. Find the centre and the radius of a circle whose equation is $x^2 + y^2 + 6y - 8x - 2y = 0$. (3marks)
15. a) Expand the Binomial expression $(2 - \frac{1}{4}x)^5$up to the term with x^3. (1mark)
    b) Using the binomial expansion in(a) above estimate the value of $(1.75)^5$. (2marks)
16. Grade A sugar cost ksh.75 per kg and grade B sugar costs ksh. 50 per kg. The two grades are mixed in a ratio such that the blend costs ksh. 70 per kg. Find the ratio. (3marks)

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

17. A car hire company hire out cars such that there is a fixed charge and another part which varies with the distance covered. Taking C to stand for total cost, d for distance covered, k for fixed charge and t for charge per kilometer.
    a) Express C in terms of k, t and d. (1mark)
    b) Given that the total cost is 7000 when the distance is 200km and the total cost is 11000 when distance is 400km.
        i) Find the values of k and t. (2marks)
        ii) Find the equation connecting c,t,k and d. (1mark)
    (c) Find the cost of hiring a car to area a distance of 500km. (2marks)
    (d) Due to increase in fuel prices, the company increased the fixed charge by 20% and charge per kilometer by 10%:
        i) Find the cost of hiring the car for 500km. (2marks)
        ii) Find the percentage increase of hiring the car for the 500km. (2marks)

18. ABC is a triangle with vertices A(-7,2), B(-2,1) C(2,8).A′B′C ′is the image of ABC under a transformation $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$.
    a) i) Find the co-ordinates of A′B′C ′ (2 marks)
    ii) On the grid provided draw ABC and A′B′C′. (2marks)
    b) i) Find the coordinates of A″B″C″ the image of the triangle A′B′C′D′ under the transformation matrix. $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$. (2marks)

    ii) On the same grid draw A″B″C″. (1 mark)

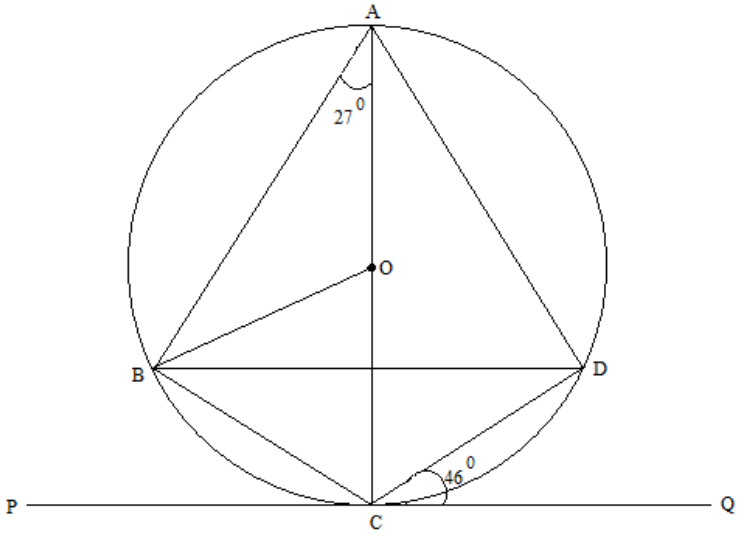
    c) i) Find the single matrix that maps A″B″C″ onto ABC. (2 marks)

ii) Describe the transformation fully. (1mark)

19. An airplane leaves town A(40^0N,155^0W) and flys to town B(40^0N,25^0E) using the shortest route and at a speed of 450 knot (Take $\pi = 3.142$ and radius of the earth R=6370km.)
    (a)
    i) Calculate the distance between A and B covered by the airplane in nautical miles. (2marks)
    ii) Calculate the time taken by the aeroplane to fly from A to B. (2 marks)
    (b) From B the plane flies westwards along the latitude to a town C(40^0N, 13^0W). Calculate the distance BC in kilometres. (3marks)
    (c) From town C, The plane took off at 3:10 p.m towards townD(10^0N, 13^0W) at the same speed. At what time did the plane land at D? (3marks)
20. Purity bought a camera on hire purchase terms by paying a deposit of Ksh.7, 200 and cleared balance in 24 equal monthly installment each of ksh.1, 250.
    a) Find the hire purchase price of the camera. (3marks)
    b) The hire purchase price of the camera is 24%higher than the cash price. Find the cash price of the camera. (2marks)
    c) Eunice took a loan from a financial institution and bought the camera with cash. She repaid the end of the two years. Find the total interest paid by Eunice. (3marks)
    d) A car is worth Ksh.800,000 when new. It depreciates by 20% every year. How much will it cost after five years. (2marks)
21. The table below shows marks obtained by 50 students in a maths quiz.

32	64	68	55	52	68	37	46	65	26
45	87	44	88	39	54	21	44	76	23
65	42	82	87	75	44	47	48	52	32
23	76	74	91	28	33	27	48	56	66
45	56	98	21	34	31	83	65	77	76

    (a) Starting from 21 and using equal class intervals of 10 make a frequency distribution table. (2marks)
    (b) On the grid provided, draw the cumulative frequenting curve for the data. (4marks)
    (c) Using the graph in(b) above estimate :
    i) The upper quartile. (1mark)
    ii) The lower quartile. (1mark)
    iii) Hence find the quartile deviation. (2marks)
22. In a carton there are 8 red pens, 5 blue pens and 2 green pens. Two pens are picked at random from the carton without replacement.
    a) Draw a probability three diagram to represent this information. (2marks)
    b) Use the tree diagram to find the probability that:
    i) The first pen picked is red. (1mark)
    ii) The first pen picked is blue or green. (2marks)
    iii) The two pens picked are blue. (2marks)
    iv) At least one of the pens picked is green. (3marks)
23. The diagram below shows a circle centre O. PQ is the tangent to the circle at C. Angle DCQ= 46^0 and angle BAC=27^0.



Find giving reasons the size of each of the following angles.

a) Angle OAD. (2 marks)
b) Angle DBO. (2 marks)
c) Angle ACD. (2 marks)
d) Angle BDA. (2 marks)
e) Reflex angle BOC. (2 marks)

24.

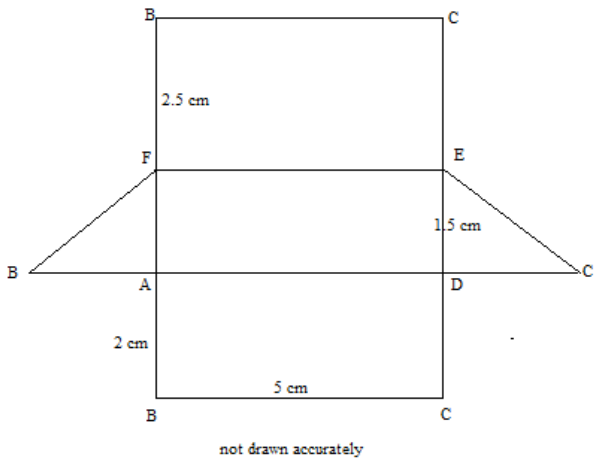
a) Complete the table below for the following function $y = x^3 - 3x^2 - 5x + 7$(2 marks)

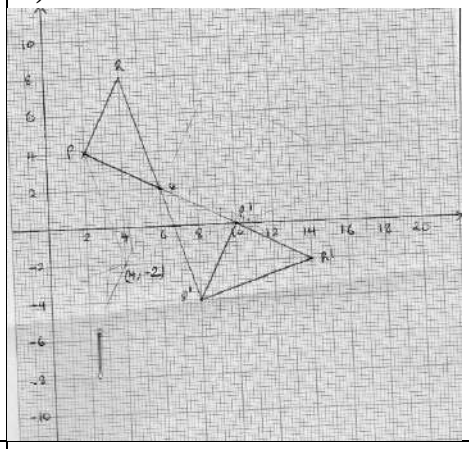
x	-3	-2	-1	0	1	2	3	4	5
$y = x^3 - 3x^2 - 5x + 7$									

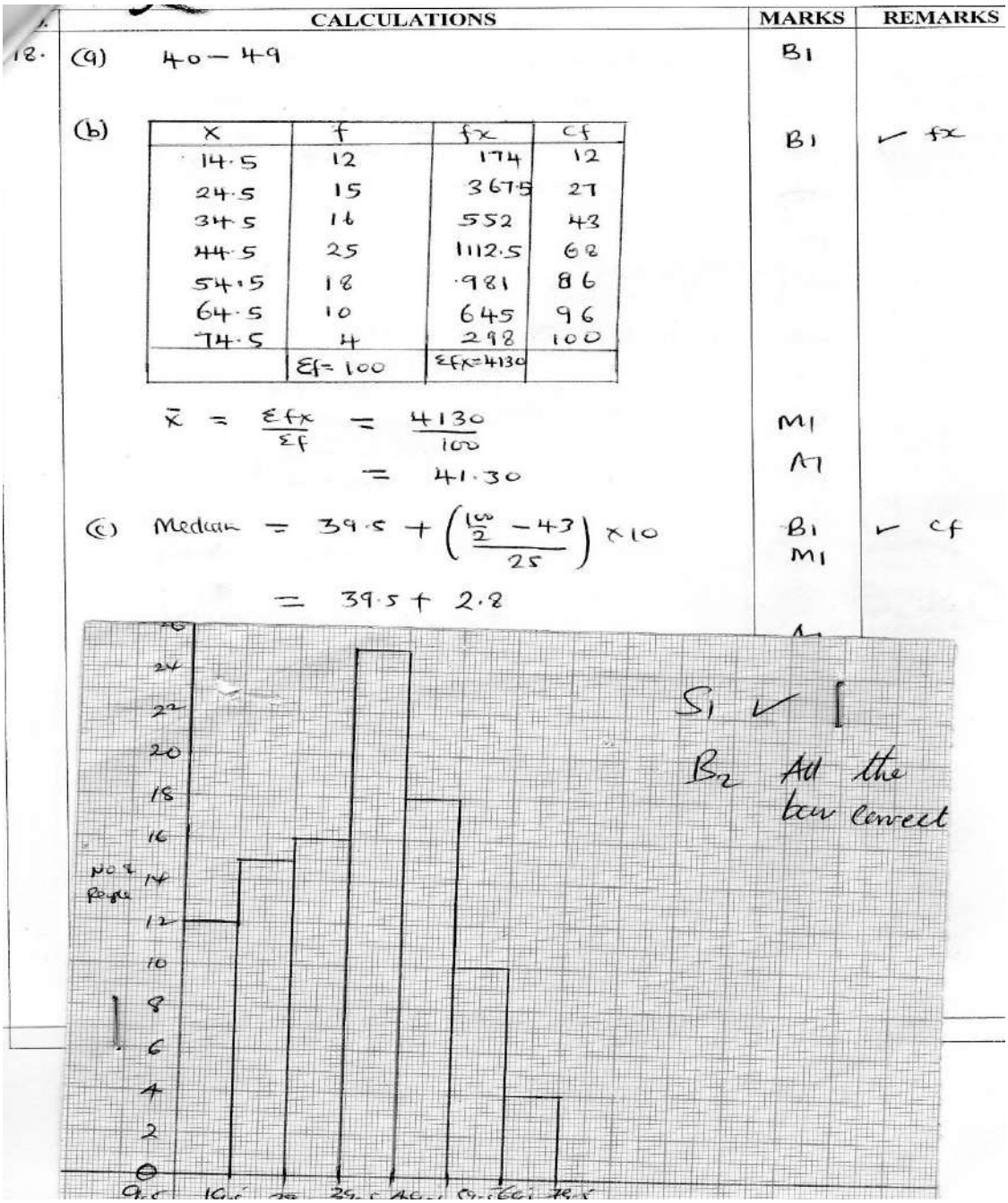
b) On the grid provided draw the graph of $y = x^3 - 3x^2 - 5x + 7$for $-3 \leq x \geq 5$. (Use 2cm to represent 1 unit on the x- axis and 1 cm to represent 5 units on the y-axis). (3marks)
c) Use the graph to solve the equation $x^3 - 3x^2 - 5x + 7 = 0$ (2 marks)
d) By drawing a suitable line, use the graph in (b) to solve the equation$x^3 - 3x^2 - 10x + 17 = 0$. (3 marks)

BUURI EAST STANDARDS EXAMINATIONS – 2019
MARKING SCHEME
121/1
JULY/AUGUST 2019

	CALCULATIONS	MARKS	REMARKS
1.	$\frac{133X0.51X1000000}{0.19X0.0017X1000000}$ $\frac{133X51X100}{19X17}$ 2100	**M1** **M1** **A1**	**Multiplying** **Correct …..** **CAO**
		03	
2.	2 | 48 | 72 | 100 2 | 24 | 36 | 50 2 | 12 | 18 | 25 2 | 6 | 9 | 25 3 | 3 | 9 | 25 3 | 1 | 3 | 25 5 | 1 | 1 | 25 5 | 1 | 1 | 5 | 1 | 1 | 1 L.C.M = $2^4 \times 3^2 \times 5^2$ = 3600 Number =3600 + 3 = 3603	**M1** **M1** **A1**	**Correct lcm** **Adding 3** **CAO**
		03	
3.	No. log 849.6 2.9292 $\frac{2.41}{3941}$ $\frac{0.3820}{3.5956}$ 3.3112 $\frac{\bar{1}.7156}{3}$ $\bar{3}/_3 + \frac{2.7156}{3}$ 0.08039 $\bar{1}$.9052	**M1** **M1** **M1** **M1** **A1**	**All logs correct** **Dividing by 3 correctly** **CAO**
		04	
4.	Volume = $^{22}/_7$ x $\frac{(76-62)^{2 x3}}{100}$ = 0.1848 Density = $\frac{890}{0.1848}$ = 4.816.0	**M1** **M1** **A1**	**Process of getting volume** **Process of density** **Correct to 1 d.p** **Follow through for other 11 used.**
		03	
5.	$3^{4(x+1)} + 3^{4x} = 246$ $3^{4x+4} + 3^{4x} = 246$ $3^{4x}(3^4+1)=246$ $3^{4x}=\frac{246}{81}$ $3^{4x}=3^1$ $4x= 1$ $X=^1/_4$	**M1** **M1** **A1**	**Accept the alternative.** **Factorizing 3^{4x}** **Equating powers** **Accept 0.25**
		03	

6.	Num $4x^2 - 9$ (2x +3) (2x-3) Den $2x^2$ +2x+3x+3 (x+1) (2x+3) (2x+3)(2x-3) (x+1) (2x +3) 2x-3 X+1	**M1** **M1** **A1**	**Factorizing numerator.** **Factorizing denominator.** **Must be extracted.**
		03	
7.	 not drawn accurately	**B1** **B1** **B1**	**All angles correct** **All lengths correct** **Correct labelling Measurement must be correct**
		03	
8.	G+c=45 4g+2c= 100 G=45-c 4(45 – c) + 2c=100 180 – 4c +2c=100 C=40 g=5	**M1** **M1** **A1**	**Forming the two equation.** **Attempt to eliminate one variable.** **For both**
9.	a) boys = 900 – 600= 300 ratio 3000:600 1:2 B) 300/900 x 100 331/3%	**M1** **A1** **B1**	**Getting the number of boys.** **Should be simplified.**
		03	
10.	4(t-1) – 3(4+t)=0 4t-3t – 4 – 12=0 t- 16 = 0 t= 16	**M1** **M1** **A1**	**Attempting to remove fractions.** **Removing brackets correctly.**
		03	
11.	90 (2n -4) = 1980 180n = 1980- 360 N = 1620 180 N=9 Name nonagon	**M1** **A1** **B1**	**A1 Must be got to get B1**
		03	

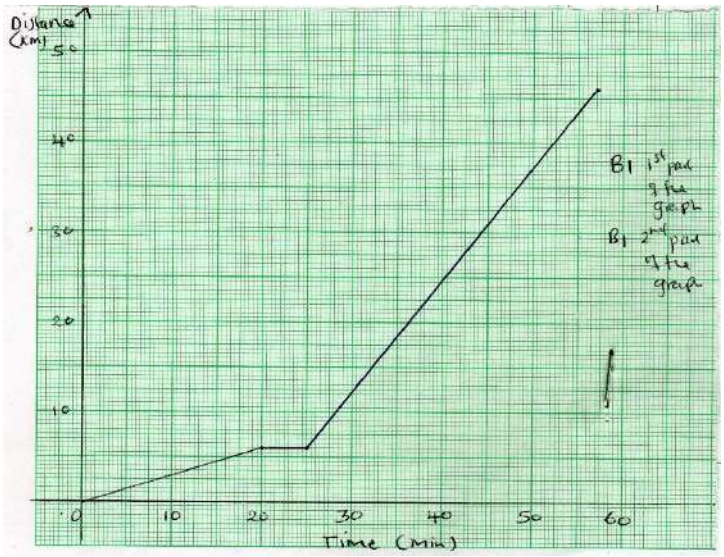
12.	Coordinates: 0,2.5,6.0,10.5,16.0,22.5,30 A= ½ x1 (6+30) +2(2.5+6.0+10.5+16.0+22.5) = 72.5	**B1** **M1** **A1**	**All correct ordinates.**
		03	
13.	Gradient of Q= -1/2 y-y= -1/2 x+2 2y – 14= -x-2 2y=-x+12	**B1** **M1** **A1**	 **Accept 2y+x=12**
		03	
14.	a)$r^2 = 7.6^2 + 4.8^2 – 2x7.6 \times 4.8 \cos 80$ = 57.76 + 23.04 – 12.67 = 68.13 R= 68.13 = 8.3 cm. b) $\frac{\sin b}{4.8} = \frac{\sin 80}{8.254}$ Sin B = 0.5727 B= SIN -10.5727 $= 34.9^0$	**M1** **A1** **M1** **A1**	**Substituting in the rule.** **Substituting correctly.**
		04	
15.	$\frac{93 \times 450\,000}{100}$ 418 500 $\frac{418500 \times 100}{113}$ 370,353.98 = 370, 354	**M1** **M1** **A1**	
		03	
16.	a) b) 	**B1** **B1** **B1**	**For correct image drawn** **For centre (4,-2)** **For -90^0**
		03	
17.	a) i) $v=3.142 \times 3^2 \times 12+12+{}^2/_3 \times 3.142 \times 3^3$ =339. 336 + 56.556 = 395.892 = 395.9 ii) v= 15 x 6 x6 – 395.892 = 144.108	**M1** **M1** **A1**	

	144.1 b) i) S.A = $3.142 \times 3^2 + 2 \times 3.142 \times 3 \times 12 + 2 \times 3.14 \times 3^2$ = 28 .278 +226.224+56.556 311.058 = 311.1 ii) Cost = $\frac{311.058}{8 \times 1000} \times 900$ = ksh. 34.99 = 35.0	**A1** **M1** **M1** **A1** **M1** **A1**	
18.			
		10	

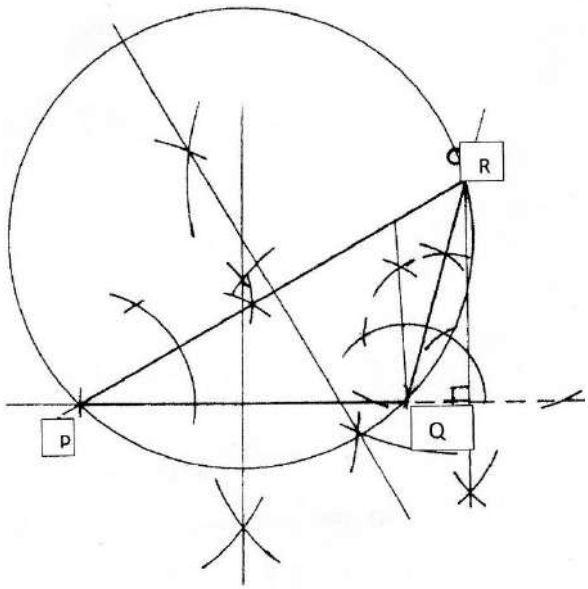
x	f	fx	cf
14.5	12	174	12
24.5	15	3675	27
34.5	16	552	43
44.5	25	1112.5	68
54.5	18	981	86
64.5	10	645	96
74.5	4	298	100
	$\Sigma f = 100$	$\Sigma fx = 4130$	

$\bar{x} = \frac{\Sigma fx}{\Sigma f} = \frac{4130}{100} = 41.30$

M1 A1

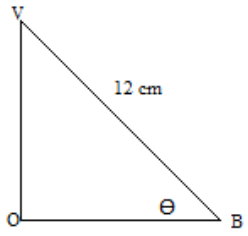
19.	a) 2c +9g = 98200 3c + 4g= 96000 b) (2 9)c = (98200) 3 4 9 96000 2 9 =1/ (4 -9) 3 4 19 -3 2 -1/ (4 -9) (2 9) (c)=-1/ (4 -9)(98200) 19 -3 2 3 4 19 -3 2 96000 (c = -1/ (-471200) G 19 -102600) (c=(24800) G 54000) Cows = Ksh 24800 Goats = Ksh. 5400 c) i) Selling price = 2 x 24800 x 1.3 + 9 x 5400 x 1.4 = 132 520 ii) 132520 – 98200 / 98200 x 100% 34.95%	**B1** **B1** **M1** **B1** **M1** **A1** **M1** **A1** **M1** **A1**	**For matrix equation formed** **Inverse.** **Must be seen.** **Deny if any other method is used.**
		10	
20	a) i) Distance travelled by kimathi in $^1/_2$h= 40 x ½ = 20km Relatively speed = 40+60 =100km/h Time taken to meet= 60/100 = 3/5h. ii) distance from Meru = 20 +$^3/_5$ x 40 = 20 +24 = 44km. iii) 10h 30min 36min 11h: 06 min b) time = 40/75 x 60 	**M1** **M1** **A1** **M1** **A1** **M1** **A1** **B1**	

		10	
21.	i) AN= 2/3B – A ii) BM= 2/5 a – b iii) AB = B-A c) i) OX = OB+BX = B+K (2A-B) = 2/5 KA +(i-k) b OX = OA + AX = (i-h)a+2/3 hb ii) $^{2}/_{5}$ ka +(1-k)b)= (1-h)a +$^{2}/_{3}$ b 2/5k=1-h……..(i) 1-k=$^{2}/_{3}$h……..(2) From (1)h=1-2/5k 1-k=$^{2}/_{3}$(1-2/5k) K=5/11 h= 1- 2/11 = 9/11 OX=2/5 X 5/11a+b (1-5/11) =2/11a+6/11b	**B1** **B1** **B1** **B1** **B1** **M1** **M1** **M1**	**Equating the two expressions.** **Extracting the two equation** **Attempting to eliminate one value.** **For both k and h correct.** **Correct expression.**
		10	
22.	a) i) V= ds = ts – 7t +6 dt ii) t2 – 7t +6=0 (t-1)(t-6)0 T=1 or t=6 b) v= 32- 7(3)+6 = - 6m5-1 c) i)a=dv=2t-7 dt ii) when t=2 a)=2(2)-7 =-3m52 When t= 6 A=2(6)-7 =5m$^{5-2}$	**B1** **M1** **M1** **A1** **B1** **B1** **B1** **B1** **B1** **B1**	**Equating to zero.**
		10	

23.	 **ii) Radius = 3.5 ± 0.1** **iii) height construction** **height = 3.4±0.1** **b) area of circle outside triangle** **= $^{22}/_{7}$ x 3.5 – ½ x 3.4 x 5** **= 29.98**	**B1** **B1** **B1** **B1** **B1** **B1** **M1** **A1**	**Construction of 30^0.** **Construction of 105^0** **Completion of 3ABC.** **1 bisectors.** **circle** **height constructed**
		10	
24.	a) i) $\frac{100}{x}$ ii) $\frac{100+1}{x-5}$ b) $\frac{100}{x-5} - \frac{100}{x} = 1$ $\frac{100x - 100(x-5)=1}{X(x-5)}$ $\frac{100x - 100x + 500=1}{X^2 - 5x}$ $X^2 - 5x - 500=0$ $(x - 25)(x+20)=0$ X=25 or x = -20 (impossible) X=25 c) $(y+3)(y-2)=24$ $X^2+x-30=0$ $(x-5)(x+6)=0$ $(x-5)(x+6)=0$ X=5 or x =-6	**B1** **B1** **B1** **M1** **M1** **A1** **M1** **M1** **A1** **10**	**Forming the equation** **-20 must be discriminated if not AO.** **Forming & equating to xero.** **For both values of x correct.**

BUURI EAST STANDARDS EXAMINATIONS – 2019
MARKING SCHEME
121/2
JULY/AUGUST 2019

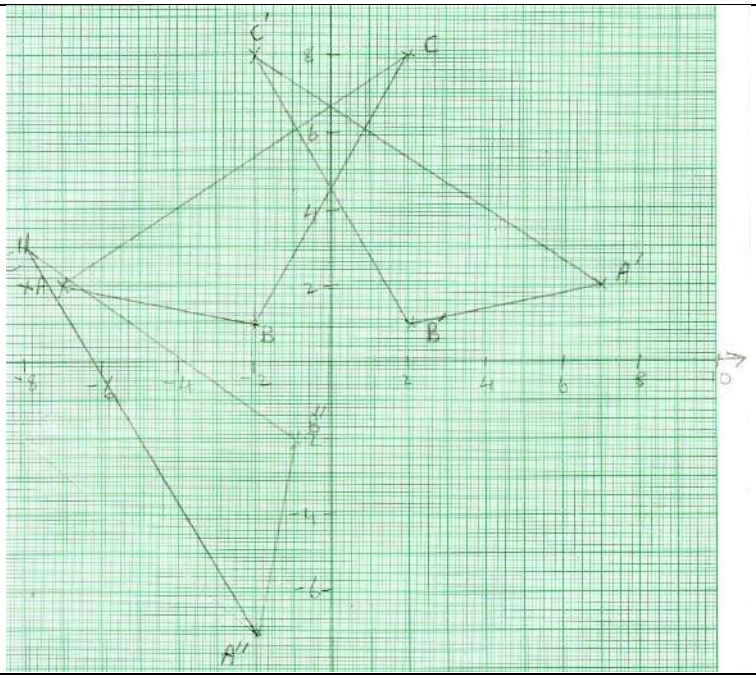
	CALCULATIONS	MARKS	REMARKS
1	$\frac{12+6}{8-6}$ $= 18/2$ $= 9$	M1M1 A1	M1 for the max possible value of the numerator m1 for the min.possible value for the denominations.
2	$\frac{4}{5} - \frac{3}{2} - \frac{3}{3-2}$ $\frac{4(5-2)-3(5-2)}{5+2(5-2)}$ $\frac{4(5-4(2-3(5-3(2)}{5-2}$ $\frac{5-7(2}{3}$	 M1 M1 A1	
3	$\frac{nt}{2M} = \frac{L-A}{3K}$ $\frac{n^2T^2}{4m^2} = \frac{L-A}{3K}$ $4M^2(L-A) = 3K(n^2T^2)$ $4LM^2 - 4AM^2 = 3KN^2T^2$ $4 = \frac{4LM^2 - 3KN^2T^2}{4M^2}$	M1 M1 A1	Multiplication by reciprocal n/2m both sides
4	$a+24d=51$ $\underline{-a+4d=11}$ $20d=40$ $d=2$ $d=11-8$ $d=3$	M1 M1 A1	Both equation . Attempt to solve for d. Both values correct.
5	Let $\cos 3x + 60^0 = @$ $\cos @ = {}^3/_2$ $@ = 30^0, 330^0, 390^0$ $X = -10, 90^0, 110^0$ Hence $x = 90^0, 110^0$	 B1 B1 B1	For 3 values of c. For 3 values os x. Correct values of x.
6	$(x+1)(x-2)=22$ $X^2 - x - 2 = 22$ $X^2 - x - 24 = 0$ $X^2 - x = 24$ $x - x + (-{}^1/_2)^2 = 24 + (-{}^1/_2)^2$ $(x - {}^1/_2)^2 = 24 + {}^1/_4$	M1 M1	Correct equation equated to 0.

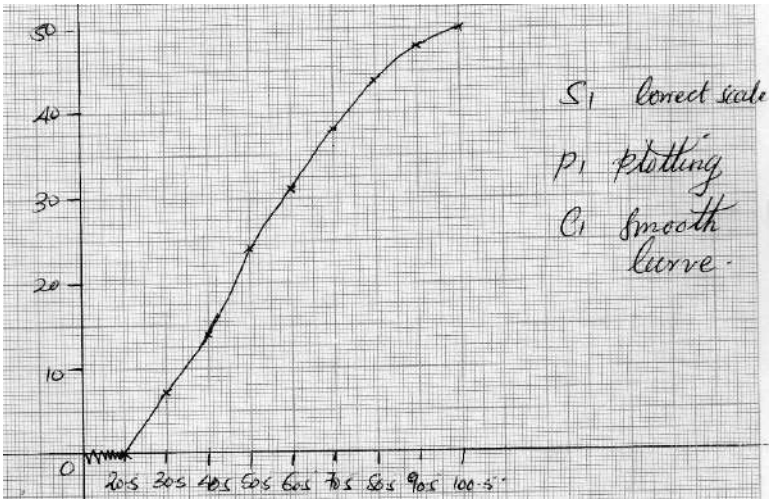
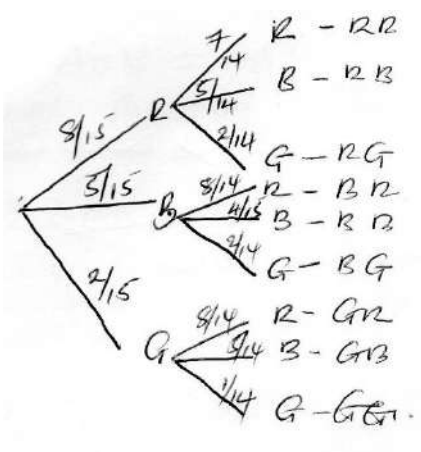
	$x-{}^{1}/_{2} = +- 24.25$ $x=+-0.5 +- 4.924$ $x = 5.424$	A1	Positive value of x.
7	3(2i-3j+k) +2(3i-4j-3k) 6i-9j+3k+6i-8j-6k 12i-17j-3k ii) $(12)^2+(-17)^2 +(-3)^2$ 442 21.02		M1 A1Accept the column vector. M1 for r of 442 seen. A1
8.	a) AO b)  OB = 2.828 Cos @ = 2.828 12 @ = cos -1(2.828) 12 @ = 76.37^0	B1 M1 A1 03	Accept OA.
9.	Log (x+5) = log(4 X+2 X+5 = 4 1 x+2 $4=x^2+5x+2x+10$ $4=x^2 +7x+6=0$ X(x+1) +6(x+1)=0 (x+6)(x+1)=0	M1 M1 A1	 Equation equated to Xero.
10.	$9680 \times {}^{10}/_{100}=968$ $(x-9680) \times {}^{15}/_{100} = 948$ 0.15x=2400 X=1600	M1 M1 A1	
11.	X+y ≤60 1500x+10,000y = 120000 3x+2y ≤24 x>y y<,0	B1 B1 B1 B1	
12.	 $(x^3-3x^2-4x+12)dx$ X4 – x^3 – $2x^2$ + 12) -2 (-2)4 – (-2)3 – 2(-2)2+12(-2) – -20 - -6.75 -13.25	M1 M1 A1	 CAO

13.	Locus l_1 (correct bisector of line p4) Locus l_2 (angle bisector of PQ= (measure scale of pq)	B1 B1 B1	
14.	X^2-8x+16+y^2+6y+a=24+16+9 (x-4)2 + $(y+3)^2$=49 Center (4,-3)radius 7	M1 M1 A1	
15.	2^5-5$(2)^4$($^1/_4$x)+10$(2)^3$$(1/4x)^2-10(2)^2$$(1/4x)^3$ = 32 – 20x +5x^2-5x^3 -1/4x = -0.25 x = 1 32 – 20 + 5 – 5/8 = 16 $^3/_8$	B1 M1 A1	
16.	Let x kg of grade A be mixed of kg of grade b. 75x +50y=70(x+y) 75x+50y=70x+70y. 5x=20y x/y = $^5/_{20}$ = ¼ x:y=1:4	M1 M1 A1	ACCEPT THE ALTERNATIVE
17.	C=k+td 7000=k+2000t <u>11000=k+4000t</u> 400=200t t=20 7000=k+200x20 K=3000 C=3000+20d C=3000 +20 x500 =3000 +10,000 =13,000 K_1=<u>120</u> x 3000 = 3600 100 T_1=110/100 x 20 =22 C= 3600 +22 x 500 = 3600 +11,000 14,600 Increase = 14,600 – 13,000 = 1600 <u>1600</u> x 1000 = 12.31% 13000	B1 M1 A1 B1 M1 A1 M1 A1 B1 A1	Correct equations. Both values of t and k correct. For 1600 For 12.31%
		10	

18.

NO.	CALCULATIONS	MARKS	REMARKS
a (i)	$\begin{pmatrix}-1 & 0\\ 0 & 1\end{pmatrix}\begin{pmatrix}-7 & -2 & 2\\ 2 & 1 & 8\end{pmatrix}=\begin{pmatrix}7 & 2 & -2\\ 2 & 1 & 8\end{pmatrix}$	M1	
	$A^1(7,2),\ B^1(2,1),\ C^1(-2,8)$	A1	
(ii)	Image of ABC	B1	
	Image of $A^1B^1C^1$	B1	On the Graph.
b (i)	$\begin{pmatrix}0 & -1\\ -1 & 0\end{pmatrix}\begin{pmatrix}7 & 2 & -2\\ 2 & 1 & 8\end{pmatrix}=\begin{pmatrix}-2 & -1 & -8\\ -7 & -2 & 2\end{pmatrix}$ ($A^1\ B^1\ C^1$ / $A^{11}\ B^{11}\ C^{11}$)	M1	
	$A^{11}(-2,-7)\ B^{11}(-1,-2)\ C^{11}(-8,2)$	A1	
(ii)	Image $A^{11}B^{11}$	B1	On the Graph.
c (iii)	$\begin{pmatrix}a & b\\ c & d\end{pmatrix}\begin{pmatrix}-2 & -1 & -8\\ -7 & -2 & 2\end{pmatrix}=\begin{pmatrix}7 & 2 & -2\\ 2 & 1 & 8\end{pmatrix}$	M1	
	$-2a-7b=7$, $-a-2b=2$ $\Rightarrow$ $-2a-7b=7$, $-2a-4b=4$; $-3b=3$, $b=-1$, $a=0$		
	$-2c-7d=2$, $-2c-4d=2$; $-3d=0$, $d=0$, $c=-1$		
	Matrix $\begin{pmatrix}0 & 1\\ -1 & 0\end{pmatrix}$	A1	
	Negative Quarter turn about the origin	B1	
		10	

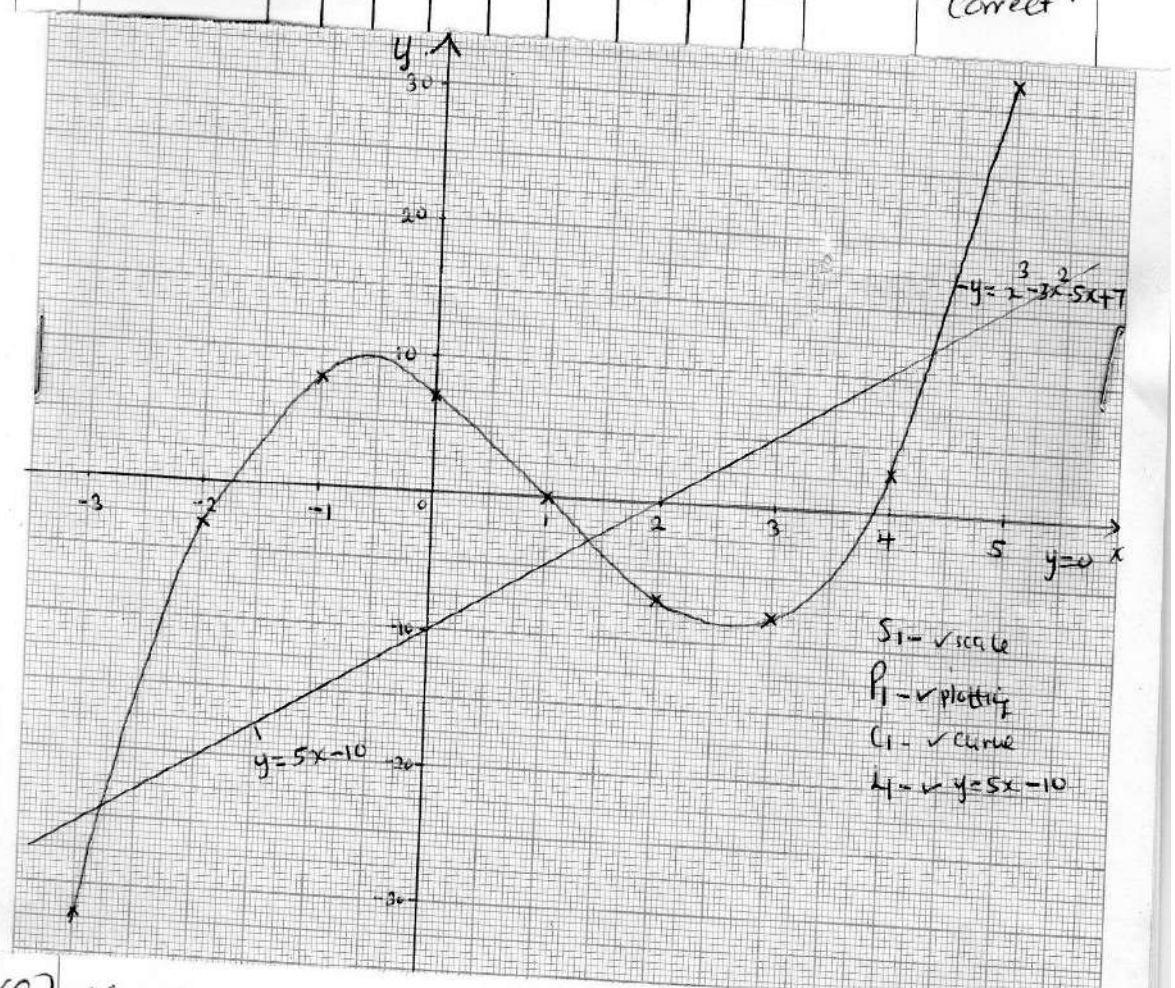
			
19.	i) 180-80=100 100 x 60 =6,000 6000/450 $=13^{1}/_{3}$ hrs b) $13 + 25 = 380^{0}$ 38/360 x 2 x 3.142 x 6370 cos 400. 3,236.76km. c) CD = 60 x 30 1800 mm. Time taken = 1800/450 = 4hrs . Arrival time 3:10 4:00 7.10 p.m	 M1 A1 M1 A1 B1 M1 A1 A1 B1 B1 B1	 For 380. For 1800nm. 4hrs. For 7:10p.m
20.	H.P = (24 X 1250) + 7200 = 3000 +7200 37200. b) cash price = $\frac{100}{124}$ X 37200 = 30,000 c) A= $30\,000(1 + {}^{18}/_{100})^{2}$ = $30{,}000(1.18)^{2}$ = 41772. Total interest = 41772 – 30,000 =11772. d) A= $800{,}000(1- 20/100)^{5}$ = 262, 144.	M1 m1 A1 M1 M1 M1 A1 M1 A1	
		10	

21.	Class Tally f. c.f 21 = 30 7 7 31 – 40 7 14 41 – 50 10 24 51 – 60 7 31 61 – 70 7 38 71 – 80 6 44 81 – 90 4 48 91 – 100 2 50  a) i) 69.5± 1 ii) 39.±1 iii) $\frac{69.5 - 39}{2}$ 15.25	B1 B1 B1 B1 B1 M1 A1	Correct classes Correct frequency. Cumulative frequency.
		10	
22.	 	B1 B1 B1	correct branches . for correct probabilities seen.

	b) i) p(R) = 8/15 ii) p(B or G) = p(b) or p(g) $= {}^{5}/_{15} \times {}^{4}/_{15}$ ${}^{2}/_{21}$ $({}^{8}/_{15} \times {}^{2}/_{14}) + ({}^{5}/_{15} \times {}^{2}/_{14}) + ({}^{2}/_{15} \times {}^{8}/_{14}) + ({}^{2}/_{15} \times {}^{5}/_{14}) + {}^{2}/_{15} \times {}^{4}/_{15})$ $= {}^{2}/_{21}$. $({}^{8}/_{15} \times {}^{2}/_{14}) + ({}^{2}/_{15} \times {}^{8}/_{14}) + {}^{2}/_{15} \times {}^{5}/_{14}) + {}^{2}/_{15} \times {}^{1}/_{14})$ $= {}^{16}/_{210} + {}^{10}/_{210} + {}^{16}/_{210} + {}^{10}/_{210} + {}^{2}/_{210}$ $= {}^{54}/_{210}$ ${}^{9}/_{25}$	M1 A1 M1 M1 A1 M1 M1 A1	
		10	
23.	$< AOB = 46^0$ Angle subtended at the circumference by the same arc/chord. $<DBO = 17^0$ Angles subtended at the circumference by the same arc/chord are equal sum angles of a triangle add to 180^0. $< BDA = 63^0$. Angles subtended at the circumference by the same arc/ chord are equal. Reflex $< BOC = 3.06^0$ Angle at a point add up to 360^0.	B1 B1 B1 B1 B1 B1 B1 B1 B1	Accept the alternative . Accept the alternative.
		10	

24

NO.	CALCULATIONS										MARKS	REMARKS
24	x	-3	-2	-1	0	1	2	3	4	5		
(a)	$y=x^3-3x^2-5x+7$	-32	-3	8	7	0	-7	-8	3	32	B_2	All values Correct.



(c) $x = 3.8$ or $x = -1.8$ or $x = 1$ — B_2 — For all values correct.

d. $y = x^3 - 3x^2 - 5x + 7$

$0 = x^3 - 3x^2 - 10x + 17$

$y = 5x - 7$.

$x = 4.35$ or $x = 1.4$ or $x = -2.8$ — B_2 HB — All values correct Allow an error of 0.1

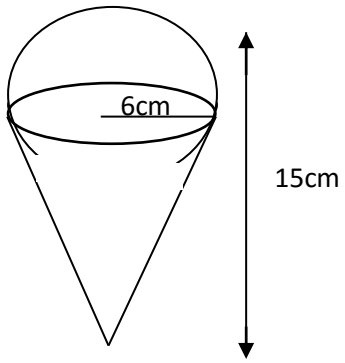
10.

CEKENA
121/1
FORM FOUR
MATHEMATICS PAPER 1

SECTION 1(50 MARKS) COMPULSORY

1. Evaluate without using a calculator (3 mks)
$$\frac{(2\frac{3}{7} - 1\frac{5}{6}) \div \frac{5}{6}}{\frac{2}{3} \text{ of } 2\frac{1}{4} - 1\frac{1}{7}}$$
2. Solve for X in: (3 mks)
$$\frac{6x-4}{3} - \frac{2x-1}{2} = \frac{6-5x}{6}$$
3. The ratio of goats to cows in a farm is 2:5 while the ratio of sheep to cows is 3:4. If there are 15 sheep, how many animals are there in the farm (2 mks)
4. Mr. Maina who deals in electronics sells a radio to a customer at Ksh. 1440 after giving him a discount of 10% but find that he still makes a 20% profit. Find the profit Mr. Maina would make if he does not give a discount (3 mks)
5. The sum of interior angles of a triangle is given by $(10x - 2y)^0$ while that of a hexagon is given by $(30x + 24y)^0$. Calculate the values of x and y (3 mks)
6. Evaluate ; $36^{x-1} + 6^{2x} - 222 = 0$ (3 mks)
7. The equation of a straight line is given by $2y + 8x - 10 = 0$. Another line L_2 cuts L_1 at right angles such that the point of intersection of the two lines is (-3, K)
   (a) Find tha value of K (1 mk)
   (b) Determine the equation of L_2 in the form $y = mx + c$ (2 mks)
8. Use Logarithms to evaluate (4 mks)
$$\sqrt[3]{\frac{7.96 \times \sin 54}{97.5}}$$

9. Given that $\sin(3x - 50)^0 - \cos(x + 20)^0 = 0$ and x is an acute angle; find the value of x (2 mks)
10. The diagram below represents a solid made up of a hemisphere mounted on a cone. The common radius is 6cm and the height of the solid is 15cm.



Calculate the external surface area of the solid (4 mks)

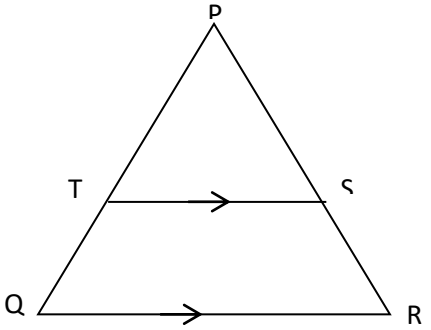
11. Simplify completely (3 mks)
$$\frac{2x^2 - 98}{3x^2 - 16x - 35} \div \frac{x + 7}{3x + 5}$$

12. Solve the simultaneous inequalities given below and list all the integral values of x (3 mks)

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

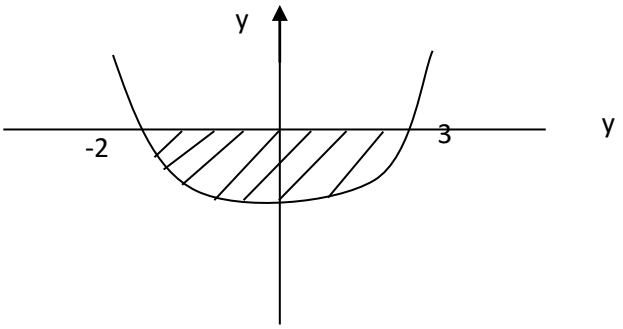
13. The gradient function of a curve is given by $3x^2 + 2x - 3$. If the curve passes through the point (-4, -6), Find the equation of the curve (3 mks)

14. The figure below shows triangle PQR in which PR = 12cm, T is a point on PR such that TR = 4cm. Line ST is parallel to QR.



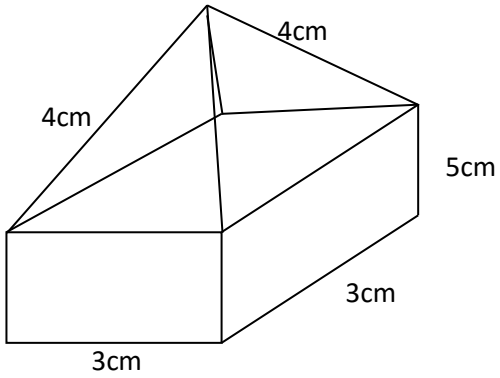
If the area of triangle PQR is $336cm^2$, find the area of the quadrilateral QRTS (3 mks)

15. The diagram below is a sketch of the curve $y = x^2 - x - 6$



Using the mid-ordinate rule with five strips, Estimate the area of the shaded region (4 mks)

16. The figure below shows a square based pyramid on top of a cuboid \



(a) Draw the net of the solid (2 mks)

(b) Calculate the total surface area of the net. (2 mks)

SECTION II (50 MARKS)

Attempt any 5 questions

17. Mtrix M is given by $\begin{pmatrix} 3 & 4 \\ 5 & 2 \end{pmatrix}$

(a) Find the inverse of M (2 mks)

(b) Two schools A and B purchased beans at Ksh. b per bag and maize at Ksh. m per bag. School A purchased 30 bags of beans and 40 bags of maize for sh. 72,000. School B purchased 50 bags of beans and 20 bags of maize for sh. 64,000

(i) Form a matrix equation to represent the information above (1 mk)

(ii) Use the inverse matrix of M to find the price of one bag of each item (4 mks)

(c) The price of beans later went up by 5% and that of maize remained constant. School A bought the same quantity of beans but spent the same total amount of money as before on the two items. State the new ratio of beans to maize. (3 mks)

18. Nairobi and Eldoret are 600km apart. At 9.20a.m. a lorry leaves Eldoret for Nairobi at a speed of 60km/hr. At 10.00a.m. a car leaves Eldoret fo Nairobi at a speed of 120km/hr. After 20 minutes of travel, the car develops a mechanical problem which takes 20 minutes to repair. The car then proceeds with the journey at the same speed.

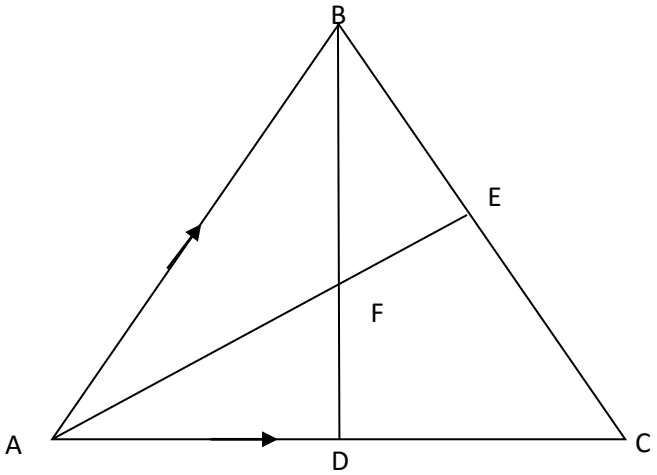
(a) Calculate the time the lorry arrived in Nairobi (2 mks)

(b) Find the time when the car overtakes the lorry (4 mks)

(c) Find the distance from Nairobi at the overtaking point (2 mks)

(d) Calculate how far the lorry was from Eldoret when the car reached Nairobi (2 mks)

19. In a triangle ABC, E is the midpoint of BC, D is a point on AC such that AD: DC = 3.2 and F is the point of intersection of AE and BD. Vectors AB = b and AC = c



(a) Express vectors

(i) AE

(ii) BD in terms of b and c only (3 mks)

(b) By expressing vectors BF in two ways, find the ratio BF: FD given that BF = hBD and AF = tAE wher h & t are constant (5 mks)

(c) Hence find vector BF in terms of b and c only (2 mks)

20. A group of people planned to contribute equally toward water project which needed Ksh. 2,000,000 to complete. However, 40 members of the group withdraw from the project. As a result each of the remaining members were to contribute Ksh. 2500 more.

(a) Find the original number of members in the group (5 mks)

(b) Forty five percent of the value of the project was funded by the constituency development fund(CDF), Calculate the amount of the contribution that would be made by each of the remaining members (3 mks)

(c) Members contribution were in terms of labour provided and money contributed. If the rate of the value of labour to the money contribution was 6:9, Calculate the total amount of money contributed by the members (2 mks)

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

Marks	5 – 14	15 – 29	30 – 34	35 – 44	45 – 49
Frequency	2	12	7	15	x

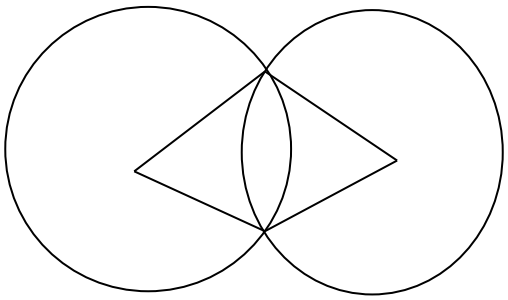
(a) Find the value of x (1 mk)

(b) Calculate the mean mark (2 mks)

(c) On the grid provided below draw a histogram to represent the data (4 mks)

(d) Drawing a straight line on the graph above determine the median mark (3 mks)

22. The figure below shows two intersecting circles radii 8cm and 6cm respectively. The common chord AB = 9cm and P and Q are the centres as shown.



(a) Calculate the size of angle:-

(i) <APB (1mk)

(ii) <AQB (1 mk)

(b) Calculate the area of :-

(i) Minor segment of the circle P (2 mks)

(ii) Minor segment of the circle centre Q (2 mks)

(iii) The quadrilateral APBQ (2 mks)

(iv) The shaded region (2 mks)

23. Town B is 180km on a bearing 050^0 from town A. Another town C is on a bearing of 110^0 from town A and on a bearing of 150^0 from town B. A fourth town D is 240 km on a bearing of 320^0 from A. Using scale drawing, such that 1cm rep 30km,

(a) Show the relative position of the towns (4 mks)

(b) Using the diagram, find

(i) Distance AC (2 mks)

(ii) Distance CD (2 mks)

(iii) Compass bearing of C from D (2 mks)

24. The displacement of a particle S metres, t seconds after passing a fixed point O is given by $S = 3 + 2t - 5t^2$ Calculate :-

(a) The displacement of the particle 2 seconds later (2 mks)

(b) The time taken for the particle to return to O (3 mks)

(c) The maximum displacement of the particle (3 mks)

(d) The initial velocity of the particle (2 mks)

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FORM FOUR
MATHEMATICS PAPER 2
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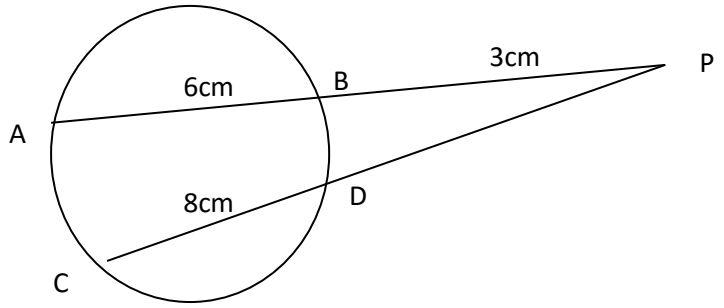
SECTION 1 (50 MARKS) COMPULSORY

1. Mwangi truncated $^{7}/_{9}$ to 3 decimal places. Calculate the percentage error resulting from the truncating (3 mks)
2. Given that A = 5i + 4j + K and B = 8i – 5j – 5k and P divides AB externally in the ratio 5:2. Find the:-
   (a) Position vector of P (2 mks)
   (b) The magnitude of OP (1 mk)
3. Express as a surd and simplify (3 mks)
$$\frac{1 + \cos 30}{1 - \sin 60}$$
4. Solve for x (3 mks)
$\log_{27}(x + 5) - \log_{27}(x - 3) = {}^{2}/_{3}$
5. (a) Find the expansion of $(1 - {}^{x}/_{3})^{7}$ in ascending powers of x up to the term in x^3 (2 mks)
   (b) Use the expansion above to find, $(0.99)^7$ to four significant figures. (2 mks)
6. Find the length of DP in the figure below



7. Use complete square method to solve for x (4 mks)
$8x^2 + 6x - 9 = 0$
8. Make T the subject of the formular (3 mks)
$$\frac{F\sqrt{T}}{d} = \sqrt{\frac{a^2 - k}{T}}$$
9. Point P(X^0N, 30^0E) and Q(X^0N, 50^0E) are 1935 km apart. Taking R = 6370km and $\pi = {}^{22}/_{7}$, Find the value of x (3 mks)
10. Three variables P,Q and R are such that P varies directly as the cube of Q and inversely as the square root of R. If Q is increased by 20% and R is decreased by 10%, Find the percentage change in P (3 mks)
11. PQ is a diameter of a circle is such that the co-ordinates of P and Q are (-6, -2) and (4, -2) respectively. Find the equation of the circle in the form $ax^2 + by^2 + cx + dy + e = 0$ where a,b,c,d and e are constants. (3 mks)
12. The third term and the sixth term of a geometric series are $3^{1}/_{3}$ and $11^{1}/_{4}$ respectively. Calculate the
   (a) Common ratio (2 mks)
   (b)First term (1 mk)
13. Solve for x in the equation (3 mks)
$6\sin^2 x - \cos x - 5 = 0$
for $0^0 \leq x \leq 360$
14. Find the equation of the normal to the curve $y = 3x^2 - 8x + 5$ at the point where x = 2 (4 mks)
15. Machine A can complete some work in 8 hours while machine B can complete the same work in 10 hours. The two machines were set to do the work at the same time. After 3 hours, machine B broke down. Determine the time taken by machine A to complete the remaining piece of work (3 mks)

16. T is a transformation represented by the matrix $\begin{pmatrix} 5x & 2 \\ -3 & x \end{pmatrix}$ Under T, a square whose area is $10cm^2$ is mapped onto c square of area $110cm^2$. Find the possible values of x (3 mks)

SECTION II (50 MARKS)

Attempt any FIVE questions

17. A transformation represented by the matrix $\begin{pmatrix} 2 & 1 \\ 1 & -2 \end{pmatrix}$ maps the point

A (0 , 0), B (2 , 0) C (2 , 3) D (0 , 3) of the quadrilateral ABCD onto $A^1B^1C^1D^1$

(a) Draw the quadrilateral ABCD and its image $A^1B^1C^1D^1$ (2 mks)

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

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

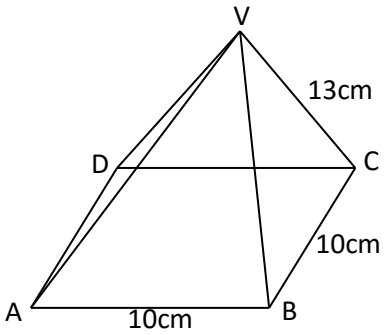
Draw the image $A^{11}B^{11}C^{11}D^{11}$ (2 mks)

(d) Determine a single matrix which maps $A^{11}B^{11}C^{11}D^{11}$ back to ABCD (2 mks)

(e) Draw an image $A^{111}B^{111}C^{111}D^{111}$ of ABCD under shear transformation of factor 2 and X – axis as the invariant line (2 mks)

18. The figure below shows a square based pyramid VABCD. Point V is vertically above middle of the base ABCD.

AB = 10cm and VC = 13cm



Find:-

(a) The length of diagonal AC (2 mks)

(b) The height of the pyramid (2 mks)

(c) The acute angle between VB and the base ABCD (2 mks)

(d) The acute angle between BVA and ABCD (2 mks)

(e) The acute angle between AVB and DVC (2 mks)

19. Mr. Karanja owns a bicycle which he sometimes rides to go to work. Out of the 21 working days in a month, he only rides to work for 18 days. If he rides to work, the probability that he is bitten by a rabid dog is $^4/_{15}$ otherwise its only $^1/_{13}$. When he is bitten by the dog, the probability that he will get treatment is $^4/_5$ and if he does not get treatment the probability that he will get rabies is $^5/_7$.

(a) Draw a tree diagram to show the events (3 mks)

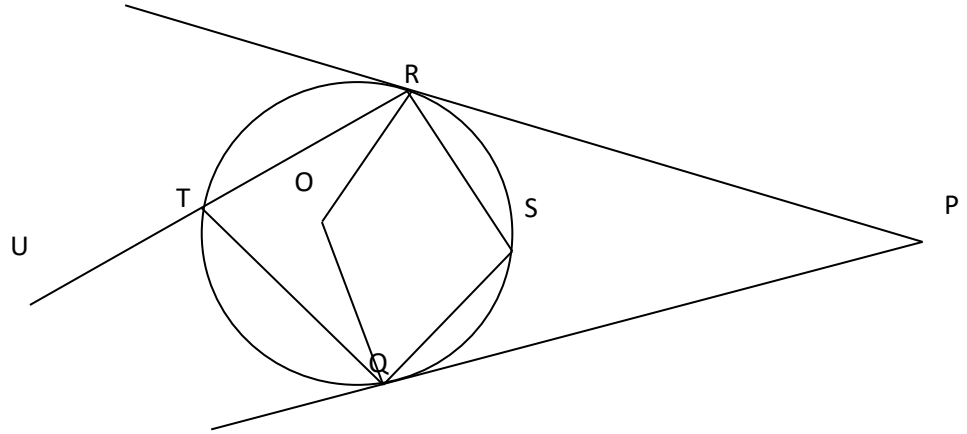
(b) Using the tree diagram in (a) above, determine the probability that

i) Karanja will not be bitten by a rabid dog (2 mks)

ii) He will get rabies (2 mks)

iii) He will not get rabies if he does not get treatment (3 mks)

20.



In the figure below, O is the centre of the circle. PQ and PR are tangent to the circle at P and R respectively. Angle PQS = 43^0 and angle PRS = 36^0, RTU is a straight line.

Find , giving reasons the angles

(i) QRS (2 mks)

(ii) RTQ 2 mks)

(iii) RPQ (2 mks)

(iv) Reflex angle QOR (2 mks)

(v) TRO given that TR = TQ (2 mks)

21. (a) Without using a protractor, construct a quadrateral ABCD such that AB = 5cm, AC = 7cm, AD = 6m, angle BAC = 30^0 and DAB = 120^0 (4 mks)

(b) Construct the locus of a point P on the same side as D such that angle APC = 90^0 (2 mks)

(c) Construct a locus T on the same side as D such that the area of triangle ATC = $7cm^2$ and angle ATC $\geq 90^0$ (3 mks)

(d) Measure $T_1 T_2$ (1 mk)

22. The table below shows income tax rates

Monthly taxable Pay in Ksh.	Rate of tax Ksh. Per %
1 - 8700	10%
8701 - 17200	15%
17201 - 26140	20%
26141 - 34800	25%
Over 34800	30%

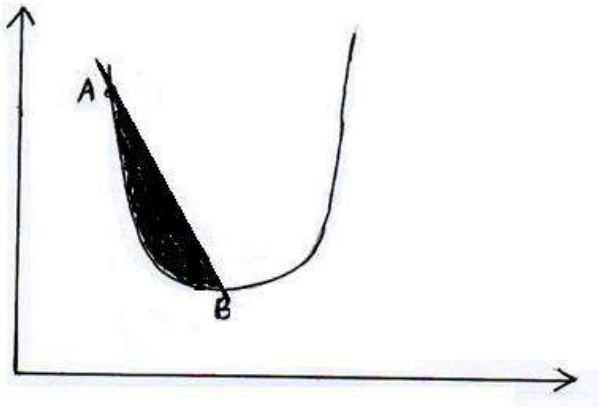
Mr. Kiprono is employed and housed by a company. For which he pays a normal rent of Sh. 2000. He earns a basic salary of Ksh. 32,000 pm. He is also given taxable allowances amounting to ksh. 8480.

(a) Calculate his taxable income in K£ (3 mks)

(b) Determine his total income tax in Ksh. (4 mks)

(c) If he pays a monthly water bill of Ksh. 350, electricity bill of Ksh. 400 and is a member of a co-operative and pays Ksh. 2500 pm. Determine his net monthly income. (3 mks)

23. The figure below shows parts of a curve whose gradient function is given by $3x - 6$



Given that the curve passes through the points A(1 , 6) and has a minimum turning point at B

(a) Determine:-
  (i) The equation of the curve (3 mks)
  (ii) The coordinates of B (3 mks)

(b) The shaded region is bounded by the curve and the straight line passing through A and B, Calculate the area of the shaded region. (4 mks)

24. A shopkeeper sells two types of chewing gum. Big G and Orbit. Each big G costs sh. 3 and each orbit costs sh. 4. The shopkeeper has put aside sh. 300 for the purchase of gums. He needs at least twice as many Big G as Orbit and there must be at least 50 Big G and at least 20 orbit. Let x represent the number of Big G and y the number of orbit the shopkeeper purchases.

(a) Write down all the inequalities representing the information (3 mks)

(b) Represents the inequalities in (a) graphically (4 mks)

(c) The shopkeeper makes a profit of sh. 1.00 on each big G and sh. 1.50 on each orbit.
  (i) Find the number of gums of each type that would give him maximum profit (2 mks)
  (ii) Hence find the maximum profit (1 mk)

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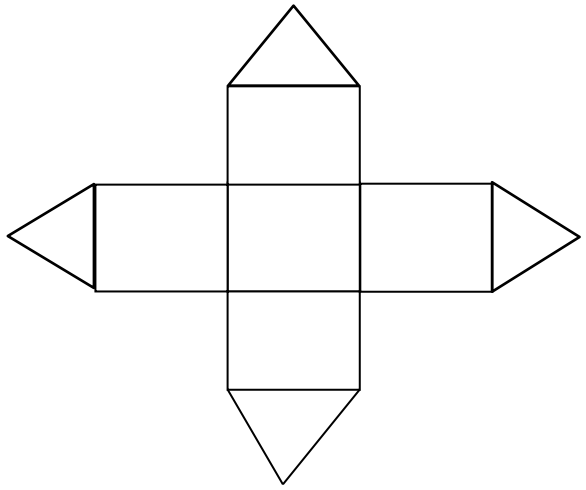
MATHEMATIC PAPER 1 (MARKING SCHEME)

1.	$\frac{17}{7} - \frac{11}{6} = \frac{25}{42} \times \frac{6}{5} = \frac{5}{7}$ $\frac{2}{3} \times \frac{9}{4} = \frac{3}{2} - \frac{8}{7} = \frac{5}{14}$ $\frac{5}{7} \times \frac{14}{5} = 2$	M1 M1 A1 **3**	
2.	$2(6x - 4) - 3(2x - 1) = 6 - 5x$ $12x - 8 - 6x + 3 = 6 - 5x$ $11x = 11$ $x = 1$	M1 M1 A1 **3**	Must by 1cm Removing brackets
3.	g : c : s = 8 : 20 : 15 $\frac{43}{15} \times 15$ 43 animals	M1 A1 **2**	
4.	m.p = $\frac{100}{90} \times 1440 = 1600$ $\frac{100}{120} \times 1440$ = Sh. 1200 1600 - 1200 = sh. 400	M1 M1 A1 **3**	
5.	$10x - 2y = 180$ $30x - 24y = 720$ $30x - 24y = 720$ $\underline{30x - 6y = 540}$ $-18y = 180$ $y = -10, x = 16$	M1 M1 A1 **3**	Both equations Elimination of one unknown Both x & y
6.	$6^{2x-2} + 6^{2x} = 222$ $6^{2x} \div 6^2 + 6^{2x} = 222$ $\frac{y}{36} + y = 222$ $37y = 7992$ $y = 216$ $6^{2x} = 216$ $2x = 3$ $x = 1^1/_2$	 M1 B1 A1 **3**	

7.	(a) $y = -4(-3) + 5 = 17$ (b) $\frac{y - 17}{x + 3} = \frac{1}{4}$	B1 M1 A1 **3**	

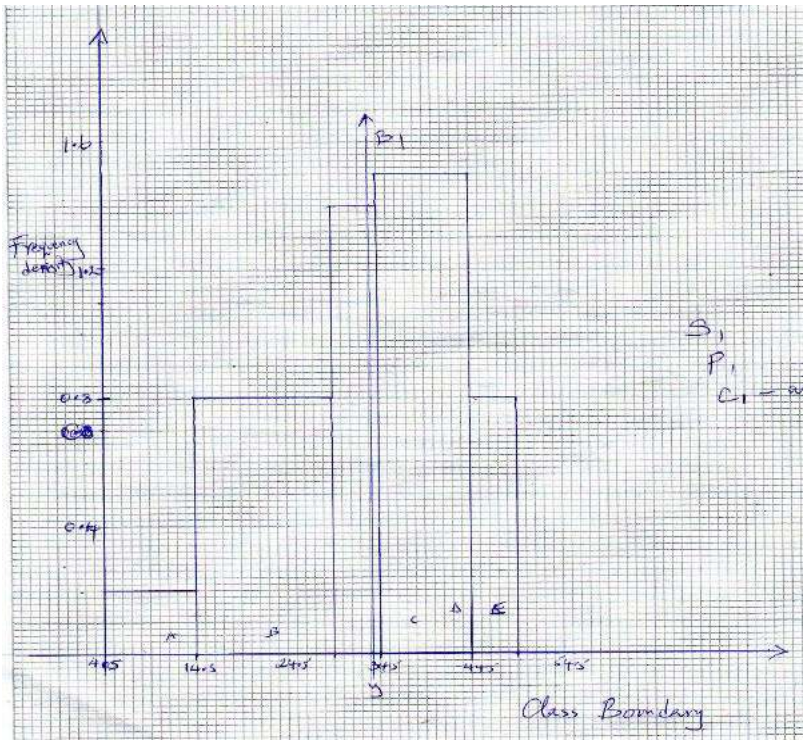
	$y = \frac{1}{4}x + 17\frac{3}{4}$		
8.	No | Log 7.96×10^0 | 0.9009 Sin 54 | 1.9080 | 0.8089 9.75×10^1 | 1.9890 | $2.8199 \times \frac{1}{3}$ 1.60663 $4.041 \times 10^{-1} = 0.4041$	M1 M1 M1 A1 **4**	
9.	$\sin(3x - 50)^0 = \cos(x + 20)^0$ $3x - 50 + x + 20 = 90$ $x = 30^0$	M1 A1 **2**	
10.	$2 \times 3.142 \times 36$ $= 226.224$ $3.142 \times 6\ 10.82$ $= 204.0$ Total 430.224	M1 M1 M1 A1 **4**	
11.	$\frac{2(x+7)(x-7)}{(3x+5)(x-7)} \times \frac{3x+5}{x+7}$ $= 2$	M1 M1 A1 **3**	
12.	$9 - 3x > 2x + 2$ $\frac{7}{5} > x$ $x + 1 > -2x - 1$ $3x > -2$ $x > -\frac{2}{3}$ $-\frac{2}{3} < x < 1\frac{2}{5}$ Interal values 0, 1	M1 M1 A1 **3**	
13.	$(3x^2 + 2x - 3)\,dx = x^3 + x^2 - 3x + c$ $-6 = (-4)^3 + (-4)^2 - 3(-4) + c$ $C = 30$ $Y = x^3 + x^2 - 3x + 30$	M1 B1 A1 **3**	

14.	$\frac{12}{8} = \frac{3}{2}$		

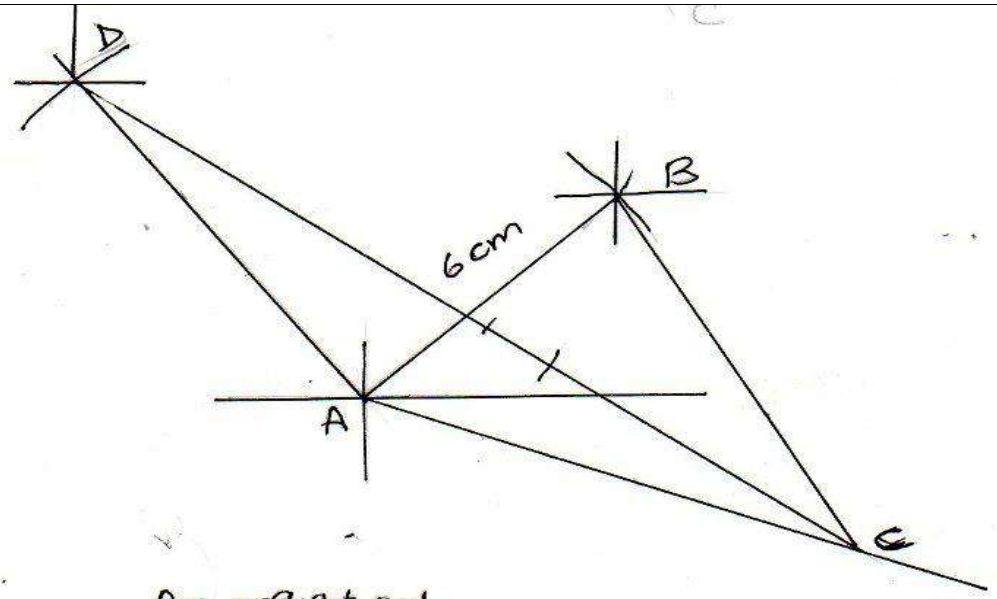
	a.s.f $= {}^{9}/_{4}$ area PST $= {}^{4}/_{9} \times 336 = 149{}^{1}/_{3}$ area QRST $= 336 - 149{}^{1}/_{3}$ $= 186{}^{2}/_{3}cm^2$	M1 M1 A1 **3**	
15.	$h = \frac{3+2}{5} = 1$ x | -1.5 | -.5 | 0.5 | 1.5 | 2.5 y | -2.25 | -5.25 | -6.25 | -5.25 | -2.25 A = -2.25 + -5.25 + -6.25 + -5.25 + -2.25 A = 21.25 sq. units	 B1 B1 M1 A1 **4**	 Values of y Values of x +ve value
16.	 (b) $(3 \times 3) + 4(3 \times 5) + ({}^{1}/_{2} \times 3 \times 3.708)^4$ $= 91.25cm^2$	 B1 B1 M1 A1 **4**	 Correct shape Correctly completed to scale
17.	(a) Det $= 6 - 20 = -14$ Inv $= \frac{-1}{14}\begin{pmatrix}2 & -4\\ -5 & 3\end{pmatrix}$ $\begin{pmatrix}{}^{-2}/_{14} & {}^{4}/_{14}\\ {}^{5}/_{14} & {}^{-3}/_{14}\end{pmatrix}$ (b) (i) $30b + 40m = 72000$ $50b + 20m = 64000$ $\begin{pmatrix}3 & 4\\ 5 & 2\end{pmatrix}\begin{pmatrix}b\\ m\end{pmatrix} = \begin{pmatrix}7200\\ 6400\end{pmatrix}$ (ii) $\frac{-1}{14}\begin{pmatrix}2 & -4\\ -5 & 3\end{pmatrix}\begin{pmatrix}3 & 4\\ 5 & 2\end{pmatrix}\begin{pmatrix}b\\ m\end{pmatrix} = \frac{-1}{14}\begin{pmatrix}2 & -4\\ -5 & 3\end{pmatrix}\begin{pmatrix}7200\\ 6400\end{pmatrix}$	B1 B1 B1 M1 M1	

	$\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}\begin{pmatrix}b\\m\end{pmatrix} = \frac{-1}{14}\begin{pmatrix}-11200\\-16800\end{pmatrix}$	M1	
	$\begin{pmatrix}b\\m\end{pmatrix} = \begin{pmatrix}800\\1200\end{pmatrix}$		
	Beans = Sh. 800 Maize = Sh. 1200	A1	For both
	(c) Beans new price $= \frac{105}{100} \times 800 =$ Sh. 840	M1	
	$(840 \times 30) + 1200m = 72000$ $1200m = 72000 - 25200$ $m = \frac{46800}{1200} = 39$	M1	
	Ratio b : m = 30 : 39 = 10 : 13	A1	
18.	(a) Time by Lorry $= \frac{600}{60} = 10$hrs	M1	
	Lorry arrived at Nairobi at 9.20 + 10.0 19.20hrs or 7.20pm	A1	
	(b) Let the time be x hrs after 10.00am. Then $(x - {}^1/_3)\ 120 = 60(x - {}^2/_3)$	M1	
	$120x - 40 = 60x + 40$ $x = {}^4/_3$ = 1hr 20 min.	A1	
	Time = 10.00 + 1hr 20min = 11.20am	M1	
	(c) Lorry had travelled for 11.20 - 9.20 2hrs		
	Dist from Eldoret = 60 x 2 = 120km		
	Dist from Nairobi = 600 – 120	M1	
	= 480km	A1	
	(d) $\frac{600}{120} = 5$hrs		
	Time taken by car = 6hrs		
	Distance of the lorry from Eldoret		
	= 60 x 6	M1	
	= 360km	A1	

19.	(i) $\underset{\sim}{AE} = \underset{\sim}{b} + \frac{1}{2}(\underset{\sim}{c} - \underset{\sim}{b})$ $= \frac{1}{2}\underset{\sim}{b} + \frac{1}{2}\underset{\sim}{c}$ (ii) $\underset{\sim}{BD} = \frac{3}{5}\underset{\sim}{c} - \underset{\sim}{b}$ (b) $\underset{\sim}{BF} = h(\frac{3}{5}\underset{\sim}{c} - \underset{\sim}{b})$ $= \frac{3}{5}h\underset{\sim}{c} - h\underset{\sim}{b}$ $\underset{\sim}{BF} = \underset{\sim}{BA} + \underset{\sim}{AF}$ $= -\underset{\sim}{b} + t(\frac{1}{2}\underset{\sim}{b} + \frac{1}{2}\underset{\sim}{c})$ $\frac{3}{5}h = \frac{1}{2}t \Rightarrow 5t = 6h$ and $\frac{t}{2} - 1 = -h \Rightarrow h = 1 - \frac{t}{2}$ $\therefore 5t = 6(1 - \frac{t}{2})$ $5t = 6 - 3t$ $t = \frac{3}{4}$ $h = 1 - \frac{3}{4}(\frac{1}{2}) = \frac{5}{8}$ $\therefore BF : FD = 5 : 3$ (c) $\underset{\sim}{BF} = \frac{5}{8}(\frac{3}{5}\underset{\sim}{c} - \underset{\sim}{b})$ $= \frac{3}{8}\underset{\sim}{c} - \frac{5}{8}\underset{\sim}{b}$	M1 A1 B1 B1 B1 M1 A1 B1 M1 A1	For both
20.	(a) let the no. be x Initial cost = $\frac{2000000}{x}$ Final cost = $\frac{2000000}{x - 40}$ $\frac{2000000}{x - 40} - \frac{2000000}{x} = 2500$ $2500x^2 - 1000000x = 80000000$ $x^2 - 40x - 32000 = 0$ $x^2 + 160x - 200x - 32000 = 0$ $(x - 200)(x + 160) = 0$ $x = 200$ or $x = 160$ $x = 200$	M1 M1 M1 M1 A1	Quad equ. Factorization After discrimination

	(b) $^{55}/_{100}$ x 2000000 = 1,100,000 Contribution = $\frac{1,100,000}{160}$ = sh. 6875 (c) $^{9}/_{15}$ x 1100000 = sh. 660,000	M1 M1 A1 M1 A1	Expression of %
21.	(a) x + 2 + 12 + 7 + 15 + x = 40 x = 4 (b) Mean of $\frac{£fx}{£f} = \frac{1287.5}{40} = 32.1875$ (c) CB | 4.5–14.5 | 14.5–29.5 | 29.5– 34.5 | 34.5- 44.5 | 44.5–49.5 Fd | 0.2 | 0.8 | 1.4 | 1.5 | 0.8 Fx | 19 | 264 | 224 | 595.5 | 188  (d) Total area A = 10 x 0.2 = 2 B = 15 x 0.8 = 12 C = 1.4 x y = 6 D = 1.5 x 10 = 15 E = 0.8 x 5 = 4 2 + 12 + 7 + 15 + 4 = $\frac{40}{2}$ =20 Point to draw the lie is 29.5 + $^{6}/_{7}$ = 30.36	B1 M1 A1 B1 S1 P1 C1 M1 A1 B1	 All bars For the corr line

22.	(a) (i) Sin APQ = $\frac{4.5}{8}$ APQ = 34.228 <APB = 34.228 x 2 = 68.46^0	 B1	
	(ii) Sin AQP = $\frac{4.5}{6}$ APQ = 48.59 < AQB = 2 x 48.59 = 97.18^0	 B1	
	(b) (i) $\frac{68.44}{360}$ x $\frac{22}{7}$ x 8^2 - ½ x 8 x 8 sin 68.46 = 38.25 – 29.77 = 8.48	M1 A1	F.T
	(ii) $\frac{97.18}{360}$ x $\frac{22}{7}$ x 62 – $\frac{1}{2}$ x 6 x 6 sin 97.18 = 30.54 – 17.86 = 12.68	M1 A1	
	(iii) Area of APBQ = 29.77 + 17.86 = 47.63	M1 A1	
	(iv) Shaded area = 47.63 - (8.48 + 12.68 = 26.47	M1 A1	
23.			



AC = 9.2 ± 0.1

CD = 16.6 ± 0.1

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24. (a) $S = 3 + 2(2) - 5(2)2$

$S = -13$

$\equiv$ 13m

(b) $3 + 2t - st^2 = 0$

$$t = \frac{-2 \pm \sqrt{4 + 60}}{-10}$$

$$T = \frac{-2 \pm 8}{-10}$$

T = 1 sec.

(c) $\frac{ds}{dt} = v = 2 - 10t$

$2 - 10t = 0$

$T = {}^{2}/_{10} = {}^{1}/_{5}$ sec

$3 + 2({}^{1}/_{5}) - 5({}^{1}/_{5})_2$

$3 + {}^{2}/_{5} - {}^{1}/_{5}$

$= 3{}^{1}/_{5}$m

(d) $V = 2 - 10(0)$

V = 2m/s

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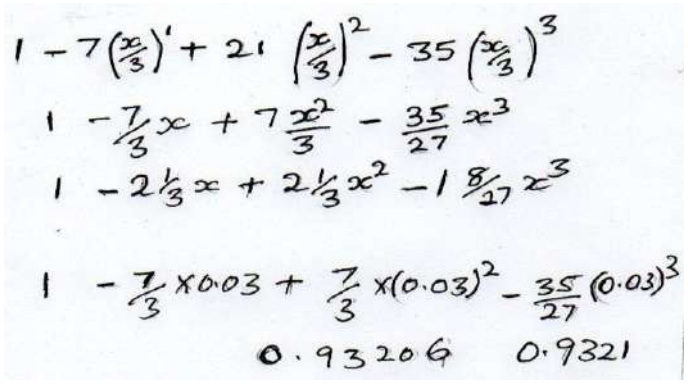
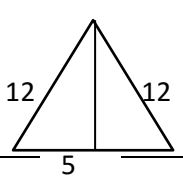
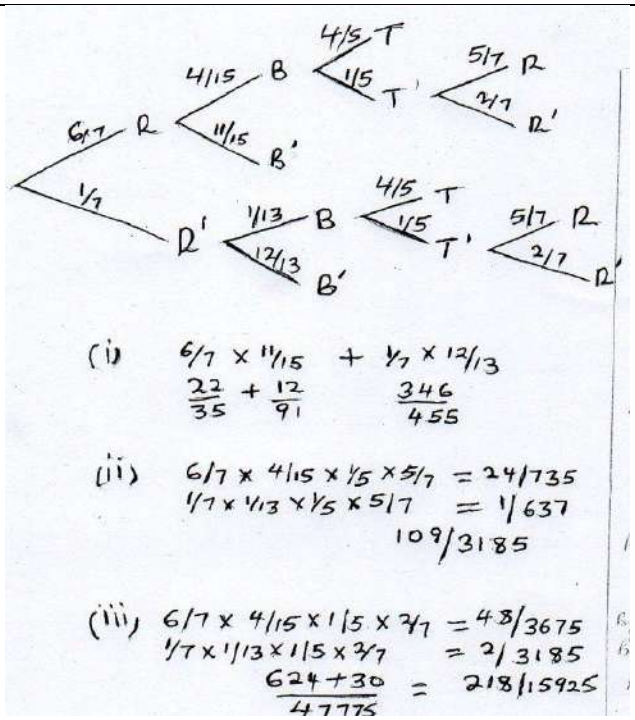
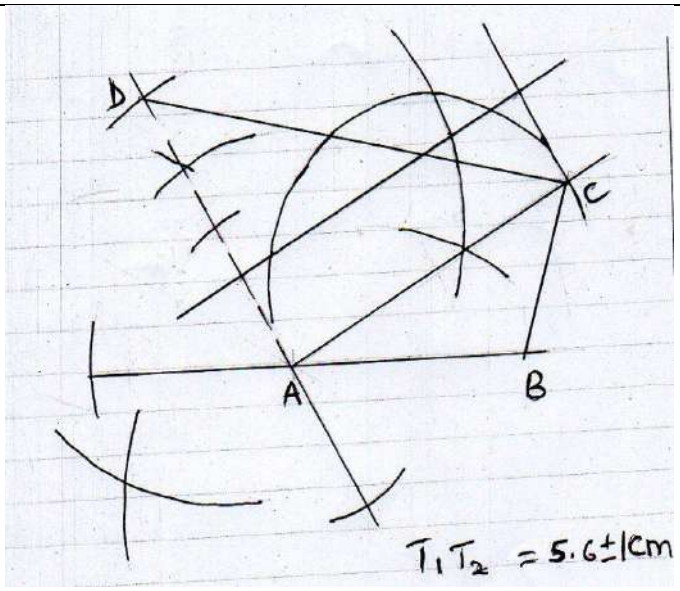
FORM FOUR
MATHEMATIC PAPER 2 (MARKING SCHEME)

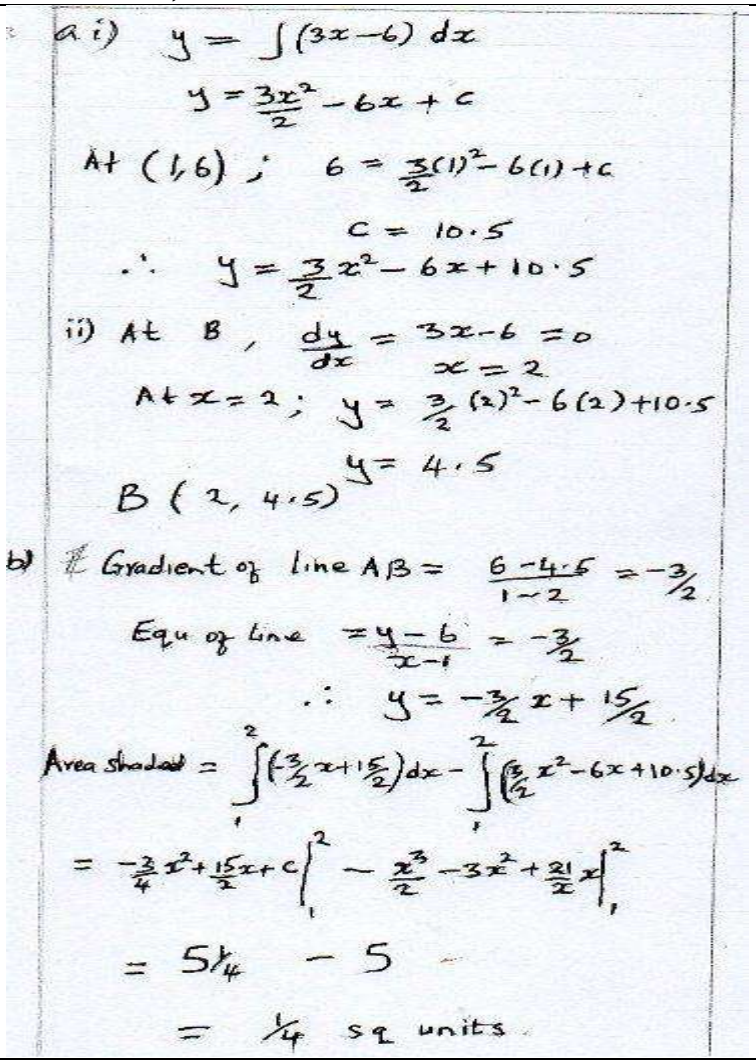
1.	$^{7}/_{9} = 0.777$ Truncating to 3dp 0.777 $^{7777}/_{1000}$ Absolute error $^{7}/_{9} - {}^{777}/_{1000} = {}^{7}/_{9000}$ $(^{7}/_{9000} \quad {}^{7}/_{9}) \times 100$ $^{7}/_{9000} \times {}^{9}/_{7}) \times 100$ $= 0.1$	M1 M1 A1	
2.	5 : -2 5PB = -2AP $^{5}/_{3}b - {}^{2}/_{3}a$ $^{5}/_{3}\begin{pmatrix}8\\-5\\-5\end{pmatrix} - {}^{2}/_{3}\begin{pmatrix}5\\4\\1\end{pmatrix} \quad \begin{pmatrix}10\\-11\\-9\end{pmatrix}$ $\sqrt{10^2 + (-11)^2 + (-9)^2} = \sqrt{302}$ 17.38	M1 M1 A1	
3.	$\frac{1 + \sqrt{3}/2}{1 - \sqrt{3}/2}$ $\frac{2+\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{4 + 4\sqrt{3} + 3}{4 - 3}$ $\frac{7 + 4\sqrt{3}}{1}$	B1 M1 A1	
4.	$\text{Log}_{27}(x + 5) - \log_{27}(x - 3) = \log_{27} 27^{2/3}$ $\text{Log}_{27}\begin{pmatrix}x+5\\x-3\end{pmatrix} = \log_{27} 9$ $\frac{x+5}{x-3} = 9 \quad x + 5 = 9x - 27$ $32 = 8x \quad x = 4$	M1 M1 A1	
5.	 $1 - 7\left(\frac{x}{3}\right) + 21\left(\frac{x}{3}\right)^2 - 35\left(\frac{x}{3}\right)^3$ $1 - \frac{7}{3}x + 7\frac{x^2}{3} - \frac{35}{27}x^3$ $1 - 2\frac{1}{3}x + 2\frac{1}{3}x^2 - 1\frac{8}{27}x^3$ $1 - \frac{7}{3} \times 0.03 + \frac{7}{3}x(0.03)^2 - \frac{35}{27}(0.03)^3$ 0.93206 0.9321	M1 A1 M1 A1	

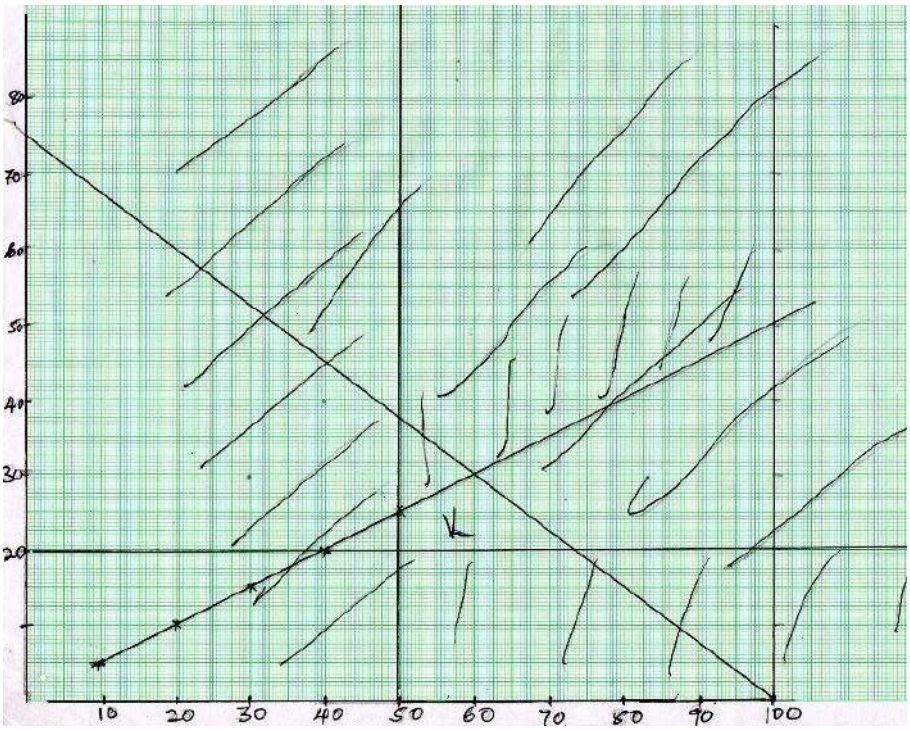
6.	AP x BP = CP x DP 9 x 3 = (8 +x)x $27 = 8x + x^2$ $\frac{-8 \pm \sqrt{64 + 108}}{2}$ $\frac{-8 \pm \sqrt{172}}{2} = \frac{-8 \pm 13.11}{2}$ x = 2.557	M1 M1 A1	
7.	$x^2 + {}^3/_4x - {}^9/_8 = 0$ $x^2 + {}^3/_4x = {}^9/_8$ $x^2 + {}^3/_4x + {}^9/_{64} = {}^9/_8 + {}^9/_{64}$ $(x + {}^3/_8)^2 = {}^9/_8$ $x + {}^3/_8 = \pm {}^9/_8$ $x = {}^{-3}/_8 \pm {}^9/_8$ $x = {}^{-3}/_8 + {}^9/_8 = ¾$ $x = {}^{-3}/_8 - {}^9/_8 = 1{}^1/_2$	M1 M1 A1	
8.	$\frac{F^2 T}{d^2} = \frac{a^2 - k}{T}$ $T^2 = \frac{(a^2 - k)}{f^2} d^2$ $T = {}^d/_f \sqrt{a^2 - k}$	M1 M1 A1	
9.	$1935 = \frac{20}{360} \times 2 \times \frac{27}{7} \times 6370 \cos x^0$ $\cos x^0 = \frac{1935 \times 360 \times 7}{20 \times 2 \times 22 \times 6370}$ $\cos x^0 = 0.8699$ $x^0 = 29.55^0$	 M1 M1 A1	
10.	$P = \frac{KQ^3}{\sqrt{R}}$ $P_2 \frac{1.2^3}{\sqrt{0.9}} = 1.8215$ % $\frac{0.8215}{1} \times 100 = 82.15\%$	M1 B1 A1	
11.	Mid point $\left(\frac{-6 + 4}{2}, \frac{-2 + -2}{2}\right)$ (-1 , -2) $\begin{pmatrix}4\\-2\end{pmatrix} - \begin{pmatrix}-1\\-2\end{pmatrix} = \begin{pmatrix}5\\0\end{pmatrix}$ Radius $\sqrt{5^2 + 0^2} = 5$ $(x + 1)^2 + (y + 2)^2 = 25$ $x^2 + 2x + y^2 + 4y - 20 = 0 = x^2+y^2+2x + 4y -20= 0$	 M1 M1 A1	

12.	$ar^2 = {}^{10}/_{3}$ $ar^5 = {}^{45}/_{4}$ $r^3 = \frac{45}{4} \times \frac{3}{10} = \frac{27}{8}$ $r = {}^{3}/_{2}$ $a \times {}^{9}/_{4} = {}^{10}/_{3}$ $a = {}^{10}/_{3} \times {}^{4}/_{9} = {}^{40}/_{27} = 1{}^{13}/_{27}$	B1 A1 A1	
13.	$6(1 - \cos^2 x) - \cos x - 5 = 0$ $6 - 6\cos^2 x - \cos x - 5 = 0$ $6a^2 + a - 1 = 0$ $6a^2 + 3a - 2a - 1 = 0$ $3a(2a + 1) - 1(2a + 1) = 0$ $3a = 1 \quad 2a = -1$ ${}^{1}/_{3}$ and $-{}^{1}/_{2}$ $120^0 \quad 240^0$ $70.53^0 \quad 289.5^0$		
14.	$\frac{dy}{dx} = 6x - 8$ $6 \times 2 - 8 = 4$ $M_2 = {}^{-1}/_{4}$ $x = 2 \quad y = 1$ $\frac{y-1}{x-2} = {}^{-1}/_{4}$ $4y - 4 = -x + 2$ $4y = -x + 6$	M1 A1 R1 A1	
15.	$\frac{1}{8} + \frac{1}{10} \quad \frac{5+4}{40} \quad \frac{9}{40} \times 3 = \frac{27}{40}$ ${}^{1}/_{8} = 1\text{hr}$ ${}^{13}/_{40}$?? ${}^{13}/_{40} \times 8 = {}^{13}/_{5} = 2{}^{3}/_{5}\text{ hr}$	M1 B1 A1	
16.	Det $\frac{110}{10} = 11$ $5x^2 + 6 = 11 \quad 5x^2 = 5$ $x = \pm 1$	M1 R1 A1	Both

17.	$\begin{pmatrix}2 & 1\\1 & -2\end{pmatrix}\begin{pmatrix}0 & 2 & 2 & 0\\0 & 0 & 3 & 3\end{pmatrix}$		
	(a) $\begin{pmatrix}0 & 4 & 7 & 3\\0 & 2 & -4 & -6\end{pmatrix}$ A^1 (0 0) B^1 (4 , 2) C^1 (7 -4) D^1 (3 -6)	M1 M1	For drawing
	(b) Det -5 5 x 6 = 30sq	M1 M1	For area
	(c) $\begin{pmatrix}0 & -1\\-1 & 0\end{pmatrix}\begin{pmatrix}0 & 4 & 7 & 3\\0 & 2 & -4 & -6\end{pmatrix}$		
	$\begin{pmatrix}0 & -2 & 4 & 6\\0 & -4 & -7 & -3\end{pmatrix}$ A^{11}(0 , 0) B^{11} (-2 , -4) C^{11} (4 ,-7) D^{11} (6 , -3)	M1 M1	
	(d) $\begin{pmatrix}a & b\\c & u\end{pmatrix}\begin{pmatrix}-2 & 4\\-4 & -7\end{pmatrix} = \begin{pmatrix}2 & 2\\0 & 3\end{pmatrix}$		
	2 (-2a - 4b = 2) 4a – 7b = 2 + -4a -8b = 4 -15b = 6 b = $-^2/_5$ -2a + 4 x $^2/_5$ = 2 a = $^4/_5 - 1 = -^1/_5$	M1	
	2 (-2c - 4d = 0) 4c – 7d = 3 + -4c -8d = 0 -15d = 3 d = $-^1/_5$ $\begin{pmatrix}-1/5 & -2/5\\2/5 & -1/5\end{pmatrix}$ c = $^2/_5$	A1	
	(e) A^{111} (0 , 0) B^{111} (2 ,0) C^{111} (8 , 3) D^{111}(6 , 3)	M1 A1	
18.	(a) AC = $\sqrt{10^2 + 10^2}$ = 14.14	M1 A1	
	(b) Height = $\sqrt{13^2 - 7.07^2}$ = 10.91	M1 A1	
	(f) cosO = $\frac{7.070}{13}$ = 0.5438 Q = 57.05^0	M1 A1	
	(g) tanΘ = $\frac{10.91}{5}$ = 2.182 Θ = 65.38^0	M1 A1	
	(h)  SinΘ = 5/12 24.63^0 24.68^0 x 2 49.26^0	M1 A1	

19.		B1 B1 B1 B1 A1 M1 A1 B1 B1 A1	
20.		B1 B1 B1 B1 B1 B1 B1 B1 B1 B1 120^0 B1 30^0 B1 AC & AD S1 T1 & T2 A1	

22.	(a) $\frac{115}{100}$ x 32,000 + 8480 – 2000 Sh. 43,280 (b) 8700 x $^{10}/_{100}$ = 870 8500 x $^{15}/_{100}$ = 1275 8940 x $^{20}/_{100}$ = 1788 8660 x $^{25}/_{100}$ = 2165 8480 x $^{30}/_{100}$ = 2544 = 8642 (c) 40,480 – (8642 + 350 + 400 + 2500) sh. 28,588	M1 M1 A1 M1 M1 M1 A1	
23.	 a i) $y = \int (3x-6)\,dx$ $y = \frac{3x^2}{2} - 6x + c$ At (1, 6); $6 = \frac{3}{2}(1)^2 - 6(1) + c$ $c = 10.5$ $\therefore y = \frac{3}{2}x^2 - 6x + 10.5$ ii) At B, $\frac{dy}{dx} = 3x - 6 = 0$ $x = 2$ At $x = 2$; $y = \frac{3}{2}(2)^2 - 6(2) + 10.5$ $y = 4.5$ B (2, 4.5) b) Gradient of line AB = $\frac{6 - 4.5}{1 - 2} = -\frac{3}{2}$ Equ of line $= \frac{y-6}{x-1} = -\frac{3}{2}$ $\therefore y = -\frac{3}{2}x + \frac{15}{2}$ Area shaded $= \int_1^2 \left(-\frac{3}{2}x + \frac{15}{2}\right)dx - \int_1^2 \left(\frac{3}{2}x^2 - 6x + 10.5\right)dx$ $= -\frac{3}{4}x^2 + \frac{15}{2}x + c\Big]_1^2 - \frac{x^3}{2} - 3x^2 + \frac{21}{2}x\Big]_1^2$ $= 5\frac{1}{4} - 5$ $= \frac{1}{4}$ sq units	M1 M1 A1 M1 M1 A1 M1 B1 M1 A1	

24.	$3x + 4y \leq 300$ $y \leq 1/2x$ $x \geq 50$ $y \geq 20$	B1 B1 B1	
	 	B1 B1 B1 B1	For each inequality
	Objective function $X + 1.5y = n$ No. of Big G 60 No. of orbit 30 Max profit = 60 x 1 + 30 x 1.5 Sh. 105	B1 B1 B1	Objective function

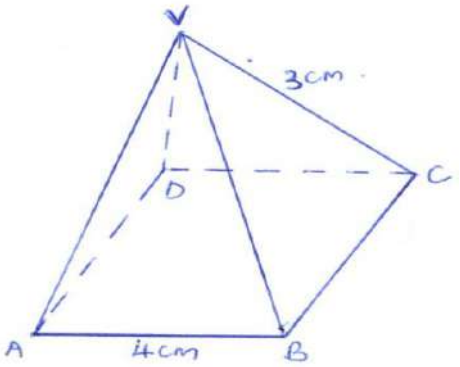
MERU SOUTH
121/1
MATHEMATICS
PAPER 1

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

1. Evaluate without using a calculator; (3 marks)

$$\frac{\frac{5}{6}\ of\ \left(4\frac{1}{3}-3\frac{5}{6}\right)}{\frac{5}{12}\times\frac{3}{25}+1\frac{5}{9}\div 2\frac{1}{3}}$$

2. Solve for $x$in the equation $125^{-x}\times 5^{2(x-2)}=25^{(x+2)}$ (3 marks)
3. A cylindrical tank of diameter 1.4 m and height 1.2 m is two – thirds full of water. The tank if filled using a cylindrical bucket of diameter 35 cm and diameter 20 cm. Find the number of buckets required to fill the tank. (3 marks)
4. The figure below shows a right pyramid with a square base of side 4 cm and a slant height of 3 cm. Draw the net of the pyramid. (3 marks)

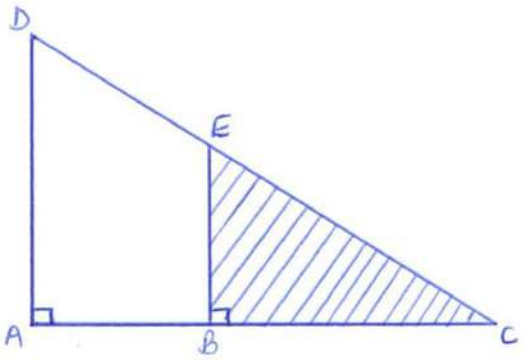


5. A square room is covered by a number of whole rectangular slabs of sides 60 cm by 42 cm. calculate the least possible area of the room in square metres. (3 marks)
6. The distance from **A** to **B** is d km and that from **B** to **C** is x km. if a bus maintains an average speed of 50 km/h between **A** and **B** and 60 km/h between **B** and **C**, it takes 3 hours to travel from **A** to **C**. If it maintains 60 km/h between **A** and **B** and 50 km/h between **B** and **C**, the journey takes 8 minutes less. What is the distance from **A** to **C** via **B**? (4 marks)
7. (a) Using a ruler and a compass only, construct triangle ABC in which BC = 8 cm, angle ABC = 30° and angle ACB = 45° . (2 marks)
   (b) At A drop a perpendicular to meet BC at D and measure AD. (2 marks)
8. The position vectors of A and B are $\binom{2}{5}$ and $\binom{8}{-7}$ respectively. Find the magnitude of the vector $\overrightarrow{AB}$

   (3 marks)

9. A man sets off by bus on a journey of 130 km. after the bus has travelled 119 km at an average speed of 42 km/hr, it breaks down and he is immediately given a lift by a passing cyclist who takes him to his destination at average speed of 66 km/h.
   Calculate;
   a) The time taken for the whole journey. (2 marks)
   b) His average speed for the whole journey. (2 marks)

10. Find the area of the shaded region in the figure below given that AD = 15 cm, BE = 3 cm, AB = 3 cm, $\angle DAB = \angle EBC = 90°$. (3 marks)



11. Write the expression below in surd form and rationalize the denominator. (3 marks)

$$\frac{1 - \cos 60°}{1 + \tan 30°}$$

12. Solve the equations below using matrix method. (3 marks)

$x + y = 8$

$2y - 3x = 1$

13. Expand and simplify $(1 - 4x)^6$ up to the expansion of the term in x^3. (3 marks)

14. Use reciprocals tables to evaluate $\frac{10}{0.625} + \frac{4}{1.5}$ (3 marks)

15. At the end of his stay in Kenya, a French tourist had 3 420 French francs which he decided to change into Euros. Given the exchange rate was;

1 French franc = Ksh. 11.25

1 Euro = Ksh. 72.50

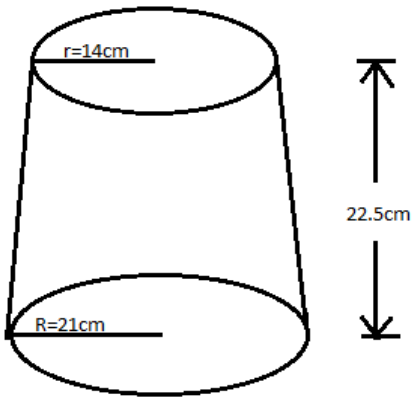
Calculate the number of Euros he received if the bank charged him 2% commission (3 marks)

16. A number ***m*** is such that if its reciprocal is added to three times itself the result is 4. Form an equation in ***m*** and solve it. (3 marks)

SECTION II (50 Marks)

Answer ONLY FIVE questions in the spaces provided.

17. The diagram represents a solid frustum with base radius 21cm and top radius 14cm. The frustum is 22.5cm high and is made of a metal whose density is 3 g/cm^3. (Take $\pi = \frac{22}{7}$)



a) Calculate

(i) The volume of the metal in the frustum. (5 marks)

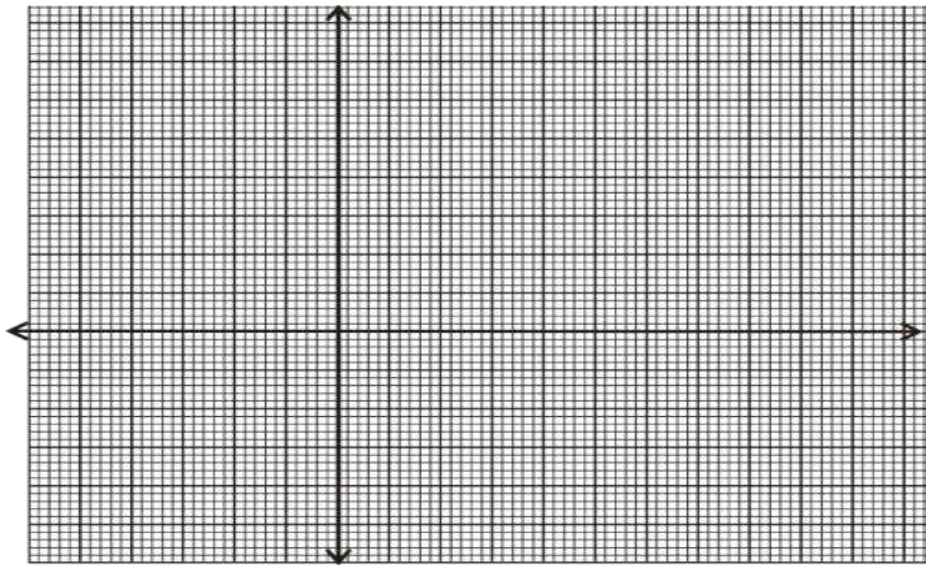
(ii) The mass of the frustum in kg. (2 marks)

b) The frustum is melted down and recast into a solid cube. In the process 20% of the metal is lost. Calculate to 2 decimal places the length of each side of the cube. (3 marks)

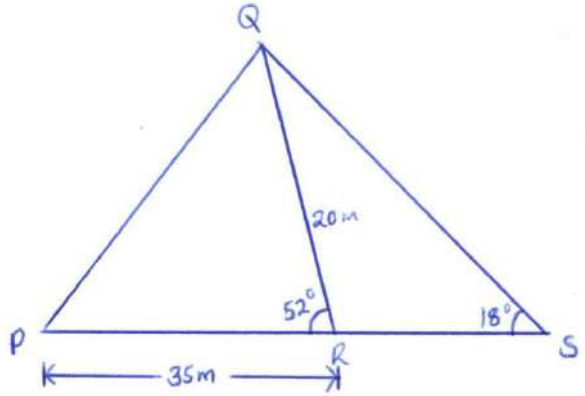
18. A line L_1 passes through the points $(-2, 3)$ and $(-1, 6)$ and is perpendicular to L_2 at $(-1, 6)$.
    a) Find the equation of L_1. (2 marks)
    b) Find the equation of L_2 in the form $ax + by - c = 0$ where a, b and c are constants. (2 marks)
    c) Given that another line L_3 is parallel to L_1 and passes through point $(1,2)$, find the x and y intercepts of L_3 . (3 marks)
    d) Find the point of intersection of L_2 and L_3. (3 marks)
19. (a) Complete the table below for the function $y = 3x^2 - 2x + 5$ (2 marks)

x	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
y	38		21		10		5		6		13		26		45		70

    b. Use the completed table and mid ordinate rule to estimate the area bounded by the curve, the $x-$ axis and the lines $x = -3$ and $x = 5$ (3 marks)
    c. Use calculus to calculate the actual area in part b above. (3 marks)
    d. Calculate to 3 significant figure the percentage error when mid ordinate rule is used to estimate the area. (2 marks)
20. On the grid provided, draw the square whose vertices are $A(6, -2), B\ (7, -2), C\ (7, -1)\ and\ D\ (6, -1)$.



    (b) On the same grid, draw:
        (i) $A'B'C'D'$ the image of ABCD, under an enlargement scale factor 3 centre $(9, -4)$ (3 marks)
        (ii) $A''B''C''D''$ the image of $A'B'C'D'$ under a reflection in the line $x = 0$ (2 marks)
        (iii) $A'''B'''C'''D'''$ the image of $A''B''C''D''$ under a rotation of $+90°$ about (0,0). (2 marks)
    (c) Describe a single transformation that maps $A'B'C'D'$ onto $A'''B'''C'''D'''$. (2 marks)
21. The figure below represent two neighboring plots with QR as their common boundary.



Find to 2 decimal places,
    i. The length of boundary PQ. (3 marks)

ii. The length of boundary RS. (3 marks)
iii. The angle RQS. (1 mark)
iv. Area of triangle QRS. (3 marks)

22. The velocity $V\ m/s$ of a particle projected into space is given by the formula $V = 5t^2 - 2t + 9$ where t is the time in seconds elapsed since projection.
Determine;
a. The acceleration of the particle when $t = 4$ seconds. (3 marks)
b. The value of t which minimizes the acceleration. (2 marks)
c. The velocity of the particle when acceleration is minimum. (2 marks)
d. The total distance covered by the particle between $t = 1$ to $t = 4$ seconds. (3 marks)

23. (a) The ratio of Juma's and Akinyi's earnings was 5: 3. Juma's earnings rose to Ksh 8 400 after an increase of 12%. Calculate the percentage increase in Akinyi's earnings given that the sum of their earnings was Ksh. 14 100 (6 marks)
(b) Juma and Akinyi contributed all the new earnings to buy maize at Ksh 1 175 per bag. The maize was then sold at ksh 1 762.50 per bag. The two shared all the money from the sales of the maize in the ratio of their contributions. Calculate the amount that Akinyi got. (4 marks)

24. The equation of a curve is given by $y = x^3 + 4x^2 - 3x$.
a) Find the value of y when $x = 1$ (1 mark)
b) Determine the stationary points of the curve. (5 marks)
c) Find the equation of the normal to the curve at $= 1$. (4 marks)

MERU SOUTH
121/2
MATHEMATICS PAPER 2

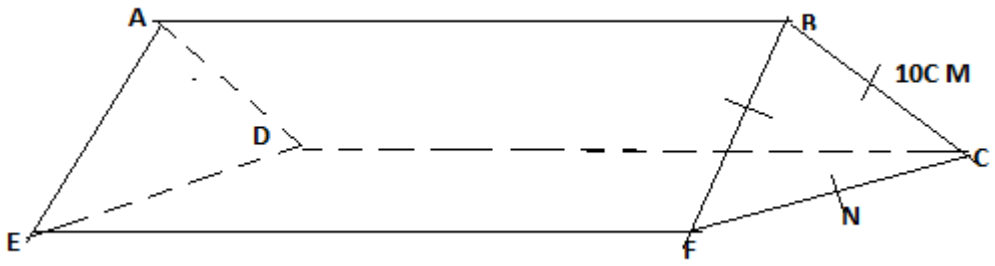
SECTION I (50 Marks)
Answer all the questions in the spaces provided in this section.

1. Solve for x in the equation (2 marks)
$$log\ (5x - 15) - log(2x - 3)\ = 1$$

2. Given that z varies directly as the square of x and inversely as the square root of y. If $x\ =\ 2, y\ =\ 9$ when $z\ =\ 3$, find z when $x =\ 3$ and $y\ =\ 4$. (3 marks)

3. Calculate the exact value of compound interest earned on Sh. 20 000 for $1\frac{1}{2}$ years at the rate of 12% p.a, compounded half yearly. (3 marks)

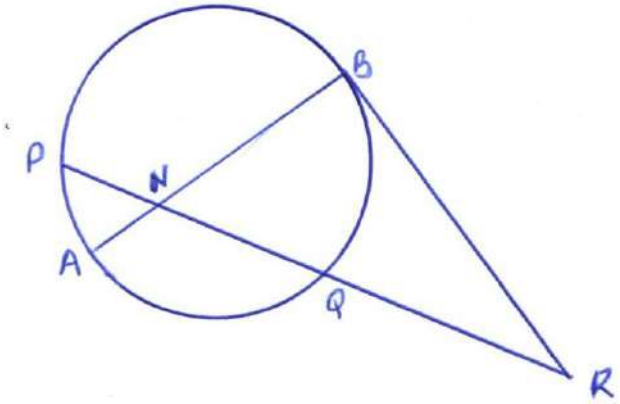
4. The triangular prism shown below has the sides AB =DC =EF = 12 cm. The ends are equilateral triangles of sides 1ocm. The point N is the midpoint of FC (3Marks)



a) Find the length of BN (1 mark)
b) Find the angle between the line EB and the plane CDEF (2 marks)

5. Evaluate $\frac{1+\sqrt{5}}{2+\sqrt{5}} + \frac{1-\sqrt{5}}{2-\sqrt{5}}$ (3 marks)

6. In the figure below, AB is a diameter of the circle. Chord PQ intersects AB at N. A tangent to the circle at B and meets PQ produced at R.



Given that PN = 14 cm, NB = 4 cm and BR = 7.5 cm, calculate the length of;

a) NR (2 marks)

b) AN (2 marks)

7. Solve the quadratic equation by completing the square method. (3 marks)

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

8. Mogutu and Onacha working together can do a piece of work in 6days. Mogutu working alone takes 5days longer than Onacha. How many days does it take Onacha to do the work alone? (3 marks)
9. In an experiment, water was heated and its temperature changes recorded at intervals of 2 minutes as shown in the table below.

Time (Min)	0	2	4	6	8	10	12	14	16
Temperature (℃)	25	35	42.5	50	60	67.5	77.5	85	92.5

a) On the grid provided, plot the points and draw the line of best fit. (3 marks)

b) Use the line of best fit to estimate the time taken for the temperature of the water to be 75℃. (1 mark)

10. State the amplitude and the phase angle of the curve $4y = \cos(5x - 40^0)$ (2 marks)
11. Calculate the semi-interquartile range of 3,4,1,2,3,6,8,5,7,9. (3 marks)
12. Points A and B lie on latitude 15°N andtheir longitudes differ by 25°. An aircraft takes 8 hours to fly between the points. Calculate its speed in knots. (3 marks)
13. Given the points P(-6,-3) , Q(-2,-1) and R(6,3) express Vectors $\overrightarrow{PQ}$ and$\overrightarrow{QR}$ as column vectors and hence show that the points P,Q and R are collinear (4 marks)
14. During inter-school competitions, rugby and football teams from Ranje sec school took part. The probability that the rugby would win their first match was $\frac{1}{8}$ while that the handball team could lose was $\frac{4}{7}$. Find the probability that at least one team won the first match. (3 marks)
15. The original area of an object after two successive transformations given by $\begin{bmatrix} 2 & 1 \\ 3 & 5 \end{bmatrix}$ and $\begin{bmatrix} 3 & 1 \\ 0 & 1 \end{bmatrix}$ in that order becomes 168 square units. Find the original area of the object. (3 marks)
16. Evaluate $\int_{-1}^{3}(3x+1)(2x-2)$ (4 marks)

SECTION II (50 Marks)

Answer ONLY FIVE questions in this section

17. An arithmetic progression of 41 terms is such that the sum of the first five terms is 560 and the sum of the last five terms is -250. Find:
    a) The first term and the common difference (5 marks)
    b) The last term (2 marks)
    c) The sum of the progression (3 marks)
18. A pavement is of length $(x-1)m$ and width $(x-8)m$. The area of the pavement is $4.56\ m^2$.

a) (i) Write a quadratic equation for the area of the pavement in the form $ax^2 + bx + c = 0$ where a, b and c are constants. (2 marks)

(ii) Using the method of completing square, find the actual length and width of the pavement. (6 marks)

b) The pavement is covered with rectangular tiles measuring 0.4 m by 0.3 m. determine the number of tiles used to cover the pavement completely. (2 marks)

19. The table below shows the masses measured to the nearest Kg of 200 people.

Mass kg	40-49	50-59	60-69	70-79	80-89	90-99	100-109
No of people	9	27	70	50	26	12	6

a) Draw a cumulative frequency curve for the data above. (4 marks)

b) Use your graph to estimate

i) The median mass. (1 mark)

ii) The number of people whose mass lies between 70.5 kg and 75.5 kg (1 mark)

c) From your graph find

i) The lower quartile (1 mark)

ii) the upper quartile (1 mark)

iii) the interquartile range (2 marks)

20. Without using a protractor, construct line XY = 8cm

a) Construct the locus of all points R such that $\angle XRY = 60°$ (4 marks)

b) Construct the locus of all points P such that the area of triangle XPY is 16 cm^2. (3 marks)

c) Mark all the points where the locus of R intersects the locus of P with the letters A,B,C and D (3 marks)

21. Given that $y = 2\sin 2x$ and $y = 3\cos(x + 45°)$;

a) Complete the table below

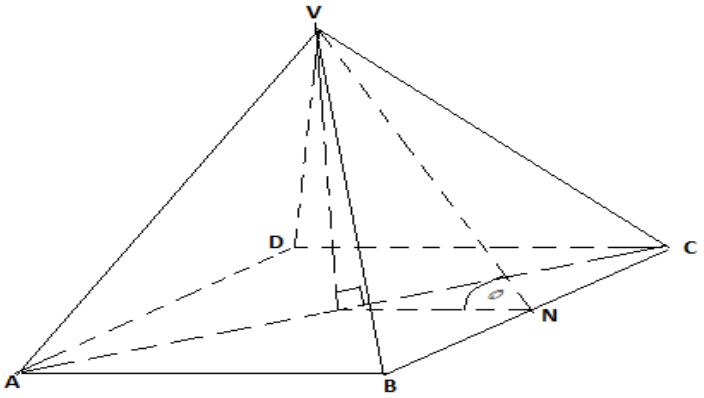
$x°$	0	20	40	60	80	100	120	140	160	180
$2\sin 2x°$	0.00		1.97		1.68	-0.68	-1.73		-1.28	0.00
$3\cos(x + 45°)$	2.12	1.27		-0.78		-2.46			-2.72	-2.12

b) Use the data to draw the graphs of $y = 2\sin 2x°$ and $y = 3\cos(x + 45°)$ for $0° \leq x \leq 180°$ on the same axes. (3 marks)

c) State the amplitude and period of each curve. (2 marks)

d) Use the graph to solve the equation $2\sin 2x - 2\cos(x + 45°) = 0$ for $0° \leq x \leq 180°$. (2 marks)

22. The figure below shows a right pyramid standing on a rectangular base ABCD. AB = 8cm, BC = 15cm and each slant edge is 12 cm long M is the midpoint of BC.



Calculate to one decimal place

a) the vertical height of the pyramid (3 marks)
b) the volume of the pyramid (2 marks)
c) the angle between plane VBC and the base (3 marks)
d) the angle between line VA and the plane ABCD (2 marks)

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

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

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

(a) (i) His taxable income per month (2 marks)
(ii) Net tax (5 marks)

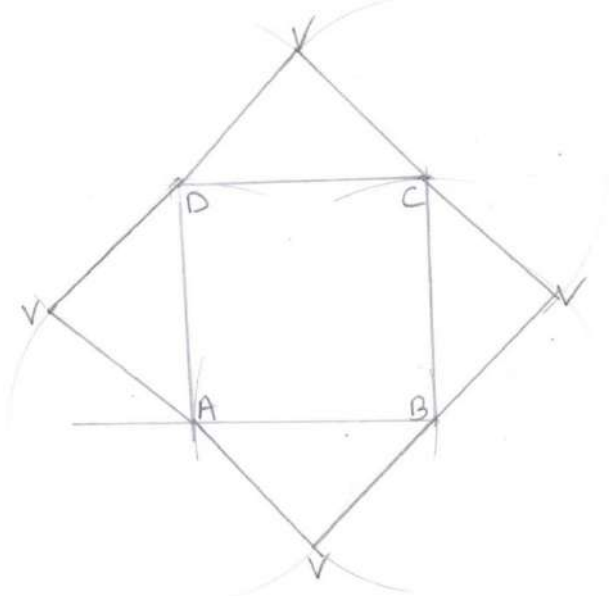
(b) In addition, the following deductions were made.
NHIF sh.230
Service charge ksh.100
Loan repayment ksh.4, 000
Cooperative shares of ksh.1, 200
Calculate his net salary per month (3 marks)

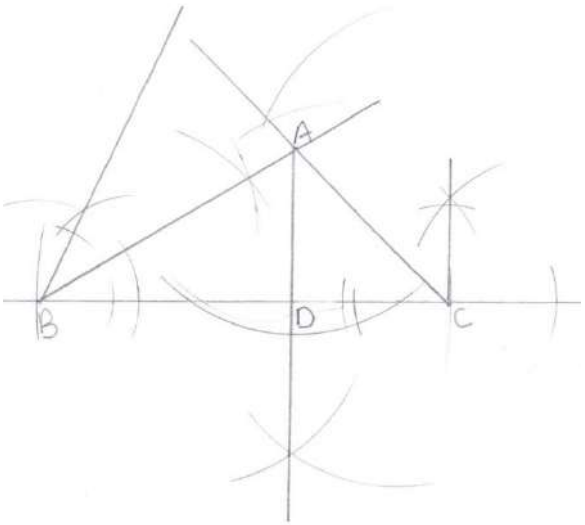
24. Radon Company has two types of machines A and B for juice production. Type A machine can produce 800 litres per day while type B machine can produce 1 600 litres per day. Type A machine needs four operators and type B need seven operators. At least 8 000 litres must be produced daily and the total number of operators should not exceed 41. There should be two or more machine of each type.

Let x be the number of machines of type A and y for type B.

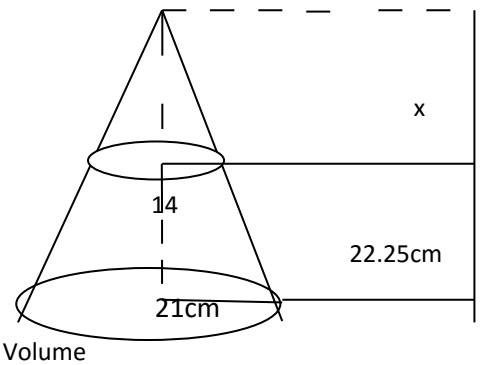
a) Form all inequalities in x and y to represent the above information. (4 marks)
b) In the grid provided below, draw the inequalities and shade the unwanted region. (4 marks)
c) Use the graph in (b) above to determine the least number of operators required for maximum possible production. (2 marks)

MERU SOUTH
FORM FOUR PAPER 1
MARKING SCHEME

NO	WORKING	MARKS	REMARKS
1	Numerator $\frac{13}{3}-\frac{23}{3}=\frac{26-23}{6}=\frac{1}{2}$ $\frac{5}{6}\times\frac{1}{2}=\frac{5}{12}$ Denominator $\frac{14}{9}\times\frac{3}{7}=\frac{2}{3}$ $\frac{5}{12}\times\frac{3}{25}=\frac{1}{20}$ $\frac{1}{20}+\frac{2}{3}=\frac{43}{60}$ $\frac{N}{D}\Rightarrow\frac{5}{12}\div\frac{43}{60}=\frac{5}{12}\times\frac{60}{43}=\frac{25}{43}$	M 1 M 1 A 1	
2	$125^{-x}\times5^{2(x-1)}=25^{x+2}$ $5^{-3x}\times5^{2x-2}=5^{2x+4}$ $-3x+(2x-2)=2x+4$ $-x-2=2x+4$ $3x=-6$ $x=-2$	M1 M1 A1	Simplification Addition of power
3	Volume of tank to be filled = $\frac{1}{3}\times\frac{22}{7}\times0.7\times0.7\times1.2$ $=0.616\ m^3$ Volume of bucket = $\frac{22}{7}\times0.175\times0.175\times0.2$ $=0.01925\ m^3$ Number of buckets = $\frac{0.616}{0.01925}=32\ buckets$	M 1 M 1 A 1	
4		B 1 B 1 B 1	Construction Correct labelling Complete diagram
5	$\mathbf{60=2^2\times3\times5}$ $\mathbf{42=2\times3\times7}$		

	Side of the pavement = LCM $= 2^2 \times 3 \times 5 \times 7 = 420\ cm$ Least area= $4.2\ m \times 4.2\ m$ $= 17.64\ m^2$	B1 M1 A1	
6	$\frac{d}{50} + \frac{x}{60} = 3$ ..... (i) $\frac{d}{60} + \frac{x}{50} = 2\frac{13}{15}$ ..... (ii) $6d + 5x = 900$ ..... (iii) $5d + 6x = 860$ ..... (iv) From (iii) $d = \frac{900 - 5x}{6}$ $5\left(\frac{900 - 5x}{6}\right) + 6x = 860$ $5(900 - 5x) + 36x = 5160$ $4500 - 25x + 36x = 5160$ $11x = 660$ $x = \frac{660}{11} = 60\ km$ $d = \frac{900 - 5(60)}{6}$ $= \frac{900 - 300}{6} = \frac{600}{6} = 100\ km$ $x + d = 100 + 60 = 160\ km$	M 1 M 1 A 1 B 1	
7	a.  b. $AD = 3.0 \pm 0.1\ cm$		B 1 constructing 30° at B B 1 constructing 45° at C B 1 perpendicular from A to BC B 1
8	$\overrightarrow{AB} = \begin{pmatrix} 8 \\ -7 \end{pmatrix} - \begin{pmatrix} 2 \\ 5 \end{pmatrix} = \begin{pmatrix} 6 \\ -12 \end{pmatrix}$ $= \sqrt{6^2 + (-12)^2}$ $\sqrt{36 + 144} = \sqrt{180}$ 13.42	B1 M1 A1	

9	a) Time taken = $\frac{119}{42}+\frac{11}{66}$ $= 3\ hours$ b) Average speed = $\frac{130\ km}{3\ hrs}$ $= 43.33\ km/hr$	M 1 A 1 M 1 A 1	
10	$\Delta\ ADC\ and\ \Delta BCE$ are similar $\frac{AD}{BE}=\frac{AC}{BC}$ $\frac{15}{3}=\frac{8+x}{x}\Rightarrow 15x=24+3x$ $x=2$ Shaded region = area of ΔBCE $=\frac{1}{2}\times 2\times 3=3\ cm^2$	M 1 M 1 A 1	
11	$\frac{1-\frac{1}{2}}{1+\frac{1}{\sqrt{3}}}$ $\frac{\frac{1}{2}-\left(\frac{1}{\sqrt{3}}+\frac{1}{2\sqrt{3}}\right)}{\frac{2}{3}}$ $\frac{3-\sqrt{3}}{4}$	B1 M1 A1	
12	$\begin{pmatrix}1 & 1\\ -3 & 2\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}8\\ 1\end{pmatrix}$ Inverse $\frac{1}{5}\begin{pmatrix}2 & -1\\ 3 & 1\end{pmatrix}$ $\begin{pmatrix}\frac{2}{5} & \frac{-1}{5}\\ \frac{3}{5} & \frac{1}{5}\end{pmatrix}\begin{pmatrix}1 & 1\\ -3 & 2\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}\frac{2}{5} & \frac{-1}{5}\\ \frac{3}{5} & \frac{1}{5}\end{pmatrix}\begin{pmatrix}8\\ 1\end{pmatrix}$ $\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}3\\ 5\end{pmatrix}$ $x=3,\quad y=5$	B1 M 1 A 1	
13	$1(-4x)^0+6(-4x)^1+15(-4x)^2+20(-4x)^3+\cdots$ $1-24x+80x^2-1280x^3+\cdots$	M 1 A 1	
14	$10\times\frac{10}{6.25}+4\times\frac{1}{1.5}$ $100\times 0.16+4\times 0.6667$ $16+2.6668$ $=18.6668$	**B1** **M1** **A1**	
15	3420 French francs into Ksh. 11.25×3420 $= Ksh.\ 38\ 475$ Commission = $2\%\ of\ 38\ 475$ $= Ksh.\ 769.5$	M 1 M 1	

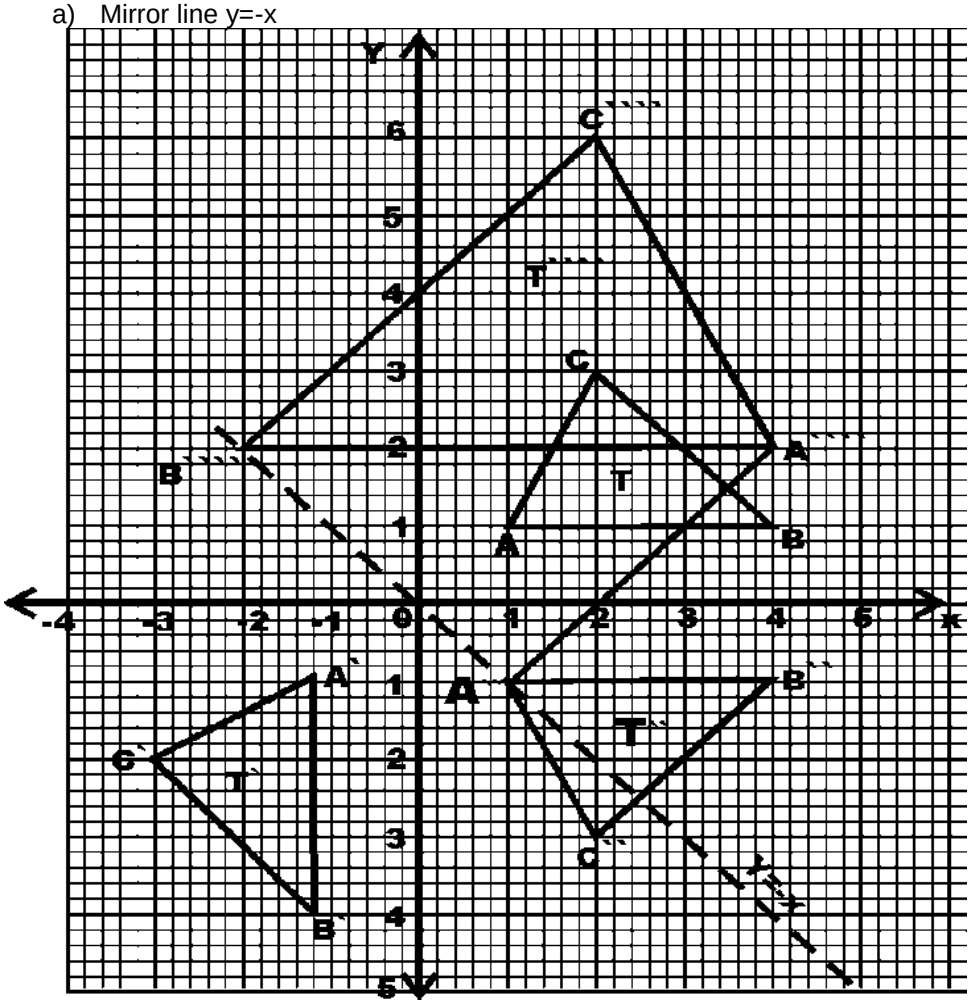
	Amount of Euros received = $\frac{37\,705.5}{72.50}$ = 520 Euros	A 1	
16	Let $\frac{1}{m}$ be the reciprocal $3m + \frac{1}{m} = 4$ $3m^2 + 1 = 4m \Rightarrow 3m^2 - 4m + 1 = 0$ $3m^2 - 3m - m + 1 = 0$ $3m(m-1) - 1(m-1) = 0$ $(3m-1)(m-1) = 0$ $3m - 1 = 0 \Longrightarrow m = \frac{1}{3}$ OR $m - 1 = 0 \Longrightarrow m = 1$	M 1 M 1 A 1	Both values of m
17	 a) I) Volume Ratio $\frac{x}{14} = \frac{22.5+x}{21}$ $21x = 14(22.5 + x)$ $21x - 14x = 315$ $x = 45\ cm$ Volume of whole cone $= \frac{1}{3} \times \frac{22}{7} \times 21 \times 21 \times 67.5 = 31\,185\ cm^3$ Volume of small cone $= \frac{1}{3} \times \frac{22}{7} \times 14 \times 14 \times 45 = 9\,240\ cm^3$ Volume of frustum = $31\,185 - 9\,240 = 21\,945\ cm^3$ ii) mass of frustum mass = $21\,945 \times \frac{3g}{cm^3} = 65\,835\ g$ mass in kg = $\frac{65\,835\ g}{1000\ g} = 65.835\ kg$ b) $20\%\ of\ 65.835kg = 13.167\ kg$ $65.835 - 13.167 = 52.668\ kg$		

	Volume of material remaining = $\frac{56682}{3} = 17\,556\ cm^3$ Length of cube = $\sqrt[3]{17\,556} = 25.99\ cm$		
18	a) $m_1 = \frac{6-3}{-1+2} = 3$ $\frac{3}{1} = \frac{y-3}{x+2}$ $y - 3 = 3(x+2)$ $y = 3x + 9$ b) $m_2 = -\frac{1}{3}$ $\frac{-1}{3} = \frac{y-6}{x+1}$ $3y - 18 = -x - 1$ $x + 3y - 17 = 0$ c) $m_3 = 3$ $\frac{3}{1} = \frac{y-2}{x-2}$ $y = 3x - 1$ At x intercept; $y = 0, x = \frac{1}{3}; x - intercept\ \left(\frac{1}{3}, 0\right)$ At y intercept; $x = 0, y = -1; y\ intercept = (0, -1)$ d) At point of intersection, y values are equal $3x - 1 = \frac{-x}{3} + \frac{17}{3}$ $9x - 3 = -x + 17$ $10x = 20;\ x = 2$ $y = 3(2) - 1 = 5$ Point of intersection (2, 5)	M 1 A 1 M 1 A 1 M 1 A 1 A 1 M 1 M 1 A 1	

19. (a)

x	−3	−2.5	−2	−1.5	−1	−0.5	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
y	38	28.75	21	14.75	10	6.75	5	4.75	6	8.75	13	18.75	26	34.75	45	56.75	70

19	b) Area = $h[y_o + y_1 + y_2 + \cdots + y_n]$ $= 1[28.75 + 14.75 + 6.75 + 8.75 + 4.75 + 18.75 + 34.75 + 56.75]$ $= 174$ c) Area = $\int_{-3}^{5}(3x^2 - 2x + 5)dx$ $[x^3 - x^2 + 5x]_{-3}^{5}$ $= \left(5^3 - 5^2 + 5(5)\right) - \left((-3)^3 - (-3)^2 + 5(-3)\right)$ $= (125 - 25 + 25) - (-27 - 9 - 15)$ $= 125 - (-25) = 176\ sq\ units$	M 1 M 1 A 1 M 1 M 1 A 1

	d) $\%\ error = \frac{176-174}{176} \times 100$ $= 1.136\%$	M 1 A 1
20	a) Mirror line y=-x  b) I) ii)reflection on line y=0 c) Area scale factor $(-2)^2 = 4$ Area of object= $\frac{12}{4}$ $=3cm^2$	

21	(i) $r^2 = p^2 + q^2 - 2pqcos\ R$ $= 20^2 + 35^2 - (2 \times 35 \times 20\cos 52°)$ $= 400 + 1225 - 861.93$ $r^2 = 763.07$ $r = 27.62\ m$ (ii) $\angle QRS = 180 - 52°$ $\angle RQS = 180 - (128 + 18) = 34°$ $\frac{q}{\sin Q} = \frac{s}{\sin S} = \frac{r}{\sin R}$ $\frac{RS}{\sin 34°} = \frac{20}{\sin 18°}$ $RS = \frac{20 \times \sin 34°}{\sin 18°} = 36.19\ m$ (iii) $\angle RQS = 180 - (128 + 18) = 34°$ (iv) Area = $\frac{1}{2}ab\sin\theta$ $= \frac{1}{2} \times 20 \times 36.19 \times \sin 128°$ $= 285.18\ m^2$	M 1 M 1 A 1 B 1 M 1 A 1 B M 1 M1 A1	
22	a) $V = 5t^2 - 2t + 9$ Acceleration $\frac{dv}{dt} = 10t - 2$ When $t = 4$ Acceleration = $10 \times 4 - 2 = 38ms^{-2}$ b) For minimum acceleration, $\frac{dv}{dt} = 0$ $0 = 10t - 2$ $\Longrightarrow t = 0.2\ s$ c) Velocity $V = 5t^2 - 2t + 9$ Acceleration is minimum when t = 0.2 s $V = 5(0.2)^2 - 2(0.2) + 9$ $= 0.2 - 0.4 + 9$ $= 8.8\ ms^{-1}$ d) Distance = $\int_1^4 Vdt = \int_1^4 (5t^2 - 2t + 9)dt$ $\left[\frac{5t^3}{3} - t^2 + 9t\right]_1^4$ $\left(\frac{5(4)^3}{3} - (4)^2 + 9(4)\right) - \left(\frac{5(1)^3}{3} - 1 + 9\right)$	M 1 M 1 A 1 M 1 A 1 M 1 A 1 M 1	

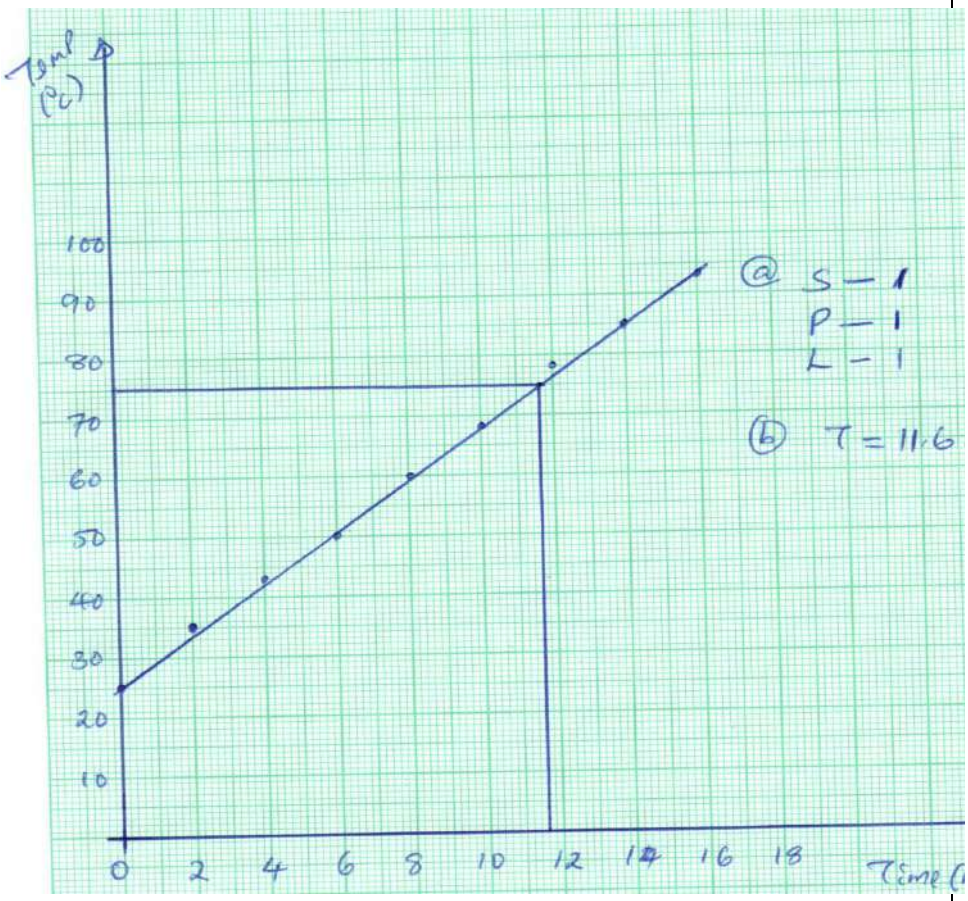
	$\left(\frac{320}{3}-16+36\right)-\left(\frac{5}{3}+8\right)=\frac{380}{3}-\frac{29}{3}=117\ m$	M 1 A 1	
23	(a) Juma's earnings before increase: 112% → 8400 100% → 8400 x $^{100}/_{112}$=7500 Akinyi's earnings before increase; $^{3}/_{5}$X 7500 Increase in Akinyi's earnings = 14100 – 8400 – 4500 =1200 % increase in Akinyi's earnings =$^{1200}/_{4500}$ x 100 = 26 $^{2}/_{3}$ =26.67 (a) No. of bags bought = $^{14100}/_{1175}$ = 12 bags Profit = (1762.50 -1175)x12 = 7050 Ratio 5700 : 8400 = 19 :28 Profit for Akinyi : 7050 x $^{19}/_{47}$ =2850 Total earning for Akinyi: 5700+2850= 8550		
24	a) $y=(1)^3+4(1)^2-3(1)$ $=1+4-3$ $=2$ b) At turning points; $\frac{dy}{dx}=0$ $\frac{dy}{dx}=3x^2+8x-3$ $3x^2+8x-3=0$ $3x(x+3)-1(x+3)=0$ $(3x-1)(x+3)=0$ $x=-3\ or\ x=\frac{1}{3}$ When $x=\frac{1}{3}$ $y=\left(\frac{1}{3}\right)^3+4\left(\frac{1}{3}\right)^2-3\left(\frac{1}{3}\right)=\frac{-14}{27}$ Point 1 $\Longrightarrow\left(\frac{1}{3},\frac{-14}{27}\right)$ When $x=-3$ $y=(-3)^3+4(-3)^2-3(-3)=18$ Point 2 $\Longrightarrow(-3,18)$ c) $\frac{dy}{dx}=3x^2+8x-3$ $At\ x=1$ $\frac{dy}{dx}=3(1)^2+8(1)-3=11$ Gradient of normal, $m_2=\frac{-1}{11}$ At $x=1$, $y=(1)^3+4(1)^2-3(1)=2$	B 1 M 1 M 1 A 1 B 1 B 1 B 1 M 1	

	$\therefore$ Slope $= \frac{dy}{dx}$ $\frac{-1}{11} = \frac{y-2}{x-1}$ $-1(x-1) = 11(y-2)$ $-x+1 = 11y-22$ $x+11y = 23 \;\; OR \; y = \frac{-x}{11} + \frac{23}{11}$	M 1 A 1	

MERU SOUTH
MARKING SCHEME
MATHEMATICS PAPER 2

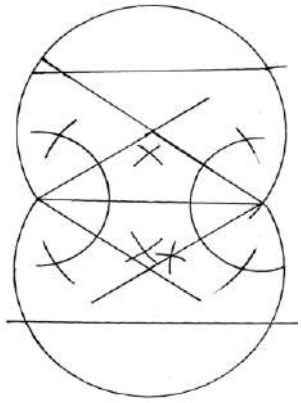
NO	WORKING	MARKS	COMMENTS
1	$\frac{5x-15}{2x-3} = 10$ $-15x-15 = 20x-30$ $-15x = -15$ $x = 1$	M1 A1	
2	$Z \propto \frac{x^2}{y^{\frac{1}{2}}} \Rightarrow Z = \frac{kx^2}{y^{\frac{1}{2}}}$ $3 = \frac{k \times 4}{3}, k = \frac{9}{4}$ $Z = \frac{9}{4} \times \frac{9}{2} = \frac{81}{8}$ $= 10\frac{1}{8}$	M_1 M_1 A_1	✓Equation connecting For ✓ substitution
3	$A = P\left(1+\frac{r}{100}\right)^n$ $= 20\,000\left(1+\frac{6}{100}\right)^3$ $= 20\,000(1.06)^3$ $= Sh.\,23\,820.32$ $interest = sh.\,23\,820.32 - 20\,000$ $= sh.\,3\,820.32$	M 1 M 1 A 1	
4	$BN^2 = 10^2 - 5^2$ $BN^2 = 75$ $BN = 8.66CM$ $EN^2 = 12^2 + 5^2$ 144+25	B1	

	$\sqrt{169}$ 13cm $\tan\theta = \frac{8.66}{13}$ $\theta = 33.67^0$	 M1 A1	
5	$\frac{(1+\sqrt{5})(2-\sqrt{5})+(1-\sqrt{5})(2+\sqrt{5})}{(2+\sqrt{5})(2-\sqrt{5})}$ $\frac{2+2\sqrt{5}-\sqrt{5}-5+2-2\sqrt{5}+\sqrt{5}-5}{4-5}$ $\frac{4-10}{-1} = 6$	M1 M1 A1	L.C.M Simplification of Numerator and Denominator
6	a) $NR^2 = NB^2 + BR^2$ $NR = \sqrt{4^2+7.5^2} = \sqrt{72.25}$ $8.5\ cm$ b) $BR^2 = PR \times RQ$ Let NQ be x. $22.5(8.5-x) = 7.5^2$ $191.25 - 22.5x = 56.25$ $x = \frac{191.25-56.25}{22.5} = 6\ cm$ $AN \times NB = PN \times NQ$ $AN = \frac{14\times 6}{4}$ $= 21\ cm$	M 1 A 1 M 1 A 1	
7	$2x^2 - 5x = -3$ $x^2 - \frac{5}{2}x + \frac{25}{4} = \frac{-3}{2} + \frac{25}{4}$ $\left(x-\frac{5}{2}\right)^2 = 4.75$ $x - \frac{5}{2} = \pm 2.179$ $x = 4.679$ or $x = 0.321$	M1 M1 A1	

8	Let Onacha take x days. Mogutu takes x + 5 days. $\frac{1}{x}+\frac{1}{x+5}=\frac{1}{6}$ $6(x+5)+6x=x(x+5)$ $x^2-7x-30=0$ $(x-10)(x+3)=0$ $x=10\ or\ -3$ Onacha takes 10 days.	M1 M1 A1	
9			
10	Amplitude $=\frac{1}{4}$ Phase angle = $\frac{-40}{5}=-8^0$	B1 B1	
11	Interquartile range (quartile deviation) $= Q_3 - Q_1$ $Q_3 = \frac{3}{4}\times 10 = 7.5$ $Q_1 = \frac{1}{4}\times 10 = 2.5$ anyone ✓ =7.5-2.5=5✓	M_1 A_1	
12	Distance between A and B = $25 \times 60 \times \cos 15°$		

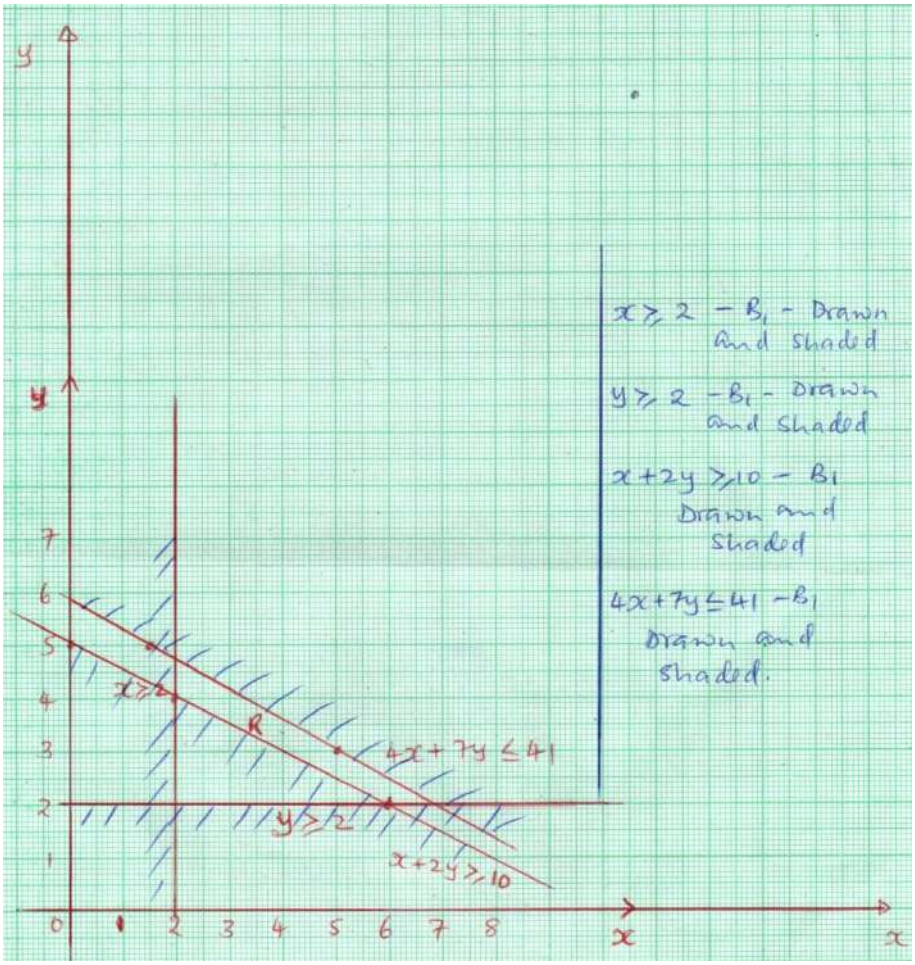
	$= 1448.89\ nm$ Speed $= \frac{1448.89\ nm}{8\ hrs} = 181.11\ knots$	M 1 M 1 A 1	
13	$PQ = \begin{pmatrix}-2\\-1\end{pmatrix} - \begin{pmatrix}-6\\-3\end{pmatrix} = \begin{pmatrix}4\\2\end{pmatrix}$ $QR = \begin{pmatrix}6\\3\end{pmatrix} - \begin{pmatrix}-2\\-1\end{pmatrix} = \begin{pmatrix}8\\4\end{pmatrix}$ $QR = \begin{pmatrix}8\\4\end{pmatrix} = 2\begin{pmatrix}4\\2\end{pmatrix}$ Hence $QR = 2PQ$ Therefore QR// PQ But Q is a common point thus P,Q,R are collinear	B1 B1 B1 B1	
14	$P(RH')$ or $P(R'H)$ or $P(RH)$ $\left(\frac{1}{8}\times\frac{4}{7}\right)+\left(\frac{7}{8}\times\frac{3}{7}\right)+\frac{3}{56}$ $\frac{4}{56}+\frac{21}{56}+\frac{3}{56}$ $=\frac{28}{56} or \frac{1}{2} or 0.5$	M 1 M 1 A_1	
15	Single matrix is $\begin{bmatrix}3 & 2\\0 & 1\end{bmatrix}\begin{bmatrix}2 & 1\\3 & 5\end{bmatrix} = \begin{bmatrix}12 & 13\\3 & 5\end{bmatrix}$ Determinant = $60 - 39 = 21$ $\frac{image\ area}{object\ area} = determinant = A.S.F$ $\frac{168}{x} = 21$ $x = \frac{168}{21} = 8\ sq\ units$	M 1 M 1 A 1	
16	$\int_{-1}^{3} 6x^2 - 4x - 2$ $\left[\frac{6x^3}{3} - \frac{4x^2}{2} - 2x\right]_{-1}^{3}$ $(54 - 18 - 6) - (-2 - 2 + 2)$ 32	M1 M1 M1 A1	Correct expression
17	(a) Sum of arithmetic progression $S_n = \frac{n}{2}(2a + (n-1)d)$ $n = 5$	M_1	Formation of each equation

	$560=\frac{5}{2}(2a+4d)$ $\frac{2}{5}\times 560=2a+4d$ $224=2a+4d$ $112=a+2d.....(i)$ Last five terms { 41^{st} term is a + 40d; 40^{th} term is a + 39d; 39^{th} term is a + 38d; 38^{th} term is a + 37d; 37^{th} term is a + 36d total $5a+190d=-250.....(ii).$ Solving (i) and (ii) simultenously; $a+2d=112$ $a+38d=-50$ − $-36d=162$ $d=\frac{162}{-36}=-4.5$ $d=-4.5$ $a+2(-4.5)=112$ $a-9=112$ $a-121$ (b) Last term is a + 40d $=121+40(-4.5)$ $=121-180$ $=-59$ (c) $S_n=\frac{n}{2}(2a+(n-1)d)$ $S_n=\frac{41}{2}(2\times 121+(41-1)(-4.5))$ $S_n=\frac{41}{2}(242-180)$ $S_n=\frac{41}{2}(62)$ $S_n=41\times 31=1271$	M_1 M_1 A_1 A_1 M_1 A_1 M_1 M_1 A_1	Solving two equations simultaneously For common difference For the first term
18	a) (i) $A=L\times W$		

	$4.56 = (x-1)(x-8)$ $4.56 = x^2 - 9x + 8$ $x^2 - 9x + 3.44 = 0$ (ii) $x^2 - 9x = -3.44$ $x^2 - 9x + (-4.5)^2 = -3.44 + (-4.5)^2$ $(x-4.5)^2 = 16.81$ $x - 4.5 = \pm 4.1$ $x - 4.5 = 4.1 \Longrightarrow x = 4.1 + 4.5 = 8.6\ m$ OR $x - 4.5 = -4.1 \Longrightarrow x = -4.1 + 4.5 = 0.4\ m$ $\therefore Length = 8.6 - 1 = 7.6\ m$ $width = 8.6 - 8 = 0.6\ m$ b) Area of tile = $0.4 \times 0.3 = 0.12\ m^2$ Area of pavement = $4.56\ m^2$ Number of tiles = $\frac{4.56}{0.12} = 38\ tiles$	M 1 A 1 M 1 M 1 M 1 M 1 A 1 A 1 M 1 A 1	
19	 Mass kg | Upper class | f | cf 30-39 | 39.5 | 0 | 0 40-49 | 49.5 | 9 | 9 50-59 | 59.5 | 27 | 36 60-69 | 69.5 | 70 | 106 70-79 | 79.5 | 50 | 156 80-89 | 89.5 | 26 | 182 90-99 | 99.5 | 12 | 194 100-109 | 109.5 | 6 | 200		
20	 ½ x 8 x h = 16 H = 4cm	B1 B1 B1 B1 B1 B1 B1	Length of XY 8.0 $\pm$ 0.1 Const of 30^0 Const of other 30^0 Centre Upper locus Lower locus Locus of P B1 marking pts A, B, C

		B1 M1 A1	and D Weight Attempt to find
21	$r^2 = p^2 + q^2 - 2pq\cos R$ $= 20^2 + 35^2 - (2 \times 20 \times\times 35 \times \cos 52°)$ $= 400 + 1225 - 861.93$ $r^2 = 763.07$ $r = 27.62\ m$ $\angle RQS = 180 - (128 + 18) = 34°$ $\frac{RS}{\sin 34°} = \frac{20}{\sin 18°}$ $RS = \frac{20 \times \sin 34°}{\sin 18°}$ $= 36.19\ m$ $\angle RQS = 34°$ $Area = \frac{1}{2}ab\ sin\ \theta = \frac{1}{2} \times 20 \times 36.19 \times sin\ 18°$ $= 285.18\ m^2$	M 1 M 1 A 1 B 1 M 1 A 1 B 1 M 1 M1 A 1	
22	a) $AC^2 = 8^2 + 15^2$ AC=17 OA $= \frac{1}{2} \times 17 = 8.5$ $OV^2 = 12^2 - 8.5^2$ OV= 8.471 b) Vol of pyramid = $\frac{1}{3} \times 8 \times 15 \times 8.471$ =338.84 c) $OM = \frac{1}{2}AB = 4cm\ and\ OV = 8.5cm$ $\tan\theta = \frac{8.5}{4} = 2.125$ $\theta = 54.8$ d) $\sin\alpha = \frac{8.5}{12} = 0.7083$ $\alpha = 45.1^0$	M1 M1 A1 M1 M1 A1 M1 M1 A1 M1 A1	
23	a)	M_1	

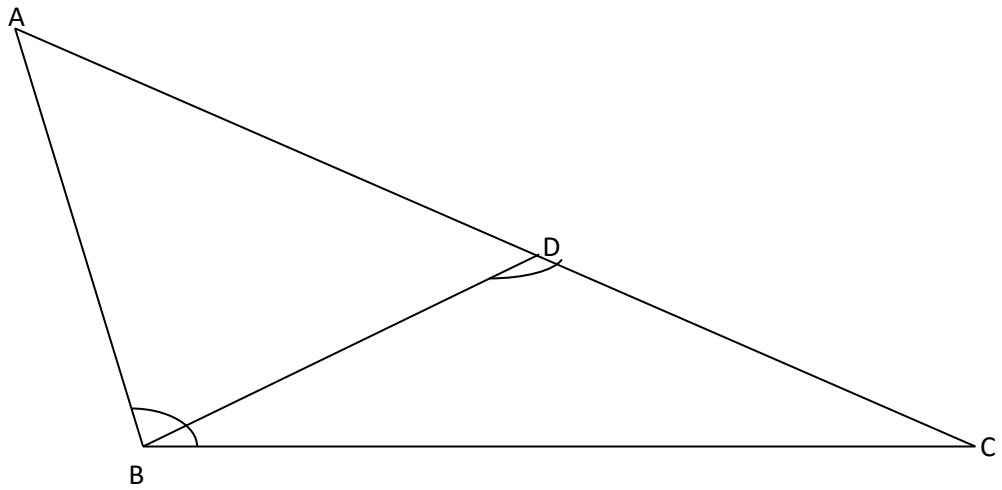
	$1.15\times 54{,}450+6000$ $68{,}617.5\times 12$ $sh.823{,}410$	M_1 A_1	
	b) $1^{st}116160\times\frac{10}{100}=sh.11{,}616$	M_1	✓1st and 2nd slabs
	$next109440\times\frac{15}{100}=sh.16{,}416$	M_1	✓3rd and 4th slabs
	$next109440\times\frac{20}{100}=sh.21{,}888$	M_1	✓last slab
	$next109440\times\frac{25}{100}=sh.27{,}360$	M_1	Subtraction of relief
	$\text{Re}\,maining378{,}930\times\frac{30}{100}=sh.113{,}95$	A_1	
	Total annually $=190{,}959$		
	Monthly $=\frac{190{,}959}{2}=sh.15{,}913.25$ Less relief 1100.00	B_1	
	Net tax payable $=sh.14{,}813.25$	B_1	Total deductions
	c) $\frac{20}{100}\times 54{,}450=sh.10{,}890$		
	Total deductions $10{,}890+14{,}813.25$ $=25{,}703.25$		
	Monthly income $=60{,}450-25{,}703.25$ $=sh.34{,}746.75$		
24			


y
x
x ≥ 2 – B1 – Drawn and shaded
y ≥ 2 – B1 – Drawn and shaded
x + 2y ≥ 10 – B1 Drawn and shaded
4x + 7y ≤ 41 – B1 Drawn and shaded.
R
4x + 7y ≤ 41
y ≥ 2
x + 2y ≥ 10
0 1 2 3 4 5 6 7 8
1 2 3 4 5 6 7

THE SALVATION ARMY KENYA WEST TERRITORIAL EVALUATION TESTS (SAKWETET)
121/1
MATHEMATICS
PAPER 1

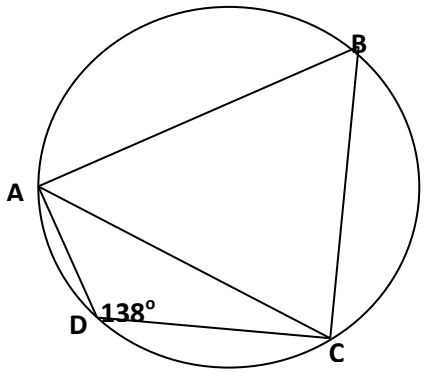
SECTION 1 (50 MARKS)
ANSWER ALL QUESTIONS IN THE SPACES PROVIDED.

1. Evaluate without using a calculator $\dfrac{\left(2\frac{3}{7}-1\frac{5}{6}\right)\div\frac{5}{6}}{\frac{2}{3}of\,2\frac{1}{4}-1\frac{1}{7}}$ (3mks)
2. Calculate the standard deviation for the data below (3mks)
   5,8,13,12,7,10,8,15,3,14
3. A straight line L_1 is perpendicular to another line L_2 whose equation is 3y+4x=12. If the two lines meet at point P which lines on the x-axis, find:
   (i) The co-ordinate of point P (1mk)
   (ii) The equation of line L1 in the form y=mx+c (3mks)
4. Mr. Otieno who deals in electronics sells a radio to a customer at Kshs. 1,440 after giving him a discount of 10% but finds that he still makes a 20% profit. Find the profit Mr. Otienowould make if he does not give a discount. (3mks)
5. A solid block in the shape of a cylinder has a height of 14cm and weighs 22kg. If it is made of material of density 5g/cm^3, find the radius of the cylinder. Take $\pi=\frac{22}{7}$ (3mks)
6. Simplify completely by factorization $\dfrac{20-45x^2}{6x^2-x-2}$ (3mks)
7. The figure below shows a triangle ABC not drawn to scale, D is a point on line AC. Given that BC=14cm, DC=7cm and $\angle ABC=\angle BDC$. Find the length of AD (3mks)



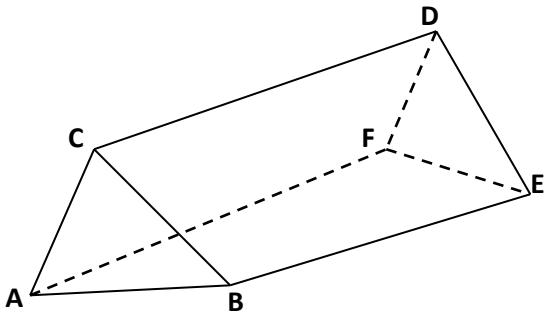
8. Solve the simultaneous inequalities given below and list all the integral values of **x** (3mks)
   $\dfrac{3-x}{2}\geq\dfrac{x+1}{3}\geq\dfrac{2x+1}{-3}$

9. In the circle drawn to scale below A,B,C and D are points on its circumference, Chord BC=AC and angle ADC=138^o



Giving reasons calculate the angle ACB (3mks)

10. The figure below shows a triangular prism ABCDEF. AF=CD=BE=18cm, The ends ABC and EDF are equilateral triangles of side 8cm. calculate the angle plane ABD makes with the lie CD (3mks)



11. Patricia a student at Simwa mixed Secondary bought 5 pens and 3 exercise books from Solving supermarket at Kshs. 135, at the same time Jane her class mate also bought 4 pens and 5 exercise books and spent Ksh. 25 more than Patricia. Find the cost of each pen and exercise book (4mks)
12. Evaluate using mathematical tables only expressing your answer to 4 significant figures

$$\frac{4}{0.2356}+(0.9873)^3$$ (3mks)

13. A Kenyan bank buys and sells foreign currencies as shown below,

	Buying(Ksh.)	Selling (Ksh)
1 Euro	84.15	84.26
100 Japanese yen	65.37	65.45

A Japanese travelling from France arrives in Kenya with 5000 Euros.He converts all the 5000 Euros to Kenya shillings at the bank.While in Kenya he spends a total of Ksh289850 and then converts the remaining Kenya shillings to Japanese yen at the bank.Calculate the amount in Japanese yen that he receives. (4mrks)

14. Given that $\sin(3x-35)^o - \cos(x+20)^o = 0$ and x is an acute angle, find its value (2 mks)
15. A train of length 80m crosses a bridge 20 m long in 5 seconds. Calculate the average speed of the train in km/h (3mks)
16. The principal of a secondary school would wish to cover the floor of the new administration block using the square tiles. The floor is a rectangle of sides 12.8m by 8.4m. Find the area of each of the largest tiles which can be used to fit exactly without breaking (3mks)

SECTION B (50 MARKS)

Answer ONLY FIVE questions in this section in the spaces provided

17. Four towns **W, A, N** and **G** are such that W 15km from **A** on a bearing of 158^o, **N** is to the west of **A** and 20km away while **G** is to the South of **N** and on a bearing of 240^o from **W**.
    (a) Using a scale of 1:400,000 draw a scale diagram showing the relative positions of the four schools. (5mks)
    (b) Using your diagram determine the distance and bearing of **G** from **A** (2mks)
    (c) A mast is to be erected so that its equidistant from **A** and **N** and 20km from **G** on the same diagram show

the position of the mast and find its distance from **W** (3mks)

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

Marks	5-14	15-29	30-34	35-44	45-49
Frequency	2	12	7	15	x

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

(b) On the grid provided below draw a histogram to represent the data (5mks)

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

19. A matatu left Kakamega for Kisumu town 51km away at an average speed of 48km/h at 7.00am. At 7.30am a Bodaboda left Kisumu for Kakamega travelling along the same route at an average speed of 60km/h

(a) The time when Bodaboda meet the matatu (3mks)

(b) How far from Kisumu did the Bodaboda meet the matatu (3mks)

(c) After meeting the Bodaboda the matatu stopped for fifteen minutes before resuming the journey. At what speed should it travel then to reach Kisumu at the same time when the Bodaboda reached Kakamega. (4mks)

20. A certain number of form four students agreed to contribute equally to buy a gift worth sh. 1200 for their class prefect's birthday. Five students pulled out and so the others agreed to contribute an extra sh. 10. Their contribution enabled them to buy a gift worth sh. 200 more than they originally expected.

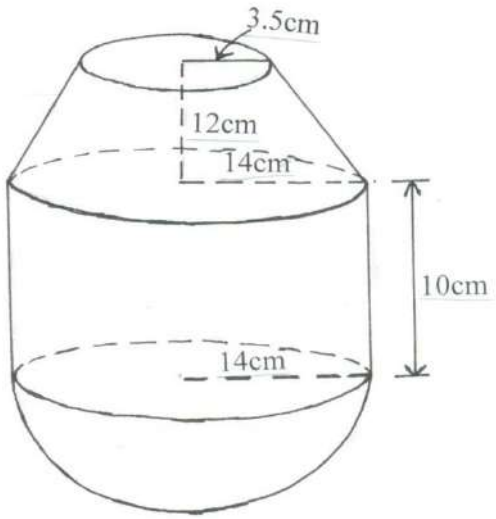
(a) If the original number of students was X, write an expression of how much each was originally going to contribute. (1 mark)

(b) Write down two expressions of how much each contributed after the five students pulled out. (2 marks)

(c) Calculate how many students made the contribution. (5 marks)

(d) Find how much each contributed. (2 marks)

21.



A right frustrum of base radius 14cm, top radius 3.5cm and height 12cm is stuck onto a cylinder of base radius 14cm and height 10cm and further attached to a hemisphere to form a closed solid as shown above.

(Use $\pi = {}^{22}/_{7}$)

Find

(a) The full height of the solid. (1 mark)

(b) The volume of the solid. (4 marks)

(c) The total surface area of the solid. (5 marks)

22. The displacement of a particle S metres, t seconds after passing a fixed point O is given by $S=3+2t-5t^2$

Calculate:

(a) The displacement of the particle 2 seconds later (2mks)

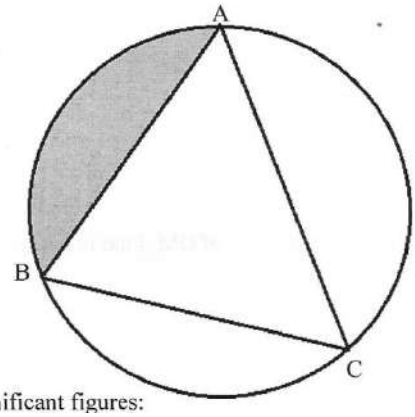
(b) The time taken for the particle to return to O (2mks)

(c) The maximum displacement of the particle (3mks)

(d) The initial velocity of the particle (2mks)

(e) The acceleration of the particle after t seconds (1mk)

23. The diagram below shows a circle ABC with AB=12cm, BC=15cm, and AC=14cm



: to 4 significant figures:

Calculate to 4 significance figures:
(a) The angle ACB (3mks)
(b) The radius of the circle (3mks)
(c) The area of the shaded region (4mks)

24. OABC is a trapezium such that the coordinates of O,A,B and C are (0,0),(2,-1) (4,3) and (0,y)
(a) Find the value of y (2mks)
(b) M is the mid-point of AB and N is the mid point of OM. Find in column form
(i) The vector AN (3mks
(ii) The vector NC (2mks)
(iii) Vector AC (1mk)
(c) Hence show that A, N and C are collinear (2mks)

THE SALVATION ARMY KENYA WEST TERRITORIAL EVALUATION TESTS (SAKWETET)
121/2
MATHEMATICS
PAPER 2

SECTION I (50 MARKS)
ANSWER ALL QUESTIONS IN THIS SECTION

1. Use logarithm tables to evaluate: (3mks)

$$\left(\frac{36.15\times 0.2753}{1.938^2}\right)$$

2. Make χ the subject of the formula:

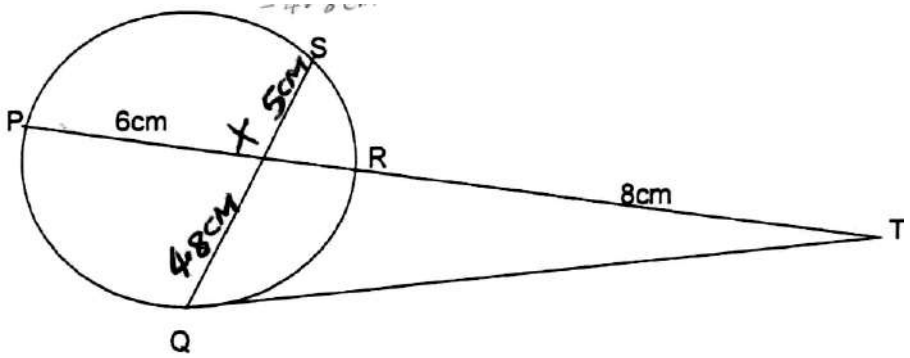
$$A=\sqrt{\frac{3+2\chi}{5-4\chi}}$$ (3mks)

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

4. Solve the equation $2\sin(4x-30)^0 = -1$ for the range $0^0 \leq x \leq 180^0$ **(3marks)**
5. Rationalize and simplify. (3mks)

$$\frac{3}{2\sqrt{7}-4\sqrt{3}}-\frac{3}{2\sqrt{7}+4\sqrt{3}}$$

6. The position vectors of A and B are given as **a**= 2**i**-3**j**+4**k** and **b**= -2**i**-**j**+2**k** respectively. Find to 2decimal places, the length of the vector$\overrightarrow{AB}$. (3 marks)
7. In the figure below QT is a tangent to a circle at Q. PXRT and QXS are straight lines. PX = 6cm, RT = 8cm, QX = 4.8cm and XS = 5cm.



Find the length of:
(a) XR (2mks)
(b) QT (2mks)

8. Find the centre and the radius of a circle whose equation is
$x^2-6x+y^2-10y+30=0$ (3 marks)
9. (a.) Expand $(3+\frac{2}{x})^5$ up-to the term x^4. (2marks)

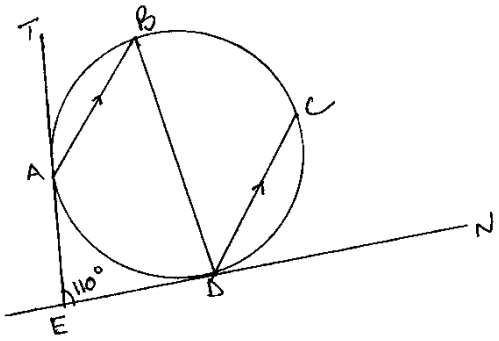
(b) Hence estimate the value of $(3.5)^5$ to 4sf. (2marks)

10. Juma, Ali and Chege are three masons and together complete building a stone wall together in 12 Hours Juma and Ali working together complete the work in 18 hours while Juma and Chege working together complete the work in 24 hours. Find how long each would take to complete the building of the stone wall while alone. (4 marks)
11. A point (x, y) is mapped onto (13, 13) by two transformations M followed by T where
T = $\begin{pmatrix}-4\\3\end{pmatrix}$ and x = $\begin{pmatrix}3&1\\2&4\end{pmatrix}$. Find the point (x y) {3 marks}
12. The table below shows the distribution of marks scored in a test by form 2 students.

Marks	No. of students
30 - 34	2
35 – 39	5
40 - 44	13
45 - 49	12
50 - 54	8

Find the mean mark. {3 marks}

13. A computer whose marked price is sh. 40,000 is sold at sh. 56,000 on hire purchase terms.Mary bought the computer on hire purchase terms. She paid a deposit of 25% of the hire purchase and cleared the balance by equal monthly installments of sh. 2,625. Calculate the rate of interest charged per month if compound interest was applied. {3 marks}
14. TAE and EDN are tangents to a circle at A and D respectively. Line AB and DC are parallel chords, BD is another chord of the circle. Angle TAB is 46^o. Find angle CDN giving reasons. {3 marks}



15. Find the equation of the normal to the curve $y = (x^2 + 1)(x - 2)$ at $x = 0.5$ {3 marks}
16. The co-ordinates of a point A and B are (8 -12 8) and (-4 28 -4) respectively. A point Q divides AB in the ratio 9:-5. Find the co-ordinates of Q. {3 marks}

SECTION II (50 MARKS)

Answer FIVE questions in this section

17. (i) complete the table below, giving the values correct to 2 decimal places (2marks)

X^0	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0	135^0	150^0	165^0	180^0
Cos $2X^0$	1.00	0.87		0.00	-0.5		-1.00		-0.5	0.00	0.50	0.87	1.00
Sin (X^0+30^0)	0.50	0.71	0.87	0.97	1.00		0.87	0.71	0.50		0.00		-0.50

(ii) Using the grid provided draw on the same axes the graph of $y=\cos 2X^0$ and $y=\sin(X^0+30^0)$ for $0^0 \leq X \leq 180^0$. (4marks)

(iii) Find the period of the curve $y=\cos 2x^0$ (1mark)

(iv) Using the graph, estimate the solutions to the equations;

(a) $\sin(X^0+30^0)=\cos 2X^0$ (1mark)

(b) $\cos 2X^0=0.5$ 1mark)

18. A trader bought 8 cows and 12 goats for a total of Ksh.294,000. If he had bought 1 more cows and 3 more goats he would have spend Ksh.337, 500.

(a)Form two equations to represent the above information. (2 marks)

(b) Use matrix method to determine the cost of a cow and that of a goat. (4 marks)

(a) The trader sold the animals he had bought making a profit of 40% per cow and 45% per goat.

(i) Calculate the total amount of money he received. (2 marks)

(ii) Determine his profit in Kenya shillings. (2 marks)

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

Taxable income (K£)	Rate (shs per K£)
1 – 1500	2
1501 – 3000	3
3001 – 4500	5
4501 - 6000	7
6001 – 7500	9
Over 7500	10

A civil servant earns a monthly basic salary of Ksh.8570. He is housed by the government and as a result, his taxable income is 15% more than his salary. He is entitled to a tax relief of Ksh. 150 per month.

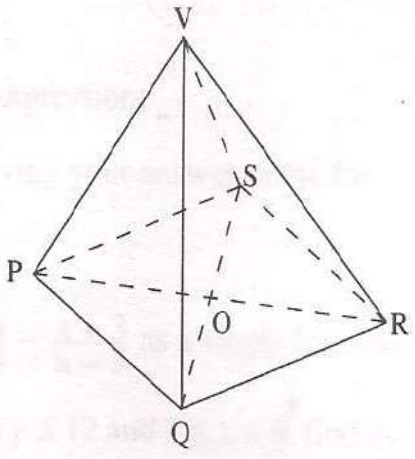
a) How much tax does he pay in a year? (6mks)

b) From his salary, the following deductions are also made every month.

WCPS	2% basic salary
NHIF	Ksh 20

Calculate the civil servants net salary per month. (4mks)

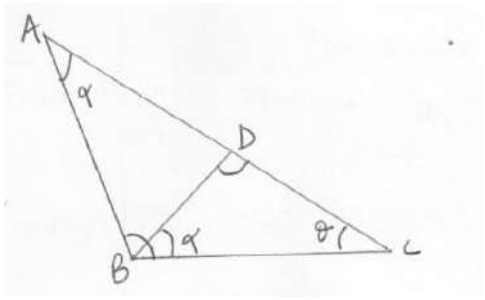
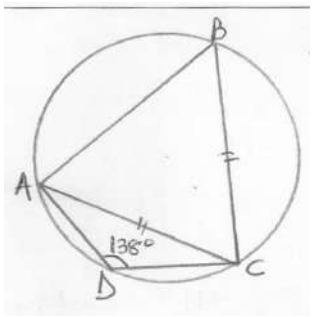
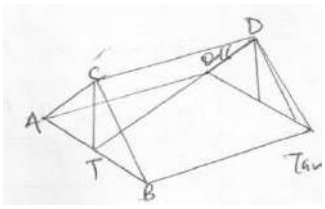
20. A plane takes off from airport P at (0°, 40°W) and flies 1800 nautical miles due East to Q then 1800 nautical rules due South to R and finally 1800 nautical rules due West before landing at S.
    (a) Find to the nearest degree the latitudes and longitudes of Q, R and S. (4mks)
    (b) the total flight time is 16 hours, find the average speed in knots for the whole journey. (4mks)
    (c) Find the time taken to fly from R to S (2mks)
21. A certain number of people agreed to contribute equally to but books worth Sh. 1200 for a school library. Five people pulled out, so the others agreed to contribute an extra sh. 10 each. Their contribution enabled them to buy books worth sh. 200 more than they originally expected.
    a) If the original number of people x, write an expression of how much each was originally to contribute. {1 mark}
    b) Write down two expressions of how much each contributed after the people pulled out. {2 marks}
    c) Calculate how many people made the contribution? {5 marks}
    d) State how much each contributed. {2 marks}
22. A farmer has at least 50 acres of land on which he plans to plant potatoes and cabbages. Each acre of potatoes requires 6 men and each acre of cabbages requires 2 men. The farmer has 240 men available and he must plant at least 10 acres of potatoes. The profit on potatoes is Ksh. 1000 per acre and on cabbages is Ksh. 1200 per acre. If he plants x acres of potatoes and y acres of cabbages:
23.
    (a) Write down 3 in equalities in x and y to describe the information. (2 marks)
    (b) Represent these in equalities graphically. (use a scale of 1:10 for both axes) (4 marks)
    (c) Use your graph to determine the number of acres for each vegetable which will give maximum profit. (4 marks)
24. The velocity of a particle after t seconds is given by $v = t^2-2t+4$
    (a) Use the mid ordinate rule with six strips to estimate the displacement of the particle between t = 1 and t = 13 (3 marks)
    (b) Determine (i) the exact area of the particle between t = 1 and t = 13. (3 marks)
    (iii) accelerate of the particle at t = 4 (2 marks)
    (c) Calculate the percentage error arising from the estimated area in (a) above. (2mks)
25. The figure below represents a right pyramid on a square base PQRS of side 12 cm. O is the centre of the base and VO = 14 cm.



Calculate;
(a) The length of VP to 1 decimal place (3 marks)
(b) The angle which VP makes with the base PQRS (2 marks)
(c) The surface area of the pyramid to 1 decimal place (3 marks)
(d) The volume of the pyramid (2 marks)

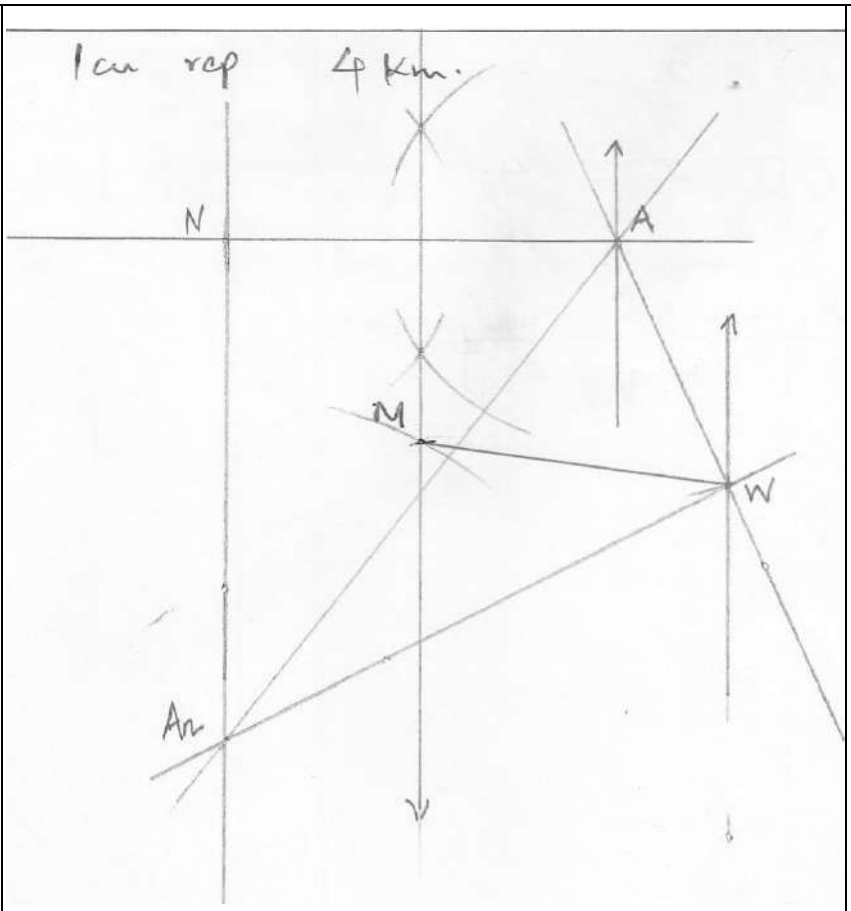
THE SALVATION ARMY KENYA WEST TERRITORIAL EVALUATION TESTS (SAKWETET)
MATHEMATICS PAPER I
MAY 2019
MARKING SCHEME

NO	WORKING	MKS	COMMENTS
1.	Numerator $2^3/_7 - 1^5/_6 = \frac{17}{7} - \frac{11}{6} = \frac{102-77}{42} = \frac{25}{42}$ ⇨ $^{25}/_{42} \times {}^6/_5 = {}^5/_7$ Denominator $^2/_3 \times {}^9/_4 - 1^1/_7 = {}^2/_3 - {}^8/_7$ $= \frac{21-16}{14} = {}^5/_{14}$:. $= {}^5/_7 \times {}^{14}/_5 = 2$	M1 M1 A1	Simplification of numerator Simplification of denominator C.A.O
		03	
2.	$\bar{x} = \frac{95}{10} = 9.5$ let A = 10 d: -5 | -2 | 3 | 2 | -3 | 0 | -2 | 5 | -7 | 4 | -5 d^2: 25 | 4 | 9 | 4 | 9 | 0 | 4 | 25 | 49 | 16 | 145 $Sd = \sqrt{\frac{145}{10}\left[\frac{-5}{10}\right]^2}$ $= \sqrt{14.5 - 0.25} = \sqrt{14.25} = 3.775$	 M1 M1 A1	 Values of d^2 at least 7 √ one at formula To 4 sf
		03	
3.	i) at P y= o :. 3(0) + 4(x) = 12 x = 3, P(3,0) ii) $y = -{}^4/_3 x + 3$ $m_1 = -{}^4/_3$ m2 =3/4 $\frac{y-0}{x-3} = {}^3/_4$ $4y = 3x - 9$:. $Y = {}^3/_4 x - 2^1/_4$	 B1 B1 M1 A1	 For co-ord For gradient Exp for equation
		04	
4	$\frac{90}{100}$ mP = 1440 Mp = $\frac{1440}{90} \times 100 = 1600$ $\frac{120}{100}$ cp = 1440 Cp = $\frac{1440}{120} \times 100 = 1200$ Profit = 1600 – 1200 = 400	 M1 M1 A1	 Exp for mp Exp for Cp
5	Volume = $\frac{22000}{5}$ cm^3 ----------> $= 4400cm^3$ $4400 = {}^{22}/_7 \times r^2 \times 14$ $r^2 = \frac{4400 \times 7}{22 \times 14} = 100$:. r= ±10cm = 10 cm	M1 M1 A1	exp to obtain volume exp to obtain radius
		03	
6.	Numerator $= 5(4 - 9x^2)$ $= 5(2 - 3x)(2+3x)$ ----------> Denominator $= 6x^2 - 4x + 3x - 2$ $= 2x(3x - 2) + 1(3x - 2)$ $= (2x + 1)(3x - 2)$ ---------->	M1 M1	Fact of numerator

	:. => $\frac{5(2-3x)(2+3x)}{(2x+1)(3x-2)} = \frac{-5(2+3x)}{2x+1}$	A1 03	
7.	 $\frac{BC}{DC} = \frac{AC}{BC}$ $\frac{14}{7} = \frac{AC}{14}$ AC = $\frac{14 \times 14}{7}$ = 28cm AD 28 – 7 = 21cm	M1 M1 A1 03	Identifying corresponding value. Exp for AC Value of AD
8.	$\frac{3-x}{2} \geq \frac{x+1}{3}$ $9 - 3x \geq 2x + 2$ $7 \geq 5x$:. $X \leq 1^2/_5$ ---------- $\frac{X+1}{3} \geq \frac{2x+1}{-3}$ $-3x - 3 \leq 6x + 3$ $-6 \leq 9x$:. $x \geq -^2/_3$ ---------- $-^2/_3 \leq x \leq 1^2/_5$ X = 0 , 1	M1 M1 A1	Upper value Lower value List of values
9.	 <ABC= 42º Opp <s in a cyclic Quard <ACB = 180º - 2(42)º = 96º Sm of <s in a △	M1 M1 A1 03	Exp for <ACB √ reason given (tied to m_1 above scored)
10.	 CT = $\sqrt{8^2 - 4^2}$ = $\sqrt{48}$ ---------- Tan θ = $\frac{\sqrt{48}}{18}$ ---------- θ = $\tan^{-1}$ 0.3849 = 21. 05º	B1 M1 A1 03	Att. Of prism Exp To min 4 sf.

11	Let cost of pen = x ex bk = y 5x + 3y = 135 x 4 4x + 5y = 160 x 5 20x + 25y= 800 20x + 12y =540 13y = 260 :. y=20 X = 135-3(20) = 15 5 Pen = 15 , ex bk =20	M1 M1 A1 B1	For forming √ attempt to solving any method Cost of pen Cost of ex bk.
12.	$\frac{4}{0.2356} = 4\left(\frac{1}{2.356x10^{-1}}\right)$ = 4(4.244) = 16.976 $(0.9873)^3 = (9.873 \times 10^{-3})$ = 0.9624 Total => 16.976 + 0.9624) = 17.9384 ≈ 17.94	M1 M1 A1	Soln of LHS Soln of RHS To 4 sf
		03	
13.	1 Euro=84.15 5000Euros=5000x84.15 =Ksh 420750---------- Less expenditure 420750-289850 Ksh130900---------- 1 Japanese yen=65.45 ? =130900 130900/65.45=2000JY----------	M1 M1 M1A1	From euros to ksh Less expenditure
		04	
14	Sin (3x – 35)º = Cos (x + 20) :. 3x – 35 + x +20 = 90º ---------->4xº - 15º = 90º 4xº = 105 X = 26.25º	M1 A1	Equating to 90º
		02	
15.	Distance = 100m = 0.1km Time = 5sec = $^5/_{3600}$ hrs Speed = 0.1 ÷ $^5/_{3600}$ = 72 kmh^{-1}	M1 M1 A1	Conversion of values Exp for speed
		03	
16.	840 =2x2x2 x3x5x7 1280 = 2x2x2x2x2x2x2x2x5 GCD = 2^3 x5 ---------->Dimension = 0.4 x 0.4m = 0.16m^2	M1 M1 A1	Exp in factor form Identifying the GCD Dimension
		03	

17



1 cm rep 4km

b) 8.8 x 4 = 35.2 km ± 0.4 ----------> S1

Bearing => 215º ± 1º ----------> B1 √ line AN

c) must ⊥ bisector ----------> B1 √line AW

Arc drawn for angle ----------> B1 √line GW

Distance = 4 x4 = 16 km ----------> B1 √line NG

B1

B1

B1

B1

B1

B1

10

18 a) 2+12+7+15+x =40

x = 4

B1

b)

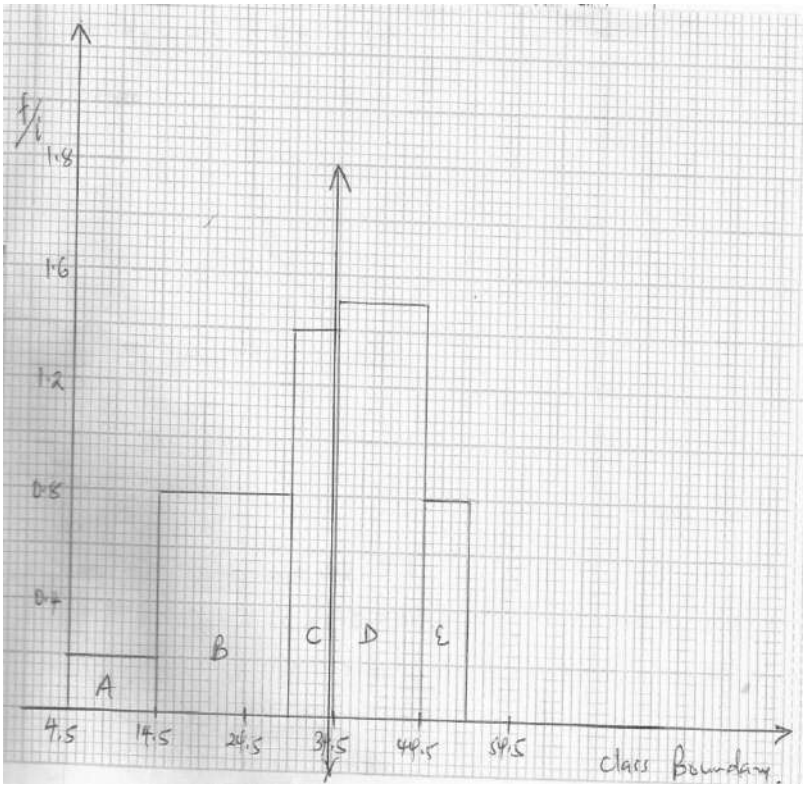
CB	4.5 – 14.5	14.5 – 29.5	29.5 – 34.5	34.5 – 44.5	44.5 – 49.
Fd	0.2	0.8	1.4	1.5	0.8

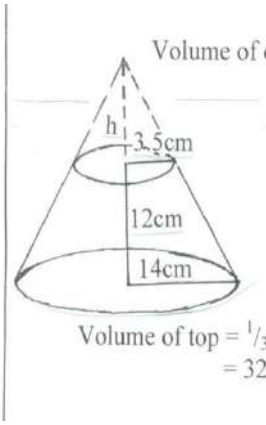
P1

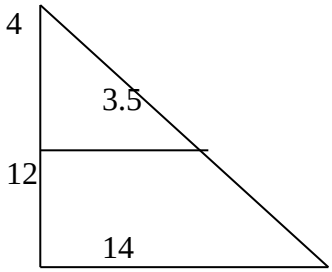
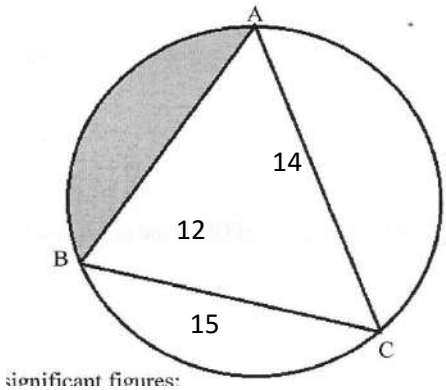
Graph

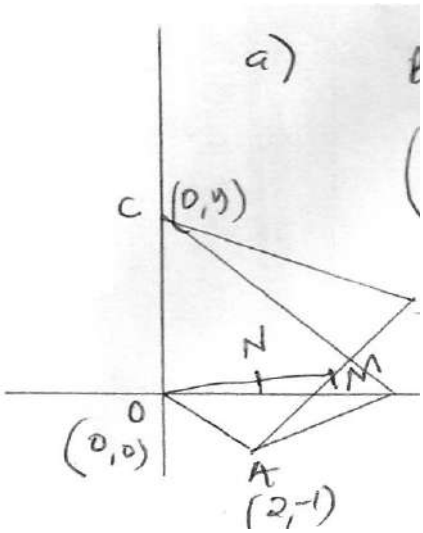
S1 Correct drawing of A

B1B1

		L1	Total area
	Total area A = 10 x 0.2 = 2 B = 15 x 0.8 = 12 C = 1.4 x y = $^{6}/_{20}$ y= $^{6}/_{1.4}$ = 4.286 $^{6}/_{1.4}$ x 5 = 2d = $\frac{4.286}{5}$ Line drawn between 4th & 5th s/square Value = 29.5 + 4.3 = 33.8	M1 B1 10	
19.	a) 51 km oyugi 24km 27km H/Bay 7.00am 7.30am 7.30am Distance = 51 -------($^{1}/_{2}$ x 48) = 27 km---------->	M1	Obtaining distance
	A . speed = 48 + 60 =108 kmh^{-1} ---------->	M1	Obtaining speed
	Time = $^{27}/_{108}$ x 60 min = 15 min ---------->	M1	Exp for time
	⇨ 7.45 am ---------->	A1	Exact time given
	b) from Oyugi = 24 + $\left(\frac{15}{60} \times 48\right)$ ---------->	M1	Exp for tot dist
	= 36 km ---------->	A1	
	c) Time $\left(\frac{36}{60} \times 60\right)$ min = 36min Travelling time = 36 – 15 ---------->	M1	
	21 min ---------->	M1	
	Distance = 15 km Speed = 15 ÷ $^{21}/_{60}$ ---------->	M1	
	= $42^{6}/_{7}$ kmh^{-1}	A1	
		10	
		M1	

20.	a) sh. $\frac{1200}{x}$ (b) (i) $\frac{1200}{x} + 10$ (ii) $\frac{1400}{x-5}$ (c) $\frac{1200}{x} + 10 = \frac{1400}{x-5}$ $\frac{1200 + 10x}{x} = \frac{1400}{x-5}$ $1200 (x – 5) + 10x (x – 5) = 1400x$ $1200x – 6000 + 10x^2 – 50x = 1400x$ $10x^2 – 250x – 6000 = 0$ $x^2 – 25x – 600 = 0$ $x^2 – 40x + 15x – 600 = 0$ $x (x – 40) + 15 (x – 40) = 0$ $(x – 40) (x + 15) = 0$ $x = 40$ or $x = 15$ $x = 40$ Those who contributed = 35 (d) Each contributed sh. $\frac{1400}{35}$ Sh. 40	B1 B1 B1 M1 M1 M1 A1 B1 M1 A2 **10**	Exp of % ÷ by 160
		10	
21	(a) Full height = 14 + 10 + 12cm = 36cm (b) Volume of hemisphere = ½ x 4/3 x 22/7 x 14 x 14 x 14cm3 = 57491/3cm3  Volume of cylinder = $^{22}/_7$ x 14 x 14 x 10cm^3 = 6160cm^3 $\frac{h}{h+12} = \frac{3.5}{14} = \frac{1}{4}$ $4h = h + 12$ $h = 4$ Volume of top = $^1/_3$ x $^{22}/_7$ x 14 x 14 x 16 – $^1/_3$ x $^{22}/_7$ x 3.5 x 3.5 x 4 = $3285^1/_3 – 51^1/_3$ = 3234cm^3 volume = $5749^1/_3$ + 6160 + 3234cm^3 = $15143^1/_3$cm^3 C_1 SA of hemisphere = $\frac{4}{2}$ x $\frac{22}{7}$ x 14 x 14 cm^2 = 1232cm^2	M1 M1 A1 M1 M1 M1 A1 M1 M1 A1 **10**	

	SA of cylinder = $2 \times {}^{22}/_{7} \times 14 \times 14 \times 10cm^2$ $= 880cm^2$ $L_1 = \sqrt{4^2 + 3.5^2}$ $= 5.315$ $L_2 = \sqrt{16^2 + 14^2}$ $= 21.26$  SA of top = ${}^{22}/_{7} \times 14 \times 21.26 - {}^{22}/_{7} \times 3.5 \times 5.315$ $935.44 - 58.465$ 876.975 $877cm^2$ Area of circle = ${}^{22}/_{7} \times 3.5 \times 3.5$ $= 38.5cm^2$ Total SA = 1232 + 880 + 877 + 38.5 $= 3027.5cm^2$		
		10	
22.	a) $s = 3+2(2) - 5(2)^2$ ---------->	M1	Substitution t = 2
	$= -13m$	A1	
	b) $3+2t - 5t^2 = 0$		
	$3+3t-5t-5t^2 = 0$ ---------->	M1	
	$(3+5t)(1 - t) = 0$		
	$t=-{}^{3}/_{5}$ or 1 :. t= 1 second ---------->	A1	
	c) $v = 2 -10t = 0$	M1	Exp for v= 0
	$t= {}^{1}/_{5}$	M1	Exp for s
	$s= 3+2({}^{1}/_{5}) - 5 ({}^{1}/_{5})^2 = 3{}^{1}/_{5}$ min	A1	Both values of t
	d) $v = 2 - 10 (0)$	M1	
	$= 2m/s$	A1	
	e) $a= -10m/s^2$	B1	
		10	
23.	 significant figures:	M1	
	a) $\cos C = \frac{14^2 + 15^2 - 12^2}{2 \times 14 \times 15}$ ----------	M1 A1 M1	

	Cos C = 0.6595 ---------- C = 48.74º b) $\frac{12}{\sin 48.74^\circ} = 2r$ ---------- $r = \frac{6}{\sin 48.74^\circ}$ ---------- = 7.982cm ---------- c) Area sector = $\frac{97.48}{360}$ x3.142 x 7.982^2 = $54.21cm^2$ Area $\triangle$ = $\frac{1}{2}$ x 7.982^2 x sin 97.48 = $31.59cm^2$ Area sh = 54.21 – 31.59 ---------- = $22.62cm^2$	M1 A1 M1 M1 M1 A1	
		10	
24.	 B(4,3) BC is // OA $\begin{pmatrix} 4 \\ 3-y \end{pmatrix} = k \begin{pmatrix} 2 \\ -1 \end{pmatrix}$ K = 2 -2 = 3 – y Y = 5 b) i) M = $\left(\frac{4=+2}{2}, \frac{3-1}{2}\right)$ = (3,1) N = ($^3/_2$, ½) = (1.5 , 0.5) ---------- $\overrightarrow{AN} = \begin{pmatrix} 1.5 \\ 0. \end{pmatrix} - \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} -0.5 \\ 1.5 \end{pmatrix}$ ii) $NC = \begin{pmatrix} 0 \\ 5 \end{pmatrix} - \begin{pmatrix} 1.5 \\ 0.5 \end{pmatrix} = \begin{pmatrix} -1.5 \\ 4.5 \end{pmatrix}$ ii) $AC = \begin{pmatrix} 0 \\ 5 \end{pmatrix} - \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} -2 \\ 6 \end{pmatrix}$ c)AN = λAc $\begin{pmatrix} -0.5 \\ 1.5 \end{pmatrix}$ $\lambda \begin{pmatrix} -2 \\ 6 \end{pmatrix}$ λ = ¼ AN= ¼ Ac and they Share Point A	Exp for An M1 Exp for NC **A1** B1 M1 A1 M1 A1 B1 M1 A1	

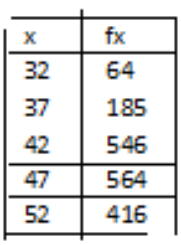
THE SALVATION ARMY KENYA WEST TERRITORIAL EVALUATION TESTS (SAKWETET) (KCSE)
MATHEMATICS PAPER II

MARKING SCHEME

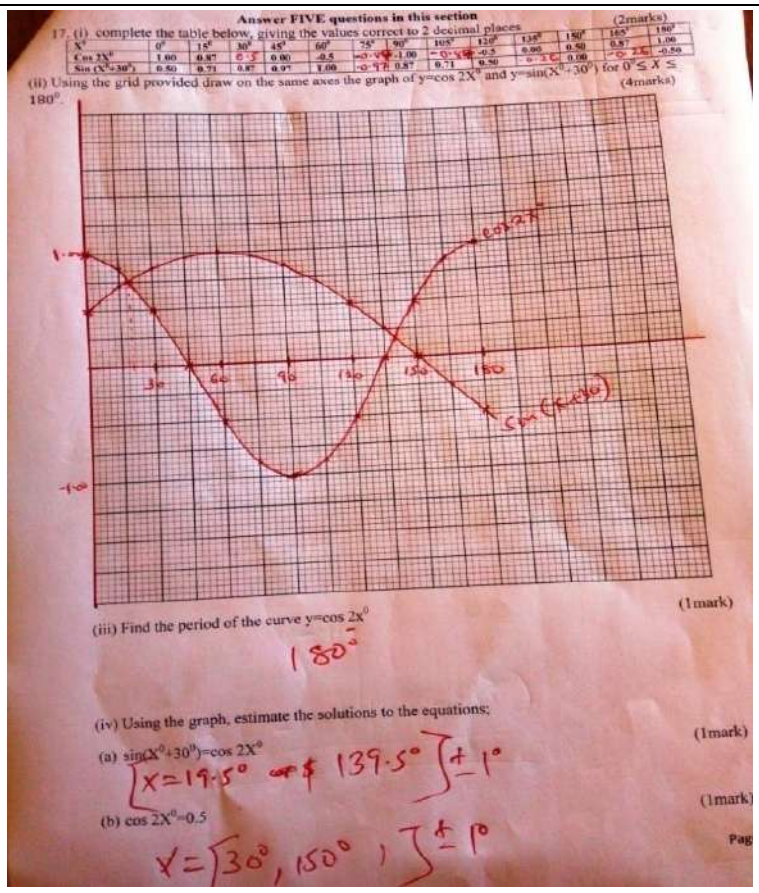
No.	Working	Marks	Comments
1.	<table><tr><td>No.</td><td>log</td></tr><tr><td>36.15</td><td>1.5581</td></tr><tr><td>0.2573</td><td>$\bar{1}.4398$</td></tr><tr><td></td><td>0.9979</td></tr><tr><td>1.938</td><td>0.2874×2</td></tr><tr><td></td><td>0.5748</td></tr><tr><td>2.6498 ←</td><td>0.4231</td></tr></table>	M1 M1 A1 **03**	All logs correct Correct addition , subtraction and multiplication by 2 Correct Answer Only
2.	$A^2 = \frac{3+2\chi}{5-4\chi}$ $A^2(5-4\chi) = 3+2\chi$ $5A^2 - 4A^2\chi = 3+2\chi$ $5A^2 - 3 = 2\chi + 4A^2\chi$ $5A^2 - 3 = \chi(2+4A^2)$ $\chi = \frac{5A^2-3}{4A^2+2}$		M1 ✓ remove of $\sqrt{}$ M1 Bringing like terms of χ together A1
3.	$\frac{5}{10}\times\frac{3}{9}\times\frac{2}{8}$ $=\frac{1}{24}$		M1 A1

No.	Working	Marks	Comments
4.	$\sin(4x-30^0)=-0.5$ $4x-30=210,330,570,690$ $4x=240,360,600,720$ $X=60,90,150,180$		B1 B1 B1 for all values
5.	$\frac{3\left(2\sqrt{7}+4\sqrt{3}\right)-3\left(2\sqrt{7}-4\sqrt{3}\right)}{\left(2\sqrt{7}-4\sqrt{3}\right)\left(2\sqrt{7}+4\sqrt{3}\right)}$ $\frac{24\sqrt{3}}{-20}$ $\frac{-6\sqrt{3}}{5}$	M1 M1 A1	Use of brackets and x by the conjugate Simplifying the denominator
6.	$AB = \begin{pmatrix}-2\\-1\\2\end{pmatrix} - \begin{pmatrix}2\\-3\\4\end{pmatrix} = \begin{pmatrix}-4\\2\\-2\end{pmatrix}$ $\lvert AB\rvert = \sqrt{16+4+4}$ $= \sqrt{24}$	M1 M1 A1	For displacement vector AB For $\sqrt{24}$

No.	Working	Marks	Comments
	/AB/=4.90		
7.	(a) 6XR=4.8x5 XR=4 (b) QT^2=TRxTP =8x18 QT=12	**M1** **A1** **M1** **A1**	For property For relating of tangents and secant
8.	$x^2-6x+9+y^2-10y+25= -30+9+25$ $(x-3)^2+(y-5)^2=4$ R=2 C (3,5)	**B1** **B1** **B1**	
9.	a) $243+\frac{810}{x}+\frac{1080}{x^2}+\frac{720}{x^3}+\frac{240}{x^4}$ b) $243+\frac{810}{4}+\frac{1080}{16}+\frac{720}{64}+\frac{240}{256}$ $=525.2$	**M1A1** **M1** **A1**	 Substitution

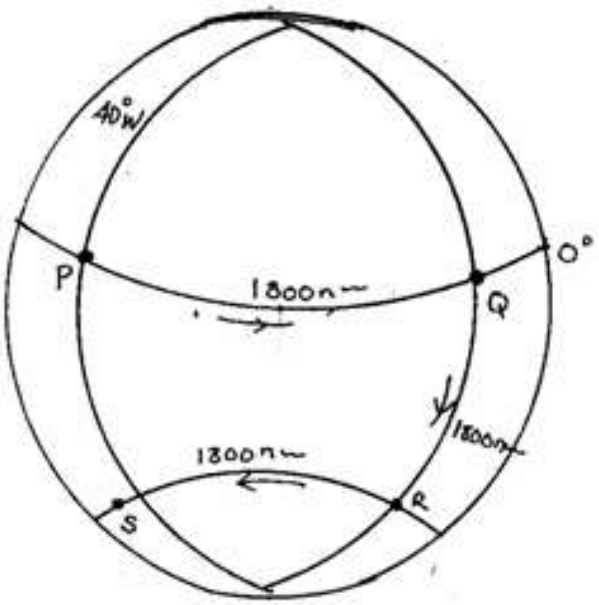
No.	Working	Marks	Comments
10.	$\frac{1}{juma}+\frac{1}{ali}+\frac{1}{chege}=\frac{1}{12}$ rate of work done in 1hr $\frac{1}{juma}+\frac{1}{ali}=\frac{1}{18}$ $\frac{1}{chege}=\frac{1}{12}-\frac{1}{18}=\frac{1}{36}$ $\frac{1}{juma}=\frac{1}{24}-\frac{1}{36}$ Juma =72hrs Ali=24hrs Chege=36hrs	 B1 B1 B1	 For chege alone For juma alone
11.	$\begin{pmatrix}3 & 1\\ 2 & 4\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}3x+y\\ 2x+4y\end{pmatrix}+\begin{pmatrix}-4\\ 3\end{pmatrix}=\begin{pmatrix}13\\ 13\end{pmatrix}$ 3x+y=17 2x+4y=10 X=5.8 Y=-0.4 (-0.4,5.8)		
12.	 $\frac{1775}{40}$ Allow use of assumed mean $=44.375$	B1 M1 A1	For fx In the formula mean CAO

No.	Working	Marks	Comments
13.	56000=14000+2625t 42000=2625t $t=\frac{42000}{2625}$ t=16 $\frac{25}{100}\times 56000=14000$ interest =16000 $A=p(1+\frac{r}{100})^n$ $42000=26000(1+\frac{r}{100})^{16}$ R=3.043%	M1 M1 M1 A1	

No.	Working	Marks	C
14.	 Answer FIVE questions in this section 17. (i) complete the table below, giving the values correct to 2 decimal places (2marks) (ii) Using the grid provided draw on the same axes the graph of $y=\cos 2X^0$ and $y=\sin(X^0+30^0)$ for $0^0 \le X \le 180^0$. (4marks) (iii) Find the period of the curve $y=\cos 2x^0$ (1mark) 180° (iv) Using the graph, estimate the solutions to the equations; (a) $\sin(X^0+30^0)=\cos 2X^0$ (1mark) X=19.5° or 139.5° ±1° (b) $\cos 2X^0=0.5$ (1mark) X=30°, 150°, ±1°	T2 P1 C1 P1 C1 B1 **B1** **B1** **B1**	Cos 2x Sinx +30

15.	(a) let the price of a cow be x and goat be y 8x+12y=294000 9x+15y=337500 Or 2x+3y=73500 3x+5y=112500 b) writing in matrix form $\begin{pmatrix} 2 & 3 \\ 3 & 5 \end{pmatrix}$ det =10-9=1 Inverse $\begin{pmatrix} 5 & -3 \\ -3 & 2 \end{pmatrix}$ $\begin{pmatrix} 5 & -3 \\ -3 & 2 \end{pmatrix}\begin{pmatrix} 2 & 3 \\ 3 & 5 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix}=\begin{pmatrix} 5 & -3 \\ -3 & 2 \end{pmatrix}\begin{pmatrix} 73500 \\ 112500 \end{pmatrix}$ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix}=\begin{pmatrix} 30000 \\ 45000 \end{pmatrix}$ X=30000 Y=4500 C) I) (140/100) X 30000 = 42000 (145/100) X 4500 = 6525 S.P = (42000X8) + (6525 X 12) = 414300 (II) S.P= 414300 B.P=(30000 X 8) + (4500 X 12) = 294000 PROFIT = S.P – B.P 414300 – 294000=120300	B1 B1 M1 M1 M1 A1 M1 A1 M1 A1	B1 for each equation For matrix equation Multiplication of inverse on both sides
16.	a) Taxable amount $= \frac{8570}{20}\times 12+\frac{15}{100}\times\frac{8570}{20}\times 12$ = k£ (5142 + 771.3) = k£ 5913.3 1st £ 1500 = 2 x 1500 = 3000 2nd £ 1500 = 3 x 1500 = 4500 3rd £ 1500 = 5 x 1500 = 7500 Rem.1413.3 = 7 x 1413.3 = 9893 Gross tax 24,893.10 Less relief sh(150 x 12) 1800.00 Ksh 23093.10 (b) WCPS = $\frac{2}{100}\times 8570$ = 171.4 NHIF = 20 Tax ksh. 1924.425 Total deduction = 2115.825 Net salary = 8570 – 2115.825 = ksh. 6454.175	M1 A1 M1 M1 M1 A1 M1 M1 M1 A1	

17.



M1
A1

M1
A1

M1
M1

(a) d = 60a

$1800 = 60 \times a$

$a = 30^o$

$\therefore$ **Q is (0°, 10°W)**

M1A1

$1800 = 60a$

$a = 30^o$

R is (30°S, 10°W)

M1

$1800 = 60a \cos\theta$

$1800 = 60a \times \cos 30^o$

$$\frac{30}{Cos\ 30} = a = 34.64^o$$

A1

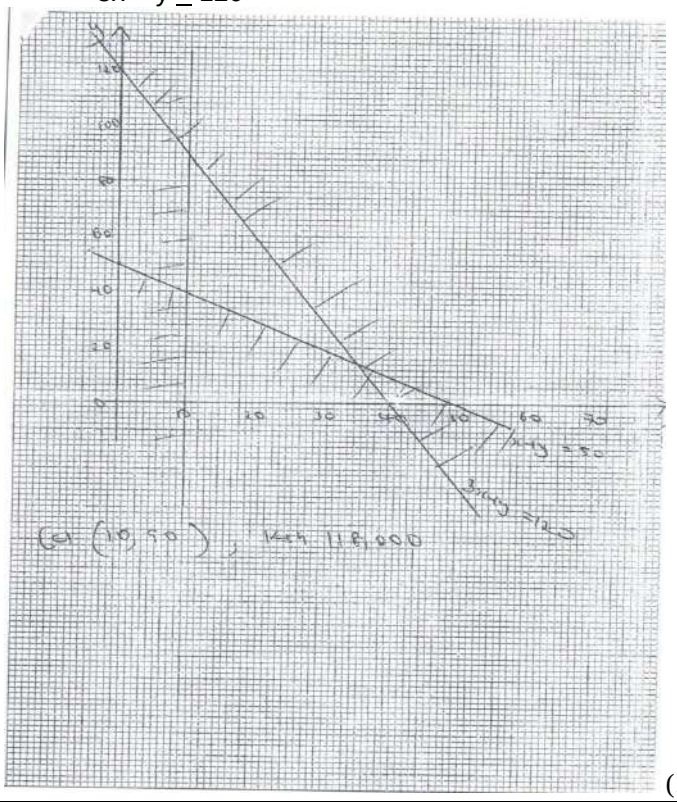
S is (30°S, 44.64°W)

(b) $$Speed = \frac{5400}{16} = \underline{\underline{337.5 knots}}$$

(c) Time for PQR = $$\frac{3600}{337.5} = 10hr\ 40\text{min}$$

Time for R to S = 10hr 40min – 2hr

= <u>8hr 40min</u>

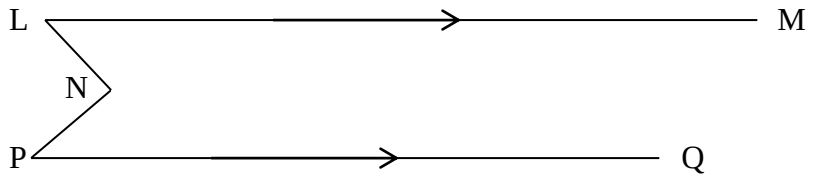
No.	Working	Marks	Comments
18.	a) $\frac{1200}{x}$ b) $\frac{1200}{x-5}, \frac{1400}{x-5}$ c) $\frac{1200}{x-5} - \frac{1200}{x} = 10$ X^2-50x-600=0 $x = \frac{50 \pm \sqrt{50^2 - 4^{\times} - 600}}{2}$ X= 60 60-5= 55 d) $\frac{1400}{55}$ 25.45	**B1** **B1** M1 M1 M1M1 M1 A1 M1 A1	Expression Quadratic equation
19.	(a) x + y ≥ 50 x ≥ 10 3x + y ≤ 120  (10,120)	B1 B1 B1 B1 B1 B1 B1 B1 B1	Allow unsimplified for x + y ≥ 50 x ≥ 10 3x + y ≤ 120 B1-for solutions B1 for substitution in 1000x +1200y B1 for obtaining maximum B1 for x and y

No.	Working	Marks	Comments
20.	a) T: 2 | 4 | 6 | 8 | 10 | 12 v: 4 | 12 | 28 | 52 | 84 | 124 Displacement =2(4+12+28+52+84+124) = 608m b) $\int_1^{13} t^2 - 2t + 4 \, dt$ $\left(\frac{t^3}{3} - t^2 + 4t\right)_1^{13}$ = 612 c) Acceleration A=2t-2 8-2 =6m/s^2 d) $\frac{608-612}{612} \times 100$ 0.6536%	**T1** M1 A M1 M A1 M1 A1 M1 A1	T0 if one of the value is wrong Integrate Substituting in the formulae

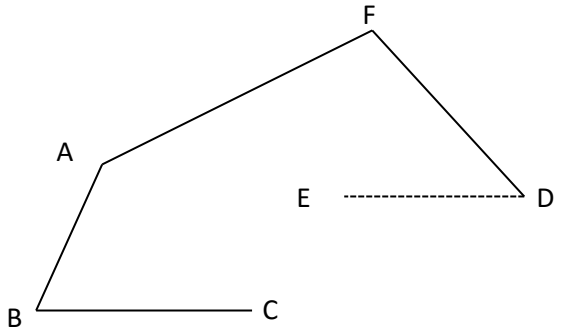
No.	Working	Marks	Comments
21.	$(a) PO = \sqrt{12^2 + 12^2} = \frac{16.97}{2}$ $= 8.485cm$ $VP^2 = 14^2 + 8.485^2$ $VP = 16.4cm$ $(b). Tan\ \theta = \frac{14}{8.485}$ $Tan\theta = 1.650$ $\theta = Tan^{-1}1.650 = 58.78^0$ $(c). Slanting\ height = \sqrt{16.37^2 - 6^2}$ $h = 15.23cm$ $Slanting\ area = 4\left(\frac{1}{2} \times 12 \times 15.23\right) = 365.52cm^2$ $Base\ area = 12 \times 12 = 144cm^2$ $Total\ surface\ area = 365.52 + 144$ $= 509.52cm^2$ $(d) Volume = \frac{1}{3} \times 12^2 \times 14$ $= 672cm^2$	M1 M1 A1 M1 A1 M1 M1 A1 M1 A1	

CEKENA
121/1
FORM FOUR
MATHEMATICS PAPER 1
SECTION 1 (50 MARKS) COMPULSORY

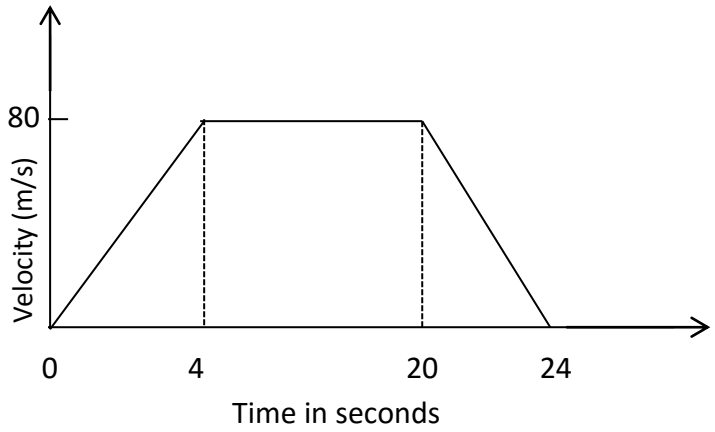
1. Mary arranged all prime numbers less than ten in descending order to get a number. Kyalo also arranged all perfect square less than ten in ascending order to get a number. Find the total value of the second digit in the difference between the numbers (3 mks)
2. Simplify the expression (3 mks)
$$\frac{y^4 - x^4}{y^3 - yx^2}$$
3. Solve for x in the equation (3 mks)
$$2^{(2x-1)} \times \left[\frac{1}{8}\right]^{(1-x)} = 4^{(3x+1)}$$
4. The marked price of a modern camera is Ksh. 24,000. A trader sold it to a customer at a 10% discount. If the trader still made a profit of 20% on the cost price, what was its cost price (3 mks)
5. A two digit number is such that the sum of the digit is 12. If the digits are interchanged the value of the new number formed is fifteen more than twice the value of the original number. Find the original number? (4 mks)
6. Using reciprocal and squareroot tables only. Evaluate. (3 mks)
$$9.452^2 + \frac{1}{63.37}$$
7. Two similar container hold $2000cm^3$ and 6.75 litres respectively. If the smaller container has a diameter of 15.50cm. What is the radius of the larger container correct to 1 decimal place. (3 mks)
8. Given that OA = i + 3j - 4k and OB = 3i - j - k. (3 mks)
Find /AB/
9. Three schools A, B, and C are such that B is 12km due south of A and C is 15km from A. C is on a bearing of $N30^0W$ from B. Calculate the bearing of C from A. (3 mks)
10. Solve the inequality
$$3 - 2x < x \leq \frac{2x + 5}{3}$$
State the integral values which satisfy these inequalities (3 mks)
11. The gradient of a line L through A(2x, 4) and B(-1, x) is $^1/_7$. Find the equation of line perpendicular to L through B. (3 mks)
12. On the figure below LM is parallel to PQ. Angle MLN = 30^0 and Angle NPQ = 70^0. Find the value of X^0 (3 mks)



13. Complete the sketch below for the prism, ABCDEF (3 mks)



14. A Jua Kali artisan has 63000g of metal of density 7g/cm^3. He intends to use it to make a rectangular pipe with external dimensions 120mm by 150mm and internal dimensions of 100mm by 120mm. Calculate the length of the pipe in metres (3 mks)
15. Jane and Mary started a business wherby contributed Ksh. 25000 and 20000 respectively. At the end of the year a profit of Ksh. 8100 was realized. From the profit funds for development dividends and reserves were set aside in the ration 4:5:6 respectively. If the dividends were shared in the ration of their contribution, determine:
    (a) The amount set aside for development (2 mks)
    (b) The dividends Mary received (2 mks)
16. The figure below is a velocity timegraph for car



    (a) Find total distance traveled by the car (2 mks)
    (b) Calculate ther decelaration of the car. (1 mk)

SECTION II (50 MARKS)

Answer any five questions in this section

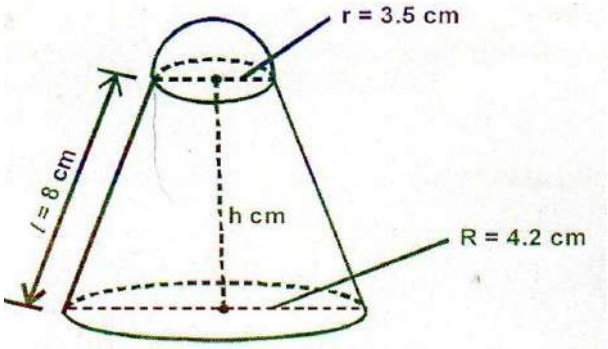
17. Five members of 'SILK', a self supporting enterprise Jane, Jepchoge, Esther, Mama Charo and Chepkoech were given a certain amount of money to share amongst themselves. Jane got 3/8 of the total amount while Jepchoge got 2/5 of the remainder. The remaining amount was shared equally among Esther, Mama Charo and Chepkoech each of which received Ksh. 6,000;
    (a) How much was shared among the five business women? (3 mks)
    (b) How much did Jepchoge get? (2 mks)
    (c) Jane, Jepchoge and Chepkoech invested their money and earned a profit of Ksh. 12,000. A third of the profit was left to maintain the business and the rest was shared according to their investments. Find how much each got. (5 mks)
18. (a) On the grid provided draw the square whose vertices are A(6, -2), B(7, -2), C(7, -1) and D(6, -1)(1 mk)
    (b) On the same gid draw
        (i) $A^1B^1C^1D^1$ the image of ABCD, under an enlargement scale factor 3, centre (9, -4) (3 mks)

(ii) $A^{11}B^{11}C^{11}D^{11}$, the image $A^1B^1C^1D^1$ under a reflection in the line x = 0 (2 mks)

(iii) $A^{111}B^{111}C^{111}D^{111}$, the image of $A^{11}B^{11}C^{11}D^{11}$ under a rotation of $+90^0$ about the origin (2 mks)

(c) Desribe a single transformation that maps $A^1B^1C^1D^1$ onto $A^{111}B^{111}C^{111}D^{111}$. (2 mks)

19. The figure below shows a solid made up of a conical frustum and a hemispherical top. The dimensions are as indicated.



The top radius r = 3.5cm, bottom radius R = 4.2cm, slant height l = 8cm and the height of the frustum part is hcm.

(a) Find the surface area of the solid (Take $\pi = {}^{22}/_{7}$) (5 mks)

(b) If a similar solid has a total surface area of $81.51cm^2$, determine the radius of its base, to the nearest whole number (1 mk)

(c) (i) Find the heigh h of the frustum. (1 mk)

(ii) Hence determine the volume of the solid (3 mks)

20. Two towns A and b are 80km apart. Juma started cycling from town A to town B at 10.00am at an average speed of 40km/h. Mutuku started his journey from town B to town A at 10.30am and traveled by car at an average speed of 60km/h

Calculate:

(i) The distance from town A when Juma and Mutuku met (5 mks)

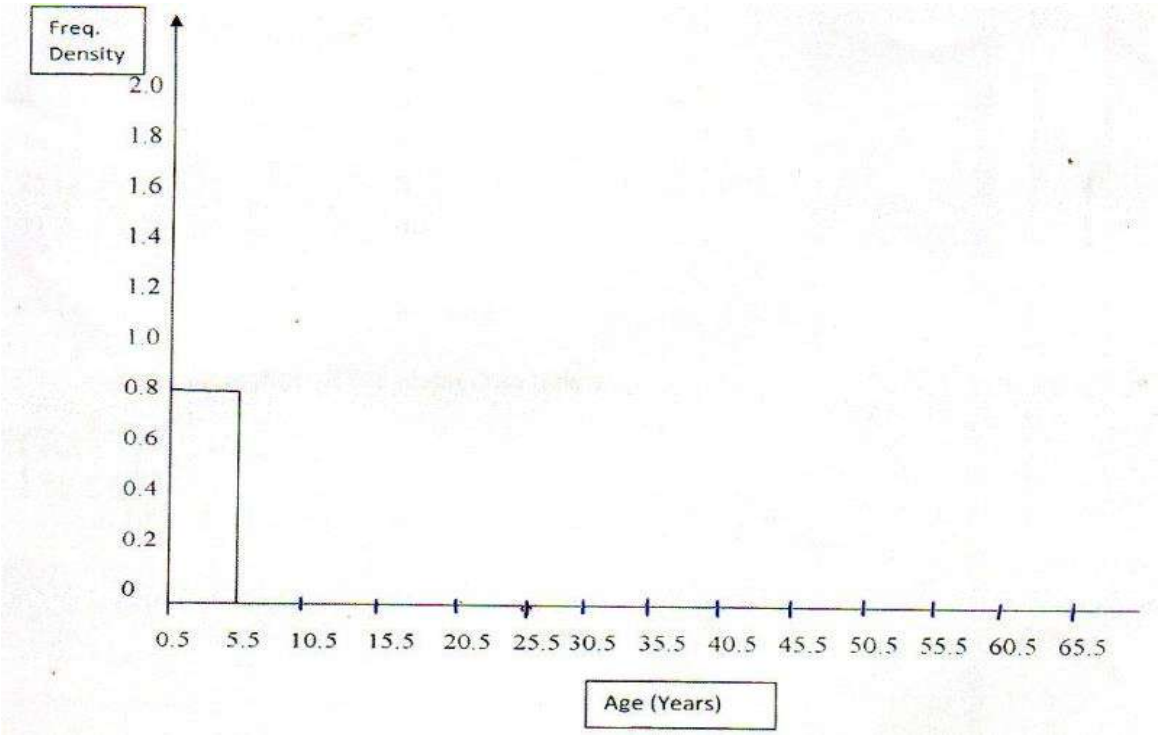
(ii) The time of the day when the two met (2 mks)

(b) Kamau started cycling from town A to town B at 10.20am. He met Mutuku at the same time as Juma did. Determine Kamau's average speed (3 mks)

21. The following data shows the sample of age distribution of the people who reside in a certain village in years, in Nandi County

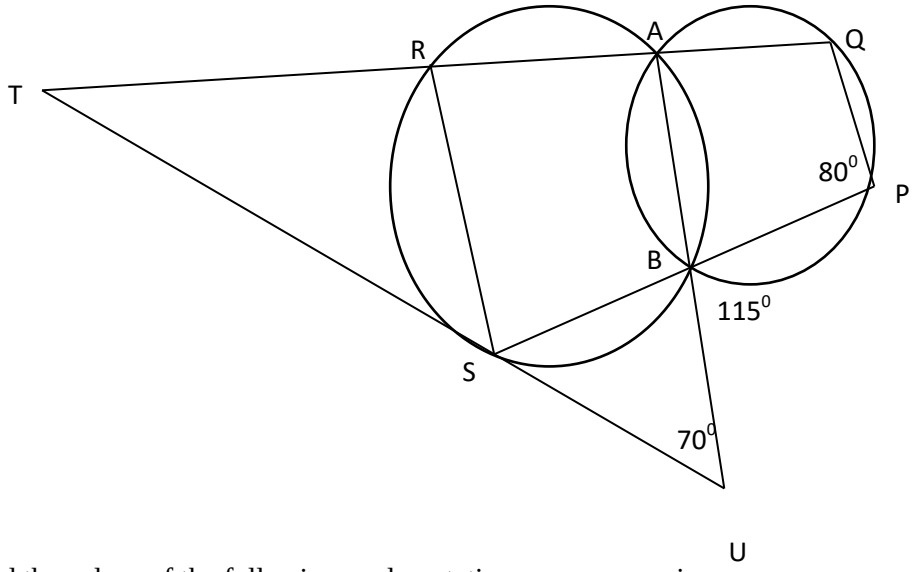
Age group	Frequency
1 …….5	4
6 ……10	8
11 ……..20	8
21 ……..30	6
31 ……..50	40
51 ……..55	3
56 …….65	3

(a) Complete the histogram of the given data below (6 mks)



(b) Calculate the mean age of the given sample in the village (4 mks)

22. the figure below shows two circles ABPQ and ABSR intersecting at A and B. PBS, QART and ABU are straight lines. The line UST is a tangent to the circle ABSR at S. Angle BPQ = 80^0, angle PBU = 115^0 and angle BUS = 70^0



Find the values of the following angles, stating your reasons in each case.

(a) <BAR (2 mks)
(b) <STR (2 mks)
(c) <BSU (2 mks)
(d) <BRS (2 mks)
(e) <SBU (2 mks)

23. Using a pair of compasses and ruler only,
(a) Construct triangle XYZ such that XY = 8cm, YZ = 6cm and angle XYZ = 30^0 (3 mks)
(b) Measure the length of XZ (1 mk)
(c) Draw a circle that touches the vertice X, Y and Z. (2 mks)
(d) Measure the radius of the circle (1 mk)
(e) Calculate the area of the circle outside the trangle to 2 d.p. (3 mks)

24. The function $y = {}^1/_3x^3 + x^2 - 3x + 2$ represents a curve.
    a) Find the gradient function of the curve (1 mk)
    b) Find the turning points of the curve and distinguish between them. (6 mks)
    c) Hence sketch the curve $y = {}^1/_3x^3 + x^2 - 3x + 2$ (3 mks)

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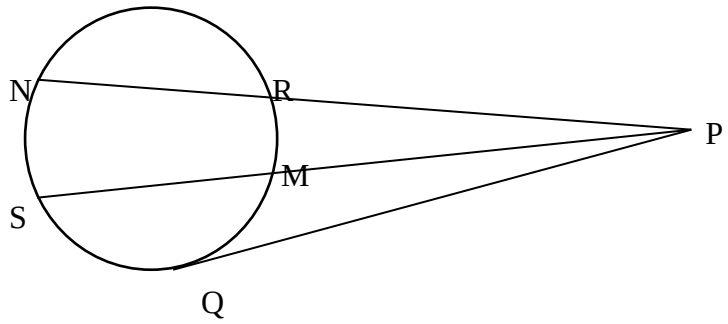
FORM FOUR
MATHEMATICS PAPER 2
SECTION 1 (50 MARKS) COMPULSORY

1. The side of a triangle measures 5cm, 7.1cm and 6.20cm respectively. Find the percentage error in calculating the perimeter (3 mks)
2. The sum of the fifth and sixth term of an AP is 30. If the third is 15, find the first term (3 mks)
3. Solve for x in the following equation (3 mks)
   $\text{Sin}({}^1/_2x - 10^0) = \text{Cos } 2x$
4. Make H the subject of the formula (3 mks)

$$F = \sqrt{\frac{H - 2WL}{3H}}$$

5. In the figure below, RN and MS are chords of a circles that meet at an external point P. PQ is a tangent to the circle at Q. Given that PR = 2cm, PN = 12cm and PM = 3cm. Find the length of :



   (i) PS (2 mks)
   (ii) PQ (1 mk)
6. By rationalizing the denominator, simplify.

$$\frac{\sqrt{3}}{3\sqrt{3} + 2\sqrt{5}}$$ leaving the answer in the form $a + b\sqrt{c}$ (3 mks)

7. Find the radius and the centre of a circle whose equation is (3 mks)
   $3x^2 + 3y^2 + 18y - 12x - 9 = 0$
8. The interior angle of a regular polygon is three times the exterior angle. Determine the number of sides in the polygon (3 mks)
9. A coffee trader buys two grades of coffee at sh. 80 and sh. 100 per parket. Find the ratio at which she should mix them so that by selling the mixture at sh. 120, a profit of 25% is realized (3 mks)
10. Given that $a = 2i + 4j$ and $b = 2i - j$. Find $/2a - 3b/$ (3 mks)
11. From the data 16, 5, 7, 13, 2, 9, 3, 20, 13, 6, 5 Find;
    (a) The range (1 mk)
    (b) Quartile deviation (2 mks)
12. Draw line AB = 5cm. On one side AB construct the locus of all points P such that angle APB = 60^0. (Using a ruler and compass only (3 mks)
13. Two similar cans have different heights 8cm and the other one 10cm. If the surface area of the larger can is $480cm^3$. Find the surface area of the smaller can. (3 mks)

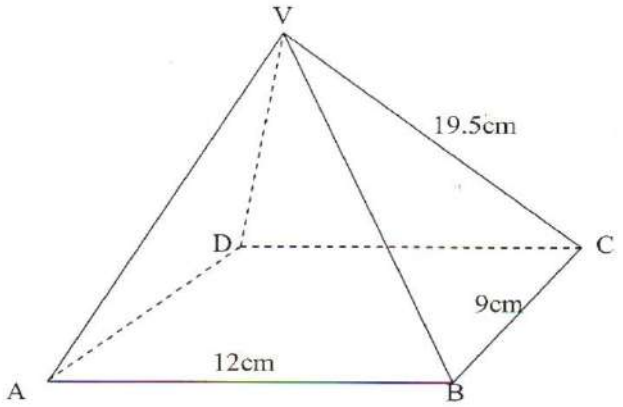
14. A bag contain 5 blue balls and 3 red balls. A ball is picked at random and replaced. A second ball is then picked. Find the probability that
    (a) Both ball are red (1 mk)
    (b) The two balls are of different colours (2 mks)
15. A commercial plot is valued at sh. 500,000. The plot depreciates at rate of 10% per six months for a period of 2 years. It then appreciates at a rate of 4% per quarter yearly for three years. Find the value of the plot after 5 years to nearest shillings (4 mks)
16. Three quantities P, Q and R are such that P varies jointly with Q and the square of R. If P = 900 when Q = 20 and R = 3, Find
    (i) An equation connecting P,Q and R (2 mks)
    (ii) The value of R when Q = 10 and P – 800 (2 mks)

SECTION II

17. A rural factory manufacturer broilers food made from sunflower seed, millet and maize in the ratio 5:3:1. Sunflower seeds are imported in to the country from Philippines at a cost of US $ 204.50 for 30kg or from Germany at £ 96.4 for 20kgs. The exchange rate is 1 US $ = £ 0.718. Bags are filled with the food at the rate of 420 grammes per second.
    (a) How much is the quantity of sunflower seed in 15kg of the food (2 mks)
    (b) Determines the cheapest source of this sunflower seed, clearly stating the difference in cost in terms of US$. (3 mks)
    (c) Determine the number of bags of the food packed in 4 hours given a bag is 15kg. (2 mks)
    (d) A trader buys the food from the factory and sell each bat at Ksh. 1377, thereby making a profit of 12.5%. Determine his buying price. (3 mks)
18. In an agricultural research station, the lengths of a sample of leaves were measured and recorded as shown in the frequency distribution table below

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

    (a) State the modal class (1 mk)
    Calculate the median to 4 d.p (3 mks)
    (b) Using an assumed mean of 5.2, find;
    (i) Mean to 4 d.p (3 mks)
    (ii) Standard deviation 4 d.p (3 mks)
19. The figure below is a right pyramid with a rectangular base ABCD of length 12cm and width 9cm. The slanting edge is 19.5cm long.

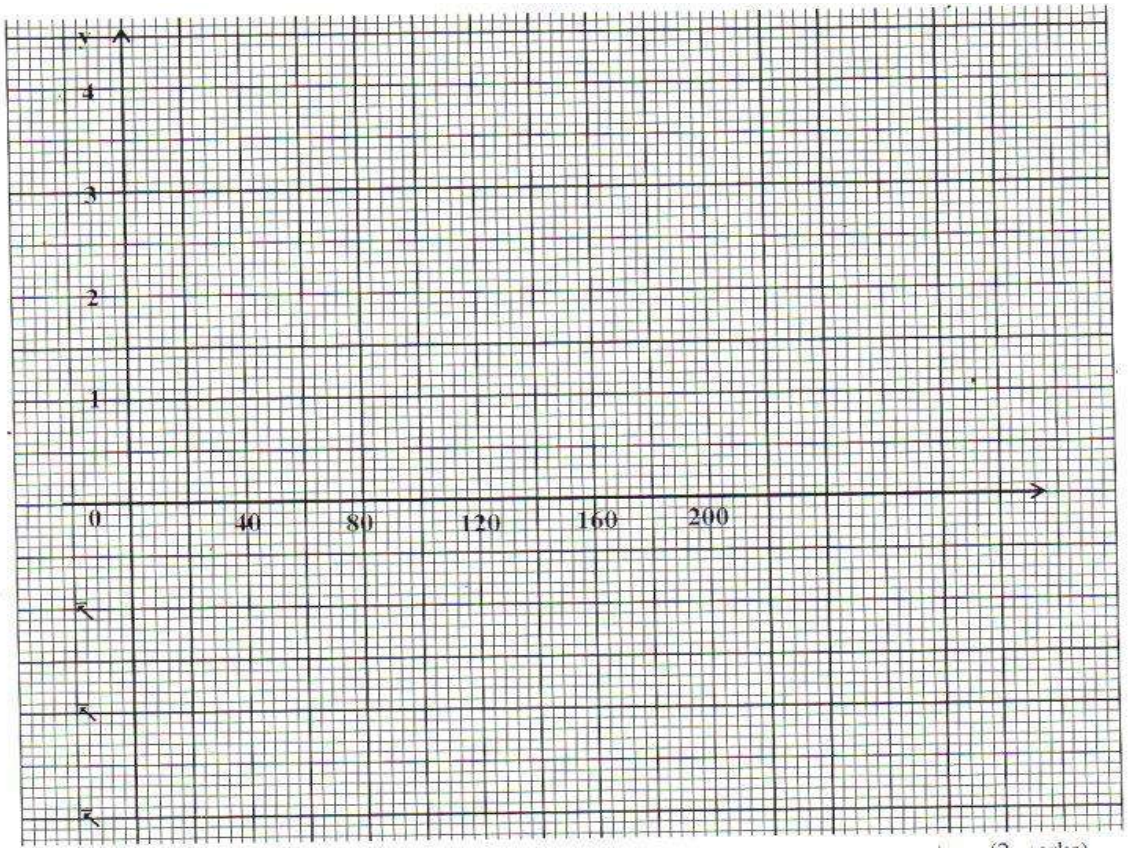


    (a) Determine the height of the pyramid (2 mks)
    (b) Find the angle, the line AV makes with base ABCD (3 mks)
    (c) Calculate the angle between planes VAD and VBC (3 mks)
    (d) Calculate the volume of the pyramid. (2 mks)
20. Given that y = 2 sin2x and y = 3 cos $(x + 45^0)$
    (a) Complete the table below: (2 mks)

Complete the table below.

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

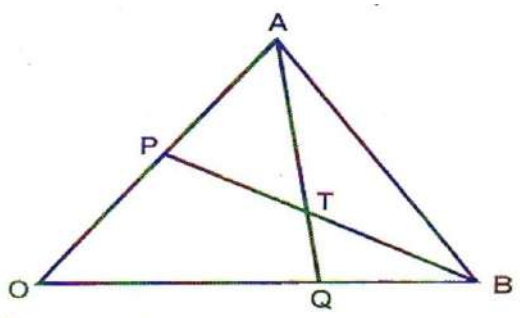
(b) Use the date to draw the graph of y = 2 sin2x and y = 3 cos (x +45^0) for $0^0 \leq x \leq 180^0$ on the same axis on the grid provided below. (5 mks)



(c) State the amplitude and period of each curve (2 mks)

(d) Use the graph to solve the equation 2 sin2x - 3 cos (x +45^0) =0 for $0^0 \leq x \leq 180^0$ (1 mk)

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



(a) Express AQ and PQ in terms of a and b (2 mks)

(b) Taking BT = kBP and AT = hAQ where h and k are real numbers.

(i) Find two expressions for OT in terms of a and b (2 mks)

(ii) Use the expression in b(i) above to find the values of h and k. (4 mks)

(c) Give the ratio BT:TP (2 mks)

22. A plane flying at 2000knots left an airport A (30^0S, 31^0E) and flew due north to an airport B (30^0N, 31^0E)
    (a) Calculate the distance covered by the plane in nautical miles (3 mks)
    (b) After a 15 minutes stop over at B, the plane flew west to the airport C (30^0N, 13^0E) at the same speed. Calculate the total time to complete the journey from airport A to airport C through B (4 mks)
    (c) If the plane left airport at 0800 hours. Find the time the plane touched down at C. (3 mks)
23. The table below shows how income tax was charged in a certain year.

(Kenya pounds)	(Ksh. Per Kenya pound)
1 – 3630	2
3631 – 7260	3
7261 – 10890	4
10891 – 14520	5
14521 – 18150	6
18151 – 21780	7
21781 and above	7.5

During the year Mwadime earned a basic salary of Ksh. 25,200 and a house allowance of Ksh. 12,600 per month. He was entitled to a personal tax relief of Ksh. 1,162 per month.
(a) Calculate:
    (i) Mwadime's taxable income in Kenya pounds per annum (2 mks)
    (ii) The net tax he pays per month (6 mks)
(b) Apart from income tax he also contributes monthly NHIF Ksh. 1600, WCPS Ksh. 1000. Calculate his net monthly pay (2 mks)

24. The initial velocity of a particle was 1 m/s and its acceleration is given by $2 - t$ m/s^2 every second after the start.
    (a) (i) Determine the equation representing its velocity (3 mks)
    (ii) Find the velocity of the particle during the third second. (3 mks)
    (b) (i) find the equation representing its distance t seconds after the start (3 mks)
    (ii) What was the distance covered by the particle during the first three seconds (1 mk)

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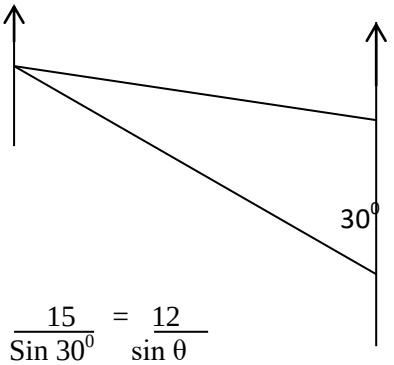
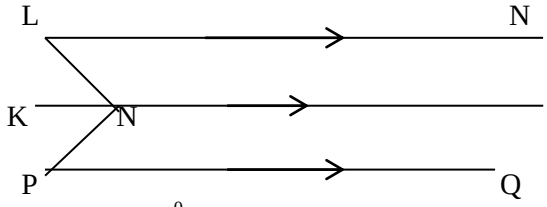
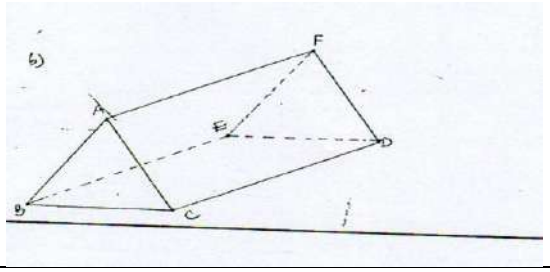
FORM FOUR
MATHEMATICS PAPER 1

MATHEMATIC PAPER 1 (MARKING SCHEME)

	WORK OUT	MKS	COMMENTS
1.	97532 – 149 = 97383 Total value = 7 x 1000 = 7000	M1 M1 A1	The two numbers formed
		03	
2.	$\frac{(y^2 + x^2)(y + x)(y - x)}{y(y - x)(y - x)}$ $\frac{y^2 + x^2}{y}$	M1 M1 A1	Simplifying the numerator fully Simplifying the denominator fully
		03	
3.	$2^{2x-1} \times 2^{-3+3x} = 2^{6x+2}$ $2x - 1 - 3 + 3x = 6x + 2$ $x = 6$	M1 M1 A1	All numbers t base two All the powers picked correctly
		03	
4.	Customers selling price $= \left(\frac{90}{100} + 24{,}000\right)$ $= 21{,}600$ $\frac{100 \times 21{,}600}{120}$ $= 18{,}000$	M1 M1 A1	
		03	
5.	No. xy $x + y = 12$ $10y + x - 15 = 2(10x + y)$ $8(12 - x) - 19x = 15$ $x = 3 \quad y = 9$ Original number 39	 M1 M1 A1 B1	 For the 2 equations Expressing in one variable For the two
		04	
6.	9.45222 = 89.34 $\frac{1}{63.37} = 0.01578$ 89.36	B1 B1 B1	 89.34
		03	

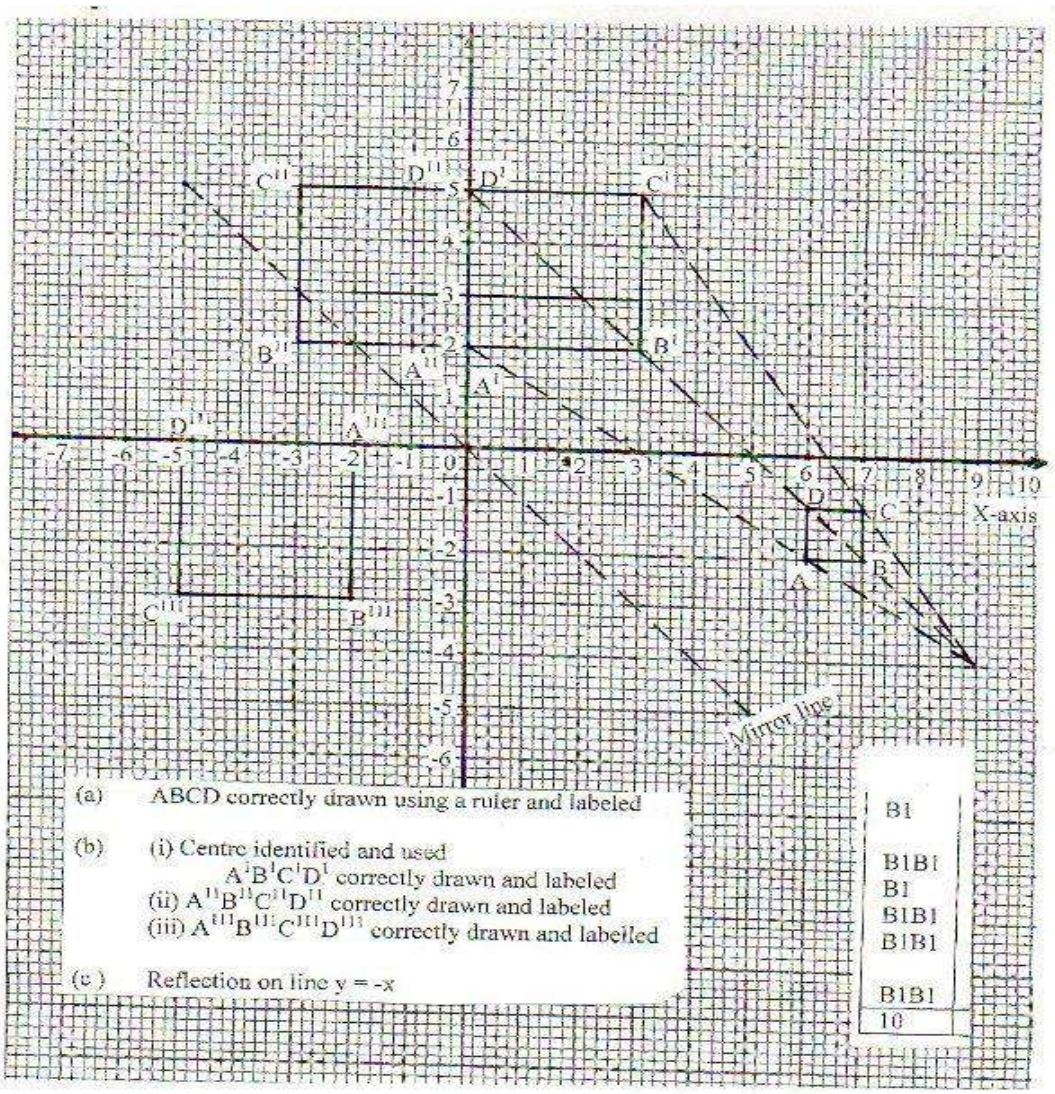
	WORK OUT	MKS	COMMENTS
7.	L.S.F = $\sqrt[3]{\frac{6750}{2000}}$	M1	89.34
	= 1.5		
	Radius of the large container 15.5 x 1.5	M1	
	= 23.25cm		
	= 23.3cm	A1	
		03	
8.	$AB = \begin{pmatrix} 3 & 1 \\ -1 & 3 \\ -3 & -4 \end{pmatrix}$	M1	
	$= \begin{pmatrix} 2 \\ -4 \\ 1 \end{pmatrix}$ = 2i – 4j + k		
	$/AB/ = \sqrt{2^2 + (-4)^2 + 1^2}$	M1	
	$= \sqrt{21}$		
	= 4.583	A1	
		03	
9.			
	$\frac{15}{\sin 30^0} = \frac{12}{\sin \theta}$	M1	
	$\theta = 23.58^0$		
	n = 180 – 30 – 23.58		
	$= 126.42^0$	A1	
	Bearing = 180 + 126.42		
	$= 306.42^0$	B1	Accept N 53.58^0W
		03	
10.	3 – 2x < x		
	3 < 3x	B1	
	1 < x		
	3x ≤ 2x + 5		
	x ≤ 5 1 < x ≤ 5	B1	
	2,3,4,5	B1	
		03	
11.	$\frac{4 - x}{2x + 1} = \frac{1}{7}$	M1	
	28 + 7x = 2x + 1		
	x = 3		
	$\frac{y - 3}{x + 1} = -7$	M1	
	y = -7x - 4	A1	Give for the equivalent
		03	

	WORK OUT	MKS	COMMENTS
12.	 $< LNK = 30^0$ $< PNK = 70^0$ $x = 360^0 - (30^0 + 70^0)$ $= 260^0$	B1 M1 A1	
		03	
13.		B1 B1 B1	For correct paralle and equal corresponding lines For dotted lines For correct diagram
		03	
14.	Volume $= \left(\frac{63000}{7}\right)$ $= 9000cm^3$ Volume L (15 x 12) - (12 x 10) h = 9000 60h = 9000 h = 0.15m	M1 M1 A1	
		03	
15.	(a) Jane Mary 5 : 4 Dev. Div Re 4 : 5 : 6 Dev $= \frac{4}{15} \times 81000$ = sh. 21600 (b) Div $= \frac{5}{15} \times 81000$ = 27000 Mary got $\frac{4}{9} \times 27000$ = 12000	 M1 A1 M1 A1	
		04	
16.	(a) D = ½ x 80 (24 + 16) = 1600m (b) Decelaration = 80 4 $= 20m/s^2$	M1 A1 A1	Any other equivalent method
		03	

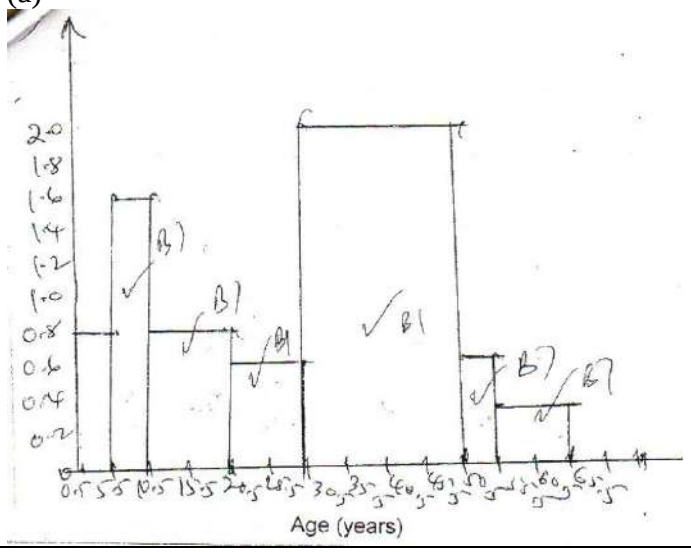
Section II

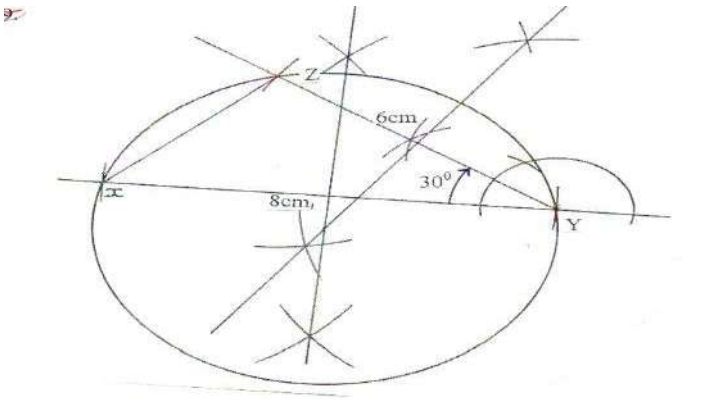
17.	(a) let the constant amount be x Jane - $(^3/_8 \text{ x})$ / = Jepchoge's - $^2/_5$ $(^5/_8 \text{x})$ /= = ¼ x /= Remaining $^3/_5$x - 18,000 x = 48,000 Therefore the original amount is 48,000 (b) Jepchoge received $(^1/_4 \text{ x } 48{,}000)$ = 12,000/= (c) Business maintenance $(^1/_3 \text{ x } 12{,}000)$ = 4,000/= Balance = 8,000 Ratios: Jane - $(^3/_8 \text{ x } 48{,}000)$ = Ksh. 18,000/= Jepchoge - $(^1/_4 \text{ x } 48{,}000)$ = 12,000/= Chepkemboi - $(^1/_3 \text{ x } 18{,}000)$ = 6,000/= Ratio: 18,000 : 12,000 : 6,000 3 : 2 : 1 Jane got $^3/_6$ x 8,000 + 18,000 = Ksh. 22,000/= Jepchoge got 2/6 x 8,000 = Ksh. 2,677/= Chepkemboi got $^1/_6$ x 8,000 + 18,000 = Ksh. 1,337/=	M1 M1 M1 A1 M1 M1 M1 A1 B1 B1	Any other equivalent method
		10	

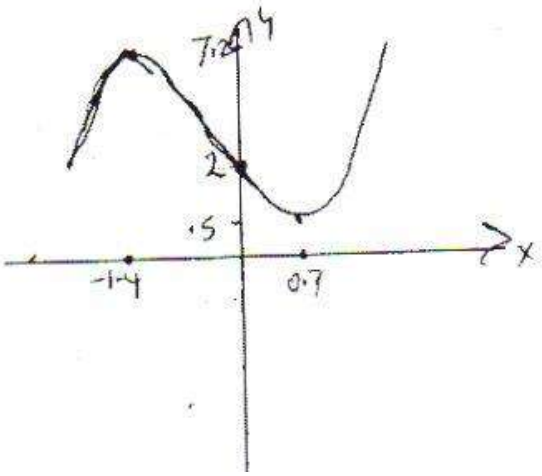
18.



19.	(a) bottom = $^{22}/_{7}$ x 4.2^2	M1	
	= $55.44cm^2$	M1	
	Top = 4 x $^{22}/_{7}$ x 3.5^2 x ½		
	= $77cm^2$	M1	
	Curved = $^{22}/_{7}$ x 8 x (4.2 + 3.5)		
	= $193.6cm^2$	M1	
		A1	
	T_{SA} = 77 + 55.44 + 193.6		
	= $\underline{326.04}cm^2$		
	(b) $\frac{r}{1.2} = \sqrt{\frac{81.51}{326.04}}$	B1	
	r = 2cm		From working
	(c) $H = \sqrt{8^2 - 0.7^2}$	B1	
	= 7.97cm		From working

19.	(d) volume = $^1/_3$ = $^{22}/_7$ x 7.97 (4.22 +3.5 +4.2 x 3.5) = $^1/_3$ x $^{22}/_7$ x 7.97 x 44.59 = 372.3 cm^3	M1 M1 A1	
		10	
20.	(i) 15km, 185km, J 7.00am 7.30am 7.30a.m 30km/hr 40km/hr R.S = 30km/hr + 40km/hr = 70km/hr √m1 T = D/R.S = 185km/70km/hr = 2 ½ hours √m1 Time they met = 7.30am √m1 2.30 10.00am √m1 (ii) Distance from Onyango's house where the two met: Distance = 30km/hr x $^5/_2$ hours = 75km = 75 + 15 = 90km √m1 (iii) Distance from Onyango to Juma's house when they met: 200km – 90km √m1 = 110km √A1 (b) Meeting time = 10.00a.m + 15 10.15am T = 110km/20km/hr = 5 ½ hours√m1 Time of arrival to Jumas house = 10.15am +5.30√m1 = 15.45pm or 3.45pm	B1 B1 B1 M1 A1 M1 M1 A1 M1 M1 A1	
		10	
21.	(a)  		

21.	(b) Class x f fx 1 – 5 3 4 12 6 – 10 8 8 64 11 – 20 15.5 8 124 21 – 30 25.5 6 153 31 – 50 40.5 40 1620 51 – 55 53 3 159 56 – 65 60.5 3 181.5 72 2313.5 Mean = $\frac{\Sigma fx}{\Sigma f}$ = $\frac{2313.5}{72}$ = 32.13	B1 B1 M1 A1	
		10	
22.	(a) BAR < QAB = 100^0 – opposite angles in a quadrilateral add up to 180^0 < BAR = 80^0 – angles in a straight line add up to 180^0 (b) STR < STR = 180 – (80 + 70^0) = 30 – angles in a straight line add up to 180^0 (c) BSU < UBS = 180 – 115^0 = 65^0 – angles in a straight line add up to 180^0 < BSU = 45^0 – angles in a straight line add up to 180^0 (d) BRS < SBA = 115^0 – vertically opposite angles are equal < BRS = 65 – opposite angles in a cyclic quadrilateral add up to 180^0 (e) SBU - 180 – 115 = 65^0 – angles on a straight line	B1 B1 B1 B1 B1 B1 B1 B1B1	
		10	
23.	 XY and YZ ∠XYZ construction of ∠ 30^0 Completing Δ XYZ (b) XZ = 4.0cm ± 0.1 (c) Bisecting any 2 sides Curve circle (d) Radius = 4.2cm ± 0.1 (e) Area of circle ⟶ 3.142 $(4.2)^2$ Area of Δ ⟶ ½ x 8 x 6 sin 30^0 Area = 55.425 – 12 = $43.43cm^2$	B1 B1 B1 B1 B1 B1 B1 B1 M1 M1 A1	
		10	

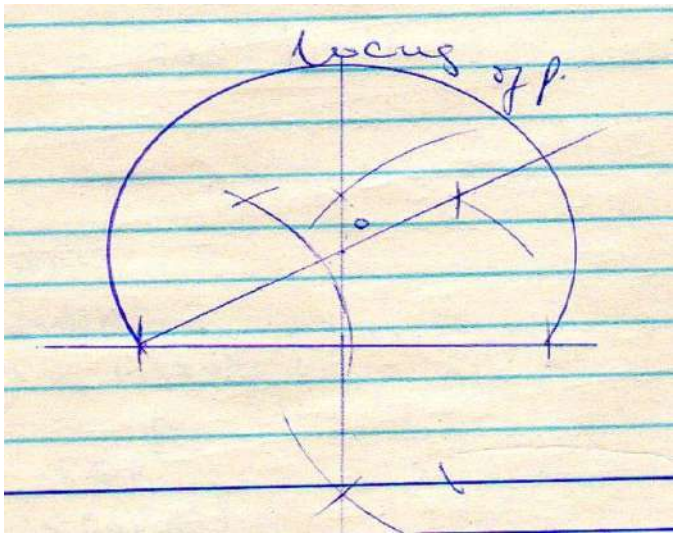
24.	a) $\frac{dy}{dx} = 3x^2 + 2x - 3$	B1	
	b) $3x^2 + 2x - 3 = 0$	M1	
	$x = \frac{-2 \pm \sqrt{4+36}}{6}$		
	$x = \frac{-2 \pm 6.325}{6}$	M1	
	$x = -1.3875, 0.7208$	A1	
	$x \approx -4, 0.7$		
	$\frac{d^2y}{dx^2} = 6x + 2$		
	$\rightarrow \frac{d^2y}{dx^2}\Big\|_{x=-1.4} = 6 \times -1.4 + 2 = -6.4$	M1	Testing for Max or min
	$\frac{d^2y}{dx^2}\Big\|_{x=0.7} = 6 \times 0.7 + 2 = 6.2$		
	$Y\|_{x=-1.4} = 7.2$ •(-1.4, 7.2) M_X.T.P	A1	
	$Y\|_{x=0.7} = 0.5$ •(0.7, 0.5)M_n T.P	B1	
	Y intercept = 2		
	c) 	B1	For y – intersect
		B1	Mx, Mn pts estimated
		B1	curve

CEKENA
121/2
FORM FOUR
MATHEMATICS PAPER 2

MATHEMATIC PAPER 2 (MARKING SCHEME)

	WORK OUT	MKS	COMMENTS
1.	Actual max min 6.20 6.25 6.15 7.1 7.15 7.05 5 5.5 4.5 Maximum sum = 6.25 + 7.15 + 5.5 = 18.9cm Actual sum = 6.20 + 7.1 + 5 = 18.3cm PE = $\frac{(18.9 - 18.3)}{1.83} \times 100$ $= \frac{0.6}{18.3} \times 100$ = 3.279%	B1 M1 A1	
		03	
2.	a + 4d + a + 5d = 30 2a + 9d = 30…….i a + 2d = 5 …….ii 2a + 9d = 30 2a + 4d = 10 5d = 20 d = 4 a + 2 x 4 = 5 a = -3, d = 4	B1 M1 A1	
		03	
3.	½ x- $10^0 = 90^0 - 2x$ $2^1/_2x = 100$ x = 40	M1 M1 A1	
		03	
4.	$F^2 = \frac{H - 2WL}{3H}$ $3HF^2 = H - 2WL$ $3HF^2 - H = -2WL$ $H(3F^2 - 1) = -2WL$ $H = \frac{-2WL}{3F^2 - 1}$ $= \frac{2WL}{1 - 3F^2}$	M1 M1 A1	
		03	

5.	(i) PR x PN = PM x PS 2 x 12 = 3 x PS 8 = PS (ii) $PQ^2 = 2 \times 12 = 24$ $PQ = \sqrt{24}$ = 4.899	M1 A1 B1	
		03	
6.	$\frac{\sqrt{3}(3\sqrt{3} - 2\sqrt{5})}{(3\sqrt{3} + 2\sqrt{5})(3\sqrt{3} - 2\sqrt{5})}$ $= \frac{3 \times 3 - 2\sqrt{15}}{27 - 20}$ $= \frac{9 - 2\sqrt{15}}{7}$ $= \frac{9}{7} - \frac{2\sqrt{15}}{7}$	M1 M1 A1	
7.	$x^2 + y^2 + 6y - 4x - 3 = 0$ $x^2 - 4x + 4 + y^2 + 6y + 9 = 3 + 4 + 9$ $(x - 2)^2 + (y + 3)^3 = 4^2$ Centre = (2, -3) radius = 4cm	 M1 M1 A1	
		03	
8.	$3x + x = 180^0$ $x = \frac{180^0}{4} = 45$ $n = \frac{360^0}{45^0} = 8$ sides	M1 M1 A1	
		03	
9.	Cost = 80x + 100y Selling price = $\frac{125}{100}(80x + 100y$ $120x + 120y = 100x + 125y$ $120x - 100x = 125y - 120y$ $20x = 5y$ $\frac{x}{y} = \frac{5}{20} = \frac{1}{4}$ x : y = 1 : 4	 M1 M1 A1	
		03	
10.	$2(2i + 4j) - 3(2i - j)$ $= 4i + 8j - 6i + 3j$ $= -2i + 11j$ $\|12a - 3b\| = \sqrt{(-2)^2 + 11^2}$ $= \sqrt{125}$ = 11.2	 B1 M1 A1	
		03	

11.	(a) Range = 20 – 2 = 18 (b) 2,3,5,5,6,7,9,13,13,16,20 Q1 = 5 Q3 = 13 $\frac{Q3 - Q}{2} = \frac{13 - 5}{2} = 4$	B1 M1M1	
		03	
12.		B1 B1 B1	Construction of AB and $< 60^0$ Locating centre O Locus of P
		03	
13.	L.s.f. $= \frac{10}{8} = \frac{5}{4}$ A.s.f $= \frac{25}{16}$ $\frac{25}{16} = \frac{480}{x}$ $x = 480 \times \frac{16}{25}$ $= 307.2cm^2$	B1 M1 A1	
		03	
14.	(a) P(RP) $= \frac{3}{8} \times \frac{3}{8}$ $= \frac{9}{64}$ (b) P(RB) or P(BR) $= \left(\frac{3}{8} \times \frac{5}{8}\right) + \left(\frac{5}{8} \times \frac{3}{8}\right)$ $= \frac{15}{32}$	B1 M1 A1	
		03	

15.	After 2 years $A = 500{,}000 \left(1 - \frac{10}{100}\right)^4$ $= 328{,}050/=$ After 3 years $A = 328{,}050 \left(1 + \frac{4}{100}\right)^{12}$ $= 525{,}219/=$	M1 A1 M1 A1	
		04	
16.	(i) $P \propto QR^2$ $P = KQR^2$ $900 = K(20)(3^2)$ $5 = K$ $P = 5QR^2$ (ii) $P = 5(10)(R^2)$ $800 = 50 \times R^2$ $16 = R^2$ $4 = R$	 M1 A1 M1 A1	
		04	
17.	(a) $^5/_9 \times 15$ $= 8^1/_3$ kgs (b) Philippine cost per kg $= \frac{204.5}{30}$ $= US\$ 6.817$ Germany cos per kg $\frac{96.4}{20 \times 0.718} = US\$ 6.713$ Germany by $6.817 - 6.713 = \$ 0.104$ (c) $\frac{4 \times 420 \times 3600}{15 \times 1000}$ $= 403.2$ bags (d) Buying price $\frac{1377}{112.5} \times 100$ $= 1{,}224/=$	M1 A1 M1 M1 A1 M1 A1 M1M1 A1	
		10	

18.

CLASS	χ	f	$d = A = 5.2$ $\chi - A$	fd	d^2	fd^2	cf
3.0 – 3.4	3.2	1	-2.0	-2.0	4	4	1
3.5 – 3.9	3.7	4	-1.5	-6.0	2.25	9	5
4.0 – 4.4	4.2	9	-1.0	-9.0	1	9	14
4.5 – 4.9	4.7	14	-0.5	-7.0	0.25	3.5	28
5.0 – 5.4	5.2	12	0	0	0	0	40
5.5 – 5.9	5.7	10	0.5	5	0.25	2.5	50
6.0 – 6.4	6.2	6	1.0	6	1	6	56
6.5 – 6.9	6.7	3	1.5	4.5	2.25	6.75	59
7.0 – 7.4	7.2	1	2.0	2.0	4	4	60
		$\Sigma f = 60$		$\Sigma fd = 6.5$	$\Sigma fd^2 = 44.75$		
		B1		B1	B1		

(a) 4.5 – 49 — B1

(b) Median $\frac{60}{2} = 30^{th}$ — M1

Median $= 4.95 + \frac{2}{12} \times 0.5$

$1.95 + 0.0833$ — A1

$= 5.0333$

$= 5.033$

(c) (i) $Mean\ (\bar{\chi}) = A + \left(\frac{\Sigma fd}{\Sigma f}\right) = 5.2 + \left(\frac{-6.5}{60}\right)$ — M1

$= 5.2 - 0.1083$

$= 5.099177$ (5dp) — A1

(ii) $S.d = \sqrt{\frac{\Sigma fd^2}{\Sigma f} - \left(\frac{\Sigma fd}{\Sigma f}\right)^2}$

$= \sqrt{\frac{44.75}{60} - \left(\frac{-6.5}{60}\right)^2}$ — M1

$= \sqrt{0.74583 - 0.01176}$

$= \sqrt{0.73407}$ — A1

$= 0.8568$ (4dp)

10

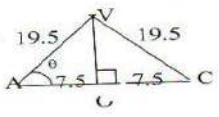
19.

(a) $AC = \sqrt{12^2 + 9^2} = 15cm$ — M1

$Or^2 = 19.5^2 - 7.5^2$

$= \sqrt{324}$ — A1

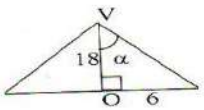
$= 18cm$

(b) 

$\cos\theta = \frac{7.5}{19.5} = 0.3846$ — M1

$\theta = \cos^{-1}(0.3846)$

$= 67.38^0$ — A1

(c) 

$\tan\alpha = {}^6/_{18} = 0.3333$ — M1

$\alpha = \tan^{-1}(0.3333)$ — A1 — Angle identified

$= 18.43^0$

Required angle $= 2(18.43)$

$= 36.86^0$ — B1

(d) Vol $= {}^1/_3 \times 12 \times 9 \times 18$ — M1

$= 648cm^3$ — A1

10

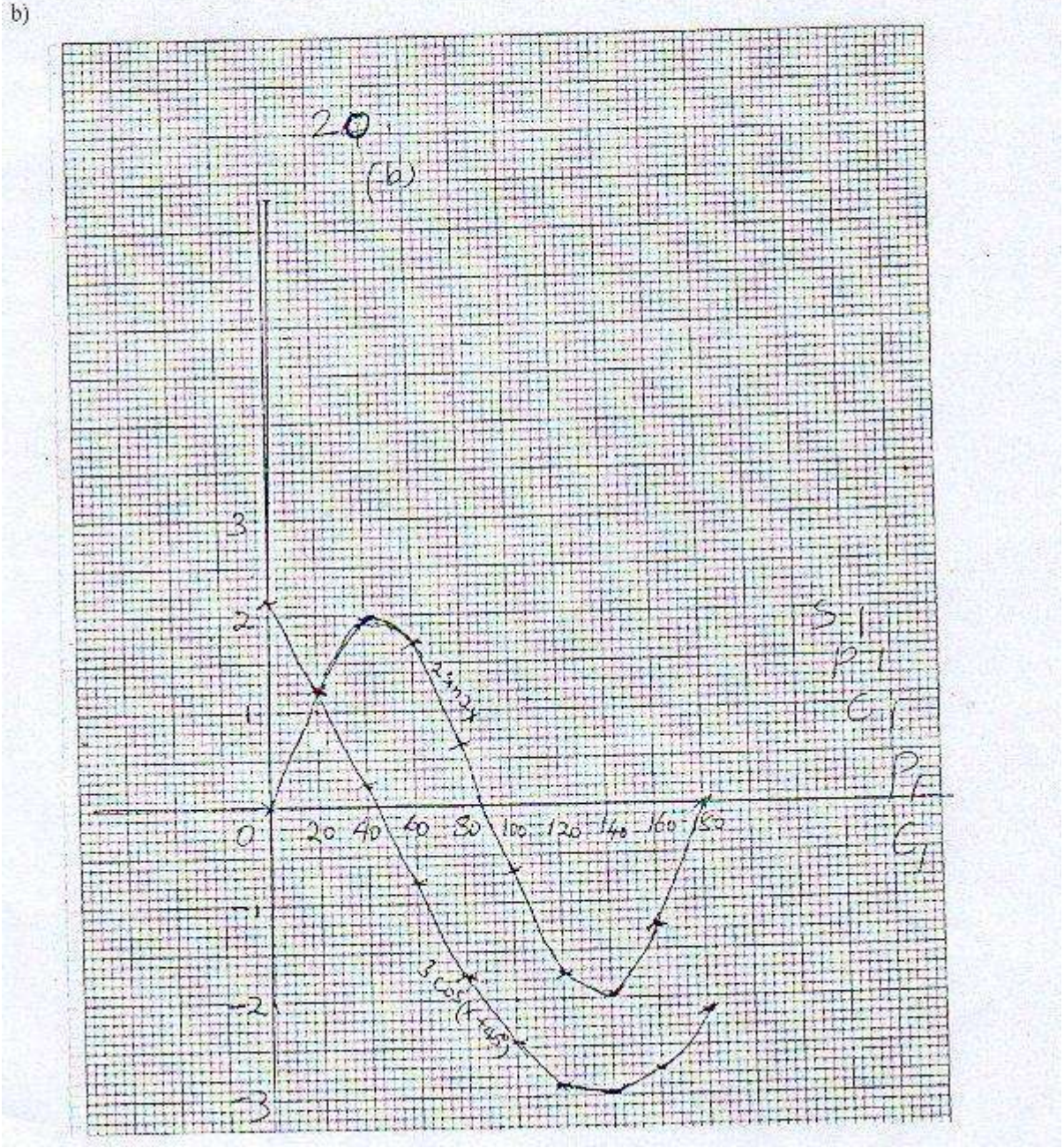
20.

a)

x	0°	20°	40°	60°	80°	100°	120°	140°	160°	180°
2 sin 2x	0	**1.29**	1.97	**1.73**	0.68	-0.68	-1.73	**-1.97**	-1.28	0.00
3 cos (x + 45°)	2.12	1.27	**0.26**	-0.78	**-1.72**	-2.46	**-2.9**	**-2.99**	-2.72	-2.12

B2

b)



(c) a = 2 and 3
period = 180^0 and 360^0

(d) 20^0

		10

21.	(a) AQ = $^1/_3$ b – a PQ = $\frac{1}{3}$b - $\frac{3}{5}$ a i) $\overrightarrow{BT} = K\overrightarrow{BP}$ AND $\overrightarrow{AT} = h\overrightarrow{AQ}$ $\overrightarrow{OT} = \overrightarrow{OB} + \overrightarrow{BT}$ $= \mathbf{b} + \overrightarrow{BP} = \mathbf{b} + k\left(\frac{3}{5}\boldsymbol{a} - \boldsymbol{b}\right)$ $= \mathbf{b} + \frac{3}{5}k\mathbf{a} - k\mathbf{b}$ $OT = \overrightarrow{OA} + \overrightarrow{AT}$ $= \mathbf{a} + h\,(\overrightarrow{AQ})$ $= \mathbf{a} + h\left(\frac{1}{3}\boldsymbol{b} - \boldsymbol{a}\right)$ $= \mathbf{a} + \frac{h}{3}\boldsymbol{b} - h\boldsymbol{a}$ ii) $\mathbf{b} + \frac{3}{5}k\boldsymbol{a} - k\boldsymbol{b} = \boldsymbol{a} + \frac{h}{3}\boldsymbol{b} - h\boldsymbol{a}$ $(1-k)\mathbf{b} + \frac{3}{5}k\boldsymbol{a} = (1-h)\mathbf{a} + \frac{h}{3}b - h\boldsymbol{a}$ $1 - k = \frac{1}{3} \rightarrow 3 - 3k = h$ $\cdot\ 3k + h = 3$ .....(i) $\frac{3}{5}k = 1 - h \cdot 3k = 5 - 5h$ $\cdot\ 3k + 5h = 5$ .....(ii) $3k + h = 3$ .....(i) $3k + 5h = 5$ .....(ii) $-4h = -2$ $h = ½$ $k = \frac{5}{6}$ c) BT : TP = k : 1 – k $= \frac{5}{6} : 1 - \frac{5}{6}$ $= \frac{5}{6} : \frac{1}{6}$ = 5 : 1	B1 B1 B1 B1 B1 M1 M1 A1 M1 A1	Both equations Elimination of one valuable both
		10	
22.	(a) $30 + 30^0 = 60^0$ Distance = 60^0 x 60 = 3600nm (b) $31^0 - 13^0 = 18^0$ Distance = 18 x 60 cos 30^0 = 935.28 = 4535.25nm Total distance = 3600 + 935.28 = 4535.28nm	B1 M1 A B1 B1	

	Total time taken $= \frac{4235.28}{2000}$ = 2.26764hrs = 2 hrs 31 minutes (c) Difference in time between A and C = 18 x 4 = 72mins = 1hr 12 min Time at C when it is 8.00 at A = 8 – 1hr 12mins = 06:48am	M1 A1 M1 M1	
23.	(a) (i) salary + house allowance = 25,200 + 12,600 = 37,800p.m 37,800 x 12 = Ksh. 453,600 p.a ÷ 20 kε 22,600 p.a (ii) Tax on first kε 3630 x 2 = 7,260 Next kε 3630 3630 x 3 = 10,890 Next kε 3630 3630 x 4 = 14,520 Next kε 3630 3630 x 5 = 18,150 Next kε 3630 3630 x 6 = 21,780 Next kε 3630 3630 x 7 = 25,410 Remaining kε 900 900 x 7.5 = 6,750 Total tax p.a 104,760 Less relief 1162 x 12 = 13,944 Net tax p.a 90,816 Monthly tax = 90,816 ÷ 12 = Sh. 7,568 (b) Total deductions = tax + other deduction = 7,568 + 1,600 + 1,000 = Shs. 10,168 Net monthly pay = total income – total deductions = 37,800 – 10,168 = Kshs. 27,632	M1 A1 M1 M1 M1 A1 M1 A1 M1 A1	First three Next three Last slab Less relief
24.	(a) (i) $V = 2t - t^2 + c$ V = 1, t = 0 I = C $V = 2t - t^2 + 1$ (ii) $V = 2t - t^2 + 1$ t = 3 $V = 2 \times 3 (3)^2 + 1$ V = 6 – 9 + 1 V = -2m/s (b) (i) $S = t^2 - t^3 + c$ $S = t^2 - t^3 + t$ (ii) t = 3 $s = 3^2 - (3)^3 + 3$ s = 0m	B1 B1 A1 M1 M1 A1 M1 B1 B1	
		10	