MATHEMATICS PP2, MOCK SERIES 1,

K.C.S.E TOP EXAMINERS' 10 QUESTION PAPERS



MATHEMATICS PP2, MOCK SERIES 1, K.C.S.E TOP EXAMINERS' 10 QP

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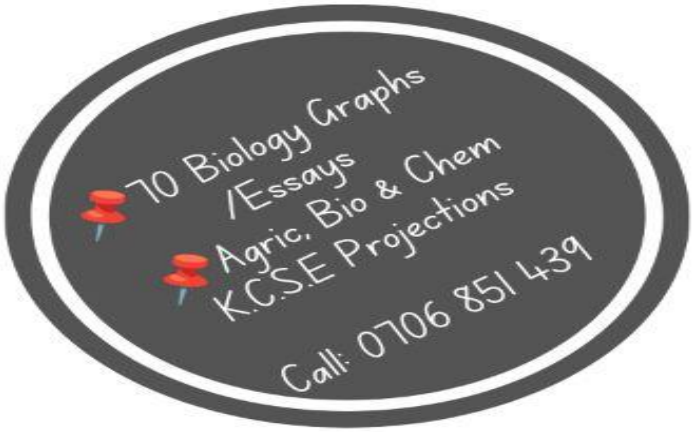



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K.C.S.E TOP EXAMINERS' MOCK SERIES 1

QUESTION PAPER NO: 1

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

SECTION I (50 MARKS)

Answer <u>all</u> questions in this section spaces provided.

1. Using logarithms, evaluate correct to 4d.p. **(4mks)**

$$\left(\frac{25.48 \text{ X } 0.0212}{6.159}\right)^{0.8}$$

2. Solve the equation below.

$7^{2x} - 8 \text{ X } 7^{x} + 7 = 0$ **(3mks)**

3. The expression $1 + x/2$ is taken as an approximation for $\sqrt{1 + x}$. Find the percentage error in doing so if $x = 0.44$. **(3mks)**

4. The initial salary of Mr. Lutta is sh. 42, 000 per annum. His salary increases by 13% each year. Determine his total earnings after 15 years. Give your answer to the nearest thousands. **(3mks)**

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5. Mrs. Musundi bought a television set on hire purchase by paying a down payment of Kshs. 5,000 and monthly installments of Kshs. 1, 250 for 2 years. If the interest rate charged was 12% p.a, what is the carrying charge to the nearest hundreds? **(3mks)**

6. A ball is dropped from the top of a building and its height h, metres above the ground at any time t, seconds is given by $h = 350 + 65t - t^2$.

(i) Find the velocity of the ball when t= 2seconds. **(2mks)**

(ii) State the time when the ball hits the ground. **(2mks)**

7. Atieno is now four times as old as her daughter and six times as old as her son. Twelve years from now, the sum of the ages of her daughter and son will differ from her age by 9 years. What is Atieno's present age? **(3mks)**

8. Solve for θ in the equation $\sin(3\theta + 120)^o = \sqrt{3}$ for $0^o \leq \theta^o \leq 180^o$. **(3mks)**

9. T is a transformation represented by the matrix $\begin{pmatrix} 5x & 2 \\ -3 & x \end{pmatrix}$. Under T, a square of area $10cm^3$ is mapped onto a square of area $110cm^2$ find the value of x. **(3mks)**

10. Make x the subject of the formula**:** $h = \sqrt[3]{\frac{c-x^2}{b}}$ **(3mks)**

11. The following distribution shows the masses to the nearest kilogram of 50 pupils in standard 8.

Mass (Kg)	26-30	31-35	36-40	41-45	46-50	51-55
frequency	4	12	18	11	4	1

Calculate the standard deviation. **(3mks)**

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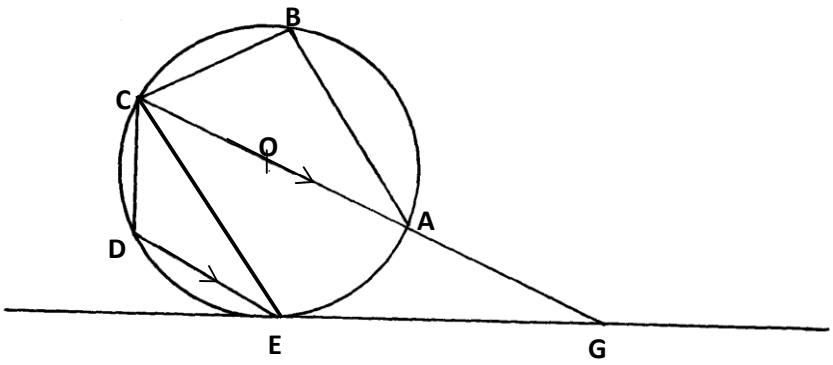
12. The diagram below shows a circle **ABCDE**. The line **FEG** is a tangent to the circle at point E. Line DE is parallel to **CG**, ∠**DEC** = 28° and ∠**AEG** = 32 °.



Calculate:

(a) ∠AEG **(1mk)**

(b) ∠ABC **(1mk)**

13.A two digit number is such that the square of the unit digit is equal to one less than the tens digit and that the unit digit raised to power four and add three times the tens digit is equal to seven. Find the number. **(3mks)**

14.(i) Expand $\left(5+\frac{x}{2}\right)^6$ up to the term in x^3. **(2mks)**

(ii) Use your expansion to estimate the value of $\left(\frac{11}{2}\right)^6$. Correct to one decimal place**.** **(2mks**)

.

15.A line segment joining two points P (0, 7) and S (2, 3.8) is divided externally by point Q in the ratio 7:3. Find the co-ordinates of point Q. **(3mks)**

16.A dam containing $4158m^3$ of water is to be drained. A pump is connected to a pipe of radius 3.5cm and the machine operates for 8 hours per day. Water flows through the pipe at the rate of 1.5m per second. Find the number of days it takes to drain the dam. **(3mks)**

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SECTION II (50 MARKS)

Answer only five questions from this section.

17.(a) (i) Taking the radius of the earth, R= 6370km and $\pi = {}^{22}/_{7}$, calculate the shortest distance between the two cities P(60°N, 29°W) and Q(60°N, 31°E) along the parallel of latitude. **(3mks)**

(ii) If it is 1200hrs at **P**, what is the local time at **Q**. **(3mks)**

(b) An aeroplane flew due south from a point A (60°N, 45°E) to a point B. the distance covered by the aeroplane was 800km. determine the position of B.**(4mks)**

18.(a) Complete the table for y = Sin x + 2cos x. **(2mks)**

(b) Draw the graph of y= sin x + 2 Cos x using a scale of 1cm to represent 30° on x-axis and 2cm to represent 1 unit on y-axis. **(3mks)**

(c) Solve sin x + 2 cos x = 0 using the graph. **(2mks)**

(d) Find the range of valves of x for which $y \leq -0.5$. **(3mks)**

19.(a) Using a ruler and pair of compasses only, construct triangle **ABC** in which **AB**=9cm, **BC**=8.5cm and ∠**BAC**=60°. **(3mks)**

(b) On the same side of **AB** as **C**:

(i) Determine the locus of a point P such that ∠**APB** = 60°. **(3mks)**

(ii) Construct the locus of **R** such that **AR**>4cm. **(2mks)**

(iii) Determine the region **T** such that ∠**ACT** ≥∠**BCT**. **(2mks)**

20.(a) A figure whose co-ordinates are **A**(-2, -2), **B**(-4, -1), **C**(-4, -3) and **D**(-2, -3) undergoes successive transformation ERS; where E, R and S are transformations represented by the matrices, $\mathbf{E}=\begin{pmatrix}-2 & 0\\ 0 & -2\end{pmatrix}$ $\mathbf{S}=\begin{pmatrix}0 & -1\\ -1 & 0\end{pmatrix}$ and $\mathbf{R}=\begin{pmatrix}0 & 1\\ -1 & 0\end{pmatrix}$

On the grid provided, show the figure ABCD and its image under the successive transformations **ERS**. **(6mks)**

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(b) Find the matrix representing the single transformation mapping the image found in (a) above back to the object figure **ABCD**. **(2mks)**

(c) Triangle **PQR** has vertices at **P** (2, 2), **Q** (4, 1) and **R** (6, 4).On the same grid, show the image of triangle **PQR** under a shear with line y = 2 invariant and point **R** (6,4) is mapped onto $\mathbf{R^{I}}$(2,4). **(2mks)**

21. Rates of tax in operation in 2010 are given in the table below:-

K£ p.a	**Rate of tax %**
1-5208	**10**
5209-9744	**25**
9745-14292	**20**
14293-18840	**15**
Over 18840	**30**

(a) Mr. Lukandu pays sh. 5,400 as P.A.Y.E monthly. He was entitled to house allowances of Ksh. 9,000p.m and getting a monthly tax relief of sh. 1093. Calculate his monthly basic salary. **(7mks)**

(b) Mr. Lukandu other deductions per month were;

Co-operative society contribution sh. 2,000

Loan payment sh. 2,500

Calculate his net salary per month. **(3mks)**

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22. The table below shows marks scored by 100 form four students in a mathematics examination.

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
No. of students	2	10	13	17	18	14	10	6	6	4

a) Draw an ogive to represent the above information. **(5mks)**

(b) Using your graph, estimate:

(i) the median **(1mk)**

(ii) the quartile deviation **(3mks)**

(c) If the pass mark is 45%, how many students passed? **(1mk)**

23. The velocity V metres per second of a particle at time, t seconds is given by the equation below: $V = 2t^2 - 4t + 15$.

(a) Complete the table below for values of V and t. **(2mks)**

(b) On the grid below, draw the graph of V against t. **(3mks)**

(c) (i) Using the mid-ordinate rule with seven ordinates, estimate the distance covered by the particle between t=1sec and t=8secs. **(2mks)**

(ii) Determine the exact distance covered by the particle between t=1 sec and t=8sec. **(2mks)**

(iii) Find the percentage error in the distance covered by the particle when the mid-ordinate rule is used. **(1mk)**

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24. A manager wishes to hire two types of machine. He considers the following facts:

	Machine **A**	Machine **B**
Floor space	$2m^3$	$3\ m^3$
No. of men required to operate	4	3

He has a maximum of $24m^2$ of floor space and a maximum of 36 men available. Inaddition he is not allowed to hire more machines of type **B** than of type **A**.

(a) If he hires x machines of type **A** and y machines of type **B**, write down all the inequalities that satisfy the above conditions. **(3mks)**

(b) Represent the inequalities on the grid and shade the unwanted region. **(3mks)**

(c) If the profit from machine A is sh. 4 per hour and that from using B is shs.8 per hour. What number of machine of each type should the manager choose to give the maximum profit? **(4mks)**

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K.C.S.E TOP EXAMINERS' MOCK SERIES 1

QUESTION PAPER NO: 2

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

SECTION I

Answer only five questions from this section.

1.Solve using squares, square roots and reciprocal table giving our answer to 4 decimal places. **(3mks)**

$$\sqrt{\frac{3}{0.3421}} - \frac{1}{1.025} + (0.02425)^2$$

2. A chord AB of length 13cm subtends an Angle of 67 at the circumference of a circle. Find the radius of this circle to 4 significant figures. **(3mks)**

3. Make x the subject of the formular: **(3mks)**

$P = KQ^x - R$

4. A salesman gets a commission of 2% on sales up to sh 100,000. He gets additional commission of 1.5% on sales above this. If he sells good worth sh. 360, 000 and allows a discount of 2%, calculate the amount of commission he received. **(3mks)**

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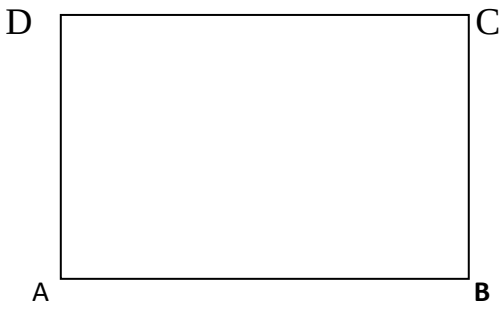
5. A solid metal cylinder with radius 7cm and height 5 cm is melted down and recast into a spherical ball. Calculate to 1 decimal place the surface are of this ball. (3mks)

6. Coffee of grade A costing Ksh. 60 per kg is mixed with Coffee of grade C costing ksh 40 per kg in the ration 1:3. In what ratio should this mixture be mixed with coffee of grade B costing ksh. 50 per kg so as to produce a mixture worth ksh. 47 per kg. (3mks)

7. In the rectangle ABCD below , clearly shade the region within the rectangle defined by locus P which satisfy the following inequalities .



i) APC 4 cm

ii) PD≤ PA

iii) Angle PAD < Angle PAB

8. Find the shortest distance between two towns A (55 N, 80 E) and B (55 80 W) Take radius of the earth to be 6370 km. **(3mks)**

9. In the figure below DA is diameter of a circle ABCD, center O.TCS is the tangent to the circle at C. BA= BC, Find the size of angle BCS **(2mks)**

10. A body start from rest and accelerate to a velocity of 10m/s. it continues with this speed for 15 seconds and then decelerates to rest. The whole journey covered is 800m. find the total time taken for the whole journey. **(3mks)**

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11. The relationship between A and n is thought to be of the form A+ BC. The two variable are graphically presented below, from some experimental data. Use the graph to obtain the values of B and C. **(3mks)**

12. The figure below represents a trapezium with AB parallel to DC, and AB = 5cm, BC= 7 cm DC= 10 cm and AD = 5 cm. Calculate the size of angle ADC **3mks**

13. Find the area of triangle PQR such that the adrea of its image is 12 cm after a transformation given by the matrix $\begin{pmatrix} 2 & 1 \\ 4 & 4 \end{pmatrix}$ (3mks)

14. In Physics lesson, a student measured the diameter of two objects and recorded them as a=20.6 and b= 15.2 cm.

Find the percentage error in working out a+b correct to 4.d.p. **(3mks)**

15. Find the quartile deviation for the following set of data.

16, 42,41,6,20,28,19,23,15 **(3mks)**

16. A bag contains 4 red balls and X green balls.

The probability of picking a red ball is 0.2. Find the total number of balls in the bag**.** **(2mks.)**

SECTION II 50 MARKS

Answer any Five questions from this section.

17. The coordinates of points P and T are (1,-2) and (3,6) respectively. A point Q divides line PT in the ratio 3: -1.

(a) Determine the coordinates of point Q. **(2mks)**

b) Find the gradient of the line perpendicular to PQ **(1mk)**

c) Hence determine the equation of the line perpendicular to PQ and passing through T, in the form Y=mx+c **(2mks)**

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(d) if the Perpendicular line meets y – axis at R. Calculate the distance TR to three significant figures **(3mks)**

(e) Point N is on OQ such that NQ = 3ON. Determine the equation to the line parallel to PQ but passing through point N. **(2mks)**

18. Water flows through a cylindrical pipe of radius 10m at a rate of 2.1 m per second.

a) Calculate the volume of water delivered by the same pipe in 1 minute in liters. **(3mks)**

b) A cylindrical storage tank of height 3m is filled with water from this pipe at the same rate of flow. Water starts flowing into the empty tank at 0630 hours and is full at 1310 hours.. calculate the radius of the storage stank in litres**.** **(5mks)**

c) Four families consume the capacity of this tank in one month. The water costs sh. 4.50 per thousand litres, plus a fixed charge of sh. 222 if they share the bill equally, calculate the amount paid by each family**.** **(2mks)**

19. The table below shows the marks scored by students in a maths test.

Marks	10-9	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of students	3	5	6	21	12	6	4	2	1

a) From the above table determine the 20th percentile**.** **(2mks)**

b) Use the above table to draw the cumulative frequency curve (O give curve). **(4mks)**

i) Using the above graph draw in (b)

Determine the pass mark if 40% of the student passed. **(2mks)**

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ii) If the pass mark was pegged at 65%. How many students passed. **(2mks)**

20. A triangle A (-5,-2) B(-2,-5) and C (-5,-5)

Undergoes a reflection transformation through the line Y= -x.

a) Obtain the coordinates of its image ABC after the above transformation hence show them on the Cartesian plane. **(2mks.)**

b) A B and C in the image of A B and C after another transformation of + 90 turn about the origin.

c) Find the cordinatate of A, B and C hence show them on the cartession plane on the same axes**. (4mks)**

d) Describe fully a transformation that maps A, B, and C onto A, B, and C**. (2mks)**

21. a) The sum of two numbers is 30

Find their maximum product. **(3mks)**

b) A curve is given by the equation Y= $2x - \frac{1}{2}x - 5x$.

Determine the stationery points, hence state their nature. **(5mks)**

c) Sketch the curve. **(2 mks)**

22. The table below shows corresponding measurements of two observed quantities which are believed to obey the law. Y= ax + bx

X	1	2	3	4	5
y					

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a) Copy and complete the table above. **(2mks)**

b) By Using a suitable scale, draw a straight line graph to represent this relationship. **(4mks)**

c) Use your graph to find the equation connecting y and x **(4mks)**

23. Two baskets X and Y contain identical ball except for the colours. Basket X contains 6 red ball and 3 black ball. Basket Y contains 2 red balls and 3 black balls.

a) If a ball is drawn at random from each basket, Find the probability that both balls are of the same colour. **(4mks)**

b) If two balls are drawn at random from each basket, one ball at a time without replacement, find the probability that .

i) The two ball drawn from basket X or basket Y are red**.** **(4mks)**

ii) All the four balls drawn are red. **(2mks)**

24. The figure below shows a triangle OAB in which OA = a and OB = b. The points P and Q are on AB and OB respectively such that AP: PB = 1:2 and OQ: QB = 2:3

a) Express in terms of a and b, the vectors:

i AB

ii AQ

iii OP

(b) Given that AX = m AQ and OX = nOp, where m and n are scalars, write an expression for:

i) OX in terms of a **b** and **n** **(2mks)**

ii) OX in terms of a $\underset{\sim}{b}$ and m **(2mks)**

iii) Solve for the values of m and n **(3mks)**

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K.C.S.E TOP EXAMINERS' MOCK SERIES 1
QUESTION PAPER NO: 3

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

SECTION I (50MARKS)

Answer all questions in this section

1. Give that x= 4 is a root of $x^2+kx-20=0$. Find the value of k and thus other roots**. (4mks)**

2. If θ is an acute angle find the value of Cos θ in the panating: $4 \text{Sin}^2\theta - 5 \text{Cos}\ \theta + 2 = 0$ **(3mks)**

3. Rationalize the following leaving your answer in the simplified surd form.

$$\frac{1+ \text{Tan}120}{1+ \text{Tan}\ 60}$$

4. Find the matrix of transformation that would map triangle ABC with vertices at A(-5,2), B(-3,2) and C(-3,5) onto triangle A1B1C1 with vertices at A1(-5,-2), B1(-3,-2) and C1(-3,-5). **(4mks)**

5. Solve the equation; $\text{Log}\ (x^2-8x+20) = \text{Log}\ 4 + \text{Log}\ (x-4)$ **(3mks)**

6. The below shows the marks obtained by Form 3 students of Rehema Secondary School in Mathematics Exam. The total numbers of students were 100.

Marks %	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79
No. of Students	5	7	10	10	19	20	20	6	2	1

Find the standard deviation of the distribution. (4mks)

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7. Find the expansion of $(1+1/2\ x)^3$ **(1mk)**

Hence use your expansion to obtain the value of $(1.05)^3$. Correct to 4s.f. **(3mks)**

8. Find the distance in kilometers between places R(40oS,25oW) and S(40oS,120oE) along the parallel of latitude(Take radius of the earth to be 6370km and $\pi = 22/7$) correct to 2 d.p.

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 a sh. 120, a profit of 25% is realized. **(3mks)**

10. Find the exact area enclosed by the curve y=3x2,the x-axis and the line x=2 and x=4. **(3mks)**

11. The equation of a circle is x2+y2-25y=-14x+38. Determine the centre and the radius of the circle. **(3mks)**

12. The figure below represents a cuboid in which AB=6cm, BC=8cm and CF=4cm.

(a) Name the projection of line AE in the vertical plane EFCD. **(1mk)**

(b) Hence calculate the size of the angle between line AE and the plane EFCD correct to 2 d.p. **(2mks)**

13. In the figure below, O is the centre of the circle and OD bisects angle EDF. Given that angle DFO=50°. Find angle DEF. **(2mks)**

14. The displacement 3 metres of a particle from a fixed point O after time t seconds is given by $S = 4t^3\ 3t^2+2$. find its velocity when t = 25 **(3mks)**

15. The sum of the first 14 of an AP is 595. Given that the sum of the first 8 terms of the same AP is 220

Find the (i) the first term **(2mks)**

(ii) The common difference. (1mk)

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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 **(2mks)**

(ii) the value of R when Q = 10 and P = 800 **(2mks)**

(iii) SECTION B (55 MARKS)

Answer <u>all</u> any five questions in this section

17. (a) Complete the table below giving the values to 2 decimal places.

X^o	0	30	60	90	120	50	180	210	240
Sin x	0		0.87	1			0	-0.5	-0.87
Sin (x+30)	0			1.73	1	0	-1		-2
X^o	270	300	300	360					
Sin x	-1		-0.5						
2 sin (x +30)	-1.73			1					

(b) On the same axis plot the graph of y sin x and y 2 sin (x +30) for the domain $0 \leq x \leq 360^o$. Take a scale of 1 cm to represent 60° on the x –axis, and 1 cm to represent 0.25 units on the y axis. (4mks)

(c) Use your graph to solve the equations 2 sin (x +30) - sin x =0 **(2mks)**

(d) State the amplitude and period of the curve for the curve y = sin x

18. Mr. Korir bought a tractor valued at Ksh. 800,00. the value of the tractor is depreciating at 20% p.a

(a) Calculate the value of the tractor after 4 years. **(3mks)**

(b) Find the time it would take for its value to be Ksh. 400,000. give you're answer correct to 2 decimal places. **(5mks)**

(c) If after 4 years the tractor is sold through a broker who charge 5% commission find the amount received by Mr. Korir from the sale **(2mks)**

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19.(a)Construct a parallelogram PQRS in which PQ = 8 cm and PS = 4cm and angle QPS = 60°

(b) Measure the length of PR **(1mk)**

(c) show the locus of a point T which moves so that it is equidistant from P and R. **(1mk)**

(d) The locus of a point V which moves so that angle QVS = 90° **(2mks)**

(e) The position of a point X so that PX ≥ Xr and QXS = 90°

20. The relationship between two variables S and T is given by the equation $S = KT^n$ where K and n are constants.

T	2	3	4	5	6	7
S	12.8	28.8	51.2	80.0	115.2	156.8

(a) Write down the linear equation relating to S and T **(1mk)**

(b) Hence complete the table above for the linera equation relating to S and T. **(4mks)**

(c) Draw a suitable straight line graph to represent the data. **(2mks)**

(d) use your graph to determine the values of K and n. **(2mks)**

(e) find the value of S when T = 3.5 **(1mk)**

21. The diagram shows triangle OBC in which CN: NB = 1: 2. OS:SN= 3:2 and M is the midpoint of OC

(a) Given that OB = b and OC=c, express the following vectors in terms of b and C

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

(ii)ON **(2mks)**

(iii) BS **(2mks)**

(i)show the points B,S and M are collinear. **(3mks)**

(ii) hence determine the radio MS: SB **(2mks)**

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22. The transformation M1 and M2 are given by the matrices.

$$\begin{pmatrix} 2 & 0 \\ -1 & 0 \end{pmatrix} M_1 = \quad \text{and} \quad M1 \begin{pmatrix} -1 & 2 \\ 0 & 2 \end{pmatrix}$$

(i) Find the co-ordinates of ABC of A(2,2)B (1,5) and C (0,1) under combined transformation $M_1 M_2$

(ii) Plot the triangles ABC and ABC on the grid triangle ABC onto triangle ABC **(2mks)**

(iv)find the inverse of t. (2mks)

(v) Find the co-ordinates of triangle ABC under transformation M_1 **(2mks)**

23. The curve y 3x2 = 6x + 6 passes through the point s (2,3)

(a) Determine the gradient function of the curve. (**1mk)**

(b) Find the co-ordinates of the turning point of the curve. **(2mks)**

(c) Determine whether the point is a minima or a maxima. **(2mks)**

(d) Find the equation of the

(i) Tangent to the curve at S. **(2mks)**

(ii) Normal to the curve at S. **(3mks)**

24. A bag contains 5 red 6 blue and 3 green marble of similar shape and size. A marble is picked at random with out replacement and the colour noted A second marble is the picked.

(i) Draw a tree diagram to represent the information above. **(3mks)**

Hence find the probability that

(ii) The first two marbles are both Red. **(1mk)**

(iii) Only one of the first two marbles picked is blue. **(3mks)**

(iv) At least one of the first two marbles picked is given. **(3mks)**

(v) the first picked is either green or blue. **(1mk)**

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K.C.S.E TOP EXAMINERS' MOCK SERIES 1
QUESTION PAPER NO: 4

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

SECTION I (50Marks)

Answer all questions in this section

1. A form four mathematics teacher originally worked out the mean mark of her fourty students to be fourty one. After correction of the quiz. She added some marks to Timina, Chobola and Cheloti in the ration of 5:2:3 respectively. If the new mean marks for the students increased by 1.5 determine how many marks Cheloti was added than Chobola. **(3mks)**

2. Simplify completely. $\dfrac{2x^2+x-3}{4x^2-9}$ (3mks)

3. Use logarithms to evaluate $\dfrac{2347\ x0.4666^{\,2}}{\sqrt[3]{0.0924}}$ **(4mks)**

4. In 100m race there are three main competitors namely Simiyu, Ondiek and Kamau. Simiyu is three times likely to win as Ondiek, while Ondiek is twice as likely to win as Kamau. Find the probability that

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a) Ondiek wins the race **(2mks)**

b) Either Simiyu or Kamau **(1mk)**

5. PQR is an equilateral triangle of sides 3cm. S is a variable point on the same side of PQ as R and on the same plane such that <PSQ=30^0. Locate by construction the possible location of S (use a ruler and a pair of compasses only) **(3mks)**

6. A point P divides AB in the ratio 7: -5 where A (2,-3, 4) and B (-4, 7,-2). Find the coordinates of P. **(2mks)**

7. Make Q the subject of the formula

$$T = P\sqrt{\frac{Q^2}{Q^2 - 1}}$$ **(3mks)**

8. The 2nd, 4th and 7th terms of an AP are the first 3 consecutive terms of a GP. If the common difference of the AP is 2 ,find

a) The common ratio **(2mks)**

b) The sum of the first eight terms of the G.P**.** **(3mks)**

9. Given that $Tan75^0 = 2+\sqrt{3}$, hence determine Tan 15^0 leaving your answer in the form $a+b\sqrt{c}$ **(3mks)**

10. a) Find the expansion in ascending powers of x of $(1-x)^7$ up to the term in x^2 (1mk)

b) Hence evaluate $(0.99)^7$ to four significant figures. **(2mks)**

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11. A field is 10m longer than its width. The area is 7200m^2. What is the width? **(4mks)**

12. The matrix $\begin{pmatrix} & \\ 0 & x-1 \end{pmatrix}$ is a singular matrix, find the values of x **(3mks)**

13. Water flows from a tap of diameter 7cm at a speed of 5m/s into a rectangular tank of length 5.5m by 3m and height 4.2m. If the tank was initially half full at 6.00pm.Find at what time the tank was full if no water was running out of the tank**.** **(3mks)**

14. Solve the equation for $0^0 \leq \theta \leq 360^0$. $10Cos^2\theta + Sin\theta = -1$ **(3mks)**

15. The overall grade (A) attained by a student is directly proportional to the teacher's effort (t), square of students effort (s) and the general discipline level (d) of the school. A student doubled his effort; teacher went further by 5% but the school discipline dropped by 40%. Find the percentage change in the overall grade. **(3mks)**

16. Find the gradient of $y = x^2 - 3x$ at x=1 (2mks)

SECTION II 50 Marks

Answer ONLY five questions in this section.

17. The table below shows income Tax rates

MONTHLY TAXBLE PAY IN KSH	RATE OFTAX KSH PER K
17,401-34,600	3
34,601-51,800	4
51,801- 69,000	5
69,001 and above	6

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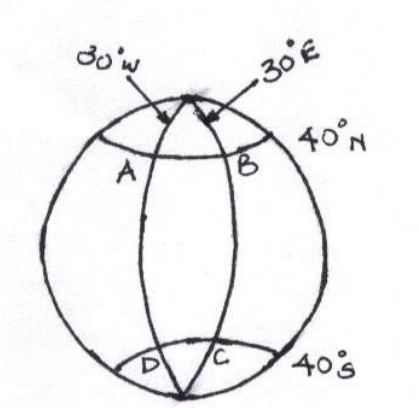
Faith earns a monthly basic salary of Ksh 45,000 and she is also given taxable allowances amounting to Ksh 20480 per month.

a) Calculate Faiths' gross income tax per month. **(4mks)**

b) Faith is entitled to a personal tax relief of Ksh 1162. Determine her net income per month. **(2mks)**

c) Faith received 50% increase in her total income; calculate the corresponding percentage increase on the net income tax. **(4mks)**

18. The figure below shows points on the earth's surface.



a) State the positions of A, B, C and D in coordinate form**.** **(2mks)**

b) An aircraft flies from A to B along latitude 40^0N, B to C. along longitude 30^0E, C to D along latitude 40^0S. Calculate to 4 S.f the total distance it covered .(Take radius of the earth =6371km) **(5mks)**

c) If the aircraft leaves A at 8.00am at a speed of 720km/h to B. At what local time is it expected at B**?** **(3mks)**

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19. The table below shows the marks scored by eighty Form 4 students in a mathematics test.

Marks	10≤x20	20≤x<30	30≤x<40	40≤x<50	50≤x60	60≤x<70	70≤x<80	80≤x<90
Frequency	2	5	9	17	22	15	8	2

a) Calculate

i) Mean mark. **(3mks)**

ii) Lower quartile **(2mks)**

b) On the grid provided draw the cumulative frequency curve to represent the above distribution. **(3mks)**

GRID

c) From the graph estimate the

i) 4th decile **(1mk)**

ii) Range of marks of the middle 70% of the students. **(1mk)**

20. a) Complete the table below giving your values correct to 2 decimal places.

x	0^0	15	30	45	60	75	90	105	120	135	150	165	180
3x-30	-30	15	60	75	150	240	285	330	375	420			
Sin x													
2Sin (3x-30)													

b) Plot on the same axes the graph of y=Sin x and y= 2 sin (3x- 30) 2cm rep 150 on x-axis and 2cm to rep 0.5 unit y-axis. (5mks)

GRID

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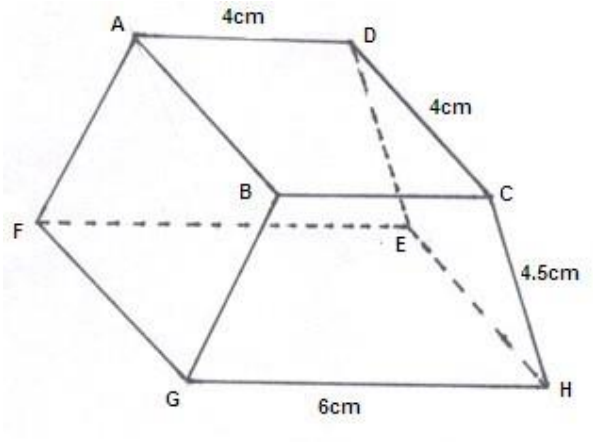
c) Describe the transformation that maps y=Sin x onto y=2Sin (3x-30) **(2mks)**

d) Use the graph of y= 2Sin (3x-30) to solve the equation 2 sin (3x-30)= -0.5 **(1mk)**

21. The figure below shows a solid of pyramid with a square top of side 4cm and a square base of side 6cm. The slant edge of the frustrum is 4.5cm.



a) Calculate the volume of the frustrum. **(6mks)**

b) Calculate the angle between

i) Line AF and the base FGHE **(2mks)**

ii) Plane BCHG and base EFGH**.** **(2mks)**

22. In a Chemistry form 4 class $\frac{1}{3}$ of the class are girls and the rest are boys, $\frac{4}{5}$ of the boys and $\frac{9}{10}$ of the girls are right handed while the rest are left handed. The probability that a right – handed student breaks a conical flask in any practical session is $\frac{3}{10}$ and the corresponding probability for a left handed student is $\frac{4}{10}$. The probabilities are independent of the students' sex.

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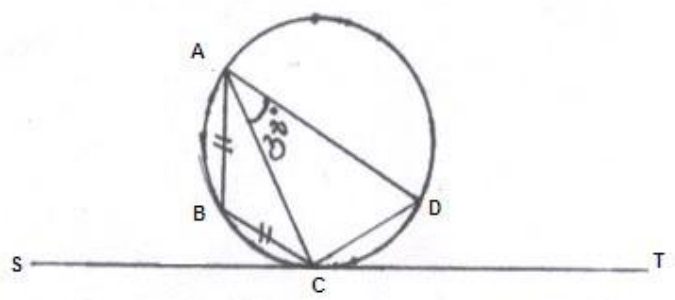
a) Represent the above information on a tree diagram . **(2mks)**

b) Determine the probability that a student chosen at random from the class is left handed and does not break a conical flask in simplest form**.** **(2mks)**

c) Determine the probability that the flask is broken in any Chemistry practical session in simplest form**.** **(3mks)**

d) Determine the probability that a conical flask is not broken by a right handed student in simplest form. **(3mks)**

23. In the diagram TCS is a tangent and DA is a diameter ,AB=BC and <DAC=38^0



Find

a) <TCD **(1mk)**

b) < ACS **(2mks)**

c) <BCA **(2mks)**

d) <BCS **(1mk)**

The radius of the circle is 10cm

e) Find CA **(2mks)**

f) Find BC **(2mks)**

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24. Kibabii university has two types of buses a big bus type X with a capacity of 52 passengers and a minibus type Y with a capacity of 28 passengers. Bungoma high school wishes to take 364 students for a tour. They have to use at most 10 buses. The high school should use at least each type of buses.

a) Form all the possible inequalities which will represent the above information. **(3mks)**

b) On the grid provided draw the inequalities and shade the unwanted region. **(3mks)**

GRID

c) The charges for hiring the vehicles are

Type x Ksh25, 000

Type y Ksh 20,000

Use your graph to determine the number of buses of each type that should be hired to maximize the income of kibabii university**.** **(2mks)**

Determine the maximum income. **(2mks)**

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K.C.S.E TOP EXAMINERS' MOCK SERIES 1
QUESTION PAPER NO: 5

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

SECTION I: (50 MARKS)

Answer all the question in this section in the spaces provided:

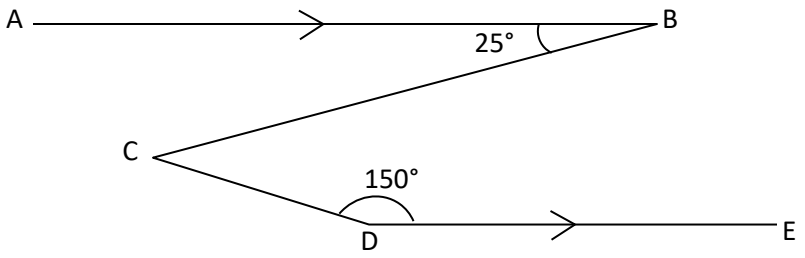
1. Using logarithm tables only, evaluate

$$\sqrt[3]{\frac{849.6 \times 2.41}{3941}}$$

(4 marks)

2. Given that AB is parallel to DE. Calculate ∠BCD.

(3 marks)



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3. Simplify $(1+\sqrt{3})(1-\sqrt{3})$ and hence evaluate $\frac{1}{1+\sqrt{3}}$ to 3 significant figures given $\sqrt{3} = 1.7321$. **(3 marks)**

4. If (M + n) : (M – n) = 8: 3. Find the ratio M: n. **(3 marks)**

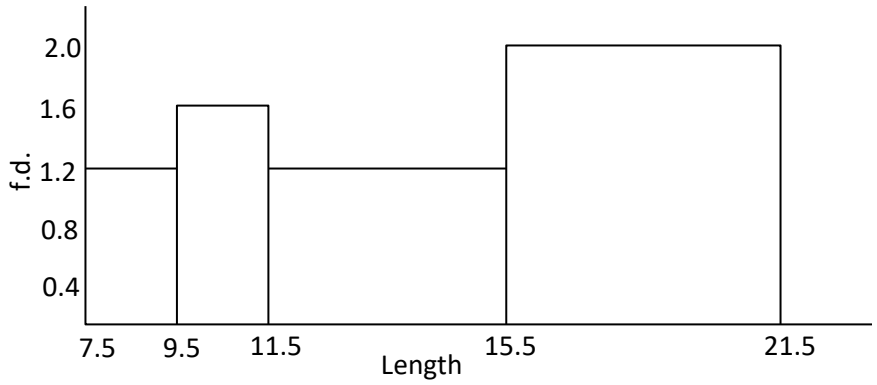
5. Evaluate without using a Mathematical table or a calculator.

$Log_6\ 216 + [Log\ 42 - Log\ 6] \div Log\ 49$ **(2 marks)**

6. Make q the subject of the formula:

$P = \sqrt[3]{\frac{nq-m}{q}}$ **(3 marks)**

7. The figure **below** shows a histogram



Use the histogram to complete the table **below**.

ζcm	Class width	Frequency density	Frequency
< 9.5		1.2	24
< 11.5			
< 15.5			
< 21.5			

(3 marks)

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8. If A = 2.3, B = 8.7 and C = 2.0 find the % error in $\frac{A+B}{C}$. **(3 marks)**

9. Simplify:

$$\frac{2\chi^2 + \chi - 6}{\chi^2 - 4} + \frac{1}{\chi - 2}$$ **(4 marks)**

10. Obtain the binomial expansion of $(1 - 2\chi)^5$ and use your expansion to evaluate $[0.98]^5$ correct to 5d.p. (3 marks)

11. After being given a discount of sh.5 on every book I bought, I was able to buy 2 more books than before I was given the discount with sh.200. What was the price of one book before the discount? **(4 marks)**

12. Find the centre and radius of a circle with equation:

$\chi^2 + y^2 - 6\chi + 8y - 11 = 0$ **(3 marks)**

13. A car was valued at Ksh.3000000 in January. Each year its value decreased by 12% of its value at the beginning of the year. Find the value of the car in January 2004 giving your answer correct to 4s.f. **(3 marks)**

14. Two similar containers have capacities of 1000 litres and 1728 litres respectively. If it costs Ksh.750 to paint the outside surface of the smaller container, how much will it cost to paint the outside of the larger container. **(3 marks)**

15. A point (-5, 4) is mapped onto (-1, -1) by a translation T. Find the image of (-4, 5) under the same translation. **(2 marks)**

16. The gradient of the curve $y = a\chi^2 + b\chi$ at the origin is equal to 8. Find the value of a and b if the curve has a maximum turning point at $\chi = 4$. **(3 marks)**

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SECTION II: (50 MARKS)

Attempt **ONLY FIVE** questions from this section.

17. A plane S flies from a point P(40°N, 45°W) to a point Q(35°N, 45°W) and then onto a point T((35°N, 135°E).

(a) Given that the radius of the earth is 6370km, find the distance from P to Q in km. **(2 marks)**

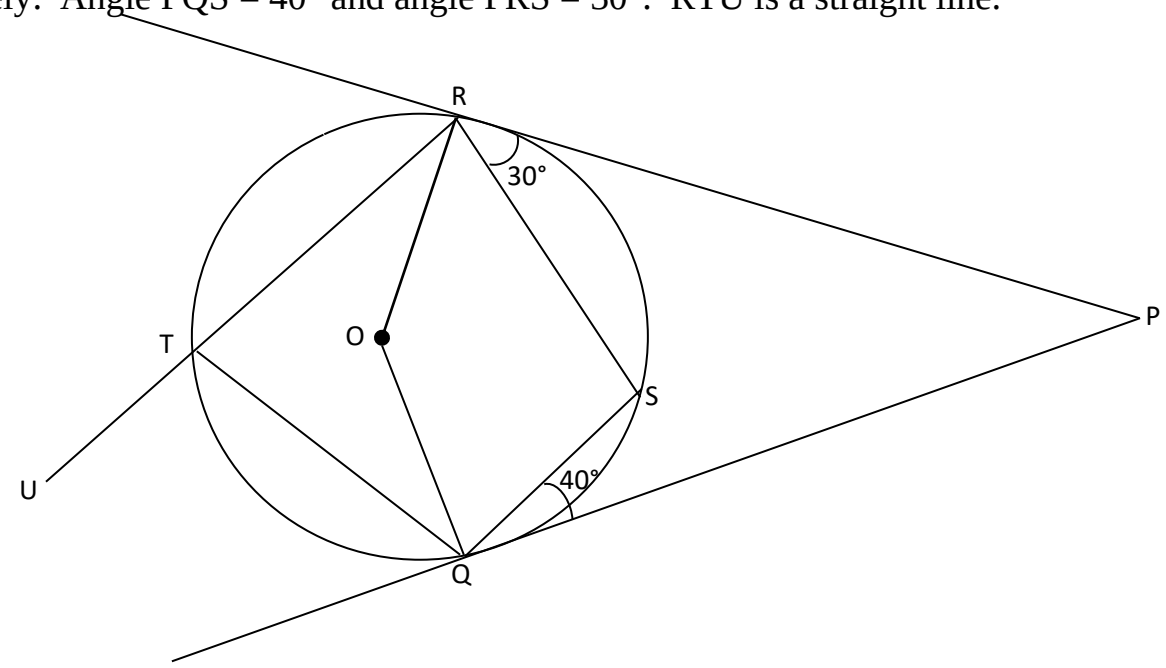
(b) Find in nm;

(i) the shortest distance between Q and T. **(2 marks)**

(ii) the longest distance between Q and T (to the nearest tens). **(2 marks)**

(c) Find the difference in time taken when S flies along the shortest and longest routes if its speed is 420 knots. **(4 marks)**

18. In the figure **below**, O is the centre of the circle. PQ and PR are tangents to the circle at P and R respectively. Angle PQS = 40° and angle PRS = 30°. RTU is a straight line.



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Find giving reasons the angles

(i) QRS. (2 marks)

(ii) RTQ. (2 marks)

(iii) RPQ. (2 marks)

(iv) Reflex angle QOR. (2 marks)

(v) TRO given that TR = TQ. (2 marks)

19. The data **below** shows the masses in grams of 50 potatoes.

Mass (g)	25 - 34	35 - 44	45 - 54	55 - 64	65 - 74	75 - 84	85 - 94
No. of potatoes	3	6	16	12	8	4	1

(a) On the grid provided draw a cumulative frequency curve for the data. (4 marks

(PROVIDE A GRAPH PAPER)

(b) Use the graph in (a) above to determine:

(i) The 60th percentile mass. **(2 marks)**

(ii) Percentage of potatoes whose masses lie in the range 53g to 68g. **(3 marks)**

(iii) Median mass. **(1 mark)**

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

(a) Find the inverse of P. **(2 marks)**

(b) Two Schools Theri and Kimathi purchased beans at sh.B per bag and maize at sh.M per bag. Theri purchased 8 bags of beans and 14 bags of maize for sh.47,600. Kimathi purchased 10 bags of beans and 16 bags of maize for sh.57,400.

(i)Form a matrix equation to represent the information above. **(2 marks)**

(ii) Use the inverse matrix of P to find the prices of one bag of each item. **(4 marks)**

(c) The price of beans later went up by 5% and that of maize remained constant. Theri bought the same quantity of beans but spent the same total amount of money as before as before on the two items. State the new ratio of beans to maize. **(2 marks)**

21. 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 it is 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 marks)**

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

(i) Karanja will not be bitten by a rabid dog. **(2 marks)**

(ii) He will get rabies. **(2 marks)**

(iii) He will not get rabies. **(3 marks)**

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22. In an examination consisting of two papers A and B both marked out of 100, a candidate is given χ marks in Paper A and y marks in Paper B. A pass mark is obtained if $\chi + 2y$ is at least 150 but candidates must score over 30 marks in Paper A and 40 marks in Paper B.

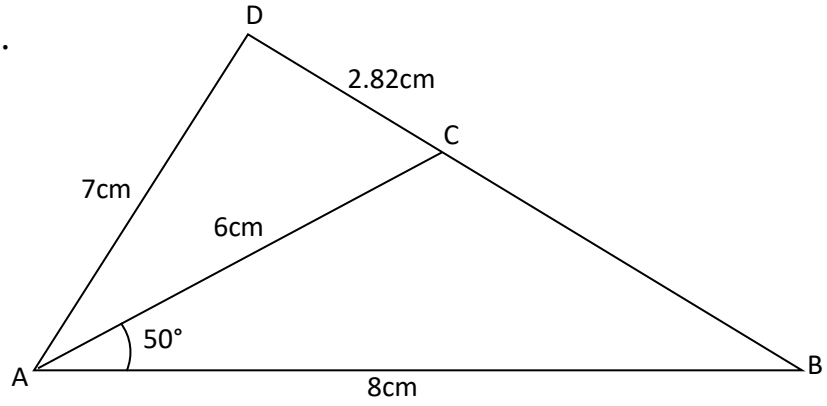
(a) Form the inequalities to represent the conditions above. **(3 marks)**

(b) Represent these inequalities graphically. **(4 marks)**

(PROVIDE A GRAPH PAPER)

(c) Find the lowest values of $\chi + y$ for any candidate who passes and give the corresponding values of χ and y. **(3 marks)**

23. In the figure **below** (not drawn to scale) AB = 8cm, AC = 6cm, AD = 7cm, CD = 2.82cm and angle CAB = 50°.



Calculate (to 2d.p.)

(a) the length BC. **(3 marks)**

(b) the size of angle ABC. **(3 marks)**

(c) size of angle CAD. **(3 marks)**

(d) Calculate the area of triangle ACD. **(2 marks)**

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24.(a) Three variables P, R and S are such that P varies directly as R and inversely as cube of S.

When R = 10, S = 2 and P = 2.5, find R when P = 15 and S = 5. **(3 marks)**

(b) Two variables P and L are such that P varies partly as L and partly varies as the square root of L. Determine the relationship between P and L given that L = 16 when P = 500 and L = 25 when P = 800. **(4 marks)**

(c) R varies as the square of S. If S is increased by 10%, find the ratio of the new value of R to the original R. **(3 marks)**

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K.C.S.E TOP EXAMINERS' MOCK SERIES 1
QUESTION PAPER NO: 6

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

SECTION 1: (50 MARKS)

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

1. Work out the following: **(3mks)**

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

2. Find all the integral values of x which satisfy the inequalities. **(4mks)**

$$3(3-x) < 5x - 9 < 2x + 8$$

3. Given that log 3 = 1.583 and log 5 = 2.322. Without using tables or calculators, evaluate:

(a) log 135 **(2mks)**

(b) log 5.4 **(2mks)**

4. The first and the last terms of an arithmetic progression is -5 and 270 respectively.

(a) Find the number of terms; if the common difference is 2.75. **(2mks)**

(b) How many terms will be able to give the same last term, if the common difference is 5. **(2mks)**

5. Two towns ELVIRA and MAKITU are such that their local times differ by 3 hours. If ELVIRA is on 20^0W, 10^0N, find two possible positions of MAKITU town. **(3mks)**

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6. Mr. Bett wants to buy a flat screen TV set on hire purchase. The cash price is sh. 28,000. He can pay the cash Price or make a down payment of sh. 8,000 and 15 monthly installments of sh. 2000 each. Calculate the rate of interest charged per month. **(3mks)**

7. Solve for x if $O \leq X \leq 2\pi^c$ in: **(3mks)**

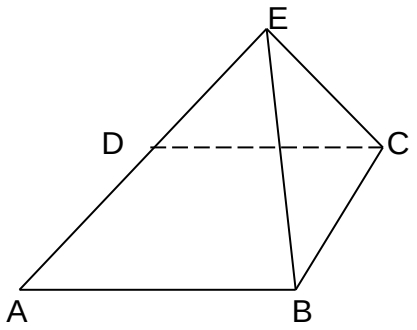
$2 \sin (x - {}^{\pi}/_{6})^c = -\sqrt{3}$

8. If $\underset{\sim}{a} = -i + 3j$, $\underset{\sim}{b} = i + 6j$ and $\underset{\sim}{c} = 5i + 12j$. Show that the points are collinear. **(3mks)**

9. Expand and simplify the binomial $(x + {}^{1}/_{x})^6$ up to the constant term. Hence use your expansion to find the value of $(2½)^6$ **(3mks)**

10. Find the co-ordinates of a point at which the gradient of the curve $y = x^2 - 3x + 3$ is seven. **(2mks)**

11. A solid has a base in the shape of a rhombus whose diagonals AC and BD are 32cm and 24cm respectively. The height CE which is perpendicular to AC, BC and DC is 24cm.



Calculate: the angles between the planes EBD and ABCD. **(2mks)**

12. The capacity of milk in Kapsabet Dairies is given to the nearest 10ml. Find the relative error in $\frac{a + b}{c - d}$, given that a = 77ml, b = 23ml, c = 36ml and d = 16ml. **(3mks)**

13. Mr. Kogo bought 5 physics books and 6 mathematical books for a total of Kshs. 2440. Mr. Ali bought 7 physics books and 9 mathematics books for a total of Ksh. 3560.

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

(ii) Use matrix method to find the price of a physics book and that of a mathematics book**.(3mks)**

14. A poultry farmer in Lelmokwo vaccinated 540 of his 720 chicken against a disease. Two months later 5% of the vaccinated and 80% of the unvaccinated chicken contracted the disease. Calculate the probability that the chicken chosen at random contracted the disease**.(3mks)**

15. How much water must be added to 36 litres of a liquid containing 65% alcohol to obtain a liquid containing 45% alcohol? **(3mks)**

16. Nelly drew a square ABCD of sides 5cm accurately. While refilling her pen, a drop of ink (I) landed inside the square ABCD.Given that IA $\leq$ 5cm, IA $\geq$ IC and the area of triangle DCI > 10cm2. Locate by construction the region I. **(4mks)**

SECTION II (50 MARKS)

Answer any five questions in this section

17. A triangle ABC has the verticals A(-5, -2), B(-3, -2) and C(-5,-5). The triangle is rotated through a positive quarter turn about the origin to obtain the image A'B'C'. The triangle A'B'C' is then reflected on the line y+x = 0 to get triangle A''B''C''.

(a) On the grid provided, plot triangles ABC, A'B'C' and A''B''C''. **(4mks)**

(b) Describe a single transformation that maps ABC onto A''B''C'' and the matrix of transformation. **(3mks)**

(c) Find the co-ordinates of the image of ABC under a stretch, scale factor 2 parallel to the x-axis and y-axis invariant. **(3mks)**

18. The table below shows the analysis of examination marks scored by 160 candidates.

Marks (%)	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
No. of candidates	2	6	15	22	36	34	20	15	6	4

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(a) Draw a cumulative frequency curve for the data. **(4mks)**

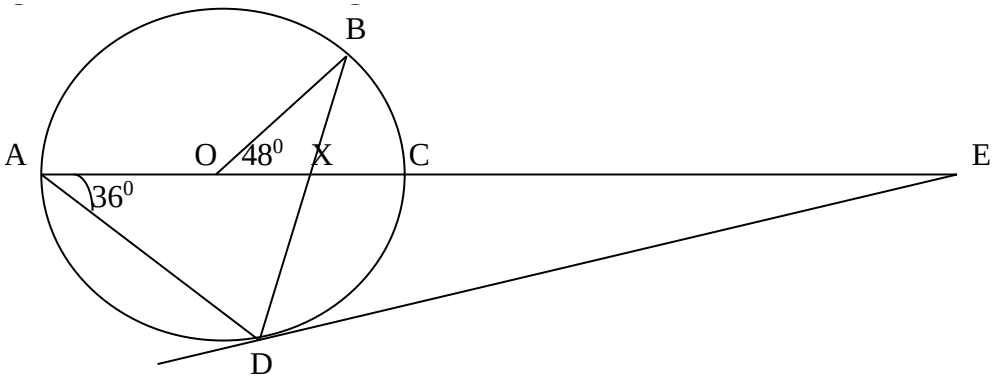
(b) State the modal class. **(1mk)**

(c) Use the graph to estimate:

(i) The quartile deviation. **(3 Marks)**

(ii) How many candidates passed if a mark of 35% and above was a pass? **(2mks)**

19. In the figure below, O is the centre of the circle. A, B, C and D are points on the circumference of the circle. A; O, X and C are points on a straight line. DE is a tangent to the circle at D. Angle BOC = 48^0 and CAD = 36^0.



(a) Giving reasons in each case, find the value of the following angles:

(i) Angle CBA. **(2mks)**

(ii) Angle BDE **(2mks)**

(iii) Angle CED **(2mks)**

(b) It is also given that AX = 12cm, XC = 4cm and DB = 14cm and DE = 15cm.

Calculate

(i) DX **(2mks)**

(ii) AE **(2mks)**

20. (a) Complete the table below for y = sin2x and y = sin $(2x+30^0)$ giving values to 2dp.

x	0	15	30	45	60	75	90	105	120	135	150	165	180
Sin 2x	0				0.87				-0.87				0.0
$\sin(2x+30^0)$	0.5				0.50				-1.0				0.5

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(b) Draw the graph of $y = 2x$ and $y = (2x+30^0)$ on the same axis. **(4mks)**

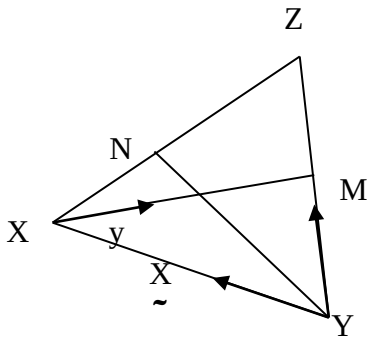
(c) Use your graph to solve $\sin(2x+30^0) - \sin 2x = 0$. **(1mk)**

(d) Describe the transformation which maps the wave sin 2x onto the wave of sin (2x + 30).

(2mks)

(e) State the amplitude and period of $y = a \cos (bx + c)$. **(2mks)**

21. In the triangle XYZ, M is the midpoint of the side YZ and L is the midpoint of XM. The line YL produced meets XZ at N. Given that $\overrightarrow{YX} = x$ and $\overrightarrow{XL} = y$.



(a) Express YM in terms of x and y. **(2mks)**

(b) Given that $\overrightarrow{YN} = q\overrightarrow{YL}$ and $\overrightarrow{XN} = r\overrightarrow{XZ}$. Use vector equation $\overrightarrow{YN} = \overrightarrow{YX} + \overrightarrow{XN}$ to find the value of q and r. **(6mks)**

(c) From (b) above, state the ratio in which:

(i) N divides line YL **(1mk)**

(ii) N divides XZ **(1mk)**

22.(a) The length of two shorter sides of a right angled triangle are (x+1)cm and (3x- 2)cm. While the length of the hypotenuse is (2x+1)cm. Form a quadratic equation that can be used to solve for x in the triangle. **(2mks)**

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(b) Complete the table below, for the function $y = 3x^2 - 7x + 2$. **(2mks)**

(c) On the grid provided below, draw the graph of the function $y = 3x^2 - 7x +$ for $-1 \leq x \leq 3$ and use the graph to estimate the value of x in (a) above. **(4mks)**

(d) Use your graph above to solve the equation $O = 6x^2 - 16x + 5$ **(2mks)**

23. Three warships X, Y and Z are at the ocean such that ship Y is 500km on a bearing of 030^0 FROM SHIP x. Ship Z is 750km from ship Y and on a bearing of 140^0 from X. An enemy ship S is sighted 900km due East of ship Y. Calculate:

(a) The bearing of Z from Y. **(3mks)**

(b) The distance of X from Z. **(2mks)**

(c) The distance S from Z. **(3mks)**

(d) The shortest distance from X to the direct route between Y and Z. **(2mks)**

24. A particle moving in a straight line passes a fixed point O on the line with velocity 7m/s the acceleration $9m/s^2$ of a particle t seconds after passing O is given by the equation $a = 4 - 6t$. Calculate:

(a) The velocity of particle 2 seconds after passing O. **(4mks)**

(b) The time taken to reach the maximum distance from O in the direction of the initial motion. **(3mks)**

(c) The value of the maximum distance. **(3mks)**

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K.C.S.E TOP EXAMINERS' MOCK SERIES 1
QUESTION PAPER NO: 7

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

SECTION I: (50 MARKS)

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

1. Simplify: $\dfrac{2\frac{1}{4}-1\frac{2}{3}}{\frac{1}{6}-\left(\frac{-1}{3}\right)^2}-\frac{5}{8}\ of\ 3$. **(4 marks)**

2. (a) Expand $(2+\chi)^4$. **(1 mark)**

(b) Use the expansion in (a) above to. Find the value $(2.01)^4$ to 4d.p.

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

$\text{Log}_{10}(3y+2)-1=\text{Log}_{10}(y-4)$.

4. Make P the subject of the formula. **(3 marks)**

$$\mathbf{E}+\chi=\chi+\sqrt{\frac{P-3u}{y-3\chi P}}\ .$$

5. Points P, Q and R are points on the circumference of a circle. If PQ = PR = 13cm

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and QR = 10cm, what is the radius of the circle. **(3 marks)**

6. Find the radius and the centre of the circle whose equation is: **(3 marks)**

$$3\chi^2 + 3y^2 - 6\chi + 12y + 3 = 0.$$

7. Find C that divide AB externally in the ratio 5: 2, given that

A (3, -6, 9) and B (-15, 3, 12). **(3 marks)**

8. A two digit number is formed from the first four prime numbers.

(a) Draw the table to show the possible out comes. **(2 marks)**

(b) Calculate the probability that a number chosen from the two digits is even number. **(2 marks)**

9. A dam containing 4158m³ of water is to be drained. A pump is connected to a pipe of radius 3.5cm and machine operate for 8 hours per day. Water flows through the pipe at the rate of 1.5m per second. Find the number of days it takes to drain the dam.

(4 marks)

10. The population of two town Kana and Jane for three years were as follows:

Kana	40,000,	48000,	56000
Jane	40,000,	48000,	57600

Calculate the difference in population of the two after six years.

11. The gradient of a curve at any point given by $2\chi - 1$. Given that the curve passes through point (1, 5). Find the equation of the curve. **(3 marks)**

12. Simplify: $\frac{3}{\sqrt{7}-\sqrt{2}} - \frac{2}{\sqrt{7}+\sqrt{2}}$. **(3 marks)**

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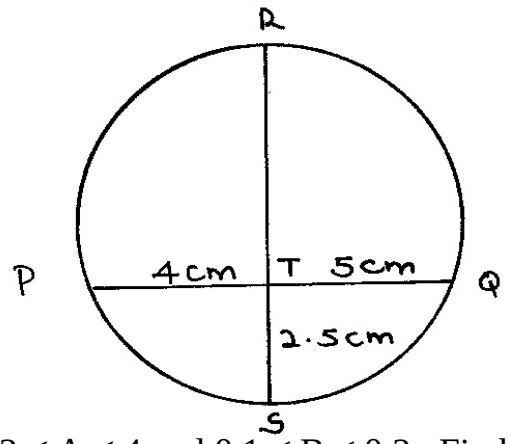
13. Given that AB = 6cm construct locus of P such that angle ∠APB = 90. **(2 marks)**

14. A car valued at Ksh.500,000 in January 2008. Each year, it value depreciates at 12%p.a. Find after how long would the value depreciate to Ksh.250,000. **(3 marks)**

15. In below figure PT = 4cm and TQ = 5cm and TS = 2.5cm find TR by calculation.

(2 marks)



16. Given that $2 \leq A \leq 4$ and $0.1 \leq B \leq 0.2$. Find the minimum value of $\frac{AB}{A-B}$. **(3 marks)**

SECTION B: (50 MARKS)

Answer any FIVE questions from this section in the spaces provided.

17. Two towns A and B lie on the same parallel of latitudes 60°N. If the longitudes of A and B are 42°W and 29°E respectively.

(a) Find the distance between A and B in nautical miles along the parallel of latitude. **(2 marks)**

(b) Find the local time at A if at B is 1.00pm. **(2 marks)**

(c) Find the distance between A and B in km. $\left(Take\ \pi = \frac{22}{7}\ and\ R = 6370km\right)$. **(2 marks)**

(d) If C is another town due South of A and 10010km away from A, Find the co-ordinate of C. **(4 marks)**

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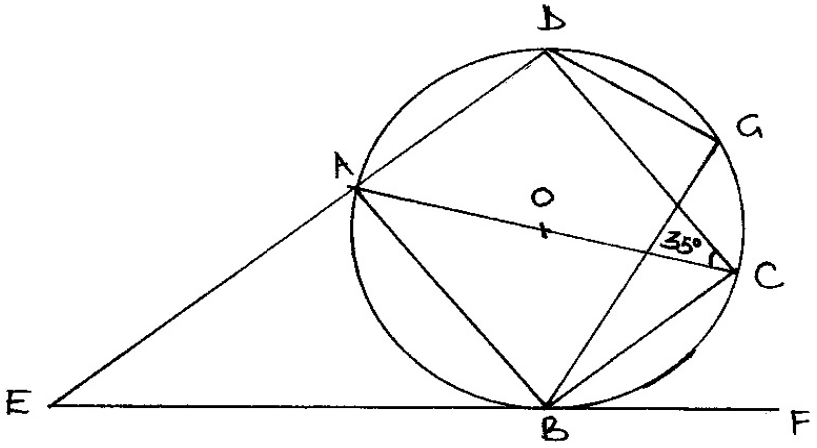
18. In the figure below AOC is a diameter of the circle centre O. AB = BC and ∠ACD = 35°, EBF is a tangent to the circle at B. G is a point on minor arc CD.



Calculate the size of the following angles giving reasons in each case.

(a) ∠BCD. **(2 marks)**

(b) Obtuse angle BOD. **(2 marks)**

(c) ∠BAD. **(2 marks)**

(d) ∠CGD. **(2 marks)**

(e) ∠AEB. (2 marks)

19. (a) Complete the table below for the function $y = 3\chi^2 - 2\chi - 1$ for $-3 \leq \chi \leq 4$.

χ	-3	-2	-1	0	1	2	3	4
$y = 3\chi^2 - 2\chi - 1$		15				7		

(2 marks)

(b) Draw the graph of $y = 3\chi^2 - 2\chi - 1$. (3 marks)

(PROVIDE A GRAPH PAPER)

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(c) Draw the line $y = 3\chi + 1$ on the same axis hence find the values of χ for which

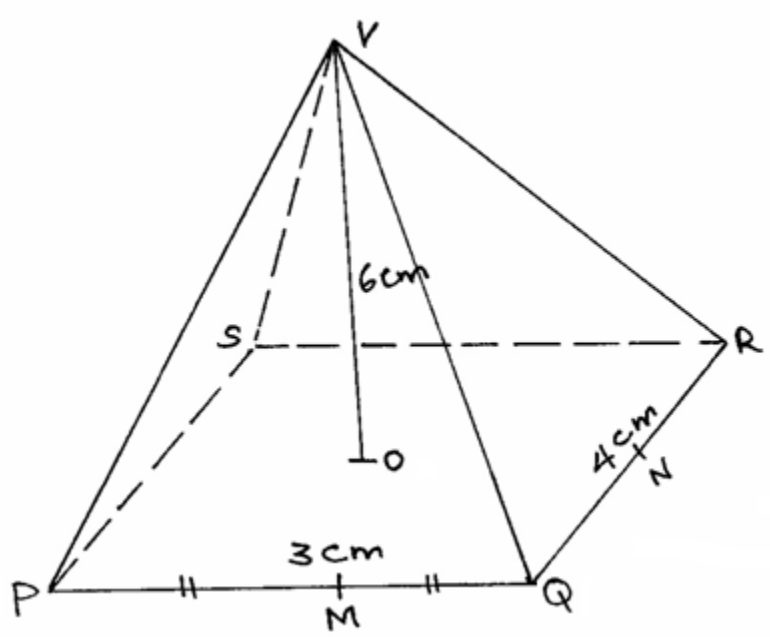
$y = 3\chi + 1$ and $y\ 3\chi^2 - 2\chi - 1$ are equal. **(3 marks)**

(d) Write down the simplified quadratic equation whose roots are the solutions of

the simultaneous equation in (c) above. **(2 marks)**

20. The diagram below shows a right pyramid VPQRS with V as the vertex and a rectangular base PQRS. PQ = 3cm, QR = 4cm. The height of the pyramid is 6cm.

PM = MQ and OQ = NR.



(a) Calculate.

(i) the length PV. **(3 marks)**

(ii) the angle between face VPQ and the base. **(2 marks)**

(b) (i) the slant height VM and VN. **(2 marks)**

(ii) What is the surface area of the pyramid? **(3 marks)**

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21. On the same axes, draw this graph of $y = 2 \text{ Sin } \chi$ and $y = 3 \text{ Sin } (\chi + 30°)$ for the domain $-360° \leq \chi \leq 360°$. **(5 marks)**

(PROVIDE A GRAPH PAPER)

From your graph determine.

(a) the period of each of the functions. **(1 mark)**

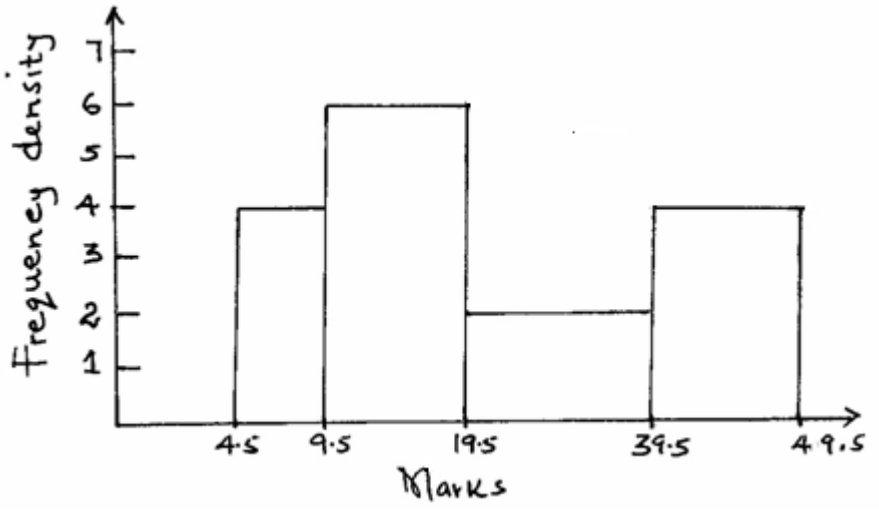
(b) the amplitude of each of the functions. **(1 mark)**

(c) the solution to $2 \text{ Sin } \chi = 3 \text{ Sin } (\chi + 30°)$. **(1 mark)**

(d) the transformation that maps the graph of $y = 2 \text{ Sin } \chi$ onto the graph of **$y = 3 \text{ Sin } (\chi + 30°)$.**

(2 marks)

22. The diagram below shows a histogram marks obtained in a certain test.



(a) Develop a frequency distribution table for the data if the first class 5-9 has a frequency of 8. **(3 marks)**

(b) Estimate the mean. **(3 marks)**

(c) Calculate interquatile range. **(4 marks)**

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23. The cost C, of producing n items varies partly as n and partly as the inverse of n. To produce two items it cost 50Sh and to produce six items it costs 70Sh. Find

(a) the constants of proportionality and hence write the equation connecting C and n. **(5 marks)**

(b) the cost of producing 12 items. **(2 marks)**

(c) the number of items produced at a cost of 106Sh. **(3 marks)**

24. An auto spare dealer sells two types of lubricant A and B in his shop. While purchasing type A cost Sh.40 per 100ml tin and type B cost Sh.60 per 100ml tin. He decided to buy at least 30 tins altogether of type A and B with Sh.1500 available. He decides that at least one third of the tins should be of type B. He buys χ tins of type A and y tins of type B.

(a) Write down three inequalities, which represent the above information. **(3 marks)**

(b) On a graph paper, draw a graph to show the three inequalities (a) above. **(3 marks)**

(PROVIDE A GRAPH PAPER)

(c) Determine how many tins of each type that he should buy to maximize his profit if he makes a profit of Sh.10 of each type A and a profit of Sh.20 on each type B tin. **(2 marks)**

(d) Calculate maximum possible profit. **(2 marks)**

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K.C.S.E TOP EXAMINERS' MOCK SERIES 1
QUESTION PAPER NO: 8

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

SECTION I (50 MARKS)

1. Use logarithm tables to evaluate **(4mks)**

$$\sqrt[3]{\frac{0.0485\times\log 3.846}{(0.9834)+88.3}}$$

2. Make Q the subject of the formula. **(3mks)**

$$T=\sqrt[3]{\frac{Q^2}{Q^2-1}}$$

3. A student misreads $(p+q)^2$ as P^2+q^2 find the percentage error if p = 5 and q = 3. **(3mks)**

4. (a) Expand $(x-y)^6$ upto the term with y^3 **(2mks)**

(b) Use the first four terms in ascending powers of y to find the approximate value of $(0.98)^6$.

Correct to 4 significant figure **(2mks)**

5. Given that matrix $\underset{\sim}{A}=\begin{pmatrix}2 & 1\\ 3 & 4\end{pmatrix}$, Find matrix $\underset{\sim}{B}$ such that: $A^2=\underset{\sim}{A}+\underset{\sim}{B}$ **(3mks)**

6. Chord QR and ST intersect at U. QR = 15cm, RU = 16cm and TU = 14 cm. **(3mks)**

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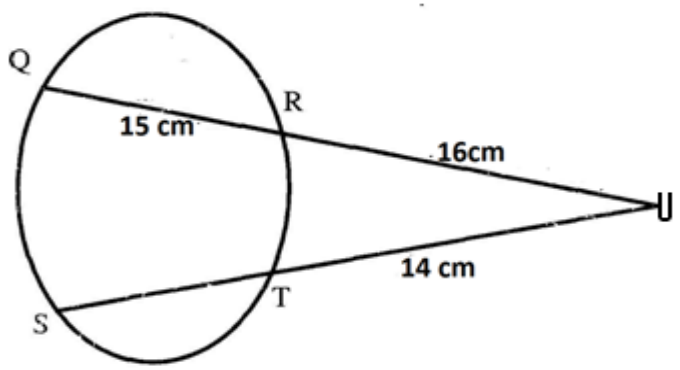


Find the length SU to 2 dp

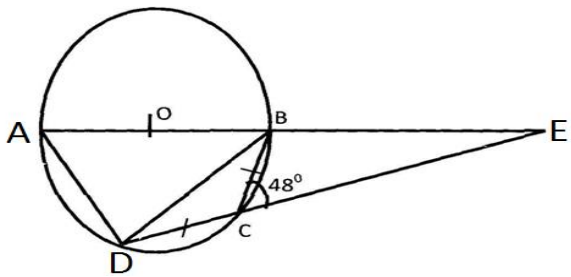
7. Simplify $\frac{3}{\sqrt{5}-2}+\frac{1}{\sqrt{5}}$ leaving your answer in the form $a+b\sqrt{c}$, where a, b and c are rational numbers. **(3mks)**

8. Achang'a deposited sh. 20 000 in a saving account. Find the interest after two years. If the intrest was paid at 16% per annum compound semi-annually. **(3mks)**

9. A coffee blender has two brands of coffee, Tamu and Chungu. A kilogram of Tamu costs sh. 70 while a kilogram of Chungu costs Shs. 64. In what ratio should he mix the two brands to make a blend which costs Shs. 68 per kilogram? **(3mks)**

10. Find the centre and radius of a circle whose equation is $x^2+8+y^2-2y-1=0$. **(3mks)**

11. In the figure below ABCD is a circle with centre O. AB and DC meet a point E outside the circle. DC = BC and $\angle$BCE = 48^0. Find the angles **(3mks)**



(i) BAD **(ii)** BDC **(iii)** BEC

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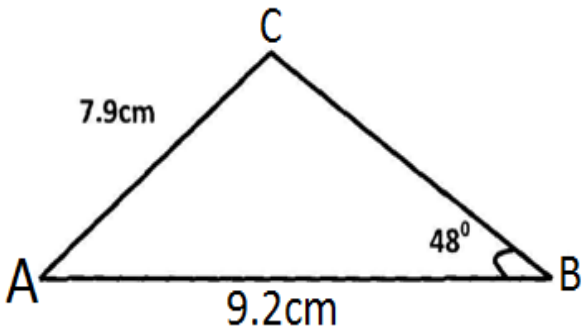
12. Given that $4x^2 - 32y - 20 + k$ is a perfect square , Find K. **(3mks)**

13. Given the triangle ABC below, AB = 9.2cm, AC = 7.9cm and $\angle ABC = 48^0$. **(2mks)**

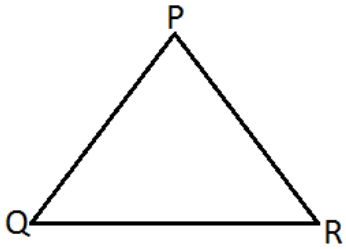
Calculate to 1 decimal place the angle A C B.



14. A geometric progression has its first and second terms as 128 and 32 respectively. If the sum of the first five terms of the progression is $\frac{2^x - 1}{6}$, find x **(4mks)**

15. P varie directly as the square of B and inversely as the square root of C. Find the percentage change in P when C increases by 4% and B decreases by 10%. **(3mks)**

16. The diagram below represents a field PQR



(a) Draw the locus of points equidistant from sides PQ and PR. **(1mk)**

(b) Draw the locus of points equidistant from points P and R. **(1mk)**

(c) (i) Label the point of intersection of the two loci (a) and (b) as X. **(1mk)**

(ii) Measure QX **(1mk)**

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SECTION II (50 MARKS)

Answer any five questions in this section

17. James' earning are as follows:- Basic salary 38,000 p.m, House allowance Sh. 14, 000p.m Travelling allowance Sh. 8,500p.m. Medical allowance sh. 3,300

The table for the taxable income is as shown below

Income tax in k£ p.a	Tax in Sh. Per pound
1 – 6000	2
6001 – 12000	3
12001 – 18000	4
1001 – 24 000	5
24001 - 30 000	6
30001 - 36000	7
36001 – 42 000	8
42001 – 48 000	9
Over 48 000	10

(a) Calculate Jame's taxable income in p.a **(2mks)**

(b) Calculate Jame's P.A.Y.E if he is entitled to a tax relief of Sh. 18 000 p.a **(4mks)**

(c) James is also deducted the following per month:-

NHIF Sh. 320

Pension scheme Sh. 1000

Co-operative shares Sh. 2000

Loan repayment Sh. 5000

Interest on loan Sh. 500

(i) Calculate James' total deduction per month in Ksh. **(2mks)**

(ii) Calculate his net salary per month. **(2mks)**

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18 .i) Fill the table, below of the function $y = 2x^2 + 5x - 12$ *for* $-8 \le x \le 4$ **(2mks)**

x	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4
y	76					-9		-5					40

ii) Using the table draw the graph of the function $y = 2x^2 + 5x - 12$. Use the scale of 1cm to 1 unit for x – axis and 1cm for 10units for y-axis. **(3mks)**

(b) Using the graph drawn above, solve the following equation.

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

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

19. The first three consecutive terms of a geometric progression are $3^{2x+1}, 9^x$ *and* 81 *respectivdy*.

(a) Calculate the value of x. **(3mks)**

(b) Find the common ratio of the series **(1mk)**

(c) Calculate the sum of the first 4 terms of this series. **(3mks)**

(d) Given that the fifth and the seventh terms of the G.P form the first two consecutive terms of an arithmetic sequence, Calculate the sum of the first 20 terms of the sequence. **(3mks)**

20. The table below shows marks scored by some students in a Maths exam

Marks	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 - 89
No. of candidates	3	17	27	23	8	2

(a) Draw a cumulative frequency curve for the data. **(4mks)**

(b) Use your graph to find

(i) The median **(1mk)**

(ii) Quartile deviation **(3mks)**

(iii) The pass mark if 55 students passed the exam. **(2mks)**

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21.A tank has two inlet taps P and Q and an outlet tap R. When empty, the tank can be filled by tap P alone in 4 ½ hour or by tap Q alone in 3 hours. When full, the tap can be emptied in 2 hours by tap R.

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

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

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

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

P at 8.00 a.m

Q at 8.45 a.m

R at 9.00 a.m

(i) Find the fraction of the tank that would be filled by 9.00 a.m **(3mks)**

(ii) Find the time the tank would be filled up. **(3mks)**

22. At a rifle contest, the probability of any particular rifle being accurate is $\frac{1}{16}$. A soldier chooses a rifle at random. If the rifle is accurate, the probability of hitting the target is $\frac{4}{5}$. If the rifle is inaccurate the probability of hitting target is $\frac{6}{25}$.

By use of a tree diagram determine the probability that;

(a) The soldier selecting an accurate rifle and hitting the target in the first shot. **(3mks)**

(b) The soldier selecting an inaccurate rifle and hitting the target in the first shot. **(2mks)**

(c) The soldier misses the target in the first shot. **(4mks)**

(d) the soldier gets the target in the first shot. **(1mk)**

23. The figure below shows a pulley system where a conveyor belt is tied round the two wheels. The radius of the large wheel is 180cm and the distance between the centres of the wheel is 300cm and $\angle XOY = 140^0$

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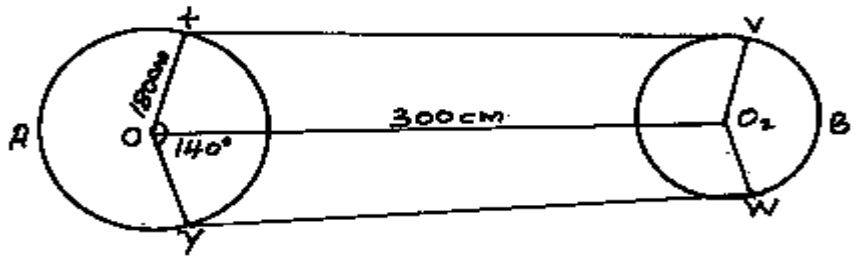

Determine

(a) Length XV **(3mks)**

(b) Length VBW **(3mks)**

(c) Length XAY **(2mks)**

(d) The total length of the conveyor belt

24.The vertices of a triangle ABC are A(3,1) B(0,2) and C(2,-1) is $A^1B^1C^1$ the image of ABC under a reflection on the line y + x = 0

(a) State the coordinates of $A^1B^1C^1$ hence draw triangles ABC and $A^1B^1C^1$ on the grid provided. **(3mks)**

(b) $A^{11}B^{11}C^{11}$ is the image of $A^1B^1C^1$ under positive quarter turn about the origin. Draw $A^{11}B^{11}C^{11}$ and state the coordination of the vertices. **(2mks)**

(c) $A^{111}B^{111}C^{111}$ is the image of $A^{11}B^{11}C^{11}$ under a shear matrix with y axis invariant and linear scale factor 3.

(d)(i) Write down the shear matrix **(1mk)**

(ii) Find the coordinates of the vertices of triangle $A^{111}B^{111}C^{111}$. **(2mks)**

(iii) Find the ratio of area of triangle ABC to that of $A^{111}B^{111}C^{111}$. **(2mks)**

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K.C.S.E TOP EXAMINERS' MOCK SERIES 1
QUESTION PAPER NO: 9

121/2

MATHEMATICS

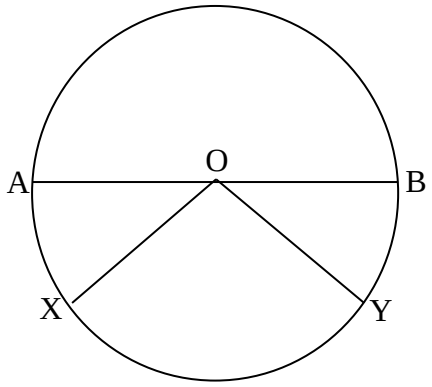
PAPER 2

TIME: 2 ½ HOURS

SECTION A- 50 MARKS

1. The cost of maize flour and millet flour is Ksh.40 and Khs.52 respectively. Calculate the ratio in which they were mixed if a profit of 15% was made by selling the mixture at Ksh.52.90 per kilogram. **(3marks)**

2. In the figure below XY= 8cm and O is the centre of the circle



Determine the area of the circle if angle AOX=15^0 **(3marks)**

3. **OA=3i+4j-6k** and **OB=2i+3j+k** are two position vectors. P divides a line AB in the ratio 3:-2. Write down the coordinates of P. **(3marks)**

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4. The table below show tax rates on a certain year

Income (K£ p.a)	Rate (Ksh.per £)
1 – 4200	2
4201 -8000	3
8001 – 12600	4
12601 and above	5

Rose earns a basic salary of ksh. 20,000 per month, she is given allowances amounting to ksh.5000.She is housed by her employer therefore pays a nominal rent of sh. 700 per month and is entitled to a personal relief of Ksh. 1200 per month. Calculate;

i) Her taxable income in Kenya pounds per year. **(2marks)**

ii) Her gross tax per month. **(2marks)**

5. Rationalize the denominator and simplify **(3marks)**

$$\frac{\sqrt{3}}{\tan 60 - 1}$$

6. Solve for x in **(3marks)**

$$3\log_3 x + 4 = \log_3 24$$

7. The transformation represented by the matrix $\begin{bmatrix} x-1 & x \\ 1 & 2x \end{bmatrix}$ maps a triangle whose vertices are **A (-1, 2), B (4, 1)** and **C (1,-4)** onto a straight line. Find the possible values of x. **(3marks).**

8. Expand $(2 + \frac{1}{4}x)^6$, hence find the value of $(2.025)^6$ rounded off to 3 decimal places.

(4marks)

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9. The resistance to the motion of a car is partly constant and partly varies as the square of the speed. At 40km/h^{-1} the resistance is 530 and at 60kmh^{-1} it is 730N. What will be the resistance at 70kmh^{-1} **(4marks)**

10. By completing the square, solve for x in the equation $\mathbf{2x^2 - 6 = x.}$ **(3marks)**

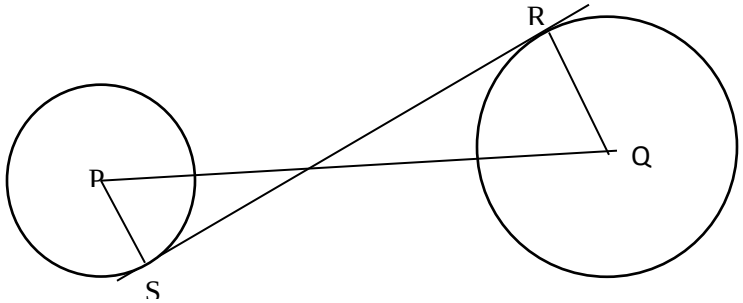
11. A die has two of its faces numbered 3.Calculate the probability of obtaining a 1or a 3 on a single cast. **(3marks)**

12. Solve the equation $4cos(3x - 10)^0 = -3.0640 \ \ for \ 0^0 \leq x \leq 180^0$ **(3marks)**

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

14. The points P(8,4) and Q(2,2) are the ends of a diameter of a circle. Find the equation of the circle**.** **(3marks)**

15. In the diagram below, PQ = 10cm,and the radius of the circle centers P and Q are 2cm and 4cm respectively, calculate the length of the transverse common tangent SR. **(3marks)**



16. Line $\mathbf{y=}\frac{3}{5}x$ is parallel to diameter LM of circle $\mathbf{x^2+y^2+6x-8y=0}$. Find the equation of the tangent to the circle at L. **(4marks)**

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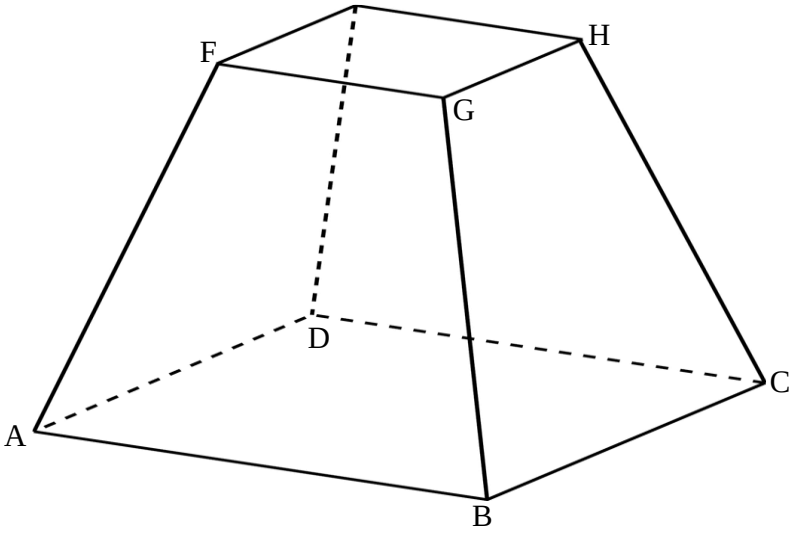
SECTION B 50 MARKS

17. The figure below shows a frustum ABCDEFGH of a right pyramid such that AB=9cm,BC=12cm,FG=6cm,GH=8cm and the height of the frustum is 10cm.



Find the

a) Height of the pyramid **(2marks)**

b) Length of

(i) AC **(2marks)**

(ii)AH **(2marks)**

c) Calculate the angle between:

i) Line AH and the plane ABCD **(2marks)**

ii) The planes ABHE and ABCD **(2marks)**

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18. A and B are two points on the latitude 40^0N. The two points lie on the longitudes 20^0 W and 100^0 E respectively.

(a)Calculate:

(i) The distance from A to B along a parallel of latitude. **(3marks)**

(ii) The shortest distance from A to B along a great circle. **(4marks)**

(b)Two planes P and Q left A for B at 400 knots and 600 knots respectively. If P flew along the great circle and Q along parallel latitude, which one arrived earlier and by how long. Give your answer to the nearest minute (Take R = 6370 km and $\pi = {}^{22}/_{7}$). **(3marks)**

19. The following table shows the distribution of marks obtained by 50 students.

Marks	45-49	50-54	55-59	60-64	65-69	70-74	75-79
No of Students	3	9	13	15	5	4	1

a) By using an assumed mean of 62, calculate:

(i) The mean **(5marks)**

b) The variance **(3marks)**

c) The standard deviation **(2marks)**

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20. Matrix **S** represents a reflection on line y = x, matrix **T** represents a rotation through positive 90^0 centre (0,0).A triangle whose vertices are A(-2,0), B(1,-2) and C(0,1) is subjected to these transformations, such that :the triangle $A^IB^IC^I$ is the image of ABC under transformation matrix **S** and that $A^{II}B^{II}C^{II}$ is the image of $A^IB^IC^I$ under transformation matrix **T**.

a) Plot the three triangles on the grid provided below**.** **(4marks)**

b) Find a single matrix that will map $A^{II}B^{II}C^{II}$ onto ABC**.** **(3marks)**

c) Describe the matrix in b) above. **(1mark)**

d) If triangle ABC is sheared ,shear factor 2 with the y-axis invariant, find the coordinates of the image. **(2marks)**

21. Sigei's Flower Achievers Company has 36 hectares of land. The company decides to prepare the land for planting wheat and maize. The labour cost of planting maize is Ksh. 300 per hectare while it costs Ksh 900 to plant a hectare of wheat. Maize takes 3 labourers per hectare while wheat takes 6 labourers per hectare. Atleast 72 labourers are to be hired and Ksh. 15,000 is to be spent for labour costs. The company hopes to make a profit of Ksh 2,000 per hectare of maize and Ksh 4,500 per hectare of wheat.

let the number of hectares for maize be x

let the number of hectares for wheat be y

(a) Write down inequalities representing the above information **(3marks)**

(b) On the grid provided, draw the inequalities by shading unwanted regions **(4marks)**

c) Use the graph to:

(i) determine the number of hectares of maize and wheat that should be prepared in order for the company to maximize profit **(2marks)**

(ii) Calculate the maximum profit **(1mark)**

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22.a) Using a ruler and a pair of compasses only, construct parallelogram ABCD in which AB=7cm, BC=5cm and angle CBA=45°. **(4marks)**

b) From a point T, 3cm from D on DC, construct the locus of a point Q, 3.5cm from T to intersect AD and DC at V and W respectively. Measure angle VTW. **(4marks)**

c) Find the area of the minor sector TVW in cm^2 **(2marks)**

23. The thirteenth term of an arithmetic progression is 27.Given that the seventh term equals to three times the second term, find

a) The first term and the common difference of the progression. **(4marks)**

b) The sum of the first three even numbered terms of the progression. **(3marks)**

c) It's given that $(b-\frac{9}{4})$,b and (b+3.375) are the 2nd,$3^{rd}$and 4^{th}terms of a geometric progression. Determine the value of b. **(3marks)**

24. The equation of a curve is given by $y = 11x - x^2$

(a) Determine coordinates of the stationary point. **(3marks)**

b) By integration, determine the actual area bounded by the curve $y = 11x - x^2$ and the line $y = 2x$ **(4marks)**

c) Find the equation of the normal to the curve at $x = 2$ **(3marks)**

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DATE: …….

K.C.S.E TOP EXAMINERS' MOCK SERIES 1
QUESTION PAPER NO: 10

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

SECTION 1 (50 marks)

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

1. Use logarithms table to evaluate. **(4mks)**

$$\left(\frac{7.627\times0.3734}{log4.8}\right)^{-\frac{1}{2}}$$

2. Make P the subject of the formula given. **(3 Marks)**

$$d = \sqrt[3]{\frac{p^2-2q}{q-p^2}}$$

3. Expand and Simplify $(1 - 5x)^5$ up to the term in x^3 **(2mks)**

Hence use your expansion to estimate $(0.95)^5$ correct to 4 decimal places **(2mks)**

4. Find, without using mathematical tables the values of x which satisfy the equation **(4marks)**

$$log_2(x^2-9) = 3log_2 2 + log_2 x$$

5. Solve the following inequality and list down the integral values. **(3 marks)**

$$\frac{1}{2}x + 2 \leq 5 - \frac{1}{4}x < \frac{6}{8}x + 8$$

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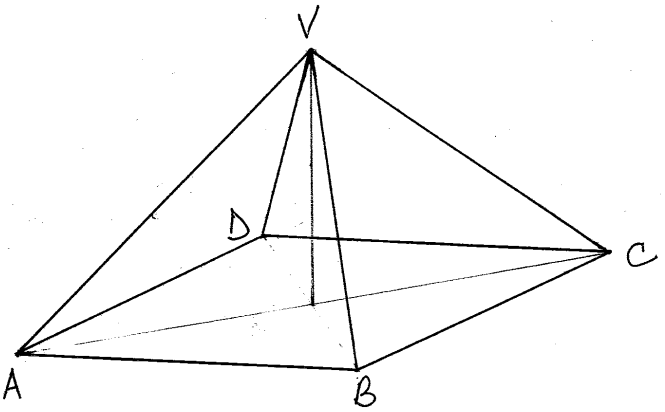
6. The diagram below represents a right pyramid on a square base of sides 4cm. The slant edge of the pyramid is 4.1cm.



(a) Draw the net of the pyramid **(2mks)**

(b) Using the net, calculate the surface area of the pyramid **(1mks)**

7. Two similar bags A and B each contain a mixture of red and blue balls. Bag A contains 6 red balls and 4 blue balls while bag B contains 3 red balls while and 7 blue balls. A bag is selected at random and two balls are picked at random from it

a) Draw a probability tree diagram to illustrate this information. **(1 Mark)**

b) Find the probability that at least a blue ball picked is blue. **(2 Marks)**

8. Given that $\frac{3}{2-\sqrt{8}} - \frac{2}{2+\sqrt{8}} = a + b\sqrt{c}$. Find the values of a, b and c. **(3 marks)**

9. The points with coordinates (13,3) and (-3,.-9) are the ends of a diameter of a circle Centre A

Determine:

(a) The coordinates of A **(1mk)**

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(b)The equation of the circle, expressing it in form $x^2 + y^2 + ax + by + c = 0$ Where a, b, and c are constants **(2mks)**

10. Determine the inverse of the matrix A = $\begin{bmatrix} 2 & 3 \\ 1 & 2 \end{bmatrix}$.

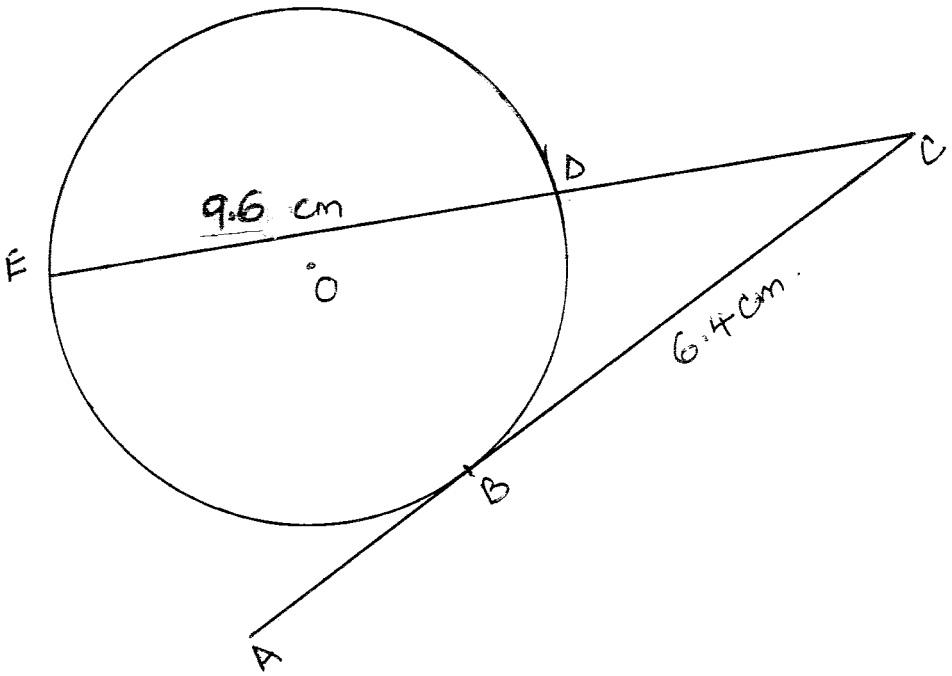
Hence find the co-ordinates to the point at which two lines 2x+3y = 17 and 2x+4y=20 intersect. **(3 marks)**

11. A man invest a certain sum of money at 16% compound interest semi-annually. Find the number of years, to the nearest year it takes to triple the money. **(4 marks)**

12. A rectangular room was measured and its measurement was found to be 40m by 80m to the nearest metre. Calculate the percentage error in working out its area. **(2 marks)**

13. A triangle ABC is such that AB=10cm, BC=12cm,K divides AC in the ratio 1:1 and angle ABC=120^0. Calculate the length of AK. **(3 marks)**

14. AC is a tangent to the circle given below (not drawn to scale) at B. ED is a chord to the same circle extended to meet tangent AC at C. Given that BC = 6.4cm and ED = 9.6cm, then find EC. **(3 Marks)**



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15. The masses of two similar bars of soap are 2560g and 5000g. If the surface area of the smaller bar is 256 cm^2. Calculate the surface are of the larger bar. **(3 marks**

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

a) Construct triangle ABC such that AB = 6cm, AC=BC and angle ACB = $120^0$2mks

b) On one side only construct the locus of P such that $\angle APB = 60^0$ **1mks**

SECTION 11 (50 marks)

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

17. An aircraft leaves town A (60°S, 62°E) and moves directly northwards to B(60°N, 62°E). It then moved at an average speed of 480 knots for 8 hours westwards to town C. Determine;

a) The distance AB in kilometers. Take $\pi = \frac{22}{7}$ *and the radius of the earth as 6,370 Km.* in.

(3 marks)

b) The position of town C. **(3 marks)**

c) The local time at C if local time at A is 5.30p.m **(2 marks)**

d) The total distance moved from A to C in nautical miles **(2 mks)**

18. Three quantities A B and C are such that A varies directly as the square root of B and inversely as the square of C.

a) Given that A=4 when B=64 and C=5, find

a. The law connecting A B and C **(4mks)**

b. A when B=16 and C=10. **(2mks)**

c) If B is increased by 44% and C decreases by 20%, find the percentage change in A.

(4 Marks)

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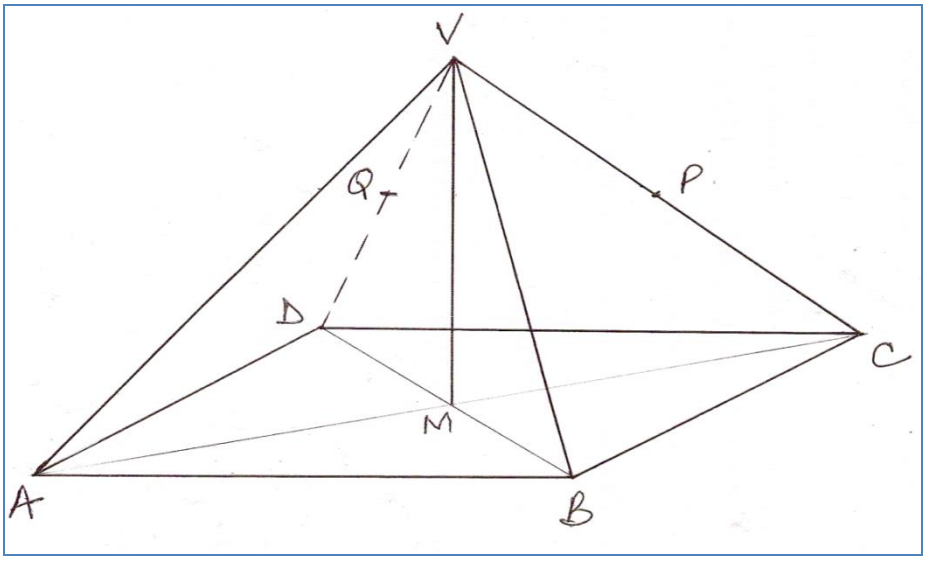
19. Three taps A, B and C can take 6 minutes, 24 minutes and 36 minutes respectively to fill a water tank. Tap D alone can take 72 minutes to empty the whole tank. Starting with an empty tank all the taps A, B, C and D are opened together for 1 ½ minutes. Tap C and D are then closed while A and B are left to continue for the next 1 minute and 12 seconds. After the 1 minute and 12 seconds taps A and B are closed while C and D are re-opened to continue for the rest of the time until the water tank is full. Determine:

(a) The portion of the tank filled during the first one minute if all the taps are opened **(2 mks)**

(b) Portion filled after 2 minutes and 42seconds. **(5 marks)**

(c) Time taken to fill the water tank completely. **(3 marks)**

20. The diagram below shows a right pyramid VABCD. The base of pyramid is a rectangle ABCD, with AB = 12CM and BC= 5CM. The height of the pyramid is 8 cm.



a) Calculate the

i) Length AC. **(2 mks)**

ii) The angle VA makes with the plane ABCD. **(2 mks)**

iii) Angle between the face VAB and the base. **(2mks)**

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b) P is the midpoint of VC and Q is the midpoint of VD. Find the angle between the plane VAB and the plane ABPQ. **(4 mks)**

21. The data below shows the masses in grams of 70 passion fruits.

Mass	1-10	11-20	21-30	31-40	41-50	51-60	61-70
f	3	8	14	19	14	9	3

a) On the grid provided above, draw a cumulative frequency curve for the data. **(4 marks)**

Use the graph in (a) above to determine

i) The 60th percentile **(1 mark)**

ii) The quartile deviation **(3 marks)**

iii) The percentage of passion fruits to the nearest two decimal places whose masses lie in the range 21.5g to 58.5g. **(2 marks)**

22. The third, fourth and fifth terms of a G.P are 2^{2x+2}, 128 and 4^{3x} respectively.

a. Calculate the value of x **(2mks)**

b. Find the common ratio of the series. **(2mks)**

c. Calculate the sum of the first 10 terms of the series. (3mks)

d. Given that the 2nd and 3rd terms of the G.P in (a) above form the first and the second terms of an A.P Calculate the sum of the first 30 terms of the A.P. **(3mks)**

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23. A quadrilateral ABCD is such that the vertices area A (1, 2),B (6,2),C (4,4) and D (2,4).

(a) $A'B'C'D'$ is the image of $ABCD$ under the transformation $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. On the grid provided below. draw the quadrilateral ABCD and its image $A'B'C'D'$. **(3 marks)**

b. $A''B''C''D''$ is the image of $A'B'C'D'$ under the transformation $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$. On the same grid draw the image $A''B''C''D''$. **(3 marks)**

c. Point $A''(6,-2)$ is mapped onto $A'''(2,-2)$ by a shear y axis invariant.

(i) Determine the shear matrix **(2 marks)**

(ii) On the same grid show image $A'''B'''C'''D'''$. **(2 marks)**

24. a) Complete the table below by filling in the blank spaces. **(2mks)**

x^0	0	30	60	90	120	150	180	210
$y = 3\,Sin\,x^0 - 2$	-2	-0.5	0.60					
$y = 2Cos\,x^0$	2	1.73	1			-1.73		

b) On the same axes draw the graphs of $y = 3\,Sin\,x^0 - 2$ and $y = 2Cos\,x^0$ for $0° \leq x \leq 210°$.

(5 Marks)

c) Use the graph to solve the equation $y = 3\,Sin\,x^0 - 2Cos\,x^0 = 2$ **(1mks)**

d) State the amplitude of **(2mks)**

a) $y = 3\,Sin\,x^0 - 2$

b) $y = 2Cos\,x^0$

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