

MATHEMATICS PAPER 1 K.C.S.E 1996 QUESTIONS
SECTION 1 (52 Marks)

1. Use logarithms to evaluate (3 marks)

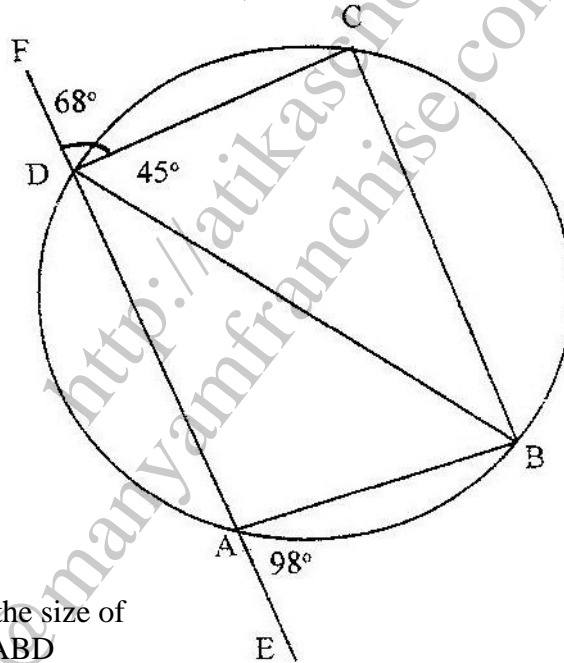
$$\sqrt[3]{\frac{36.15 \times 0.02573}{1,938}}$$

2. Factorize completely $3x^2 - 2xy - y^2$ (2 marks)

3. The cost of 5 skirts and 3 blouses is Kshs 1750. Mueni bought three of the skirts and one of the blouses for Kshs 850.
Find the cost of each item (3 marks)

4. A man walks directly from point A towards the foot of a tall building 240m away. After covering 180m, he observes that the angle of the top of the building is 45° . Determine the angle of elevation of the top of the building from A. (3 marks)

5. In the figure below, ABCD is a cyclic quadrilateral and BD is a diagonal. EADF is a straight line. $\angle CDF = 68^\circ$, $\angle BDC = 45^\circ$ and $\angle BAE = 98^\circ$.



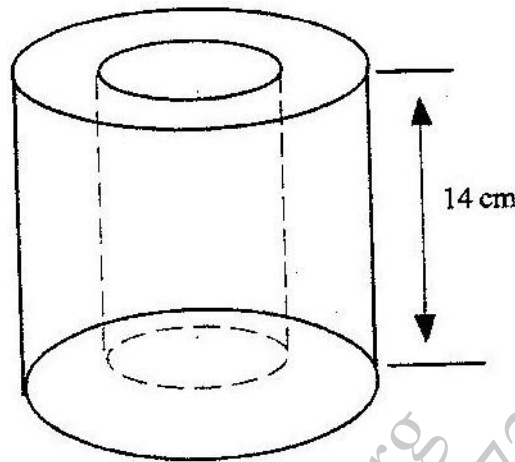
Calculate the size of

- (a) $\angle ABD$ (2 marks)
 (b) $\angle CBD$ (2 marks)

6. An employee started on a salary of £ 6,000 per annum and received a constant annual increment. If he earned a total of £ 32,400 by the end of five years, calculate his annual increment. (3 marks)

7. Mr. Ngeny borrowed Kshs. 560,000 from a bank to buy a piece of land. He was required to repay the loan with simple interest for a period of 48 months. The repayment amounted to Kshs 21000 per month.
Calculate
(a) The interest paid to the bank (2 marks)
(b) The rate per annum of the simple interest (4 marks)
8. A rectangular tank of base 2.4 m by 2.8 m and a height of 3 m contains 3,600 liters of water initially. Water flows into the tank at the rate of 0.5 litres per second
Calculate the time in hours and minutes, required to fill the tank (4 marks)
9. A car dealer charges 5% commission for selling a car. He received a commission of Kshs 17,500 for selling a car. How much money did the owner receive from the sale of his car? (2 marks)
10. Five pupils A, B, C, D and E obtained the marks 53, 41, 60, 80 and 56 respectively. The table below shows part of the work to find the standard deviation.
- | Pupil | Mark x | x - x | (x-x) ² |
|-------|--------|-------|---------------------|
| A | 53 | -5 | |
| B | 41 | -17 | |
| C | 60 | 2 | |
| D | 80 | 22 | |
| E | 56 | -2 | |
- (a) Complete the table (1 mark)
- (b) Find the standard deviation (3 marks)
11. A and B are two matrices. If $A = \begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$ find B given that $A^2 = A + B$ (4 marks)
12. Solve the equation $\sin \frac{5}{2} \theta = \frac{-1}{2}$ for $0^\circ \leq \theta \leq 180^\circ$ (2 marks)
13. A fruiterer bought 144 pineapples at Kshs 100 for every six pineapples. She sold some of them at Kshs. 72 for every three and the rest at Kshs 60 for every two. If she made a 65% profit, calculate the number of pineapples sold at Kshs 72 for every three (3 marks)
14. Make V the subject of the formula $T = \frac{1}{2} m (u^2 - v^2)$ (3 marks)

15. The figure below represents a hollow cylinder. The internal and external radii are estimated to be 6 cm and 8 cm respectively, to the nearest whole number. The height of the cylinder is exactly 14 cm.



- (a) Determine the exact values for internal and external radii which will give maximum volume of the material used. (1 mark)
- (b) Calculate the maximum possible volume of the material used
Take the value of π to be $\frac{22}{7}$ (2 marks)
16. Two lorries A and B ferry goods between two towns which are 3120 km apart. Lorry A traveled at km/h faster than lorry B and B takes 4 hours more than lorry A to cover the distance.
- Calculate the speed of lorry B (5 marks)

SECTION II (48 MARKS)

Answer any six questions from this section

17. The data given below represents the average monthly expenditure, E in K £, on food in a certain village. The expenditure varies with number of dependants, D in the family.

Dependants	3	7	12	25	32
Expenditure E (K£)	-210	250	305	440	500

- (a) Using the grid provided, plot E against D and draw the line of the best fit (2 marks)
- (b) Find the gradient and the E- intercept of the graph (3 marks)
- (c) Write down an equation connecting E and D (1 mark)
- (d) Estimate the cost of feeding a family with 9 dependants (2 marks)

18. The table below shows the income tax rates

Total income per month in Kenya	Rate in shillings per pound
1 – 325	2
326 – 650	3
651-975	4
976 – 1300	5
1301 – 1625	7
Over 1625	7.50

Mr. Otiende earned a basic salary of Kshs 13,120 and a house allowance of Kshs 3,000 per month. He claimed a tax relief for a married person of Kshs 455 per month

(a) Calculate

- (i) The tax payable without the relief
- (ii) The tax paid after the relief

(b) Apart from the income tax, the following monthly deductions are made. A service charge of Kshs 100, a health insurance fund of Kshs 280 and 2% of his basic salary as widow and children pension scheme.

Calculate

- (i) The total monthly deductions made from Mr. Otiende's income (2 marks)
- (ii) Mr. Otiende's net income from his employment (2 marks)

19. The equation of a curve is $y = 3x^2 - 4x + 1$

(a) Find the gradient function of the curve and its value when $x = 2$ (2 marks)

(b) Determine

(i) The equation of the tangent to the curve at the point (2, 5) (2 marks)

(ii) The angle which the tangent to the curves at the point (2, 5) makes with the horizontal (1 mark)

(iii) The equation of the line through the point (2, 5) which is perpendicular to the tangent in (b) (i)

20. The position of two A and B on the earth's surface are (36° N, 49° E) and (36° N, 131° W) respectively.

(a) Find the difference in longitude between town A and town B (2 marks)

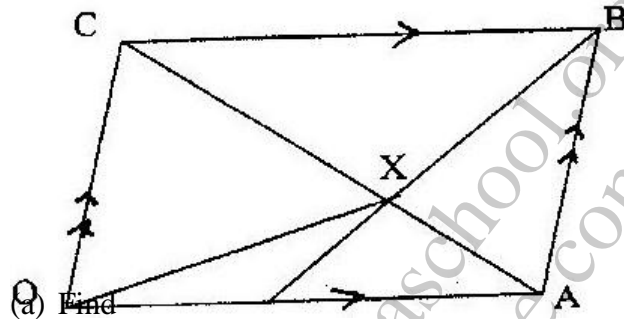
(b) Given that the radius of the earth is 6370, calculate the distance between town A and town B.

(c) Another town, C is 840 east of town B and on the same latitude as towns A and B. Find the longitude of town C.

21. The table below shows some values of the function $y = x^2 + 2x - 3$

x	-6	-6.75	-5.5	-5	-4.75	-4.5	4.25	-4.0	-3.75	-3.75	-3.5	-3.25	-3
y	21	18.56		14.06		10.06	8.25		5		2.25	1.06	0

- Complete the table
 - Using the completed table and the mid-ordinate rule with six ordinates, estimate the area of the region bounded by the $y = x^2 + 2x - 3$ and the line $y = 0$, $x = -6$ and $x = -3$ (3 marks)
 - By integration find the actual area of the region in (b) above (2 marks)
 - Calculate the percentage error arising from the estimate in (b) (2 marks)
22. In the diagram below OABC is a parallelogram, $OA = a$ and $AB = b$. N is a point on OA such that $ON : NA = 1 : 2$



- AC in terms of a and b
 - BN in terms of a and b
- (b) The lines AC and BN intersect at X, $AX = hAC$ and $BX = kBN$
- By expressing OX in two ways, find the values of h and k
 - Express OX in terms of a and b (1 mark)
23. Use ruler and compasses only in this question
- The diagram below shows three points A, B and D
- Construct the angle bisector of acute angle BAD (1 mark)
 - A point P, on the same side of AB and D, moves in such a way that $\angle APB = 22\frac{1}{2}^\circ$ construct the locus of P (6 marks)
 - The locus of P meets the angle bisector of $\angle BAD$ at C measure $\angle ABC$ (1 mark)
- Hence find area of the image $A''B''C''$ (2 marks)

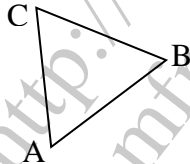
MATHEMATICS PAPER 2 K.C.S.E 1996 QUESTIONS
SECTION 1 (52 MARKS)

Answer all the questions in this section.

1. Evaluate without using mathematical tables.

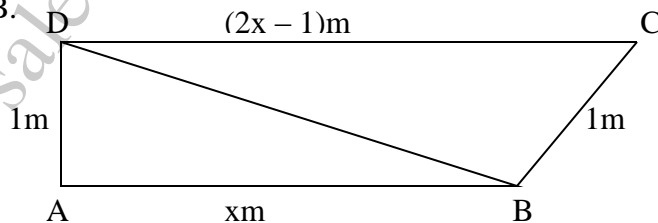
$$\sqrt{\frac{0.0625 \times 2.56}{0.25 \times 0.08 \times 0.5}}$$

2. The electrical resistance Rohms, of a given length is inversely proportional to the diameter of the wire. D mm. if $R = 2.0$ ohms when $d = 3$ mm, find the value of R when $d = 4$ mm. (3 mrks)
3. Four farmers took their goats to the market. Mohammed had two more goats than Ali. Koech had 3 times as many goats as Mohammed, whereas Odupoy had 10 goats less than both Mohammed and Koech.
- Write a simplified algebraic expression with one variable, representing the total number of goats. (1 mark)
 - Three butchers bought all the goats and shared them equally. If each butcher got 17 goats, how many did Odupoy sell to the butchers?
4. Traveler had sterling pounds 918 with which he bought Kenya shillings at the rate of Kshs. 84 per sterling pound. He did not spend the money as intended. Later he used the Kenya shillings to buy sterling pounds at the rate of Kshs. 85 per sterling pound. Calculate the amount of money on sterling pounds lost in the whole transaction.
5. Using the equilateral triangle below, construct locus of a point P such that $\angle APC = 30^\circ$



6. During inter-school competition, football and volleyball teams from Mokagu High School took part. The probability that their football teams would win were $\frac{3}{8}$ and $\frac{4}{7}$ respectively. Find the probability that;
- Both their football and volleyball teams won.
 - At least one of their teams won.

7. In the figure below BAD and CBD are right angled triangles. Find the length of AB.



8. Find the area bounded by the curve $y=2x^3 - 5$, the x-axis and the lines $x=2$ and $x=4$ (3 mks)

9. Find the value of x which satisfies the equation.

$$16^{x^2} = 8^{4x-3}$$

(3 mks)

10. Pieces of soap are packed in a cuboid container measuring 36cm by 24cm by 18cm. each piece of soap is similar to the container. If the linear scale factor between the container and the soap is $\frac{1}{6}$, find the volume of each piece of soap.

11. Complete the table below for the function $y=3x^2 - 8x + 10$ (1 mk)

x	0	2	4	6	8	10
y	10	6		70		230

Using the values in the table and the trapezoidal rule, estimate the area bounded by the curve $y= 3x^2 - 8x + 10$ and the lines $y=0$, $x=0$ and $x=10$

12. Expand $(1 + a)^5$. use your expansion to estimate $(0.8)^5$ correct to four places of decimal.

13. The base of a right pyramid is a square ABCD of side 2a cm. the slant VA, VB, VC and VD are each of length 3a cm.

- Sketch and label the pyramid.
- Find the angle between a slanting edge and the base.

14. The tables below shows milk production in litres of some days and three moving averages.

Amount of milk in litres	55	56		62	60	70
Moving averages	57	59	61			

Calculate:

- The milk production on the third and fourth days.
- The third and fifth moving averages.

15. A stream flows from East to West at a speed of 10km/h. A motorboat which can travel at 20km/h in still water starts from a point on the Southern bank. In what direction must the motorboat head in order to reach a point directly across the stream?

16. Simplify $(1 \div \sqrt{3})(1 - \sqrt{3})$

Hence evaluate $\frac{1}{1 + \sqrt{3}}$ to 3 s.f. given that $3 = 1.7321$

(3 mks)

SECTION II (48 Marks)

Answer any six questions from this section

17. Two businessmen jointly bought a minibus which could ferry 25 paying passengers when full. The fare between two towns A and B was Kshs 80 per passengers for one way. The minibus made three round trips between two towns daily. The cost of fuel was Kshs 1500 per day. The driver and the conductor were paid daily allowances of 200 and Kshs 150 respectively.

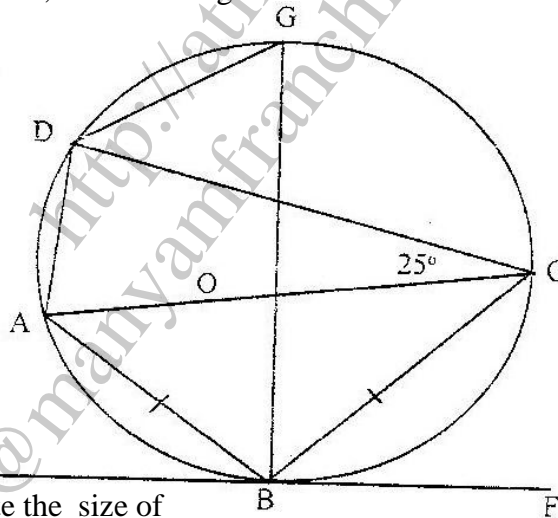
A further Kshs 4,000 per day was set aside for maintenance, insurance and loan payment.

(a) One day, the minibus was full on every trip.

- (i) How much money was collected from the passengers that day?
- (ii) How much was the net profit?

(b) On another day, the minibus was 80% full on the average for the three round trips, how much and each businessman get if the day's profit was shared in the ratio of 2: 3

18. In the figure below AOC is a diameter of the circle centre O; $AB = BC$ and $\angle ACD = 25^\circ$, EBF is a tangent to the circle at B. G is a point on the minor arc CD.



- (a) Calculate the size of
- (i) $\angle BAD$ (3 marks)
 - (ii) the Obtuse $\angle BOD$ (3 marks)
 - (iii) $\angle BGD$ (1 mark)
- (b) Show the $\angle ABE = \angle CBF$. Give reasons (2 marks)

19. In an agricultural research centre, the length of a sample of 50 maize cobs were measured and recorded as shown in the frequency distribution table below.

Length in cm	Number of cobs
8 – 10	4
11 – 13	7
14 – 16	11
17 – 19	15
20 – 22	8
23 – 25	5

Calculate

- (a) The mean
- (b) (i) the variance
- (ii) The standard deviation (8 marks)
20. Four towns R, T, K and G are such that T is 84 km directly to the north R, and K is on a bearing of 295° from R at a distance of 60 km. G is on a bearing of 340° from K and a distance of 30 km. Using a scale of 1 cm to represent 10 km, make an accurate scale drawing to show the relative positions of the town.

Find

- (a) The distance and the bearing of T from K
- (b) The distance and the bearing G from T
- (c) The bearing of R from G
21. Kubai saved Kshs 2,000 during the first year of employment. In each subsequent year, he saved 15% more than the preceding year until he retired.
- (a) How much did he save in the second year? (1 mark)
- (b) How much did he save in the third year? (1 mark)
- (c) Find the common ratio between the savings in two consecutive years (3 marks)
- (d) How many years did he take to save the savings a sum of Kshs 58,000? (3 marks)
- (e) How much had he saved after 20 years of service? (2 marks)

22. A school has to take 384 people for a tour. There are two types of buses available, type X and type Y. Type X can carry 64 passengers and type Y can carry 48 passengers. They have to use at least 7 buses.

(a) Form all the linear equalities which will represent the above information

(3 marks)

(b) On the grid provided, draw the inequalities and shade the

Unwanted region

(3 marks)

(c) the charges for hiring the buses are

Type X. Kshs 25000

Type y: Kshs 20000

Use your graph to determine the number of buses of each type that should be hired to minimize the cost.

23. Complete the table given below using the functions.

$Y = -3 \cos 2x^0$ and $y = 2 \sin (\frac{3}{2} x^0 + 30^0)$ for $0 < x < 180^0$

X^0	0^0	20^0	40^0	60^0	80^0	100^0	120^0	140^0	160^0	180^0
$-3 \cos 2x^0$	-3.00			1.50	2.82	2.82		0.52	-2.30	
$2 \sin (\frac{3}{2} x^0 + 30^0)$	1.00		2.00	1.73		0.00	-1.00			-1.73

(a) Using the grid provided, draw the graphs $y = -3 \cos 2x^0$ and $y = 2 \sin (\frac{3}{2} x^0 + 30^0)$ on the same axes.

Take 1 cm to represent 20^0 on the x - axis and 2 cm to represent one unit on the y - axis.

(4 marks)

(b) From your graphs, find the roots of $3 \cos 2x + \sin (\frac{3}{2} x^0 + 30^0) = 0$

24. Data collected from an experiment involving two variables X and Y was recorded as shown in the table below

x	1.1	1.2	1.3	1.4	1.5	1.6
y	-0.3	0.5	1.4	2.5	3.8	5.2

The variables are known to satisfy a relation of the form $y = ax^3 + b$ where a and b are constants

(a) For each value of x in the table above, write down the value of x^3 (2 marks)

(b) (i) By drawing a suitable straight line graph, estimate the values of a and b

(2 marks)

(ii) Write down the relationship connecting y and x