# MATHEMATICS PAPER 121/1 K.C.S.E 1998 QUESTIONS SECTION 1 (52 Marks)

## Answer all the questions in this section

1. Evaluate without using mathematical tables



for More

Factorize a<sup>2</sup> – b<sup>2</sup> Hence find the exact value of 2557<sup>2</sup> - 2547<sup>2</sup>

- 3. The mass of 6 similar books and 4 similar biology books is 7.2 kg. The mass of 2 such art books and 3 such biology books is 3.4 kg. Find the mass of one art book and mass of one biology book.
- 4. In the figure below, AB is parallel to DE, DE bisects angle BDG, angle DCF =  $60^{\circ}$  and angle CFG =  $110^{\circ}$  B



- 5. A salesman gets a commission of 2.4% on sales up to Kshs 100.00. He gets an additional commission of 1.5% on sales above this. Calculate the commission he gets on sales worth Kshs 280.000
- 6. A point A is directly below a window. Another point B is 15 m from A and at the same horizontal level. From B angle of elevation of the top of the bottom of the window is 300 and the angle of elevation of the top of the window is 350. Calculate the vertical distance.
  - (a) From A to the bottom of the window
  - (b) From the bottom to top of the window
- 7. A matrix A is given by A  $\begin{pmatrix} x & 0 \\ 5 & y \end{pmatrix}$

- a) Determine  $A_{2,c}^{2}e^{e^{t}c^{5}e^{2}\rho^{5}t^{5}\rho^{5}e^{t}c^{5}}$ . b) If  $A^2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}^2$ , determine the possible pairs of values of x and y
- 8. Given that  $\log y = \log (10^n)$  make n the subject
- 9. A quantity T is partly constant and partly varies as the square root of S.
  - a) Using constants a and b, write down an equation connecting T and S.
  - b) If S = 16, when T = 24 and S = 36 when T = 32, find the values of the constants a and b,
- FOT NOTE FILE 10. The third and fifth term of an arithmetic progression are 10 and -10 respectively
  - a) Determine the first and the common difference
  - b) The sum of the first 15 terms
  - A cyndrical container of radius 15cm has some water in it. When a 11. solid is submerged into the water, the water level rises by 1.2 cm.
    - Find, the volume of the water displaced by the solid leaving your (a) answer in terms of  $\prod$
    - (b) If the solid is a circular cone of height 9 cm, calculate the radius of the cone to 2 decimal places.
  - 12. Six weeks after planting the height of bean plants were measured correct to the nearest centimeter. The frequency distribution is given in the table below.

Height (x)	$0 \le x \le$	$4 \le x \le 8$	8≤ x ≤ 12	$12 \le x \le$	16 ≤ x ≤
	4			16	20
Frequency	3	8	19	14	6
Cumulative					
Frequency					

- (a) Enter the cumulative frequency values in the above table
- (b) Estimate the median height of the plants
- A financial institution charges compound interest on money borrowed. 13. A business woman borrowed Kshs. 16, 000 from the financial institution. She paid back Kshs 25,000 after 2 years. Find the interest rate per annum.

14. Solve the equation 
$$\cos (3\theta + 120^\circ) = \sqrt{3}/2$$
 for  $0 \le \theta \le 180^\circ$ 

15. The radius of circle is given as 2.8 cm to 2 significant figures

- (a) If C is the circumference of the circle, determine the limits between which  $c/\Pi$  lies  $\chi^{c}$
- (b) By taking  $\prod t \delta$  be 3.142, find, to 4 significant figures the line between which the circumference lies.
- 16. A and B are towns 360 km apart. An express bus departs form A at 8 am and maintains an average speed of 90 km/h between A and B. Another bus starts from B also at 8 am and moves towards A making four stops at four equally spaced points between B and A. Each stop is of duration 5 minutes and the average speed between any two spots is 60 km/h. Calculate distance between the two buses at 10 am.

17, Wainaina has two dairy farms. A and B. Farm A produces milk with 3 2 percent fat and farm B produces milk with 4 <sup>3</sup>/<sub>4</sub> percent fat.

(a) Determine

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- (i) The total mass fat in 50 kg of milk from farm A and 30 kg of milk from farm B
- (ii) The percentage of fat in a mixture of 50 kg of milk from A and 30 kg of milk from B
- (c) Determine the range of values of mass of milk from farm B that must be used in a 50 kg mixture so that the mixture may have at least 4 percent fat.

table below blows monthly meetine tar rates								
Monthly taxable pay	Rate of tax Kshs							
K £	per £							
1 - 342	2							
343 - 684	3							
685 - 1026	4							
1027-1368	5							
1369 - 1710	6							
Over 1710								

18. The table below shows monthly income tax rates

A civil servant earns a monthly salary of Kshs 20,000 and is provided with a house at a nominal rent of Kshs 700 per month

(a) Taxable pay is the employee's salary, plus 15% of salary, less nominal rent.

Calculate the civil servant's taxable pay in K  $\pounds$ 

- (b) Calculate the total tax
- (c) If the employee is entitled to a personal relief of Kshs. Per month, what is the net tax.
- 19. A quadrilateral ABCD has vertices A (4, -4), B(2, -4), C(6, -6) and D (4, -2)
  - (a) On the grid provided draw the quadrilateral ABCD.
  - (b) A'B'C'D is the image of ABCD under positive quarter turn about the origin. On the same grid draw the image A'B'C'D
  - (c) A'B'C'D' is the image of A' B' C' D' under the transformation given by the matrix  $\begin{pmatrix} 1 & -2 \end{pmatrix}$

- determine the coordinators of A" B" C" D" (i)
- On the same grid draw the quadrilateral A" B" C" D" (ii)
- Determine a single matrix that maps ABCD onto A" B"C"D" (d)
- The position of two towns X and Y are given to the nearest degree as 20. X ( $45^{\circ}$  N, 10°W) and Y (45° N, 70°W)
  - Find
    - (a) The distance between the two towns in
      - (i) Kilometers (take the radius of the earth as 6371)
      - Nautical miles (take I nautical mile to be 1.85 km) (ii)
    - (c) The local time at X when the local time at Y is 2.00 pm.
- For More Free 21. A cyndrical can has a hemisphere cap. The cylinder and the hemisphere are of radius 3.5 cm.

The cylindrical part is 20 cm tall. Take  $\prod$  to be 22/7 calculate

(a) the area of the circular base

is

- (b) the area of the curved cylindrical surface
- (c) the area of the curved hemisphere surface
- (d) The total surface area.
- 22. The figure below shows a grid of equally spaced parallel lines AB = a and BC = b



- (a) Express
- (i) AC in terms of a and b
- (b) Using triangle BEP, express BP in terms of a and b

(c) PR produced meets BA produced at X and Pr =  $\frac{1b}{9} - \frac{8a}{3}$ 

By writing PX as kPR and BX as hBA and using the triangle BPX determine the ratio PR: RX  $\sqrt[4n]{4}$ 

- 23. Use a ruler and a pair of compasses only for all constructions in this question.
  - (a) On the line BC given below, construct triangle ABC such that  $ABC = 30^{\circ}$  and BA = 12 cm

Construct a perpendicular from A to meet BC produced at D. Measure

(c) Construct triangle A'B'C' such that the area of triangle A'B'C is the three quarters of the area of triangle ABC and on the same side of BC as triangle ABC.

(d) Describe the lucus of A'

(b)

CD

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24. In a livestock research stations a new drug for a certain fowl disease is

being tried. A sample of 36 fowls were diagnosed to have the disease. Twenty (20) fowls were treated with the drug and the rest were not.

- (a) Calculate the probability that a fowl picked at random is
  - (i) treated with the drug
  - (ii) Not treated with the drug
- 25. If a fowl is treated, probability of dying is 1/10 while if not treated the probability is 7/10 calculate the probability that, a fowl picked at random from the 36 fowl is
  - (i) treated with the drug and will die
  - (ii) Not treated with the drug and will die
  - (iii) Not treated with the drug and will not die

### MATHEMATICS PAPER 121/2 K.C.S.E. 1998 **QUESTIONS** SECTION 1 (52 MARKS)

### Answer the entire question in this section

- 1. Use logarithms to evaluate 55.9% (02621 x 0.01177) 1/5
- 2. Simplify the expression  $\frac{x-1}{x} \frac{2x+1}{3x}$ 
  - Hence solve the equation X-

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

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- For More Free 3. Simplify as far as possible, leaving your answer in the form of surd  $\frac{1}{\sqrt{14}+2\sqrt{3}}$  $\frac{1}{\sqrt{4}-2\sqrt{3}}$ 
  - 4. In the figure below ABC =  $30^{\circ}$ , ACB =  $90^{\circ}$ , AD =  $4\sqrt{3}$  and DC = 4cm



- 5. A plot of land was valued at Kshs 50,000 at the start of 1994. It appreciated by 20% during 1994. Thereafter, every year, it appreciated by 10% of its previous years value.
  - a. The value of the land at the start 0f 1995

- b. The value of the land at the end 0f 1997
- 6. During a certain period, the exchange rate were follows
  - 1 sterling pound = Kshs. 102.0
  - 1 sterling pound **≼**Kshs. U.S dollar
  - 1 U.S dollar = Kshs. 60.6

A school management intended to import textbooks worth Kshs 500,00 from U.K. It changed the money to sterling pounds. Later the management found out that books were cheaper in U.S.A. Hence it changed the sterling pounds to dollars. Unfortunately, a financial crisis arose and the money had to be reconverted to Kenya shillings.

Calculate the total amount of money the management ended up with

- 7. A manufacturer sells bottle of fruit juice to a trader at a profit of 40%. The trader sells it for Kshs 84 at a profit of 20%. Find
  - (a) The trader's buying price

FOT NOTE

- (b) The cost of manufacture of one bottle
- 8. In the figure below a line XY and three points. A,B and C are given. On the figure construct

A PR =

ACB

- (a) The perpendicular bisector of AB
- (b) A point P on line xy such  $\frac{1}{2}$



9. In the figure, KLMN is a trapezium in which KL is parallel to NM and KL = 3 M



- astpapers.com Given that P = 3 y express the equation  $3^{2y-1} + 2 \times 3^{y-1} = 1$  terms of AP 10. Hence or otherwise find the value of y in the equation  $3^{2y-1} + 2 \ge 3^{y-1} = 1$
- A balloon, in the form of a sphere of radius 2 cm, is blown up so that 11. the volume increase by 237.5%. Determine the new volume of balloon in terms of  $\prod$
- 12. Find if  $-3 \log 5 \frac{1}{\sqrt{2}} \log x^2 = \log 1$ 125

(a) Write down the simplest expansion ( 1 + x)<sup>6</sup> 13.

 $\mathcal{C}(b)$  Use the expansion up to the fourth term to find the value of (1.03)<sup>6</sup> to the nearest one thousandth.

- FOT NOTE Free 14. A science club is made up of boys and girls. The club has 3 officials. Using a tree diagram or otherwise find the probability that:
  - (a) The club official are all boys
  - (b) Two of the officials are girls
  - 15. A river is flowing at uniform speed of 6km/ h. A canoeist who can paddle at 10 km/h through still water wishes to go straight across the river. Find the direction, relative to the bank in which he should steer.
  - 16. The triangular prism shown below has sides AB = DC = EF = 12 cm. The ends are equilateral triangle of sides 10cm. The point N is the midpoint



- (a) Find the length of
  - BN (i)
  - EN (ii)
- (b) Find the angle between the line EB and the plane CDEF **SECTION II (48 marks)**

#### Answer any six questions from this section

- 17. A cylindrical water tank is a diameter 7 meters and height 2.8 metre (a) Find the capacity of the water tank in litres
  - (b) Six members of a family use 15 litres per day. Each day 80 litres are used for cooking and washing and a further 60 litres are wasted. Find the number of complete days a full tank of water would last the family.

18.	Pai	Complete	the table	below for	the value of v	$\mathbf{v} = 2 \sin \mathbf{x} + \cos \mathbf{x}$	x.
<b>TO</b> .	, 100	Complete	the table	0010 101	uno varao or	, 2011111 0001	

	· 🗸	. (~)	r					01 0110		<u> </u>				
	X	0	30	45	60	90	120	135	150	180	225	270	315	360
	,€v ,€v	0	0	0	0	0	0	0	0	0	0	0	0	0
<sup>€</sup> C	2	0		1.4	1.7	2	1.7	1.4	1	0		-2	-1.4	0
e <sup>e</sup>	sin													
\$ <sup>1</sup>	х													
de la companya de la comp	Co	1		0.7	0.5	0	-0.5	-0.7	-0.9	-1		0	0.7	1
40	s x													
\$°	У	1		2.1	2.2	2	1.2	0.7	0.1	-1		-2	-0.7	1
(b)	Using	g the	e grid	prov	ided o	draw	the gra	aph of	y=2 s	in x +	cos x f	for $\overline{0^0}$ .	Take 1	l cm

(b) Using the grid provided draw the graph of y= 2 sin x + cos x for 0<sup>0</sup>. Take 1 cm represent 30<sup>0</sup> on the x- axis and 2 cm to represent 1 unit on the axis.

(c) Use the graph to find the range of x that satisfy the inequalities 2 sin x cos x > 0.5



 $s(x^2 - 2x - 3)dx$ (b)

,sepastpapers.com (c) Find the area bounded by the curve  $y = x^2 - 2x - 3$ , the axis and the lines x=2 and x=4

21. Two variables R and V are known to satisfy a relation  $R = kV^n$ , where k and n are constants. The table below shows data collected from an experiment/involving the two variables R and V.

V	2º	3	4	5	6	7	8
R	Ŷ, Ŷ	27	48	75	108	147	192
	S						

(a) Complete the table of log V and R given below, by giving the value to 2 decimal places.

Log V	0.48	0.60	0.70	0.78	0.85	0.90
Log R	1.43	1.88	2.03	1.80	2.28	

- (b) On the grid provided draw a suitable straight line graph to represent the relation R= kV<sup>n</sup>
- (c) (i) the gradient of the line
  - (ii) a relationship connecting R and V.
- 22. Two aeroplane P and Q leaves an airport at the same time. P lies on a bearing of 240° at 900 km/ h while Q flies due east at 750 km/ h.
  - (a) Using a scale of 1 cm to represents 100km, make a scale drawing to show the position of the aeroplane after 40 minutes.
  - (b) Use the scale drawing to find the distance between the two aeroplane after 40 minutes.
  - (c) Determine the bearing
    - P from O (i)
    - O from P (ii)
- 23. The figure below represents a rectangle PQRS inscribed in a circle centre 0 and radius 17cm PO



#### Calculate

FOR NOTE Free

(d) The length PS of the rectangle

- (f) The area of the shaded region A draper is required to sur total number of shirts -A than of type B<sup>1</sup> 300 and th bethe A draper is required to supply two types of shirts A and type B. 24. The total number of shirts must not be more than 400. He has to supply more type A than of type B however the number of types A shirts must be more than 300 and the number of type B shirts not be less than 80. Let x be the number of type A shirts and y be the number of types B shirts.
  - (a) Write down in terms of x and y all the linear inequalities representing the <sup>\*</sup>information above.
- FOT NOTE FILE LCSE (b) On the grid provided, draw the inequalities and shade the unwanted regions

Type A: Kshs 600 per shirt

Type B: Kshs 400 per shirt

- Use the graph to determine the number of shirts of each type that (i) should be made to maximize the profit.
- (ii) Calculate the maximum possible profit.