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

Answer all the questions in this section

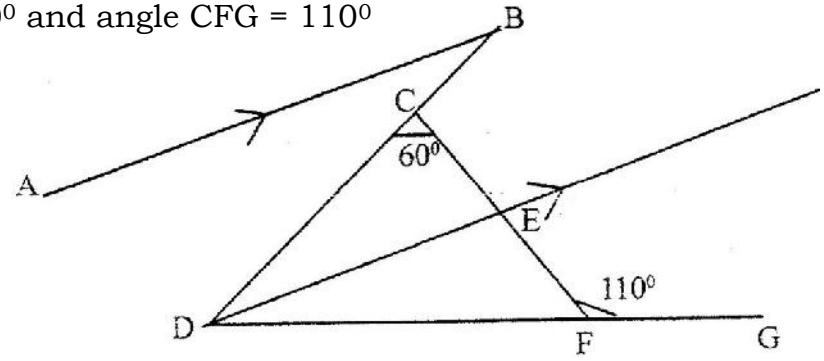
1. Evaluate without using mathematical tables

$$1000\sqrt{\frac{0.0128}{200}}$$

2. Factorize $a^2 - b^2$
   Hence find the exact value of $2557^2 - 2547^2$

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 = 60^0 and angle CFG = 110^0



   Find
   (a) $\angle$ CDF

   (b) $\angle$ ABD
   Give reasons for your answers

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

b) If $A^2 = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, 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,

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

11. A cyndrical container of radius 15cm has some water in it. When a solid is submerged into the water, the water level rises by 1.2 cm.
   (a) Find, the volume of the water displaced by the solid leaving your 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)	$0 \le x \le 4$	$4 \le x \le 8$	$8 \le x \le 12$	$12 \le x \le 16$	$16 \le x \le 20$
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

13. A financial institution charges compound interest on money borrowed. 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 $\cos (3\theta + 120^0) = \sqrt{3}/2$ for $0 \le \theta \le 180^0$

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/π lies.

(b) By taking π to 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 ½ percent fat and farm B produces milk with 4 ¾ percent fat.

(a) Determine

(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.

18. The table below shows monthly income tax rates

Monthly taxable pay K £	Rate of tax Kshs per £
1 - 342	2
343 - 684	3
685 - 1026	4
1027-1368	5
1369 - 1710	6
Over 1710	

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 £

(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 $\begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}$

(i) determine the coordinators of A" B" C" D"
(ii) On the same grid draw the quadrilateral A" B" C" D"

(d) Determine a single matrix that maps ABCD onto A" B"C"D"

20. The position of two towns X and Y are given to the nearest degree as X (45^0 N, 10^0W) and Y (45^0 N, 70^0W)
Find
(a) The distance between the two towns in
(i) Kilometers (take the radius of the earth as 6371)
(ii) Nautical miles (take I nautical mile to be 1.85 km)
(c) The local time at X when the local time at Y is 2.00 pm.

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 ∏ to be 22/7 calculate

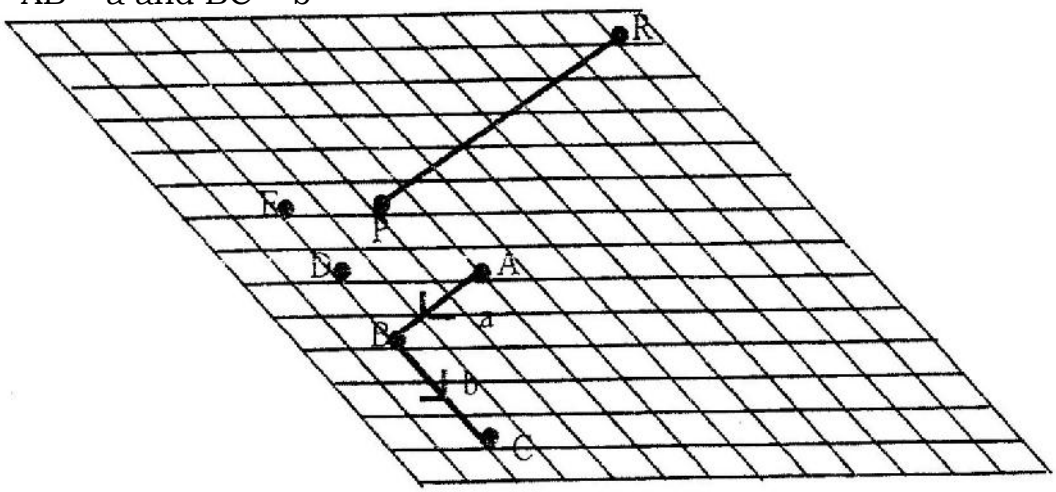
(a) the area of the circular base

(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 = $^{1b}/_{9} - {}^{8a}/_{3}$

By writing PX as kPR and BX as hBA and using the triangle BPX determine the ratio PR: RX

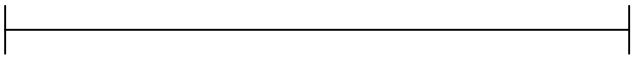
23. Use a ruler and a pair of compasses only for all constructions in this question.

(a) On the line BC given below, construct triangle ABC such that ABC = 30^0 and BA = 12 cm

(b) Construct a perpendicular from A to meet BC produced at D. Measure CD

(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'



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