K.C.S.E. MATHEMATICS PAPER 121/1 2003

SECTION I (52 marks)

Answer all the questions in this section

1. Work out the following, giving the answer as a mixed number in its simplest form

$$\frac{\frac{2}{5} \div \frac{1}{2} \text{ of } \frac{4}{9} - 1\frac{1}{10}}{\frac{1}{8} - \frac{1}{6} \times \frac{3}{8}}$$

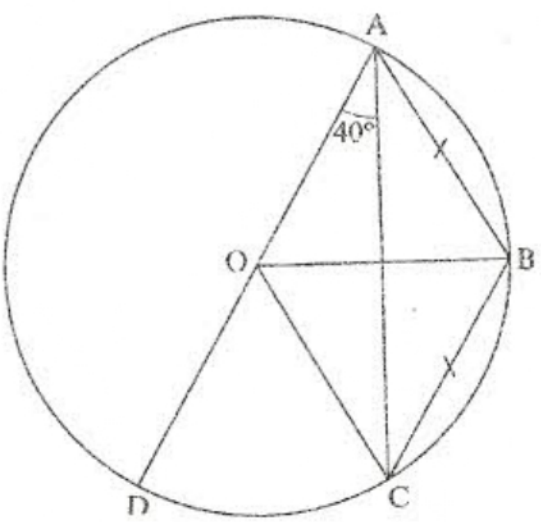
(3 marks)

2. Simplify the expression

$$\left(a + \frac{1}{b}\right)^2 - \left(a - \frac{1}{b}\right)^2$$

(3 marks)

3. In the figure below, O is the centre of the circle ABCD and AOD in a straight line. If $\overline{AB} = \overline{BC}$ and angle DAC = 40°, calculate angle BAC



(3 marks)

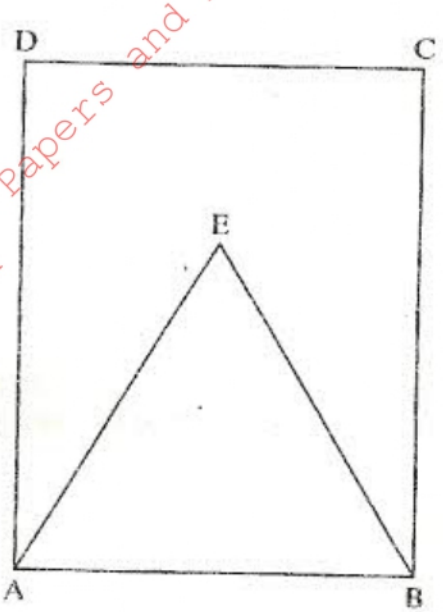
4. Using a ruler and a pair of compasses only.

   a) Construct triangle ABC in which BC=8cm, angle ABC=105° and BAC=45° (2 marks)

   b) Drop a perpendicular from A to meet CB produced at P. Hence, find the area of triangle ABC (2 marks)

5. The length of a solid prism is 10cm. Its cross-section is an equilateral triangle of side 6cm. Find the total surface area of the prism (3 marks)

6. A wire of length 21cm is bent to form the shape shown in the figure below. ABCD is a rectangle and AEB is an equilateral triangle.



If the length AD of the rectangle is 1½ times its width, calculate the width of the rectangle (2 marks)

7. Two straight paths are perpendicular to each other at point P. One path meets a straight road at point A while the other meets the same road at B. Given that PA is 50 metre while PB is 60 metres, calculate the obtuse angle made by path PB and the road (3 marks)

8. The length of a hollow cylindrical pipe is 6 metres. Its external diameter is 11 cm and has a thickness of 1 cm. Calculate the volume, in cm^3, of the material used to make the pipe. (Take π as 3.142) (3 marks)

9. a) Write an expression in terms of x and y for the total value of a two digit number having x as the tens digit and y as the units digit. (1 mark)

   b) The number in (a) above is such that three times the sum of its digits is less than the value of the number by 8. When the digits are reversed the value of the number increases by 9. Find the number (3 marks)

10. Three points O, A and B are on the same horizontal ground. Point A is 80 metres to the north of O. Point B is located 70 metres on a bearing of 060^0 from A. A vertical mast stands at point B. The angle of elevation of the top of the mast from O is 20^0. Calculate
    a) The distance of B and O (2 marks)

    b) the height of the mast in metres (2 marks)

11. Use logarithm tables to evaluate

$$\frac{2347 \times 0.4666}{\sqrt[3]{0.0924}}$$

(4 marks)

12. A shirt whose marked price in sh 800 is sold to a customer after allowing him a discount of 13%. If the trader makes a profit of 20%, find how much the trader paid for the shirt. (3 marks)

13. The table below, shows the number of goals scored by a football team in 20 matches.

Goals scored	0	1	2	3	4	5
Number of matches	5	6	4	3	1	1

Find:

a) the mode (1 mark)

b) the mean number of goals (2 marks)

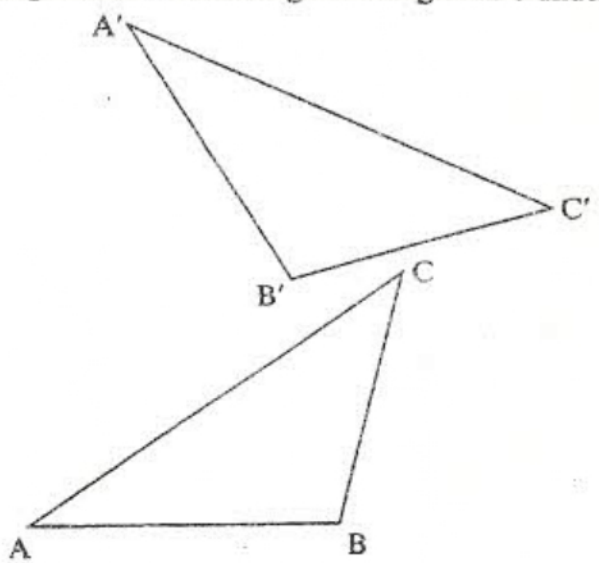
14. A straight line passes through points A (-3,8) and B (3,-4). Find the equation of the straight line through (3, 4) and parallel to AB. Give the answer in the form $y = mx + c$, where m and c are constants. (3 marks)

15. A train moving at an average speed of 72km/h takes 15 seconds to completely cross a bridge that is 80 metres long.

a) Express 72km/h in metres per second (1 mark)

b) Find the length of the train in metres. (2 marks)

16. In the figure below, triangle A'B'C is the image of triangle ABC under a rotation, centre O.



By construction, find and label the centre O of the rotation. Hence, determine the angle of the rotation. (3 marks)

17. The surface area of a solid hemisphere of radius rcm, is 75π cm^2. Find the volume of the solid, leaving your answer in terms of π. (4 marks)

18. Machine a can do a piece of work in 6 hours while machine B can do the same work in 9 hours. Machine A was set ot do the piece of work but, after 3 hours, it broke down and machine B did the rest of the work.
Find how long machine B took to do the rest of the work. (3 marks)

19. Three business partners Atieno, Wambui and Mueni contributed sh 50, 000, sh 40,000 and sh 25,000 respectively to start a business.
After some time, they realised a profit which they decided to share in the ratio of their contributions. If Mueni's share was sh 10,000 by how much was Atieno's share more than Wambui?

(3 marks)

20. A rectangular tank whose internal dimensions are 1.7m by 1.4m by 2.2m is three-quarters full of milk.

a) Calculate the volume of milk in the tank in cubic metres (2 marks)

b) The milk is to be packed in small packets. Each packet is in the shape of a right pyramid on an equilateral triangular base of side 16cm. The height of each packet is 3.6cm. Full packets obtained are sold at sh 25 per packet.

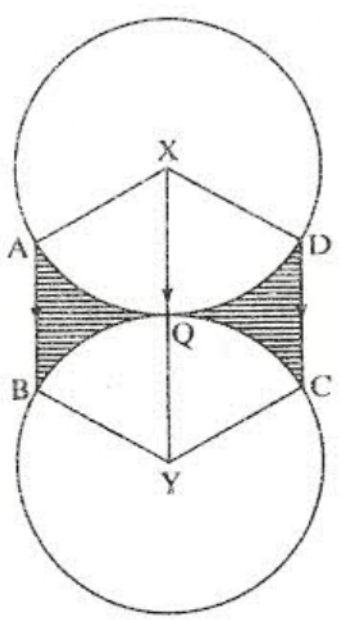
Calculate

i) the volume of milk, in cubic centimetres, contained in each packet to 2 significant figures (4 marks)

ii) the exact amount that will be realised from the sale of all the packets of milk

(2 marks)

21. The figure below shows two circles each of radius 7cm, with centres at X and Y. The circles touch each other at point Q.



Given that $\angle AXD = \angle BYC = 120^0$ and lines AB, XQY and DC are parallel, calculate the area of:

a) the minor sector XAQD (Take $\pi = \frac{22}{7}$) (2 marks)

b) the trapezium XABY (4 marks)

c) the shaded regions (2 marks)