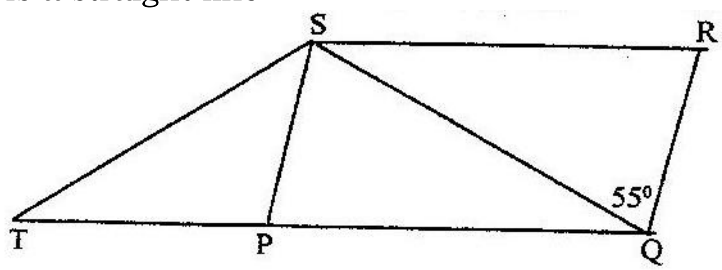
MATHEMATICS PAPER 121/1 K.C.S.E 1997 QUESTIONS
SECTION 1 (52 marks)
Answer all the questions in this section

1. Use logarithms to evaluate $\dfrac{(1934)^2 \times 0.00324}{\sqrt{436}}$

2. Find the greatest common factor of x^3y^2 and $4xy^4$. Hence completely the expression $x^3y^2 - 4xy^4$

3. In the figure below PQRS is a rhombus, < SQR = 55^0, < QST is a right angle and TPQ is a straight line



Find the size of the angle STQ

4. In geometric progression, the first is a and the common ratio is r. The sum of the first two terms is 12 and the third term is 16.
   (a) Determine the ratio $\dfrac{ar^2}{a + ar}$
   (b) If the first term is larger than the second term, find the value of r.

5. There are two signposts A and B on the edge of the road. A is 400 m to the west of b. A tree is on a bearing of 060^0 from A and a bearing of 330^0 from B Calculate the shortest distance of the tree from the edge of the road.

6. A cylinder of radius 14 cm contains water. A metal solid cone of base radius 7 cm and height 18cm is submerged into the water. Find the change in height of the water level in the cylinder.

7. A company saleslady sold worth Kshs 42, 000 from this sale she earned a commission of Kshs 4,000
   (a) calculate the rate of commission
   (b) If she sold goods whose total marked price was Kshs 360,000 and allowed a discount of 2% calculate the amount of commission she received.

8. The following enrollment figures for twenty primary schools were collected

934	923	936	924	933	933	937	926	923
934	931	929	934	927	932	934	927	940

(a) Determine the mode

(b) The difference from an assumed mean were obtained and rearranged as follows

(i) Determine the assumed mean

(ii) Use the assumed mean in (b) (i) to find the mean enrolment

9. Given that $A = \begin{pmatrix} 1 & 3 \\ 5 & 3 \end{pmatrix}$ $B = \begin{pmatrix} 3 & 1 \\ 5 & -1 \end{pmatrix}$, $C = \begin{pmatrix} p & 0 \\ 0 & q \end{pmatrix}$ and AB = BC, determine the value of P

10. The curve $y = ax^3 - 3x^2 - 2x + 1$ has the gradient 7 when x=1. Find the value of a

11. Find the value of θ between 0^0 and 360^0 satisfying the equation $5 \sin \theta = 4$

12. A businesswoman bought two bags of maize at the same price per bag. She discovered that one bag was of high quality and the other of low quality. On the high quality bag she made a profit by selling at Kshs 1,040. Whereas on the low quality bag she made a loss by selling at Kshs 880. If the profit was three times the loss, calculate the buying price per bag.

13. Given that $y = \dfrac{b - bx^2}{cx^2 - a}$ make x the subject

14. Two towns P and Q are 400 km apart. A bus left P for Q. It stopped at Q for one hour and then started the return journey to P. One hour after the departure of the bus from P, a trailer also heading for Q left P. The trailer met the returning bus ¾ of the way from P to Q. They met t hours after the departure of the bus from P.

(a) Express the average speed of the trailer in terms of t

(b) Find the ration of the speed of the bus so that of the trailer.

15. Akinyi bought three cups and four spoons for Kshs. 324. Wanjiku bought five cups and Fatuma bought two spoons of the same type as those bought by Akinyi. Wanjiku paid Kshs 228 more than Fatuma. Find the price of each cup and spoon.

16. (a) Work out the exact value of $R = \dfrac{1}{0.003146 - 0.003130}$

(b) An approximate value of R may be obtained by first correcting each of the decimal in the denominator to 5 decimal places

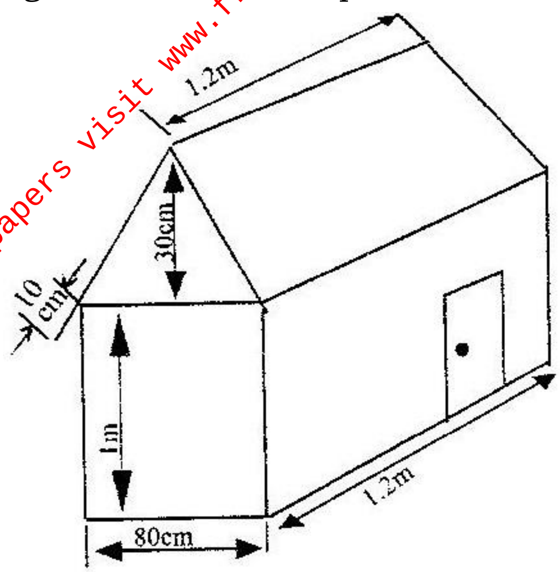
(i) The approximate value

(ii) The error introduced by the approximation

SECTION II (48 MARKS)

Answer six questions from this section

17. The figure below shows a portable kennel



(a) Calculate

(i) The total surface area of the walls and the roof (include the door as part of the wall)

(ii) The total area of the roof

(b) The cost of roofing is Kshs 300 per square metre and that of making walls and floor Kshs 350 per square metre. Find the cost of making the kennel

(c) Find the cost of roofing another kennel whose dimensions are 50% more than those of given kennel.

18. A ship leaves an island (5^0N, 45^0E) and sails due east for 120 hours to another island. The average speed of the ship is 27 knots.

(a) Calculate the distance between the two islands

(i) in nautical miles

(ii) in kilometers

(b) Calculate the speed of the ship in kilometers per hour

(c) Find the position of the second island

(take 1 nautical mile to be 1.853 Km and the radius of the earth to be 6370 Km)

19. Using ruler and compasses only construct triangle ABC such that AB = 4 cm, BC = 5cm and < ABC = 120^0. Measure AC.

On the diagram, construct a circle which passes through the vertical of the triangle ABC.

Measure the radius of the circle

Measure the shortest distance from the centre of the circle to line BC.

20. (a) Draw the graph of $y=6+x-x^2$, taking integral value of x in $-4 \le x \le 5$. (The
grid is provided. Using the same axes draw the graph of $y = 2 - 2x$

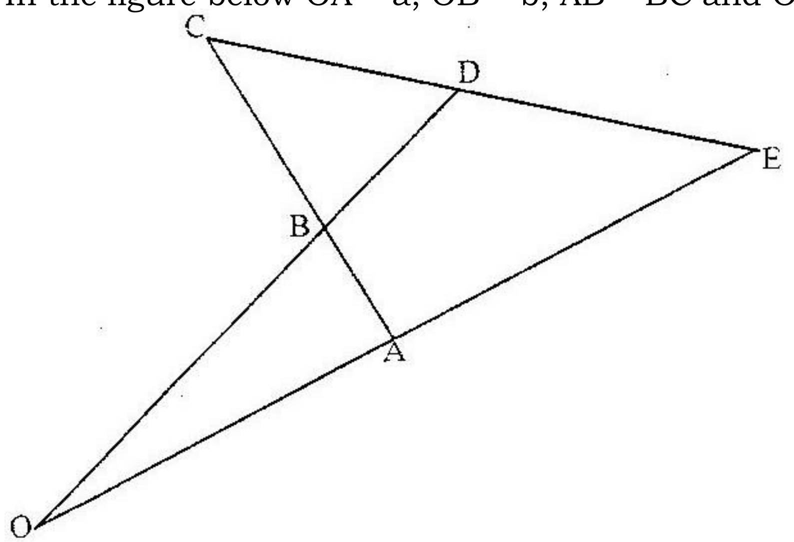
(b) From your graphs, find the values of X which satisfy the simultaneous equations $y = 6 + x - x^2$
$y = 2 - 2x$

(c) Write down and simplify a quadratic equation which is satisfied by the values of x where the two graphs intersect.

21. The water supply in a town depends entirely on two water pumps. A and B. The probability of pump A filling is 0.1 and the probability of pump B failing is 0.2. Calculate the probability that

(a) Both pumps are working
(b) There is no water in the town
(c) Only one pump is working
(d) There is some water in the town

22. In the figure below OA = a, OB = b, AB = BC and OB: BD = 3:1



(a) Determine
(i) AB
(ii) CD, in terms of a and b

(b) If CD : DE = 1:k and OA:AE = 1: m determine
(i) DE in terms of a, b and k

23. The figure on the grid shows a triangular shaped object ABC and it’s image A’B’ C’

(a) (i) Describe fully the transformation that maps ABC and A’B’C’

(ii) Find a 2 x 2 matrix that transforms triangle ABC onto triangle A’ B’ C’

(b) The matrix P = $\begin{pmatrix} 2 \end{pmatrix}$ 1 transforms triangle ABC onto A” B” C”

1 1

(i) Find the coordinates of A” B” C”

(c) Find the area of triangle ABC

(d) Hence find the area of the image A” B” C

24. The coordinates of the points P and Q are (1, -2) and (4, 10) respectively. A point T divides the line PQ in the ratio 2: 1

(a) Determine the coordinates of T

(b) (i) Find the gradient of a line perpendicular to PQ

(ii) Hence determine the equation of the line perpendicular PQ and passing through T

(iii) If the line meets the y- axis at R, calculate the distance TR, to three significant figures

MATHEMATICS PAPER 121/2 K.C.S.E 1997 QUESTIONS
SECTION 1 (52 Marks)
Answer all questions in this section

1. evaluate without using mathematical tables

$$\frac{1.9 \times 0.032}{20 \times 0.0038}$$

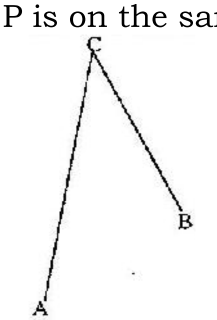
2. Mary has 21 coins whose total value is Kshs 72. There are twice as many five shillings coins as there are ten shillings coins. The rest are one shillings coin. Find the number of ten shillings coins that Mary has.

3. A commercial bank buys and sells Japanese yen in Kenya shillings at the rates shown below.

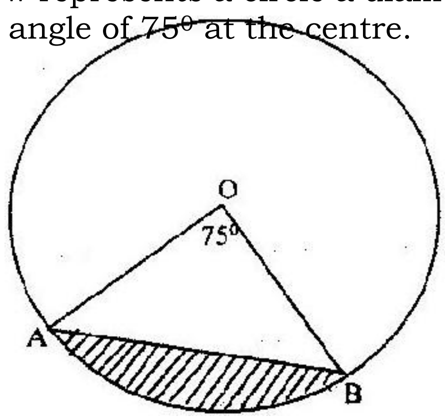
Buying	Selling
Kshs 0.5024	Kshs. 0.5446

A Japanese tourist at the end of his tour of Kenya was left with Kshs 30,000 which he converted to Japanese yen through the commercial bank. How many Japanese yen did he get?

4. On the figure below construct
   (i) the perpendicular bisector of BC
   (ii) The locus of a point P which moves such a way that $\angle$ APB = $\angle$ AVB and P is on the same side of AB on the same side of AB as C



5. The figure below represents a circle a diameter 28 cm with a sector subtending an angle of 75^0 at the centre.



Find the area of the shaded segment to 4 significant figures

6. A pyramid of height 10cm stands on a square base ABCD of side 6 cm

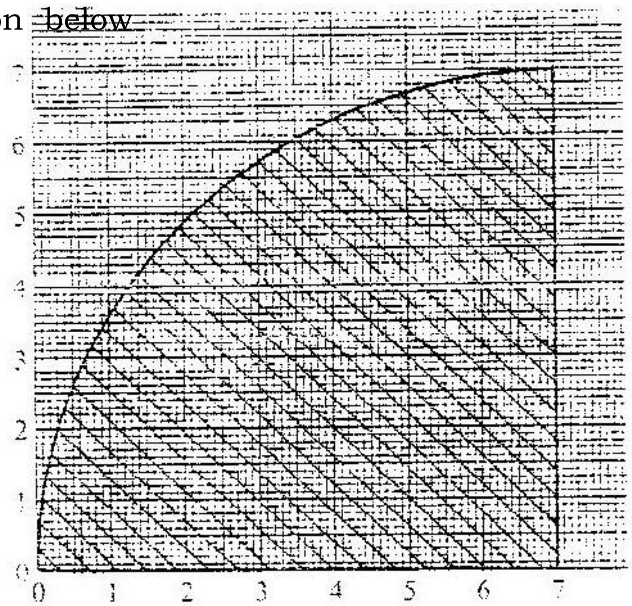
   (a) Draw a sketch of the pyramid

   (b) Calculate the perpendicular distance from the vertex to the side AB

7. Find the value of m in the following equation

   $\left(\frac{1}{2}\right)^{m} \times (81)^{-1} = 243$

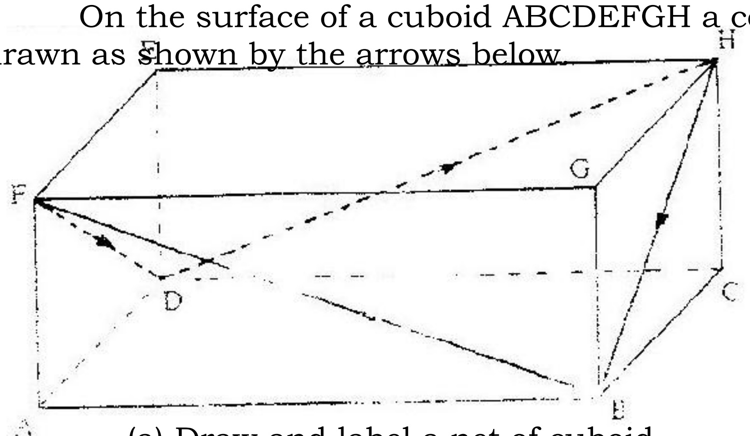
8. Use the trapezoidal rule with intervals of 1 cm to estimate the area of the shaded region below



9. Expand and simplify $(1 - 3x)^5$, up to the term in x^3

   Hence use your expansion to estimate $(0.97)^5$ correct to 4 decimal places

10. On the surface of a cuboid ABCDEFGH a continuous path BFDHB is drawn as shown by the arrows below.



   (a) Draw and label a net of cuboid
   (b) On the net show the path

11. ABC is a triangle and P is on AB such that P divides AB internally in the ratio 4:3. Q is a point on AC such that PQ is parallel to BC. If AC = 14 cm

(i) State the ratio AQ:QC

(ii) Calculate the length of QC

12. If $\frac{14}{\sqrt{7}-\sqrt{2}} \quad \frac{14}{\sqrt{7}+\sqrt{2}} = a\sqrt{7} + b\sqrt{2}$

Find the values of a and b where b are rational numbers

13. The table below represents the mean scores in six consecutive assessment tests given a form four class

Tests	T_1	T_2	T_3	T_4	T_5	T_6
Mean scores in percentage	48.40	56.25	50.30	49.00	45.60	57.65

Calculate the three moving averages of order 4

14. Mogaka and Onduso working together can do a piece of work in 6 days, Mogaka, working alone takes 5 days longer than Onduso. How many days doest it take Onduso to do the work alone?

15. The athletes in an 800 metres race take 104 seconds and 108 seconds respectively to complete the race. Assuming each athlete is running at a constant speed. Calculate the distance between them when the faster athlete is at the finishing line.

16. A metal bar is a hexagonal prism whose length is 30 cm. The cross – section is a regular hexagon with each side of the length 6 cm.
Find
(i) the area of the hexagonal face
(ii) the volume of the metal bar

SECTION II (48 MARKS)

Answer any six questions from this section

17. A company is to construct a parking bay whose area is $135m^2$. It is to be covered with concrete slab of uniform thickness of 0.15. To make the slab cement. Ballast and sand are to be mixed so that their masses are in the ratio 1: 4: 4. The mass of m^3 of dry slab is 2, 500kg.
Calculate
(a) (i) The volume of the slab

(ii) The mass of the dry slab

(iii) The mass of cement to be used

(b) If one bag of the cement is 50 kg, find the number of bags to be purchased
(c) If a lorry carries 7 tonnes of sand, calculate the number of lorries of sand to be purchased

18. Complete the table below by filling in the blank spaces

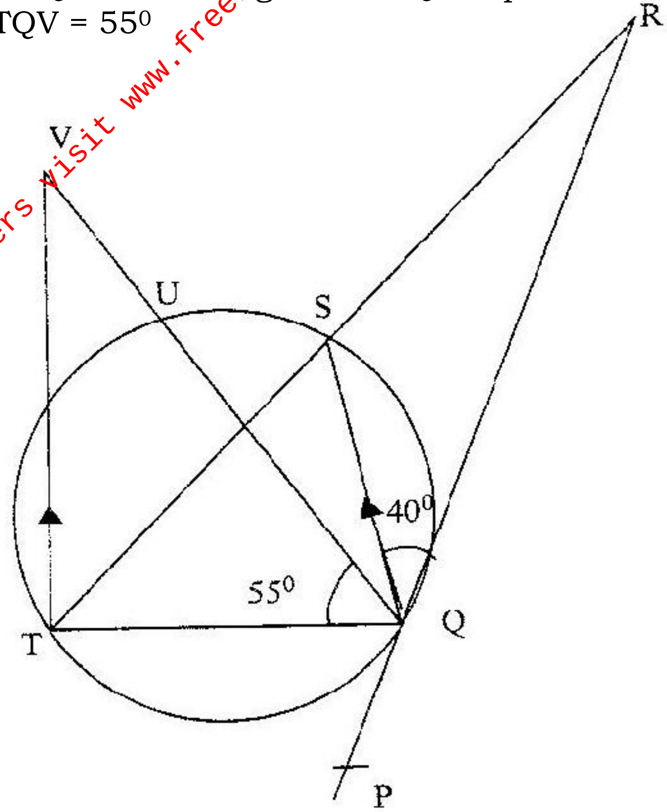
X^0	0^0	30^0	60^0	90^0	120^0	150^0	180^0	210^0	240^0	270^0	300^0	330^0	360^0
Cos x^0	1.00	0.87	0.50	0	-0.5	- 0.87	-1.0	- 0.87	-0.5	0	0.5	0.87	1.0
2 cos ½ x^0	2.00	1.93	1.73	1.41	1.0	0.52	0	0.52	- 1.00	1.47	1.73	1.93	- 2.00

Using the scale 1 cm to represent 30^0 on the horizontal axis and 4 cm to represent 1 unit on the vertical axis draw, on the grid provided, the graphs of y = $\cos x^0$ and y = 2 cos ½ x^0 on the same axis.

(a) Find the period and the amplitude of y = 2 cos ½ x^0
(b) Describe the transformation that maps the graph of y = cosx0 on the graph of y = 2 cos 1/2 x^0

19. An institute offers two types of courses technical and business courses. The institute has a capacity of 500 students. There must be more business students than technical students but at least 200 students must take technical courses. Let x represent the number of technical students and y the number of business students.
(a) Write down three inequalities that describe the given conditions
(b) On the grid provided, draw the three inequalities
(c) If the institute makes a profit of Kshs 2, 500 to train one technical students and Kshs 1,000 to train one business student, determine
(i) the number of students that must be enrolled in each course to maximize the profit
(ii) The maximum profit.

20. In the figure below PQR is the tangent to circle at Q. TS is a diameter and TSR and QUV are straight lines. QS is parallel to TV. Angles SQR = 40^0 and angle TQV = 55^0



Find the following angles, giving reasons for each answer

(a) QST

(b) QRS

(c) QVT

(d) UTV

21. The volume vcm^3 of a solid depends partly on r^2 and partly on r^3 where r cm is one of the dimensions of the solid

When r = 1, the volume is 54.6 cm^3 and

When r = 2, the volume is 226. 8cm^3

(a) Find the expression for v in terms of r

(b) Calculate the volume of the solid when r = 4

(c) Find the value of r for which the two parts of the volume are equal