KCSE 2003 MATHEMATICS PAPER 1
QUESTIONS
SECTION 1 (52 Marks)

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

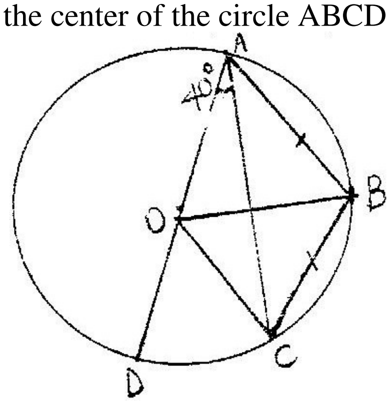
$$\frac{{}^{2}/_{5} \div \frac{1}{2} \text{ of } {}^{4}/_{9} - 1\,{}^{1}/_{10}}{{}^{1}/_{8} - {}^{1}/_{6} \times {}^{3}/_{8}}$$ (3mks)

2. Simplify the expression $\left(a + {}^{1}/_{b}\right)^{2} - \left(a - {}^{1}/_{b}\right)^{2}$ (3mks)

3. Make c the subject of t formula: $T = x\sqrt{c^2 + d^2}$ (3mks)

4. A water pump costs Kshs. 21600 when new. At the end of first year its value depreciates by 25%. The depreciation by the second year is 20% and thereafter the rate of the depreciation is 15% yearly. Calculate the exact value of the water pump at the end of the fourth year. (3mks)

5. In the figure below is the center of the circle ABCD and AOD in a straight line.



If AB = BC and angle DAC = 400, Calculate angle BAC. (3mks)

6. Give that x = 2i +j – 2k,y = - 3i +4j –k and z = - 5i +3j +2k and that p = 3x – y +2z. Find the magnitude of vector p to 3 significant figures. (4mks)

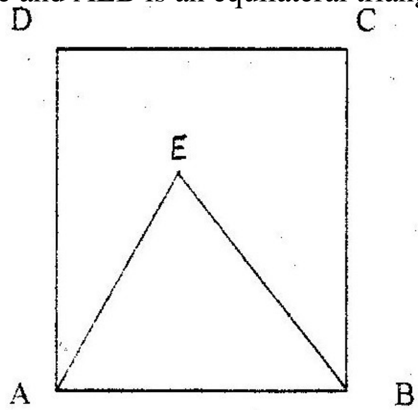
7. Solve the equation 3 tan2 x – 4 tan x -4 =0 for $0^0 \leq x \geq 180^0$ (4mks)

8. Using a ruler and a pair of compasses only.
   - a) Construct triangle ABC in which BC = 8cm, angle ABC = 1050 and BAC =450
   - b) Drop a perpendicular from A to meet CB produced at p. Hence find the area of triangle ABC.

9. There are three cars A,B and C in a race. A is twice as likely to win as B while B is twice as likely to win as c. Find the probability that.
   - a) A wins the race
   - b) Either B or C win the race. (3mks)

10. 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.

11. A wire of length 21cm is bent to form the shape down in the figure below, ABCD is a rectangle and AEB is an equilateral triangle. (2mks)



If the length of AD of the rectangle is 1 ½ times its width, calculate the width of the rectangle.

12. 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 metres while PB is 60 metres. Calculate the obtuse angle made by path PB and the road.

13. The length of a hallow cylindrical pipe is 6metres. Its external diameter is 11cm and has a thickness of 1cm. Calculate the volume in cm3 of the material used to make the pipe.
Take Π as 3.142.

14. 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.
b) The number in (a^0 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.

15. 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 from O. (2mks)
b) The height of the mast in metres (2mks)

16. The velocity Vms-1 of particle in motion is given by $V = 3t^2 - t + 4$, where t is time in seconds.
Calculate the distance traveled by the particle between the time t=1 second and t=5 seconds.

17. 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.

b) Pyramid on an equilateral triangular base of side 16cm. The height of each packet is 1.6cm. Full packets obtained are sold at sh.25 per packet.

i) The volume of milk in cubic centimeters, contained in each packet to 2 significant figures

ii) The exact amount that will be realized from the sale of all the packets of milk.

18. The mass of 40 babies in a certain clinic were recorded as follows:

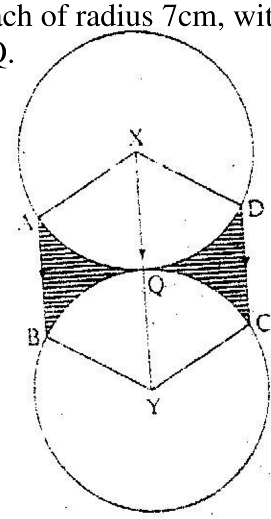
Mass in Kg	No. of babies.
1.0 – 1.9	6
2.0 – 2.9	14
3.0 -3.9	10
4.0 – 4.9	7
5.0 – 5.9	2
6.0 – 6.9	1

Calculate

(a) The inter – quartile range of the data.

(b) The standard deviation of the data using 3.45 as the assumed mean.

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

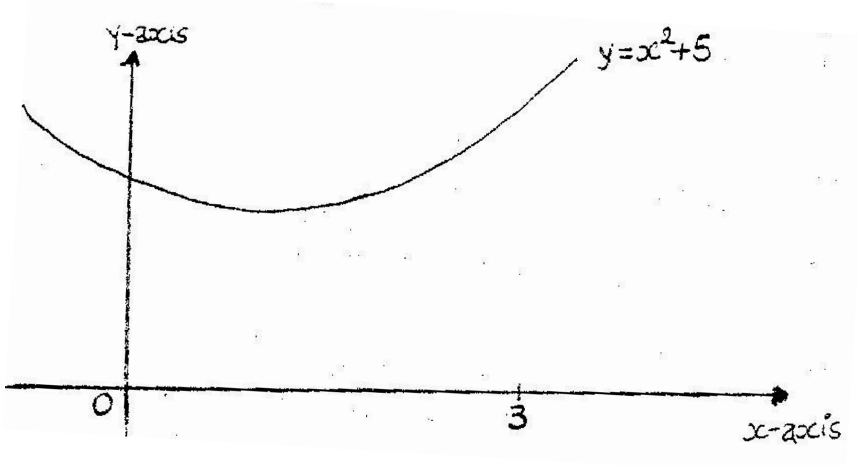


Give that AXD = BYC = 1200 and lines AB, XQY and DC are parallel, calculate the area of:

a) Minor sector XAQD (Take Π $^{22}/_{7}$)

b) The shaded regions.

20. The diagram below is a sketch of the curve $y = x^2 + 5$.

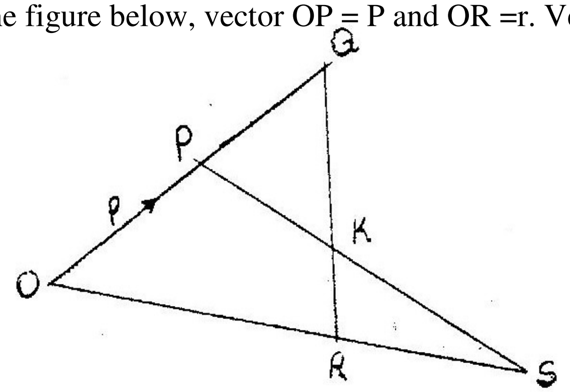


a) i) Use the mid –ordinate rule, with six strips to estimate the area enclosed by the curve, the x – axis and the y – axis and line x =3. (4mks)

ii) Calculate the same area using the integration method. (2mks)

b) Assuming the area calculated in (a) (ii) _______________ calculate the percentage error made when the mid – ordinate rule is used.

21. In the figure below, vector OP = P and OR =r. Vector OS = 2r and OQ = $^3/_2$p.



a) Express in terms of p and r (i) QR and (ii) PS

b) The lines QR and PS intersect at K such that QK = m QR and PK = n PS, where m and n are scalars. Find two distinct expressions for Ok in terms of P,r,m and n. Hence find the values of m and n. (5mks)

c) State the ratio PK:KS

22. Complete the table below, for function $y = 2x^2 + 4x - 3$

X	-4	-3	-2	-1	0	1	2
2x2	32		8	2	0	2	
4x - 3			-11		-3		5
y			-3			3	13

(b) On the grid provided, draw the graph of the function y=2x2 + 4x -3 for $-4 \leq x \leq 2$ and use the graph to estimate the rots of the equation 2x2+4x – 3 = 0 to 1 decimal place. (2mks)

c) In order to solve graphically the equation 2x2 +x -5 =0, a straight line must be drawn to intersect the curve y = 2x2 + 4x – 3. Determine the equation of this straight line, draw the straight line hence obtain the roots.

23. A businessman obtained a loan of sh.450,000 from a bank to buy a matatu valued at the same amount. The bank charges interest at 24% per annum compounded equation. 2x2 + x – 5 = 0 to 1 decimal place.

a) Calculate the total amount of money the businessman paid to clear the loan in 1 – ½ years.

b) The average income realized from the matatu per day was sh.1500. The matatu worked for 3 years at an average of 280 days year. Calculate the total income from the matatu.

c) During the three years, the value of the matatu depreciated at the rate of 16% per annum. If the businessman sold the matatu at its new value, calculate the total profit he realized by the end of three years. (3mks)

24. Two towns A and B lie on the same latitude in the northern hemisphere. When its 8am at A, the time at B is 11.00am.

a) Given that the longitude of A is 150 E find the longitude of B. (2mks)

b) A plane leaves A for B and takes 31/2 hours to arrive at B traveling along a parallel of latitude at 850km/h. Find:

(i) The radius of the circle of latitude on which towns A and B lie. (3mks)

(ii) The latitude of the two towns (take radius of the earth to be 6371km) (3mks)

MATHEMATICS PAPER 2 K.C.S.E 2003
QUESTIONS

1. Use logarithm tables to evaluate $\frac{2347 \text{ x } 0.4666}{3\sqrt{0.0924}}$

2. A shirt whose marked price in shs. 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. The table below shows the number pf 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 (1mk)

b) The mean number of goals (2mks)

4. 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, and c are constants. (3mks)

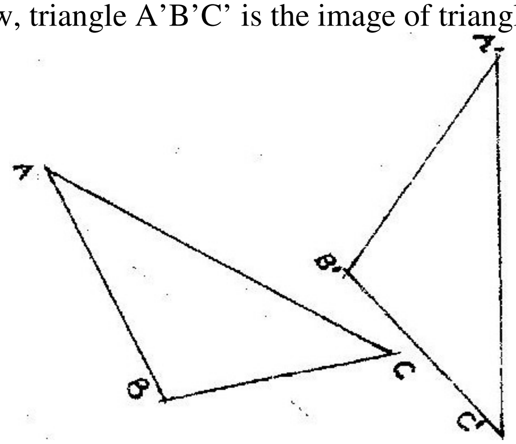
5. Solve the equation $^{\log}{}_{10}(6x - 2) - 1 = {}^{\log}{}_{10}(x - 3)$ (3mks)

6. 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 (1mk)

b) Find the length of the train in metres (2mks)

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



By construction, find the label the centre O of the rotation. Hence, determine the angle of the rotation.

8. Find the coordinates of the turning point of the curve whose equation is
$y = 6 + 2x - 4x2$

9. The surface area of a solid hemisphere is radius ____________ the volume of the solid, leaving your answer in terms of n.

10. Given that $a = \frac{1}{\sqrt{3}}$ and b =13, express $2\sqrt{3} - 6\sqrt{39}$ in terms of a and b and simplify the answer.

11. a) Expand and simplify the binomial expression $(2 – x)^6$ (2mks)

b) Use the expansion up to the term in x2 to estimate 1.99^6 (2mks)

12. A mixed school can accommodate a maximum of 440 students. The number of girls must be at least 120 while the number of boys must exceed 150.
Taking x to represent the number of boys and y the number of girls, write down all he inequalities representing the information above.

13. 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 to do the piece of work but after 31/2 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 (3mks)

14. Three business partners Atieno, wambui and Mueni contributed sh 50,000, Sh.40,000 as sh 25,000 respectively to start a business.
After some time, they realized a profit, which they decided to share in the ration of their contributions.
If Mueni’s share was sh 10.000, by how much was Atieno’s share more than wambui’s?(3mks)

15. A colony of insects was found to have 250 insects at the beginning. Thereafter the number of insects doubled every 2 days. Find how many insects there wee after 16 days.(3mks)

16. A distance s metres of an object varies with time t seconds and partly with the square root of the time.
Give that s = 14 when t = 9, write an equation connecting s and t.

SECTION ii (48 MARKS)

Answer any six questions in this section.

17. Given the simultaneous equations
$5x + y = 19$
$-x + 3y = 9$

a) Write the equations in matrix form. Hence solve the simultaneous equations. (5mks)

b) Fins the distance of the point of intersection for the line $5x + y = 19$ and $-x + 3y = 9$ from the point (11,-2) (3mks)

18. A dealer has three grades of coffee X,Y and Z. Grade X costs sh 140 per kg, grade y costs sh 160 per kg grade Z costs sh.256 per kg.

a) The dealer mixes grades X and Y in the ration 5:3 to make a brand of coffee which sells at sh 180 per kg.

b) The dealer makes a new brand by mixing the three grades of coffee. In the ratios X:Y =5:3 and Y:Z =2:5

Determine:

i) The ratio X: Y: Z in its simplest form (2mks)

ii) The selling price of the new brand of he has to make a 30% profit. (3mks)

19. A ship leaves port p for port R though port Q.Q is 200 km on a bearing of 220^0 from P.R is 420 km on the bearing of 140^0 from from Q.

a) Using the scale 1:4,000,000, draw a diagram, showing the relative positions of the three ports P,Q, and R.

b) By further drawing on the same diagram, determine how far R is to the east of p Distance = 3.5 x40

c) If the ship has sailed directly from P to R at an average speed of 40 knots, find how long it would have taken to arrive at R.(Take 1 nautical mile = 1.853 km)

20. Omondi makes two types of shoes: A and B. He takes 3 hours to make one pair of type A and 4 hours to make one pair of type B.He works for a maximum of 120 hours to x pairs of type A and Y pairs of type B.It costs him sh 400 to make a pair of type A and sh 150 to make a pair of type B.

His total cost does not exceed sh 9000. He must make 8 pairs of type A and more than 12 pairs of type B.

21. a) i) Find the coordinated of the stationary points on the curve
$y + x - 3x + 2$ (2mks)

ii) For each stationary point determine whether it is minimum or maximum.

b) In the space provided below, sketch the graph of the Function $y=x - 3x +2$ (2mks)

22. The line PQ below is 8cm long and L is its midpoint

a) i) Draw the locus of point R above line PQ such that the area of triangle PQR is $12cm^2$.

ii) Given that point R is equidistant from P and Q,show the position of point R..

b) Draw all the possible loci of a point T such that < RQL = <RTL. (4mks)

23. a) Complete the table below, giving your values correct to 2 decimal places.

X	0	15	30	45	60	75	90	105	120	135	150	165	180
Cos x	1	0.77	0.87	0.71	0.15	0.24	0	-0.26	-0.5	-0.17	0.5	0.87	1
Sin (x +30)	0.5	0.17	0.87	0.97	0.10	0.97	0.87	0.71	0.5	-0.26	0	-0.26	-0.5

b) Using the grid provided draw, on the same axes, the graph of y = cos 2x and y = sin $(x+ 30^0)$ for $0^0 < x < 180^0$

Take the scale: 1cm for 15^0 on the x axis

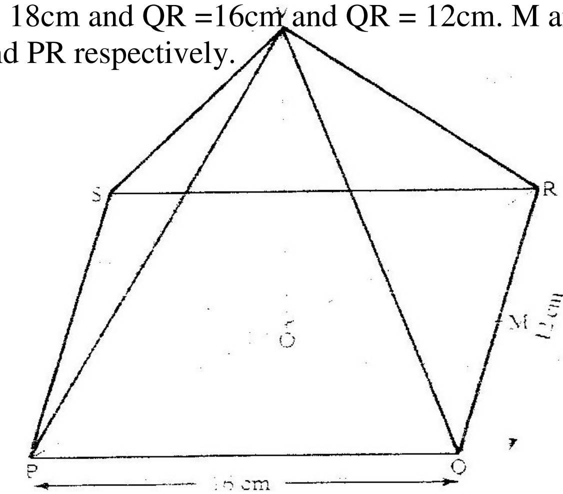
4cm for 1 unit on the y- axis. (4mks)

c) Find the periods of the curve Y = axis (1mks)

d) Using the graphs in part (b) above, estimate the solutions to the equation Sin $(x + 30^0)$ = Cos 2x (4mks)

24. The figure below represents a right pyramid with vertex V and a rectangular base PQRS.

VP = VQ = VR S = 18cm and QR =16cm and QR = 12cm. M and O are the midpoints of QR and PR respectively.



Find:

a) The length of the projection of line VP on the plane PQES (2mks)

b) The size of the angle between line VP and the plane PQRS. (2mks)

c) The size of the angle between the planes VQR and PQRS. (2mks)