

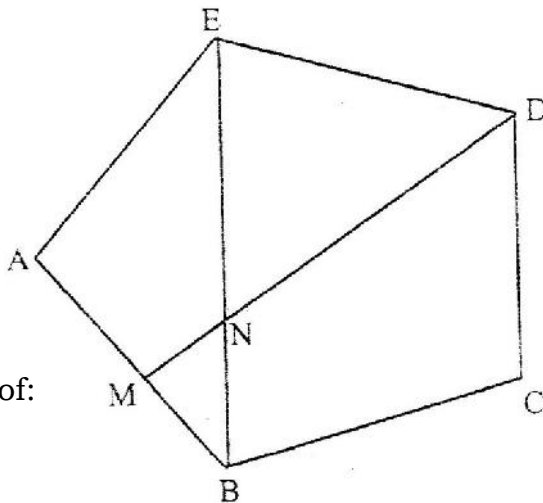
MATHEMATICS PAPER 121/1 K.C.S.E 2000
QUESTIONS
SECTION 1 (52 Marks)

Answer all the questions in this section

1. Evaluate $\frac{28 - (-18)}{-2} - \frac{15 - (-2)(-6)}{-3}$

2. Simplify the expression $\frac{3a^2 + 4ab + b^2}{4a^2 + 3ab - b^2}$

3. In the figure below ABCD is a rectangular pentagon and M is the midpoint of AB. DM intersects EB at N.



Find the size of:

- (a) $\angle BAE$
 (b) $\angle BED$
 (c) $\angle BNM$

4. The table below shows heights of 50 students

Height (cm)	Frequency
140 – 144	3
145 – 149	15
150- 154	19
155- 159	11
160-164	2

- (a) State the modal class
 (b) Calculate the median height
5. Find the value of x that satisfies the equation
 $\log (x + 5) = \log 4 - \log (x + 2)$

6. The enclosed region shown in the figure below represent a ranch drawn to scale. The actual area of the ranch is 1075 hectares.

(a) Estimate the area of the enclosed region in square centimeters



(b) Calculate the linear scale used

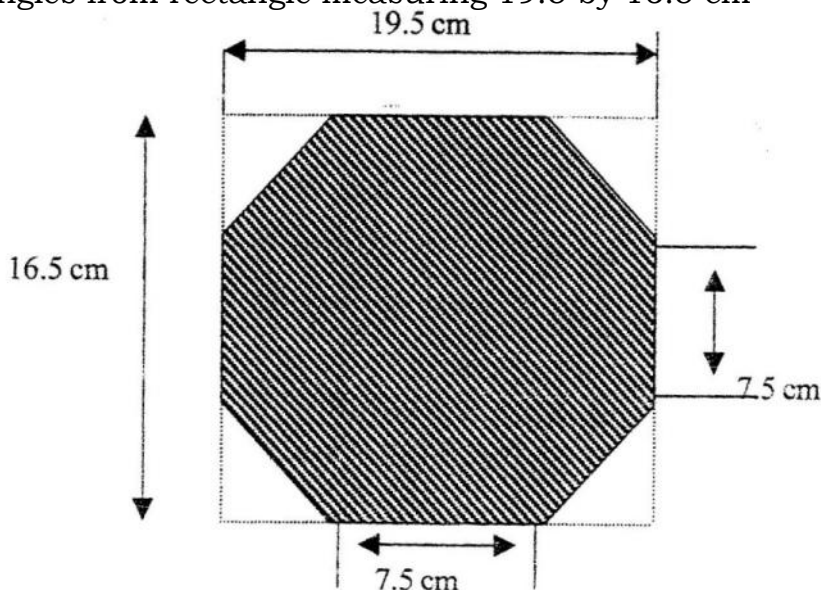
7. Given that $\sin \theta = \frac{2}{3}$ and is an acute angle find:

(a) $\tan \theta$ giving your answer in surd form

(b) $\sec^2 \theta$

8. Shopping centers X, Y and Z are such that Y is 12 km south of X and Z is 15 km from X. Z is on a bearing of 330° from Y.

9. The figure below shows an octagon obtained by cutting off four congruent triangles from rectangle measuring 19.5 by 16.5 cm



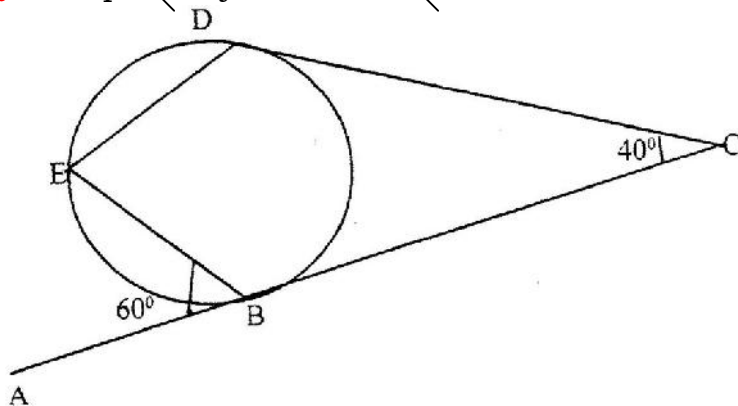
Calculate the area of the octagon

10. The length and breadth of a rectangular paper were measured to be the nearest centimeter and found to be 18cm and 12 cm respectively. Find the percentage error in its perimeter.

11. A pyramid VABCD has a rectangular horizontal base ABCD with AB = 12 cm and BC = 9 cm. The vertex V is vertically above A and VA = 6 cm. Calculate the volume of the pyramid.

12. A tailor intends to buy a sewing machine which costs Kshs. 48,000. He borrows the money from a bank; the loan has to be repaid at the end of the second year. The bank charges an interest at the rate of 24% per annum compounded half-yearly. Calculate the total amount payable to the bank.

13. On the figure below, lines ABC and DC are tangents to the circle at B and D respectively. $\angle ACD = 40^\circ$ and $\angle ABE = 60^\circ$



Giving reasons, find the size of:

(a) $\angle CBD$

(b) $\angle CDE$

14. The acceleration $a \text{ m/s}^2$ of a particle moving in a straight line is given by $a = 18t - 4$, where t is time in seconds. The initial velocity of the particle is 2 m/s

(a) Find the expression for velocity in terms of t

(b) Determine the time when the velocity is again 2 m/s

15. Three people Korir, Wangare and Hassan contributed money to start a business. Korir contributed a quarter of the total amount and Wangare two fifths of the remainder. Hassan's contribution was one and a half times that of Korir. They borrowed the rest of the money from the bank which was Kshs 60,000 less than Hassan's contribution. Find the total amount required to start the business.

16. Karani bought 4 pencils and 6 biro-pens for Kshs 66 and Tachora bought 2 pencils and 5 biro-pens for Kshs 51.

(a) Find the price of each item

(b) Musoma spent Kshs. 228 to buy the same type of pencils and biro pens. If the number of biro-pens he bought were 4 more than the number of pencils, find the number of pencils bought.

SECTION II (48 Marks)

Answer any six questions from this section

17. A triangular plot ABC is such that AB = 36m, BC = 40m and AC = 42 m
(a) Calculate the:

- (i) Area of the plot in square metres
- (ii) Acute angle between the edges AB and bc

- (b) A water tap is to be installed inside the plot such that the tap is equidistant from each of the vertices A, B and C. Calculate the distance of the tap.

18. In form 1 class there are 22 girls and boys. The probability of a girl completing the secondary education course is $\frac{3}{4}$ whereas that of a boy is $\frac{2}{3}$

- (a) A student is picked at random from class. Find the possibility that,

- (i) The student picked is a boy and will complete the course
- (ii) The student picked will complete the course

- (b) Two students are picked at random. Find the possibility that they are a boy

and a girl and that both will not complete the course.

19. (a) Complete the table below for the equation

$$y = 2x^3 + 5x^2 - x - 6$$

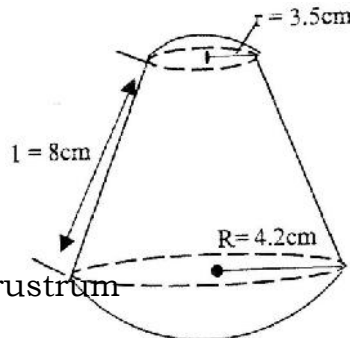
x	-4	-3	-2	-1	0	1	2
$2x^3$	-128	-54			0	2	16
$5x^2$	80	45	20	5	0	5	20
$-x$	4	3		0	-1		
-6	-6	-6	-6	-6	-6	-6	-6
y	-50		2	-6	0		

- (b) On the grid provided draw the graph $y = 2x^3 + 5x^2 - x - 6$ for $-4 \leq x \leq 2$

- (c) By drawing a suitable line use the graph in (b) to solve the equation

$$2x^3 + 5x^2 + x - 4 = 0$$

20. A solid made up of a conical frustrum and a hemisphere top as shown in the figure below. The dimensions are as indicated in the figure.

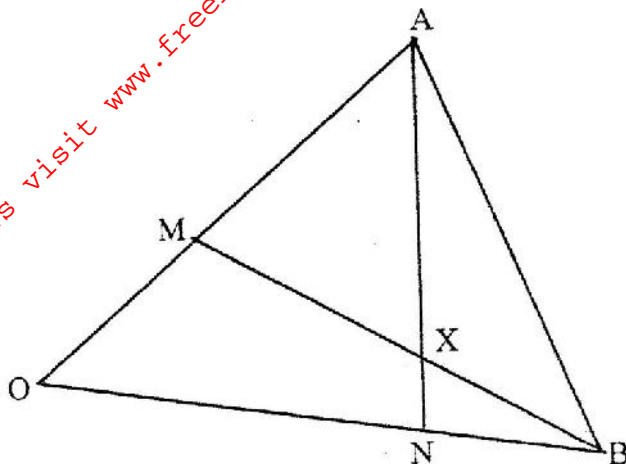


- (a) Find the area of

- (i) The circular base
- (ii) The curved surface of the frustrum
- (iii) The hemisphere surface

- (b) A similar solid has a total area of 81.51 cm^2 . Determine the radius of its base.

21. The figure below shows triangle OAB in which M divides OA in the ratio 2: 3 and N divides OB in the ratio 4:1 AN and BM intersect at X



- (a) Given that $OA = a$ and $OB = b$, express in terms of a and b :
- AN
 - BM
- (b) If $AX = s AN$ and $BX = t BM$, where s and t are constants, write two expressions for OX in terms of a, b, s and t
Find the value of s
Hence write OX in terms of a and b

22. A plane leaves an airport A (38.5° , $37.05^\circ W$) and flies due North to a point B on latitude $52^\circ N$.

- Find the distance covered by the plane
 - The plane then flies due east to a point C, 2400km from B. Determine the position of C
- Take the value of π as $\frac{22}{7}$ and radius of the earth as 6370 km

23. Matrix p is $\begin{pmatrix} \text{given by} \\ 5 & 8 \end{pmatrix}$ 4 7

- Find P^{-1}
- Two institutions, Elimu and Somo, purchase beans at Kshs. B per bag and maize at Kshs m per bag. Elimu purchased 8 bags of beans and 14 bags of maize for Kshs 47,600. Somo purchased 10 bags of beans and 16 of maize for Kshs. 57,400
- The price of beans later went up by 5% and that of maize remained constant. Elimu bought the same quantity of beans but spent the same total amount of money as before on the two items. State the new ratio of beans to maize.

24. (a) Complete the table for the equation
 $Y = 2 \sin (3x + 30^\circ)$

X	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
$3x + 30^\circ$	30	60	90	120	150	180	210	240	270	300
$Y = 2 \sin (3x + 30^\circ)$	1	1.73	2			0			-2	-1.73

- (b) Using the grid provided, draw the graph of $y = 2 \sin (3x + 30^\circ)$ for $0 \leq x \leq 90^\circ$. Take 1 cm to represent 50 on the x-axis and 2 cm to represent 1 unit on the y-axis.

- (c) Use the graph in (b) to find the range of x that satisfy the inequality $y \geq 1.6$.

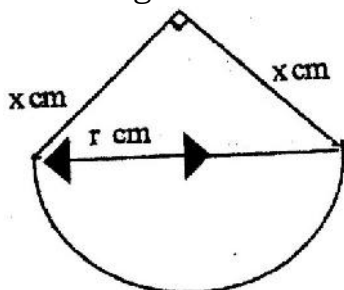
MATHEMATICS PAPER 121/2 K.C.S.E 2000

QUESTIONS

SECTION 1 (52 Marks)

- Find equation of the perpendicular to the line $x + 2y - 4$ and passes through point (2,1)
- A passenger noticed that she had forgotten her bag in a bus 12 minutes after the bus had left. To catch up with the bus, she immediately took a taxi which traveled at 95 km/h. The bus maintained an average speed of 75 km/h. Determine
 - The distance covered by the bus in 12 minutes
 - The distance covered by the taxi to catch up with the bus
- Two sides of a triangles are 5 cm each and the angle between them is 120° . Calculate the area of the triangle.

- A piece of wire P cm long is bent to form the shape shown in the figure below



The figure consists of a semicircular arc of radius r cm and two perpendicular sides of length x cm each.

Express x in terms of P and r ,

Hence show that the area A cm², of the figures is given by $= \frac{1}{2} \pi r^2 + \frac{1}{8} (p - \pi r)^2$

- The distance from a fixed point of a particular in motion at any time t seconds is given by

$$S = \frac{t^3 - 5t^2}{2} + 2t + 5$$

Find its:

- Acceleration after 1 second
- Velocity when acceleration is Zero
- Find all the integral value of x which satisfy the inequalities $2(2-x) < 4x - 9 < x + 11$

- Akinyi, Bundi, Cura, and Diba invested some money on a business in the ratio of 7: 9:10:1 respectively. The business realized a profit of Kshs 46,800. They shared 12% of the profit equally and the remainder in the ratio of their contributions.

8. Solve the equation $2 \sin^2(x-30^\circ) = \cos 60^\circ$ for $-180^\circ \leq x \leq 180^\circ$

9. A triangle is formed by the coordinates A (2, 1) B(4,1) and C(1,6). It is rotated clockwise through 90° about the origin. Find the coordinates of this image.

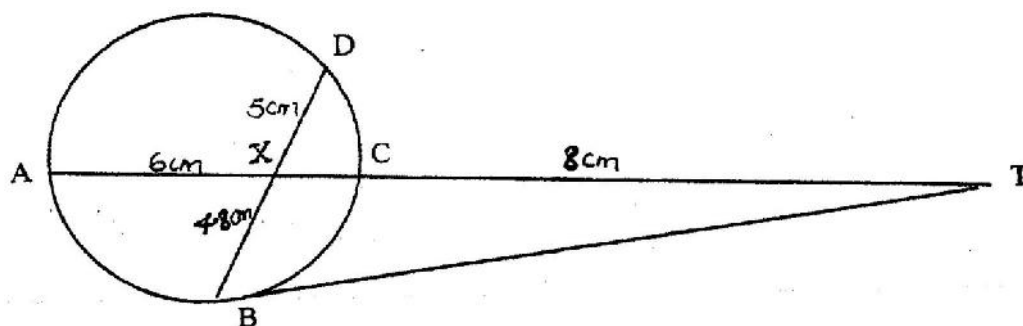
10. Three representatives are to be selected randomly from a group of 7 girls and 8 boys. Calculate the probability of selecting two girls and one boy.

11. Use the logarithms to evaluate $3 \frac{1.23 \times 0.0089}{76.54}$

12. Find the value of x which satisfy the equation
 $5^{2x} - 6 \times 5^x + 5 = 0$

13. Expand $(1 + x)^5$, hence, use the expansion to estimate $(1.04)^5$ correct to 4 decimal Places

14. In the figure below, BT is a tangent to the circle at B. AXCT and BXD are straight lines
AX = 6cm, CT = 8cm, BX = 4.8 cm and XD = 5cm.



Find the length of
(a) XC (b) BT

15. Make x the subject of the formula $p = \frac{xy}{z+x}$

16. The frequency distribution table below shows the weekly salary (K£) paid to workers in a factory

Salary (K£)	$50 \leq x < 100$	$100 \leq x < 150$	$150 \leq x < 250$	$250 \leq x < 350$	$350 \leq x < 500$
No. of workers	13	16	38	24	9

On the grid provided draw a histogram to respect the information shown above

SECTION II (48 Marks)

Answer any six questions from this section

17. A construction company requires to transport 144 tonnes of stones to sites A and

B. The company pays Kshs 24,000 to transport 48 tonnes of stone for every 28

km. Kimani transported 96 tonnes to a site A, 49 km away.

(a) Find how much he paid

(b) Kimani spends Kshs 3,000 to transport every 8 tonnes of stones to site. Calculate his total profit.

(c) Achieng transported the remaining stones to sites B, 84 km away. If she made 44% profit, find her transport cost.

18. A rally car traveled from point R to point S. S is 128 km on a bearing 060° from

R. The car then set off S at 9.30 am towards T at an average of 150 km/h. It was expected at T at 11.30 am. After traveling for 1 hour and 20 minutes it broke down at point P. The bearing of T and P from S is 300° .

Calculate the:

(i) Distance from R to P

(ii) Bearing of P and R

(b) The repair took 10 minutes and the car set off to complete its journey to T.

Find the speed at which car must now move to reach T on time.

20. The charge, C shillings per person for a certain seminar is partly fixed and partly

inversely proportional to the total number N of people.

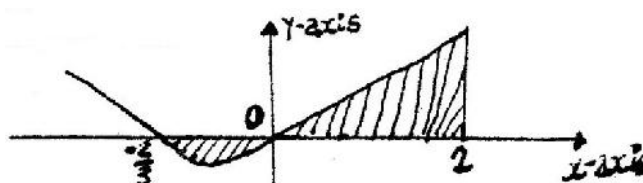
(a) Write down the expression for C in terms of N

(b) When 100 people attended the charge is Kshs 8,700 per person while for 35 people the charge is Kshs. 10,000 per person

(c) If a person had paid the full amount and does not attend, the fixed charge is refunded. A group of people paid but ten per cent of them did not attend. After the refund the organizer remained with Kshs 574,000. Find the number of people initially in the group.

21. The curve of the equation $y = 2x + 3x^2$, has $x = -2/3$ and $x = 0$ and x intercepts.

The area bounded by the axis $x = -2/3$ and $x = 2$ is shown by the sketch below.



Find:

(a) $(2x + 3x^2) dx$

(b) The area bounded by the curve $x - \text{axis}$, $x = 2/3$ and $x = 2$

22. The line segment BC given below is one side of triangle ABC

- (a) Use a ruler and compasses to complete the construction of a triangle ABC in which $\angle ABC = 45^\circ$, $AC = 5.6 \text{ cm}$ and angle BAC is obtuse
- (b) Draw the locus of point P such that P is equidistant from a point O and passes through the vertices of triangle.
- (c) Locate point D on the locus of P equidistant from lines BC and BO. Q lies in the region enclosed by lines BD, BO extended and the locus of P. Shade the locus of Q.

23. The diagram on the grid provided below shows a trapezium ABCD

On the same grid

- (a)
 - (i) Draw the image A'B'C'D' of ABCD under a rotation of 90° clockwise about the origin.
 - (ii) Draw the image of A'B'C'D' under a reflection in line $y = x$. State coordinates of A''B''C''D''.
- (b) A''B''C''D'' is the image of A'B'C'D' under the reflection in the line $x=0$. Draw the image A'''B'''C'''D''' and state its coordinates.

(c) Describe a single transformation that maps A'''B'''C'''D''' onto ABCD.

24. A theatre has a seating capacity of 250 people. The charges are Kshs. 100 for an ordinary seat and Kshs 160 for a special seat. It cost Kshs 16,000 to stage a show and the theater must make a profit. There are never more than 200 ordinary seats and for a show to take place at least 50 ordinary seats must be occupied. The number of special seats is always less than twice the number of ordinary seats.

- (a) Taking x to be the number of ordinary seats and y the number of special seats write down all the inequalities representing the information above.
- (b) On the grid provided, draw a graph to show the inequalities in (a) above
- (c) Determine the number of seats of each type that should be booked in order to maximize the profit.