## MATHEMATICS PAPER 1 K.C.S.E. 2002
QUESTIONS

1. Evaluate: $\dfrac{-12 - (-3) \times 4 - (-20)}{-6 \times 6 \div 3 + (-6)}$ (3mks)

2. Simplify: $(x + 2y)2 - (x - 2y)2$ (3mks)

3. Make y the subject of the formula $p = \dfrac{xy}{x-y}$

4. The position vectors of points X and Y are $x = 2i + j - 3k$ and $y = 3i + 2j - 2k$. Respective. Find XY

5. Use reciprocal and square tables to evaluate, to 4 significant figures,
The expression:

6. The figure below is a polygon in which $AB = CD = FA = 12cm$ $BC = EF = 4cm$ and $BAF = - CDE = 120^0$. AD is a line of symmetry.
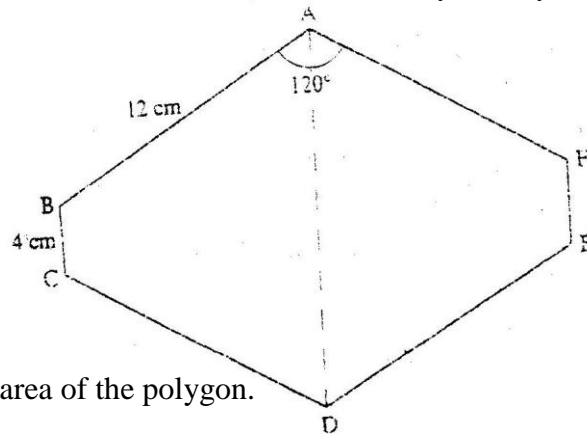
Find the area of the polygon.

7. Akenyan tourist left Germany for Kenya through Switzerland. While in Switzerland he bought a watch worth 52 deutsche Marks. Find the value of the watch in:
(a) Swiss Francs.
(b) Kenya Shillings

Use the exchange rtes below:
1 Swiss Franc = 1.28 Deutsche Marks.   (3mks)
1 Swiss Franc = 45.21 Kenya Shillings

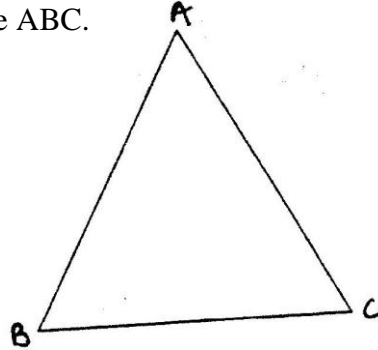8. Solve the following inequalities and represent the solutions on a single number line:
$3 - 2x < 5$
$4 - 3x \geq -8$ (3mks)

9.   The average rate of depreciation in value of a water pump is 9% per annum. After three complete years its like value was sh 150,700. Find its value at the start of the three – year period.   (4mks)

10.   The figure below shows a triangle ABC.

a)   Using a ruler and a pair of compasses, determine a point D on the line BC such that BD:DC = 1:2.   (2mks)
b)   Find the area of triangle ABD, given that AB = AC.   (2mks)

11.   The internal and external diameters of a circular ring are 6cm and 8cm respectively. Find the volume of the ring if its thickness is 2 millimeters.   (3mks)

12.   Chords XY and PQ of a circle intersect at a point M inside the circle. Given that MX = 8cm, XY = 14cm and MP = 4cm, calculate the length of MQ.   (2mks)

13.   Given that $\sin a = \dfrac{1}{\sqrt{5}}$ where a is an acute angle find, without using Mathematical tables: $\cos a$ in the form of $a\sqrt{b}$, where a and b are rational numbers atan $(90^0 - a)$.

14.   A quantity P is partly constant and partly varies inversely as a quantity q. Given that P=10 when p = 20 when q = 1.25, find the value of p when q = 0.5.

15.   The table below shows the weight and price relatives of four items in a given period.

Item	weight	Price relative
Maize meal	6	220
Meat	3	120
Sugar	4	180
Cooking fats	2	150

Compute the cost of living index for the given items.

16.   Given the curve $y = 2x^3 + 1/2x^2 - 4x + 1$. Find the:

i)   Gradient of curve at $\{1, -\frac{1}{2}\}$
ii)   Equation of the tangent to the curve at $\{1, -\frac{1}{2}\}$

17. A house is to be sold either on cash basis or through a loan. The cash price is sh.750,000. The loan conditions area s follows: there is to be down payment of 10% of the cash price and the rest of the money is to be paid through a loan at 10% per annum compound interest.

A customer decided to but the house through a loan.
- a) (i) Calculate the amount of money loaned to the customer.
  - (ii) The customer paid the loan in 3 year's. Calculate the total amount paid for the house.
- b) Find how long the customer would have taken to fully pay for the house if she paid a total of sh 891,750. (8mks)

18. The figure below represents a right prism whose triangular faces are isosceles. The base and height of each triangular face are 12cm and 8cm respectively. The length of the prism is 20cm.
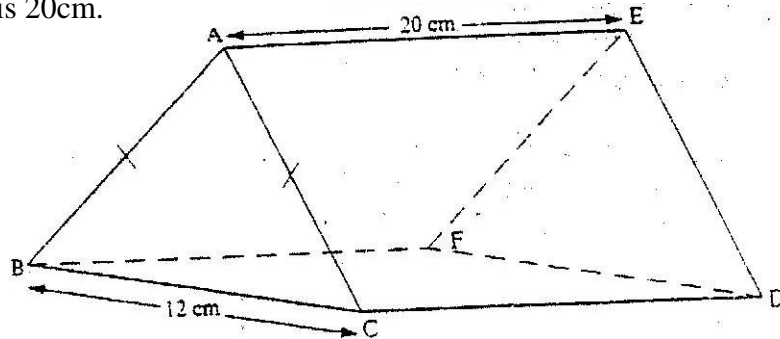
Calculate the:
- a) Angle CE
- b) Angle between
  - i) The line CE and the plane BCDF
  - ii) The plane EBC and the base BCDF

b) During a certain motor rally it is predicted that the weather will be either dry (D) or wet (W). The probability that the weather will be dry is estimated to be $^7/_{10}$. The probability for a driver to complete (C) the rally during the dry weather is estimated to be $^5/_6$. The probability for a driver to complete the rally during wet weather is estimated to be $^1/_{10}$.

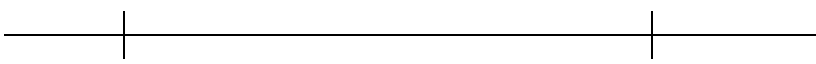Complete the probability tree diagram given below.
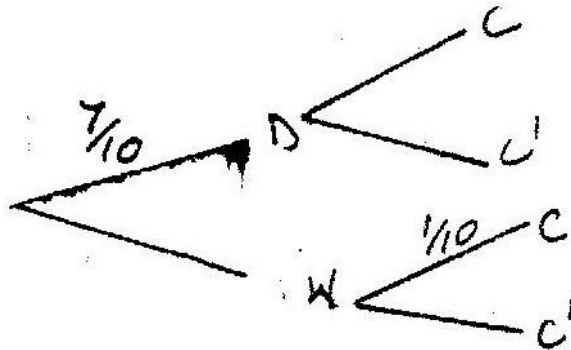
What is the probability that:-
- i) The driver completes

ii)   The weather was wet and the driver did not complete the rally?

20.   The diagram below shows a straight line intersecting the curve $y = (x-1)2 + 4$
       At the points P and Q. The line also cuts x-axis at (7,0) and y axis at (0,7)
a)   Find the equation of the straight line in the form $y = mx + c$.
b)   Find the coordinates of p and Q.
c)   Calculate the area of the shaded region.   (8mks)
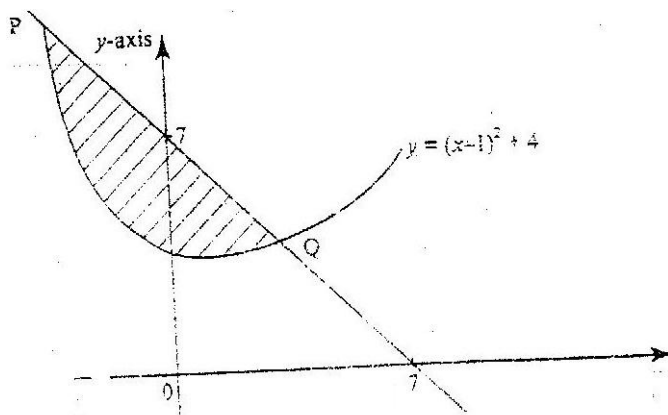
21.   In this question use a ruler and a pair of compasses.
a)   Line PQ drawn below is part of a triangle PQR. Construct the triangle PQR
       in which
       a) $< QPR = 300$ and line PR = 8cm

       b)   On the same diagram construct triangle PRS such that points S and Q
               are no the opposite sides of PR<PS = PS and QS = 8cm
       C)   A point T is on the a line passing through R and parallel to
               QS.If <QTS =90^0, locate possible positions of T and label them T^1
               and T^2, Measure the length of T^1T^2.
22.   A triangle T whose vertices are A (2,3) B(5,3) and C (4,1) is mapped onto triangle
       T^1 whose vertices are A^1 (-4,3) B^1 (-1,3) and C^1 (x,y) by a
       Transformation M = $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

       Find the: (i)   Matrix M of the transformation
                   (ii)   Coordinates of C_1
       b)   Triangle T^2 is the image of triangle T^1 under a reflection in the line $y = x$.
               Find a single matrix that maps T and T^2 (8mks)
23.   A minor sector of a circle of radius 28cm includes an angle of 135^0 at the center.
       a)   (i)   convert 1350 into radians. Hence of otherwise find the area
                        of the sector.
               ii)   Find the length of the minor arc.
       b)   The sector is folded to form a right circular cone. Calculate the :
   i)   Radius of the cone

ii)   Height of the cone. (Take the value of Π to be $^{22}/_7$)   (8mks)

24.   Two quantities P and r are connected by the equation $p = kr^n$. The table of values of P and r is given below.

P	1.2	1.5	2.0	2.5	3.5	4.5
r	1.58	2.25	3.39	4.74	7.86	11.5

a)   State a liner equation connecting P and r.

b)   Using the scale 2cm to represent 0.1 units on both axes, draw a suitable line graph on the grid provided. Hence estimate the values of K and n.   (8mks)

1. Use logarithms to evaluate
    $$\frac{(0.0056)^2}{\overline{1.38} \times 27.42}$$

2. Kipketer can cultivate a piece of land in 7 hours while Wanjiku can do the same work in 5 hours. Find the time they would take to cultivate the piece of land when working together.

3. A triangular flower garden has an area of 28m2. Two of its edges are 14 metres and 8 metres. Find the angle between the two edges.

4. Determine the inverse, T^{-1} of the matrix $T = \begin{pmatrix} 1 & 2 \\ 1 & -1 \end{pmatrix}$

5. A trader sells a bag of beans for shs. 2100 and that of maize at shs. 1200. He mixed beans and maize in the ratio 3:2. Find how much the trader should sell a bag of the mixture to realize the same profit.

6. The figure below represents a square based solid with a path marked on it.
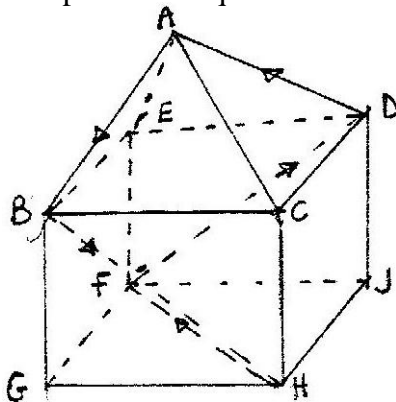

    Sketch and label the net of the solid.

7. Solve for x in the equation $\dfrac{81^{2x} \times 27^{x} = 729}{9^{xs}}$

8. The sides of a triangle were measured and recorded as 8cm, 10cm and 15cm. Calculate the percentage error in perimeter, correct to 2 decimal places.

9. a) Expand $(a-b)^6$
    b) Use the first three term of the expansion in a (a) to find the approximate value of $(1.98)^6$

10. The coordinates of points O,P,Q and R are (0,0)(3,4) (11,6) and (8,2) respectively. A point T is such that vectors OT,QP and QR satisfy the vector equation. OT = QP + ½ QR .Find the coordinates of T.

11. Simply the expression $\dfrac{4x^2 - y^2}{2x^2 - 7xy + 3y^2}$

12   Atieno and Kamau started a business by contributing sh.25000 and sh.20, 000 Respectively. At the end of the year, they realized a profit of shs. 81,000. The profit was allocated to development, dividends and reserves in the ratio 4:5:6 respectively. The dividends were the shared in the ratio of their contribution. Calculate the dividends paid to Atieno.

13.   The diagram below shows a circle ABCDE. The line FEG is a tangent to the circle at point E.
Line DE is parallel to CG, $\angle DEC = 28^0$ and $\angle AGE = 32^0$
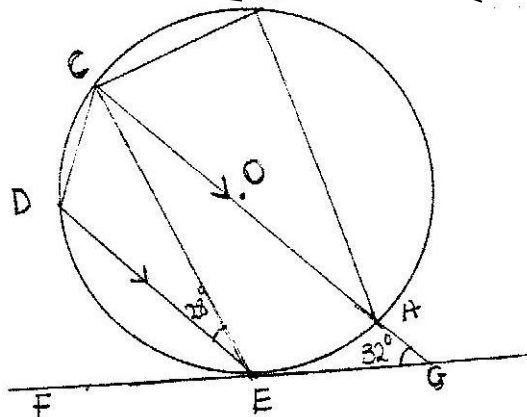
Calculate:
(a) $< AEG$
(b) $< ABC$

14.   Each month, for 40 months, Amina deposited some money in a saving scheme. In the first month she deposited sh 500. Thereafter she increased her deposits by sh.50 every month.
Calculate the:
        a)   Last amount deposited by Amina
        b)   Total amount Amina had saved in the 40 months.

15.   In the diagram below, ABCD is a trapezium with AB parallel to DC. The diagonals AC and BD intersect at E.
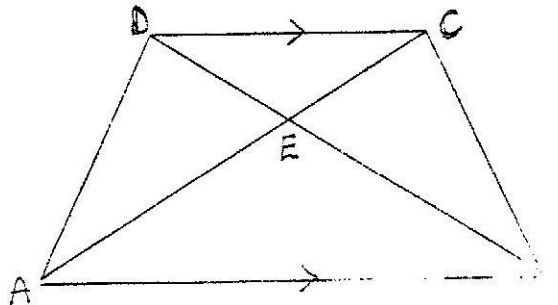
        a)   Giving reasons show that triangle ABE is similar to triangle CDE.
        b)   Giving that AB = 3DC, find the ratio of DB to EB.

16.   The equation of a circle is given by $x^2 + 4x + y^2 - 5 = 0$. Find the radius and the center of the circle.

17.   A bus travels from Nairobi to Kakamega and back. The average speed from Nairobi to Kakamega is 80km/hr while that from Kakamega to Nairobi is

50km/hr, the fuel consumption is 0.35 litres per kilometer and at 80km/h, the consumption is 0.3 litres per kilometer .Find

      i)   Total fuel consumption for the round trip

      ii)   Average fuel consumption per hour for the round trip.

18.   The table below shows Kenyan tax rates in a certain year

Income (K£ per annum)	Tax rates (Sh. Per £)
1 -4,512	2
4513 -9024	3
9025 – 13536	4
13537 – 18048	5
18049 -22560	6
Over 22560	6.5

In that year Muhando earned a salary of Ksh.16510 per month. He was entitled to a monthly tax relief of Kshs 960.
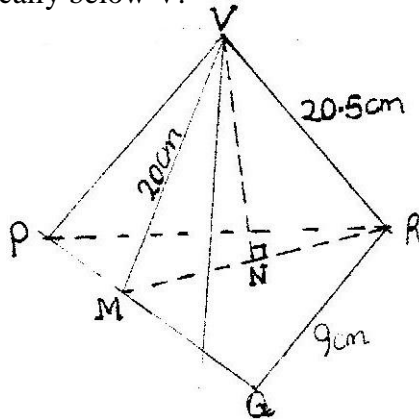
Calculate:

      a)   Muhandos annual salary in K£

      b)   The monthly tax paid by muhando in Kshs.

19.   The following distribution shows the masses to the nearest kilogram of 65 animals in a certain farm.

Mass Kg	26-30	31-35	36-40	41-45	46-50	51-55
frequency	9	13	20	15	6	2

      a)   On the grid provided draw the cumulative frequency curve for the given information.

      b)   Use the graph to find the:-

          i)   Median mass

          ii)   Inter-quartile range

          iii)   Percentage of animals whose mass is at least 42kg.

20.   The figure VPQR below represents a model of a top of a tower. The horizontal base PQR is an equilateral triangle of side 9cm. The lengths of edges are VP = VQ = VR = 20.5cm. Point M is the mid point of PQ and VM = 20cm. Point N is on the base and vertically below V.

Calculate:

      a)   i)   Length of RM

          ii)   Height of model

          iii)   Volume of the model

b)   The model is made of material whose density is 2,700 kg/m³. Find the Mass of the model.

21.   The table below shows the values of x and corresponding values of y for a given curve.

X	0	$\frac{\Pi}{12}$	$\frac{\Pi}{6}$	$\frac{\Pi}{4}$	$\frac{\Pi}{3}$	$\frac{5\Pi}{12}$	$\frac{\Pi}{2}$
y	0	0.26	0.48	0.65	0.76	0.82	0.84

a)   Use the trapezium rule with seven ordinates and the values in the table only to estimate the area enclosed by the curve, x – axis and the line $x = {}^{\Pi}/_2$ to four decimal places. (Take $\Pi = 3.142$)

b)   The exact value of the area enclosed by the curve is known to be 0.8940.Find the percentage error made when the trapezium rule is used. Give the answer correct to two decimal places.

22.   Four points B,C,Q and D lie on the same plane. Point B is 42km due southe – west of point Q. Point C is 50km on a bearing of S 60⁰ E from Q. Point D is equidistant B, Q and C.

a)   Using the scale: 1cm represents 10km, construct a diagram showing the positions of B, C, Q and D.
Determines the: i)   Distance between B and C
                 ii)   Bearing of D from B.

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

	0⁰	15⁰	30⁰	450	60⁰	75⁰	90⁰	105⁰	120⁰	135⁰	150⁰	165⁰	180⁰
Tan Θ⁰	0	0.27	0.58	1	1.73		a	3.73	1.73	-1		0.27	0
Sin Θ⁰	0	0.5		1	0.87	0.5	0	-0.5		-1	0.87	-0.5	0

b)   Using the grid provided and the table in part (a) draw the graphs of Y = tan Θ and y = sin 2Θ.

c)   Using your graphs, determine the range of values for which tan Θ>Sin 2Θ for 0⁰ ≤ Θ ≤ 90⁰.

24.   The displacement s metre of a particle moving along straight line after t seconds is given by. $S = 3t + {}^{3}/_2 t2 – 2t^3$

a)   Find its initial acceleration

b)   Calculate: i)   The time when the particle was momentarily at rest.
                 ii) Its displacement by the time it comes to rest momentarily

c)   Calculate the maximum speed attained.