**121/1**
MATHEMATICS
**Paper 1**
Oct/Nov. 2008
2 ½ hours.

SECTION 1 (50 MAKS)
Answer all questions in this section.

1. Without using a calculator, evaluate $\dfrac{-8+(-5)\times(-8)-(-6)}{-3+(-8) \div 2 \times 4}$ (2mks)

2. Simplify $\dfrac{27^{2/3} \div 2^4}{32^{-3/4}}$ (3mks)

3. Simplify the expression $\dfrac{a^4 - b^4}{a^3 - ab^2}$ (3mks)

4. Mapesa traveled by train from Butere to Nairobi. The train left Butere on a Sunday at 23 50 hours and traveled for 7 hours 15 minutes to reach Nakuru. After a 45 minutes stop in Nakuru, the train took 5 hours 40 minutes to reach Nairobi.
   Find the time, in the 12 hours clock system and the day Mapesa arrived in Nairobi.   (2mks)

5. The figure below shows a net of a solid
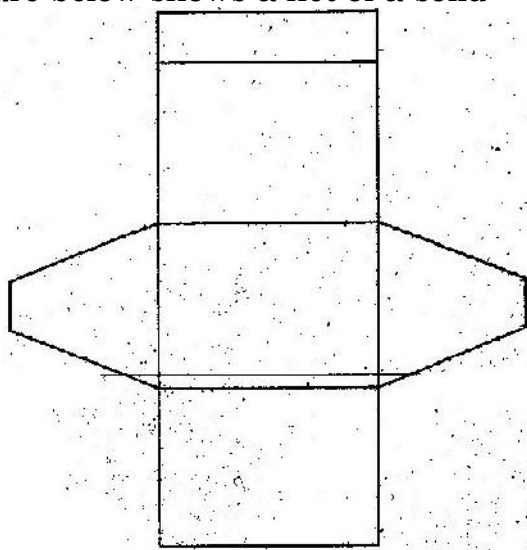
   Below is a part of the sketch of the solid whose net is shown above.
   Complete the sketch of the solid, showing the hidden edges with broken lines.
        (3mks)
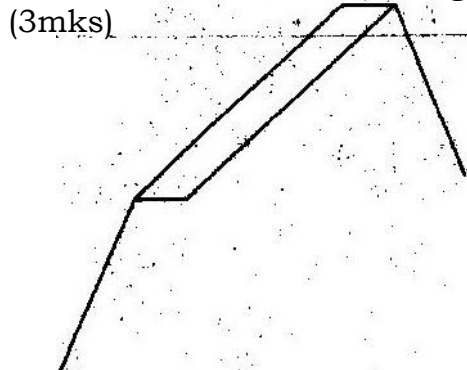
6.   A fuel dealer makes a profit of Kshs. 520 for every 1000 litres of petrol sold and Ksh. 480 for every 1000 litres of diesel sold.
     In a certain month the dealer sold twice as much diesel as petrol. If the total fuel sold that month was 900,000 litres, find the dealer's profit for the month.
     (3mks)

7.   A liquid spray of mass 384g is packed in a cylindrical container of internal radius 3.2cm. Given that the density of the liquid is $0.6g/cm^3$, calculate to 2 decimal places the height of the liquid in the container.
     (3mks)

8.   Line BC below is a side of a triangle ABC and also a side of a parallelogram BCDE.

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     ────────┼──────────────────────┼────────
            B                        C
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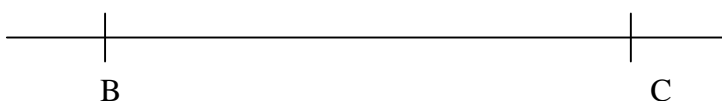
     Using a ruler and a pair of compasses only construct:
     (i)   The triangle ABC given that $\angle ABC = 120^0$ and AB= 6cm
     (1mk)
     (ii) The parallelogram BCDE whose area is equal to that of the triangle ABC and point E is on line AB   (3mks)

9.   A solid metal sphere of radius 4.2 cm was melted and the molten material used to make a cube. Find to 3 significant figures the length of the side of the cube.
                                                                        (3mks)

10. An angle 0f 1.8 radians at the centre of a circle subtends an area of length 23.4cm
     Find;
     a)   The radius of the circle   (2mks)
     b)   The area of the sector enclosed by the arc and the radii.   (2mks)

11. Three vertices of a rhombus ABCD are; A(-4,-3), B(1,-1) and c are constants.
                                                                        (2mks)
     a)   Draw the rhombus on the grid provided below.   (2mks)
     b)   Find the equation of the line AD in the form y = mx + c, where and c are constants.   (2mks)

12. Two matrices A and B are such that A= $\begin{pmatrix} k & 4 \\ 3 & 2 \end{pmatrix}$ and B $= \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

     Given that the determinant of AB = 4, find the value of k.

13. A rectangular and two circular cut-outs of metal sheet of negligible thickness are used to make a closed cylinder. The rectangular cut-out has a height of 18cm. Each circular cu-out has a radius of 5.2cm. Calculate in terms of π, the surface area of the cylinder
   (3mks)

14. Given that log 4=0.6021 and log 6=0.7782, without using mathematical tables or a calculator, evaluate log 0.096.

(3mks)

15. The equation of line L_1 is 2y-5x-8=0 and line L_2 passes through the points (-5, 0) and (5,-4). Without drawing the lines L_1 and L_2 show that the two lines are perpendicular to each other. (3mks)

16 Solve the equation;

2 cos 2θ =1 for $0^0 \le \theta \le 360^0$ (4mks)

SECTION II (50 MKS)
Answer any five questions in this section.

17 a) The ratio of Juma's and Akinyi's earnings was 5:3 Juma's earnings rose to Ksh 8400 after an increase of 12%.
Calculate the percentage increase in Akinyi's earnings given that the sum of their new earnings was Ksh. 14100.
(6mks)

b) Juma and Akinyi contributed all the new earnings to buy maize at Ksh 1175 per bag. The maize was then sold at Ksh 1762.50 per bag. The two shared all the money from the sales of the maize in the ratio of their contributions.
Calculate the amount that Akinyi got. (4mks)

18. The figure below is a sketch of the curve whose equation is $y=x^2+x+5$.
It cuts the line y=11 at points P and Q.
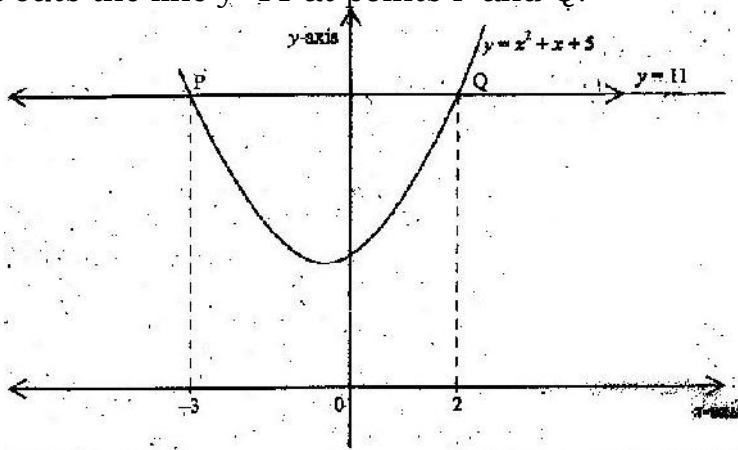
a) Find the area bounded by the curve $=x^2+x+5$ and the line y=11 using the trapezium rule with 5 strips.
(5mks)

b) Calculate the difference in the area if the mid-ordinate rule with 5 ordinates was used instead of the trapezium rule.
(5mks)

19 In the figure below AB=P, AD= q, DE= ½ AB and BC= 2/3 BD
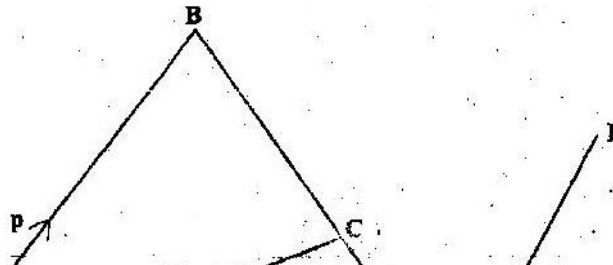
a) Find in terms of p arid q the vectors: (1mk)
   (i) BD; (1mk)
   (ii) BC; (1mk)
   (iii) CD; (1mk)
   (iv) AC. (2mks)

b) Given that AC=KCE, where k is a scalar, find
   (i) The value of k (4mks)
   (ii) The ratio in which C divides AE (1mk)

20. The diagram below represents two vertical watch-towers AB and CD on a level ground. P and Q are two points on a straight road BD. The height of the tower AB is 20m road a BD is 200m.
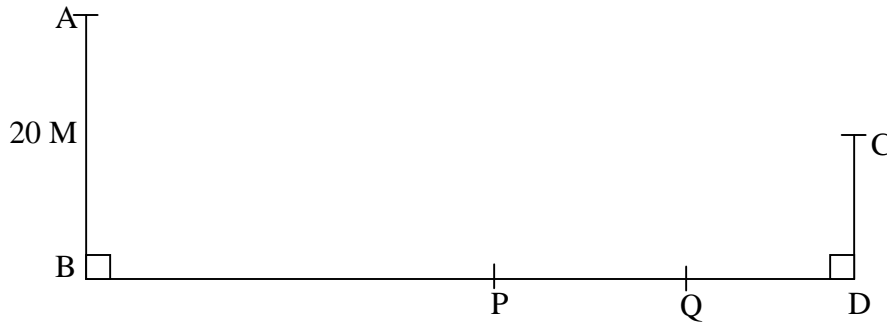

a) A car moves from B towards D. At point P, the angle of depression of the car from point A is 11.3^0. Calculate the distance BP to 4 significant figures. (2mks)

b) If the car takes 5 seconds to move from P to Q at an average speed of 36 km/h, calculate the angle of depression of Q from A to 2 decimal places (3mks)

c) Given that QC=50.9m, calculate;
   (i) The height of CD in meters to 2 decimal places; (2mks)
   (ii) The angle of elevation of A from C to the nearest degree. (3mks)

21. The diagram below shows a triangle ABC with A (3, 4), B (1, 3) and C (2, 1).

a) Draw △A 'B'C' the image of ABC under a rotation of $+90^{0+}$ about (0, 0).

(2mks)

b) Drawn △ A "B" the image of A "B'C' under a reflection in the line y=x.

(2mks)

c) Draw △ A. "B" C. the image under a rotation of -90^0 about (0, 0)
(2mks)

d) Describe a single transformation that maps △ABC" onto △A'''B'''C'''

(2mks)

e) Write down the equations of the lines of symmetry of the quadrilateral BB"A"'A (2mks)

22. The diagram below represents a conical vessel which stands vertically. The which stands vertically,. The vessels contains water to a depth of 30cm. The radius of the surface in the vessel is 21cm. (Take $\pi=22/7$).

— 21 cm

— 30 cm
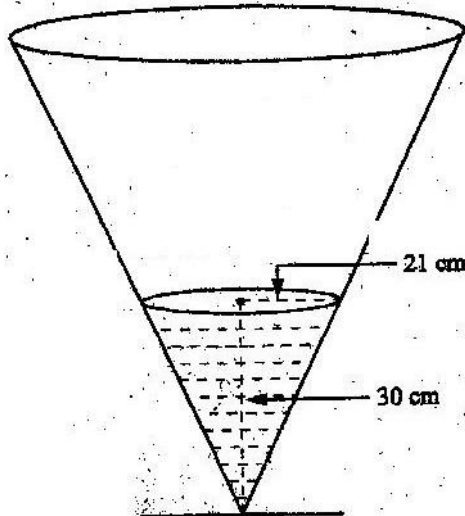
a) Calculate the volume of the water in the vessels in cm³
b) When a metal sphere is completely submerged in the water, the level of the water in the vessels rises by 6cm.
Calculate:
(i) The radius of the new water surface in the vessel; (2mrks)
(ii) The volume of the metal sphere in cm³ (3mks)
(iii) The radius of the sphere. (3mks)

23. A group of people planned to contribute equally towards a water project which needed Ksh 200 000 to complete, However, 40 members of the group without from the project.
As a result, each of the remaining members were to contribute Ksh 2500.
a) Find the original number of members in the group.
(5mks)
b) Forty five percent of the value of the project was funded by Constituency Development Fund (CDF). Calculate the amount of contribution that would be made by each of the remaining members of the group.
(3mks)
c) Member's contributions were in terms of labour provided and money contributed. If the ratio of the value of labour to the money contributed was 6:19; calculate the total amount of money contributed by the members. (2mks)

24. The distance s metres from a fixed point O, covered by a particle after t seconds is given by the equation;
$S = t^3 - 6t^2 + 9t + 5$.
a) Calculate the gradient to the curve at t=0.5 seconds
(3mks)
b) Determine the values of s at the maximum and minimum turning points of the curve. (4mks)
c) On the space provided, sketch the curve of $s = t^3 - 6t^2 + 9t + 5$.
(3mks)

121/2
MATHEMATICS
Paper 2
Oct/Nov 2008
2 ½ hours

SECTION I (50 MARKS)
Answer all the questions in this section in the spaces provided.

1. In this question, show all the steps in your calculations, giving the answer each stage. Use logarithms correct to decimal places, to evaluate.

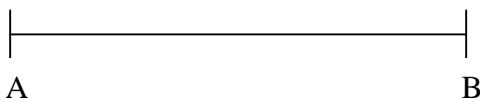 $$\frac{6.373 \log 4.948}{\sqrt{0.004636}}$$

   (3mks)

2. Make h the subject of the formula (3mks)

   $$q = \frac{1+rh}{1-ht}$$

3. Line AB given below is one side of triangle ABC. Using a ruler and a pair of compasses only;

   A   B

   (i) Complete the triangle ABC such that BC=5cm and $\angle ABC=45^0$
   (ii) On the same diagram construct a circle touching sides AC,BA produced and BC produced.

4. The position vectors of points A and B are $\begin{pmatrix} 3 \\ -1 \\ -4 \end{pmatrix}$ and $\begin{pmatrix} 8 \\ -6 \\ 6 \end{pmatrix}$ respectively.
   A point P divides AB in AB it he ratio 2:3. Find the position Vector of point P. (3mks)

5. The top of a table is a regular hexagon. Each side of the hexagon measures 50.0 cm. Find the maximum percentage error in calculating the perimeter of the top of the table. (3mks)

6. A student at a certain college has a 60% chance of passing an examination at the first attempt. Each time a student fails and repeats the examination his chances of passing are increased by 15%
   Calculate the probability that a student in the college passes an examination at the second or at the third attempt.
   (3mks)

7. An aero plane flies at an average speed of 500 knots due East from a point p (53.4^0e) to another point Q. It takes 2 ¼ hours to reach point Q.
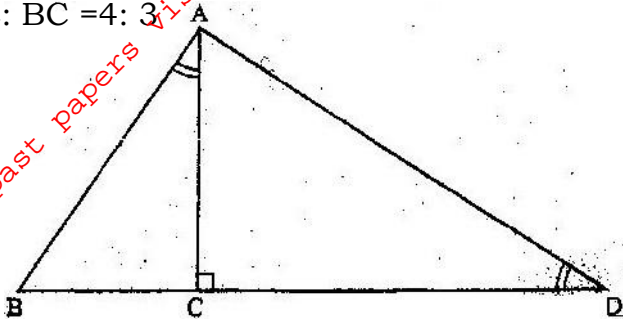   Calculate:
   (i) The distance in nautical miles it traveled; (1mk)
   (ii) The longitude of point Q to 2 decimal places (2mks)

8. a) Expand and simplify the expression

5

$10 + {}^2/_x$ (2mks)

b) Use the expansion in (a) above to find the value of 14^5 (2mks)

9. In the figure below, angles BAC and ADC are equal. Angle ACD is a right angle. The ratio of the sides.
AC: BC =4: 3

Given that the area of triangle ABC is 24 cm^{2+}. Find the triangle ACD
(3mks)

10. Points A(2,2)and B(4,3) are mapped onto A'(2,8) and b' (4,15) respectively by a transformation T.
Find the matrix of T. (4mks)

11. The equation of a circle is given by $4x^2 + 4y^{2+}- 8x+ 20y – 7 = 0$.
Determine the coordinates of the centre of the circle. (3mks)

12. Solve for y in the equation $\log_{10} (3y +2)-1-\log_{10} (y-4)$ (3mks)

13. Without using a calculator or mathematical tables, express
$$\frac{\sqrt3}{1\text{-}\cos 30^0}$$ in surd form and simplify
(3mks)

14. The figure below represents a triangular prism. The faces ABCD, ADEF and CBFE are rectangles.
AB=8cm, BC=14cm, BF=7cm and AF=7cm.
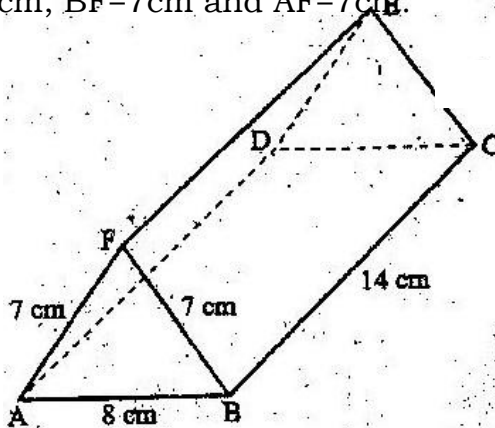
Calculate the angle between faces BCEF and ABCD. (3mks)

15. A particle moves in a straight line from a fixed point. Its velocity Vms-1 after t seconds is given by V=9t^2 – 4t +1

Calculate the distance traveled by the particle during the third second. (3mks)

16. Find in radians, the values of x in the interval $0^0 \le x \le 2\pi^{0+}$ for which 2 cos $^2x=1$.
   (Leave the answers in terms of π) (4mks)

SECTION II (50MKS)
Answer any five questions in this section.

17. a) A trader deals in two types of rice; type A and with 50 bags of type B. If he sells the mixture at a profit of 20%, calculate the selling price of one bag of the mixture. (4mks)
   b) The trader now mixes type A with type B in the ratio x: y respectively. If the cost of the mixture is Ksh 383.50 per bag, find the ratio x: y. (4mks)
   c) The trader mixes one bag of the mixture in part (a) with one bag of the mixture in part (b). Calculate the ratio of type A rice to type B rice in this mixture. (2mks)

18. Three variables p, q and r are such that p varies directly as q and inversely as the square of r.
   (a) When p=9, q12 and r = 2.
   Find p when q= 15 and r =5 (4mks)
   (b) Express q in terms of p and r. (1mks)
   (c) If p is increased by 10% and r is decreased by 10%, find;
   (i) A simplified expression for the change in q in terms of p and r

   (3mks)
   (ii) The percentage change in q. (2mks)

19. a) complete the table below, giving the values correct to 2 decimal places.

x⁰	0	30	60	90	120	150	180	210	240	270	300	330	360
Sin 2x	0		0.87		-0.87		0	0.87	0.87				0
3cosx-2	1	0.60		-2	-3.5			-4.60			-0.5		1

   b) On the grid provided, draw the graphs of y=sin 2x and y=3cosx-2 for $0^0 \le x \le 3600^0$ on the same axes. Use a scale of 1 cm to represent 30^0 on the x-axis and 2cm to represent 1 unit on the y-axis.
   c) Use the graph in (b) above to solve the equation 3 Cos x – sin 2x = 2.
   (2mks)
   d) State the amplitude of y=3cosx-2. (1mk)

20. In the figure below DA is a diameter of the circle ABCD centre O, radius 10cm. TCS is a tangent to the circle at C, AB=BC and angle DAC= 38⁰
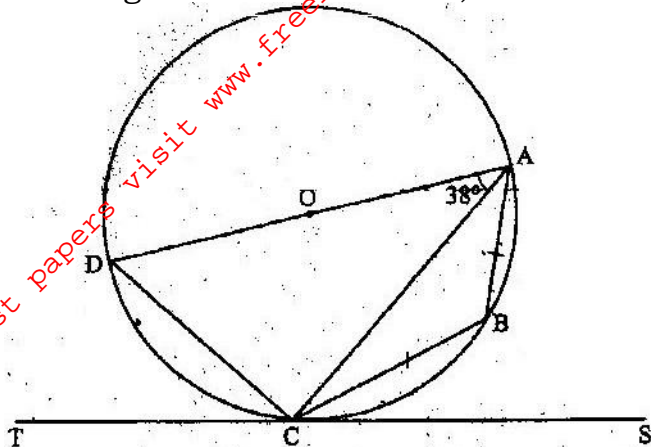
   a) Find the size of the angle;
      (i)   ACS;   (2mks)
      (ii) BCA   (2mks)
   b) Calculate the length of:
      (i)   AC   (2mks)
      (ii) AB   (4mks)

21. Two policemen were together at a road junction. Each had a walkie talkie. The maximum distance at which one could communicate with the other was 2.5 km.
    One of the policemen walked due East at 3.2 km/h while the other walked due North at 2.4 km/h the policeman who headed East traveled for x km while the one who headed North traveled for y km before they were unable to communicate.
    (a) Draw a sketch to represent the relative positions of the policemen. (1mk)
    (b) (i) From the information above form two simultaneous equations in x and y.   (2mks)

22. The table below shows the distribution of marks scored by 60 pupils in a test.

Marks	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
Frequency	2	5	6	10	14	11	9	3

    a) On the grid provided, draw an ogive that represents the above information
                                                                      (4mks)
    b) Use the graph to estimate the interquartile range of this information.
                                                                      (3mks)
23. Halima deposited Ksh. 109375 in a financial institution which paid simple interest at the rate of 8% p.a. At the end of 2 years, she withdrew all the money. She then invested the money in share. The value of the shares