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121/1
MATHEMATICS (Alt. A)
Paper 1
Oct/Nov 2011
2½ hours

Candidate's Signature ....

Date..

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education
MATHEMATICS (Alt. A)
Paper 1
2½ hours

Instructions to candidates

1. *Write your name and index number in the spaces provided above.*
2. *Sign and write the date of examination in the spaces provided above.*
3. *This paper consists of **TWO** sections: **Section I** and **Section II**.*
4. *Answer **ALL** the questions in **Section I** and only five questions from **Section II**.*
5. *All answers and working must be written on the question paper in the spaces provided below each question.*
6. ***Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.***
7. *Marks may be given for correct working even if the answer is wrong.*
8. ***Non-programmable** silent electronic calculators **and** KNEC Mathematical tables may be used except where stated otherwise.*
9. ***This paper consists of 19 printed pages.***
10. ***Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.***

For Examiner's use only
Section I

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total

Section II

17	18	19	20	21	22	23	24	Total

Grand Total

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Turn over

SECTION 1 (50 marks)

*Answer **all** the questions in this section in the spaces provided.*

1   Without using a calculator, evaluate;

$$\frac{2\frac{1}{5}+\frac{2}{3}\,\text{of}\,3\frac{3}{4}-4\frac{1}{6}}{1\frac{1}{4}-2\frac{2}{5}\div1\frac{1}{3}+3\frac{3}{4}}$$

(3 marks)

2   The diagonal of a rectangular garden measures $11\frac{1}{4}$ m while its width measures $6\frac{3}{4}$ m. Calculate the perimeter of the garden.   (2 marks)

3   A motorist took 2 hours to travel from one town to another town and 1 hour 40 minutes to travel back. Calculate the percentage change in the speed of the motorist.   (3 marks)

4 A square room is covered by a number of whole rectangular slabs of sides 60 cm by 42 cm. Calculate the least possible area of the room in square metres. (3 marks)

5 Given that $\sin (x + 60)^\circ = \cos (2x)^\circ$, find $\tan (x + 60)^\circ$. (3 marks)

6 Simplify the expression:

$$\frac{4x - 9x^3}{3x^2 - 4x - 4}$$

(3 marks)

7   The external length, width and height of an open rectangular container are 41 cm, 21 cm and
     15.5 cm respectively. The thickness of the material making the container is 5 mm. If the
     container has 8 litres of water, calculate the internal height above the water level.   (4 marks)

8   Factorise $2x^2y^2 - 5xy - 12$ (2 marks)

9   Using a ruler and a pair of compases only:
     (a)   construct a parallelogram PQRS in which PQ = 6 cm, QR = 4 cm and
            angle SPQ = 75°;   (3 marks)

     (b)   determine the perpendicular distance between PQ and SR.   (1 mark)

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10   The masses of people during a clinic session were recorded as shown in the table below.

Mass (kg)	40-44	45-49	50-54	55-59	60-64	65-69	70-74
No. of people	1	2	12	10	2	2	1

Calculate the mean mass.   (3 marks)

11   A customer paid Ksh 5 880 for a suit after she was allowed a discount of 2% on the selling price. If the discount had not been allowed, the shopkeeper would have made a profit of 20% on the sale of the suit. Calculate the price at which the shopkeeper bought the suit.   (3 marks)

12 Three vertices of a parallelogram PQRS are P(–1, 2), Q(8, –5) and R (5,0).

(a) On the grid provided below draw the parallegram PQRS. (1 mark)
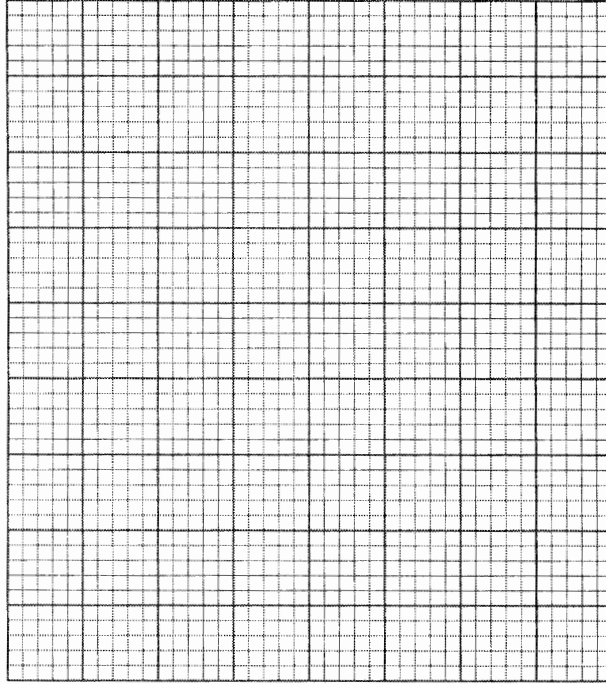
(b) Determine the length of the diagonal QS. (2 marks)

13 In January, Mambo donated $\frac{1}{6}$th of his salary to a children's home while Simba donated $\frac{1}{5}$th of his salary to the same children's home. Their total donation for January was Ksh 14 820. In February, Mambo donated $\frac{1}{8}$th of his salary to the children's home while Simba donated $\frac{1}{12}$th of his salary to the children's home. Their total donation for February was Ksh 8 675. Calculate Mambo's monthly salary. (4 marks)

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14   (a)   Express 10500 in terms of its prime factors.   (1 mark)

(b)   Determine the smallest positive number P such that 10500P is a perfect cube.

(2 marks)

15   Three police posts X, Y and Z are such that Y is 50 km on a bearing of 060° from X while Z is 70 km from Y and on a bearing of 300° from X.

(a)   Using a suitable scale, draw a diagram to represent the above situation.   (3 marks)

(b)   Determine the distance, in km, of Z from X.   (1 mark)

16 A small cone of height 8 cm is cut off from a bigger cone to leave a frustum of height 16 cm. If the volume of the smaller cone is 160 cm³, find the volume of the frustum. (3 marks)

SECTION II (50 marks)

*Answer any **five** questions in this section in the spaces provided.*

17   A solid consists of a cone and a hemisphere. The common diameter of the cone and the hemisphere is 12 cm and the slanting height of the cone is 10 cm.

(a)   Calculate correct to two decimal places:

(i)   the surface area of the solid;   (3 marks)

(ii)   the volume of the solid.   (4 marks)

(b)   If the density of the material used to make the solid is 1.3 g/cm^3, calculate its mass in kilograms.   (3 marks)

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18 Makau made a journey of 700 km partly by train and partly by bus. He started his journey at 8.00 a.m. by train which travelled at 50 km/h. After alighting from the train, he took a lunch break of 30 minutes. He then continued his journey by bus which travelled at 75 km/h. The whole journey took $11\frac{1}{2}$ hours.

(a) Determine:

   (i) the distance travelled by bus; (4 marks)

   (ii) the time Makau started travelling by bus. (3 marks)

(b) The bus developed a puncture after travelling $187\frac{1}{2}$ km. It took 15 minutes to replace the wheel.
   Find the time taken to complete the remaining part of the journey. (3 marks)

19 (a) The product of the matrices $\begin{pmatrix} 0 & 1 \\ 2 & p \end{pmatrix}$ and $\begin{pmatrix} -1.5 & -0.5 \\ p & p-2 \end{pmatrix}$ is a singular matrix.

Find the value of p. (3 marks)

(b) A saleswoman earned a fixed salary of Ksh x and a commission of Ksh y for each item sold. In a certain month she sold 30 items and earned a total of Ksh 50 000. The following month she sold 40 items and earned a total of Ksh 56 000.

(i) Form two equations in x and y. (2 marks)

(ii) Solve the equations in (i) above using matrix method. (3 marks)

(iii) In the third month she earned Ksh 68 000. Find the number of items sold.

(2 marks)

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20 In a triangle ABC, BC = 8 cm, AC = 12 cm and angle ABC = 120°.

   (a) Calculate the length of AB, correct to one decimal place. (4 marks)

   (b) If BC is the base of the triangle, calculate, correct to one decimal place:

   (i) the perpendicular height of the triangle; (2 marks)

   (ii) the area of the triangle; (2 marks)

   (iii) the size of angle ACB. (2 marks)

Turn over

21 (a) Using the trapezium rule with seven ordinates, estimate the area of the region bounded by the curve $y = -x^2 + 6x + 1$, the lines $x = 0$, $y = 0$ and $x = 6$. (5 marks)

(b) Calculate:

(i) the area of the region in (a) above by integration; (3 marks)

(iii) the percentage error of the estimated area to the actual area of the region, correct to two decimal places. (2 marks)

22 The displacement, *s* metres, of a moving particle after *t* seconds is given by, $s = 2t^3 - 5t^2 + 4t + 2$.

Determine:

(a) the velocity of the particle when $t = 3$ seconds; (3 marks)

(b) the value of *t* when the particle is momentarily at rest; (3 marks)

(c) the displacement when the particle is momentarily at rest; (2 marks)

(d) the acceleration of the particle when $t = 3$ seconds. (2 marks)

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23   In the figure below, ABCD is a trapezium. AB is parallel to DC, diagonals AC and DB intersect at X and DC = 2 AB. $\mathbf{AB} = \mathbf{a}$, $\mathbf{DA} = \mathbf{d}$, $\mathbf{AX} = k\,\mathbf{AC}$ and $\mathbf{DX} = h\mathbf{DB}$, where h and k are constants.
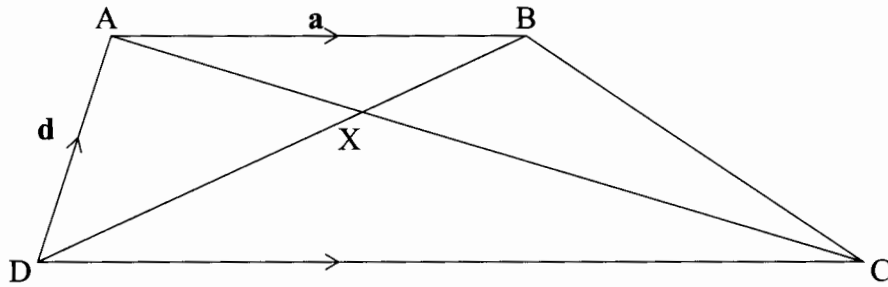
(a)   Find in terms of **a** and **d**:

   (i)   **BC**;   (2 marks)

   (ii)   **AX**;   (2 marks)

   (iii)   **DX**.   (1 mark)

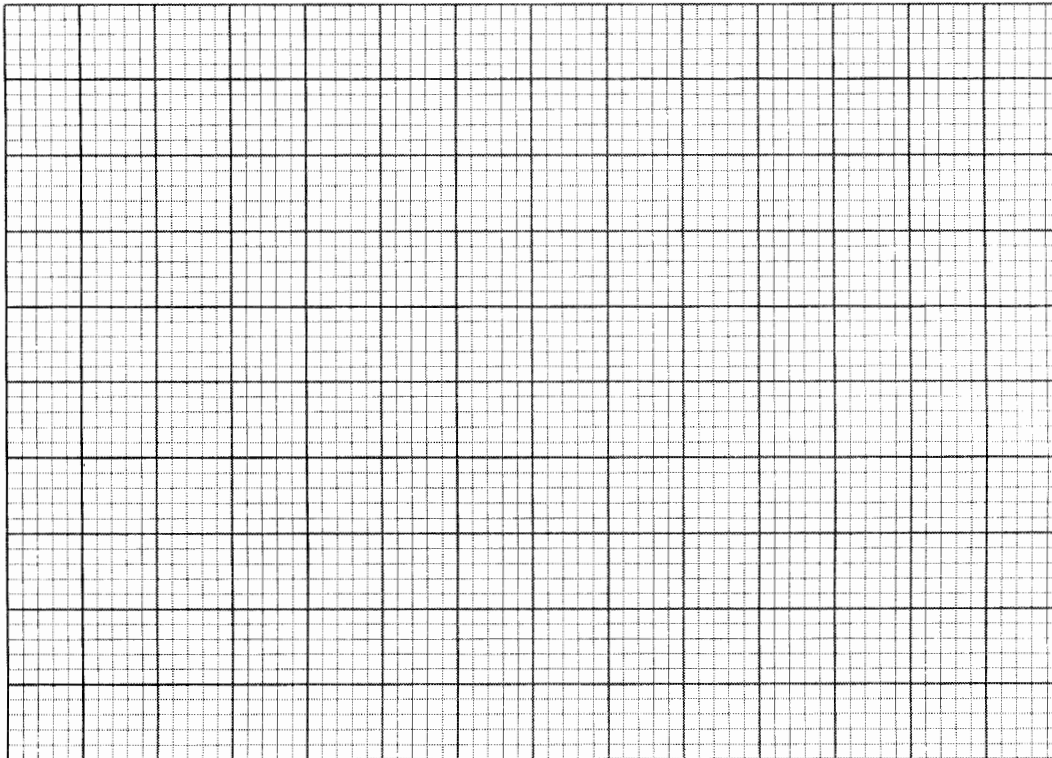(b)   Determine the values of h and k.   (5 marks)

Turn over

24 The frequency table below shows the daily wages paid to casual workers by a certain company.

Wages in shillings	100-150	150-200	200-300	300-400	400-600
No. of workers	160	120	380	240	100

(a) Draw a histogram to represent the above information. (5 marks)

(b) (i) State the class in which the median wage lies. (1 mark)

(ii) Draw a vertical line, in the histogram, showing where the median wage lies.

(1 mark)

(c) Using the histogram, determine the number of workers who earn sh 450 or less per day. (3 marks)

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