

Name.....

Index Number.....

Candidates signature.....

Date.....

121/2
MATHEMATICS
PAPER 2
JULY/AUGUST 2010
2 ½ Hours

FORM 4 MID YEAR CONTINUOUS ASSESSMENT TEST
MATHEMATICS
PAPER 2
2 ½ HOURS

INSTRUCTIONS TO CANDIDATES

- (a) Write your name and index number in the spaces provided above.
- (b) Sign and write the date of the examination in the spaces provided
- (c) This paper consists of two sections. Section I and section II.
- (d) Answer **ALL** the questions in section I and **only** five questions from section II.
- (e) All answers and working must be written on the question paper in the spaces provided below each question.
- (f) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- (g) Marks may be given for correct working even if the answer is wrong
- (h) Non-programmable silent electronic calculators and KNEC mathematical tables may be used except where stated otherwise.

FOR EXAMINER'S USE ONLY

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

17	18	20	21	22	23	24	Total

Grand Total

This paper consists of 18 printed pages

Turn over

SECTION A: Answer all the questions in this section in the spaces provided

1. Use logarithms to evaluate:

(3 marks)

$$\left(\frac{36.15 \times 0.2573}{1.938^{1/3}} \right)^{1/3}$$

2. Given that $4x^2 - 32x - 20 + k$ is a perfect square, find K.

(3 marks)

3. Quantity Q partly varies as quantity R and partly varies inversely as the square of R. Given that Q = 3 when R = 1, and Q = 5 when R = $\frac{1}{2}$

(i) Find an equation connecting Q and R.

(3 marks)

(ii) Find the value of Q when R = $\frac{3}{2}$.

(1 mark)

4. Draw a line $DF=6.4\text{cm}$. Using a ruler and a pair of compasses only, construct the locus of point K above DF such that $\angle DKF = 60^\circ$. (4 marks)

5. Use matrix method to solve these simultaneous equations.

(4 marks)

$$3p - 4q = 2$$

$$5p + 3q = 13$$

6. Mary buys a watch at Kshs. 250 which depreciates in value at the rate of 50% every year.

(a) Show that for successive years, the values of the watch form a geometric progression (1 mark)

(b) In how many years will the watch be $3\frac{1}{8}\%$ of the initial value.

(2 marks)

7. Make m the subject of the formula. (3 marks)

$$Q = \frac{d}{2\pi} \sqrt{\frac{f - hk}{m}}$$

8. Solve for x in the equation

$$\text{Log}_6 \left[\text{Log}_3 \left(\text{Log}_2 X \right) \right] = 0 \quad (3 \text{ marks})$$

9. (a) Expand $(1 + \frac{1}{5}x)^4$ (2 marks)

- (b) Use the first three terms of the expansion in (a) to find the approximate value of $(0.98)^4$ (2 marks)

10. A contractor was to finish a piece of work in 80 days. He employed 150 workers to work 6 hours a day. After 30 days, he found out that only a quarter of the work had been done. How many more workers did he require to finish the work in time. (3 marks)
11. The equation of a circle is $x^2 - 8x + y^2 + 12y + 16 = 0$
Determine the co-ordinates of the centre of the circle and its radius. (2 marks)
12. The base and perpendicular height of a triangle measured to the nearest centimeter are 6cm and 4cm respectively. Find
- (a) The absolute error in calculating the area of the triangle. (2 marks)
- (b) The percentage error in the area giving the answer to 1 decimal place. (1 mark)

13. The value of a water pump when new is Sh. 78,850. if its value after 3 years is Sh. 57,480 find the rate of depreciation. (3 marks)

14. The position of two towns A and B on the earth's surface are $(36^{\circ}\text{N}, 49^{\circ}\text{E})$ and $(36^{\circ}\text{N}, 131^{\circ}\text{W})$ respectively.

(a) Find the difference in longitude between town A and town B. (1 mark)

(b) Given that the radius of the earth is 6370km, calculate the distance between town A and town B. (2 marks)

15. Given the curve $y = 2x^3 + \frac{1}{2}x^2 - 4x + 1$.

Find the:

(i) Gradient of the curve at $(1, -\frac{1}{2})$

(2 marks)

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

(2 marks)

16. In the figure below O is the centre of the circle and PR is a tangent to the circle at Q.

$\angle TPO = 50^\circ$ $\angle QRO = 35^\circ$

Giving reasons find

$\angle TUQ$

$\angle TSQ$

$\angle SQR$

(3 marks)

SECTION B (50 MARKS)

Answer only five questions in this section in the spaces provided

17. Income tax is charged on annual income at the rate shown below

Taxable annual income	Rate Sh/£
1 – 2300	2
2301-4600	3
4601-6900	5
6901-9200	7
9201-11500	9
11501and over	10

Single relief Kshs. 1056 per month
Insurance relief Kshs. 480 per month

Mr. Wambua is single and earns Sh. 12000 per month. He lives in a company house for which he pays nominal rent of Kshs. 1000 per month.

(a) Calculate

(i) Mr. Wambua's taxable income.

(4 marks)

(ii) If he claims insurance relief calculate the amount of tax he pays per month in shillings

(4 marks)

(b) Calculate Mr. Wambua's net monthly salary in Shillings.

(2 marks)

18. (a) Complete the two parts of the table for the function $y = \frac{1}{2} \sin 2x$, where $0 \leq x \leq 360^\circ$

Part A

X	0	30	45	60	90	135	150	180
2x	0	60	90	120	180	270	300	360
Sin 2x	0	0.866			0			
$\frac{1}{2} \sin 2x$	0	0.433			0			

Part B

X	210	225	240	270	300	315	330	360
$\frac{1}{2} \sin 2x$								

(b) Draw the graph of the function $y = \frac{1}{2} \sin x$ using the scale 2cm for 45° on the horizontal axis and 4cm for 1 unit of y axis. (3 marks)

(c) Use your graph to determine

(i) The amplitude of the function

(1 mark)

(ii) The wavelength of the function

(1 mark)

(b) Use the graph to solve

$$\sin 2x^\circ - 0.5 = 0$$

(2 marks)

19. The table below shows the age groups and number of people who have perished due to HIV/AIDS pandemic in a certain village since 1999.

Age group	No. of people
10-19	12
20-29	15
30-39	16
40-49	25
50-59	18
60-69	10
70-79	4

(a) State the modal age group.

(1 mark)

(b) Using calculation estimate the median age group

(4 marks)

(c) Calculate mean age for the HIV/AIDS pandemic victims.

(5 marks)

20. A triangle ABC with vertices at A(1,-1) B(3,-1) and C(1,3) is mapped onto triangle $A^1B^1C^1$ by a transformation whose matrix is

$$\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$$

Triangle $A^1B^1C^1$ is then mapped onto $A^{11}B^{11}C^{11}$ with vertices at $A^{11}(2,2)$ B(6,2) and $C^{11}(2,-6)$ by a second transformation

- (i) Find the coordinates of $A^1B^1C^1$ (3 marks)

- (ii) Find the matrix which maps $A^1B^1C^1$ onto $A^{11}B^{11}C^{11}$. (2 marks)

- (iii) Draw the three triangles ABC, $A^1B^1C^1$ and $A^{11}B^{11}C^{11}$ on the grid provided (3 marks)

- (iv) Find the transformation matrix which maps $A^{11}B^{11}C^{11}$ onto ABC (2 marks)

21. In the diagram below $\vec{OA} = \vec{a}$, $\vec{OB} = \vec{b}$ the points P and Q are such that $\vec{AP} = \frac{2}{3}\vec{AB}$ and $\vec{OQ} = \frac{1}{3}\vec{OA}$

(a) Express \vec{OP} and \vec{BQ} in terms of \vec{a} and \vec{b} (3 marks)

(b) If $\vec{OC} = h\vec{OP}$ and $\vec{BC} = k\vec{BQ}$, Express \vec{OC} in two different way and hence;
(i) Deduce the value of h and k (4 marks)

(ii) The vector \vec{OC} in terms of \vec{a} and \vec{b} only. (2 marks)

(iii) The ratio in which C divides BQ. (1 mark)

22.

The figure represents a right pyramid standing on a square base of side 10cm. The diagonals of the square QRST meet at O and M is the midpoint of QR. Given that the vertical height OP of the pyramid is 12cm and that all slant edges are equal,

Calculate,

(a) The length of PM (3 marks)

(b) The angle made by the planes PQR and QRST (2 marks)

(c) The total surface area of its pyramid (5 marks)

23. In a form 2 class $\frac{2}{3}$ are boys and the rest are girls. $\frac{4}{5}$ of the boys and $\frac{9}{10}$ of the girls are right handed; the rest are left handed. The probability that a right handed student will answer a question correctly is $\frac{1}{10}$ and the corresponding probability for a left handed student is $\frac{3}{10}$ irrespective of the sex.

By use of tree diagram; Determine

- (a) The probability that a student chosen at random from the class is left handed (5 marks)

- (b) The probability that a question is answered correctly.

(5 marks)

24. The table below shows experimental values of V and T which are known to be linked by an equation of the form.

$T = KV^n$, where K and n are constants

V	5.6	7.1	7.9	8.9	10	11.2
T	140.9	250.6	281.2	354	445.6	561

Draw a suitable straight line graph and estimate the values of k and n

(10 marks)