

Mathematics I

010

29 Oct. 2014 08.30AM - 11.30AM



ORDINARY LEVEL NATIONAL EXAMINATIONS, 2014

SUBJECT: MATHEMATICS I

DURATION: 3 HOURS

INSTRUCTIONS:

- 1) Do not open this paper until you are told to do so.
- 2) This paper has **TWO** sections: **A** and **B**.
 - **SECTION A:** Attempt **ALL** questions. (55 marks)
 - **SECTION B:** Attempt any **THREE** questions. (45 marks)
- 3) You may use mathematical instruments and calculators **where necessary**.
- 4) USE A **BLUE or BLACK INK PEN ONLY** TO WRITE YOUR ANSWERS AND A PENCIL TO DRAW DIAGRAMS.
- 5) SHOW CLEARLY ALL THE WORKING. **Marks will not be awarded for the answer without all working steps.**

SECTION A : ATTEMPT ALL QUESTIONS.**(55 marks)**

1. Simplify: $0.42^2 - 0.58^2$ without using a calculator. **(3 marks)**
2. Simplify the fractions completely : $\left(2\frac{2}{5} \div 1\frac{6}{10}\right) \times 0.02$ **(3 marks)**
3. Find the inverse function of $g(x) = 3+4x$. **(2 marks)**
4. A piece of land is represented by a rectangle of 300cm^2 on a map. Determine the actual area of the land in hectares (ha). The scale is 1: 15,000. **(3 marks)**
5. Solve : $\frac{2x-5}{x^2-4} = \frac{5}{x-2}$ **(5 marks)**
6. To pass a certain interview, a candidate must pass both oral test(R) and a written test(W).
Of the candidates who attend the interview 70% passed R, 65% passed W and 15% passed R but not W.
Four candidates failed both tests . How many candidates passed the interview ? **(4 marks)**
7. Solve the following simultaneous equations : **(4 marks)**
$$2x + 3y = 5$$
$$3x + 2y = 10$$
8. Solve the following inequality: $2x - \frac{1}{3}(4x - 1) < \frac{3}{4} + x$. Illustrate the solution on the number line . **(4 marks)**
9. Calculate the distance between points A(-5,4) and B(3,-2). **(4 marks)**
10. Find the magnitude of vector $\vec{z} + 2\vec{w}$, given that $\vec{z} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$ and $\vec{w} = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$. **(4 marks)**
11. (a) Find the sum of the interior angles of a pentagon. **(2 marks)**
(b) The sum of the interior angles of a polygon is 900° .
How many sides has the polygon ? **(2 marks)**
12. The longest side of a right angled triangle is 15cm and the other two sides are x cm and $(x + 3)$ cm respectively. Find x and calculate the area of the triangle. **(4 marks)**
13. A (1,4) , B (1,0) and C (3,-2) are three of the vertices of a quadrilateral ABCD. $\vec{AD} = \begin{pmatrix} 4 \\ -1 \end{pmatrix}$ and X is the mid-point of AC. **(4 marks)**
Find the coordinates of D and X .
14. Solve: $6x^2 + x - 2 = 0$. **(3 marks)**

15 (a) Simplify : $36^{\frac{1}{2}} + 27^{\frac{2}{3}}$.

(2 marks)

(b) Solve for x : $4^x = 32$.

(2 marks)

SECTION B : ATTEMPT THREE QUESTIONS ONLY. (45 marks)

16. a) Two lines, one passing through points (0, 4) and (3, 1) and the other passing through point (-3, 2), are parallel. Find the equations of these lines.

- b) If $f(x) = 2x + 3$ and $g(x) = 3x - 1$, calculate :

(7 marks)

(i) $f(-1)$

(ii) $g(-4)$

(iii) $f \circ g(x)$

(iv) $g \circ f(x)$

(v) $g \circ f\left(-\frac{1}{6}\right)$

(8 marks)

(vi) $f \circ g\left(-\frac{1}{6}\right)$

17. a) A triangle with vertices A, B and C whose coordinates are (2, 0), (5, 4) and (6, 1) respectively is given a translation $\vec{t} = \begin{pmatrix} -3 \\ 7 \end{pmatrix}$.

(5 marks)

Find the images vertices: (i) A'; (ii) B'; (iii) C'.

- b) A (-5, -1), B (-2, -1) and C (-4, -2) are vertices of triangle ABC.

(4 marks)

- (i) Plot points A, B and C on a graph paper using a scale of 1cm to represent 1 unit on each axis. Join the points to form triangle ABC.

- (ii) Triangle ABC is enlarged by a scale factor of -2 with the origin (0,0) as the centre of enlargement. On the same graph as 17.b)(i) above, draw the image A'B'C' of triangle ABC.

(3marks)

- (iii) Draw triangle A'' B'' C'' which is the image of triangle ABC

under a reflection in line $y = 0$. Use the same graph as that of 17.b) (i) above .

(3 marks)

18. a) Mr. RWEMA buys a certain number of pens for £1.40 and the number of pence that each one costs him is 4 more than the number of pens that he buys. Find the cost of each pen. £=pound (British currency) and 1£=100 pence.

(5 marks)

b) Solve : $6x^3 + 11x^2 - 3x - 2 = 0$.

(10 marks)

19. The table below shows the marks scored by 52 students in a test marked out of 50

12 18 24 29 37 45 47 38 31 24
 19 13 14 20 25 32 39 40 33 25
 21 14 40 33 26 21 15 16 22 27
 34 41 41 35 27 22 16 17 27 22
 28 44 42 35 18 22 28 36 43 18
 23 36

- a) Make a grouped frequency table for the marks starting with 12 – 19.
 b) Find the modal class and its limits. Calculate the mean .

(15 marks)

20. a) Given that the points (4, -1), (1, 5) and (-3, k) lie on a straight line, calculate the value of k.

(5 marks)

- b) The data below show a relation between x and y.

x	3	4	5	6	7
y	10	13	16	19	22

(10 marks)

By plotting y against x on a graph, determine the gradient of the graph hence deduce the relation between y and x . Write the equation connecting y and x .