

1.3.4 Mathematics Alt. B Paper 2 (122/2)

SECTION I (50 marks)

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

1 Given that $m = \frac{3}{0.089^2}$ and $n = \frac{1}{\sqrt{82.49}}$,

use a calculator to find:

(a) the value of m and the value of n ; (2 marks)

(b) the value of $m + n$ to 4 significant figures. (1 mark)

2 Given that $\mathbf{a} = 2\mathbf{i} - 4\mathbf{j}$ and $\mathbf{b} = \mathbf{i} - 3\mathbf{j}$, find $3\mathbf{a} - 5\mathbf{b}$. (3 marks)

3 The mass of an object is 0.36 kg and its density is 2.5g/cm³. Calculate the volume of the object in cm³. (2 marks)

4 Make T the subject of the formula, (3 marks)

$$P = \sqrt{\frac{S(T - R)}{A}}$$

5 A trader mixes two types of fruit juices A and B in the ratio 2:5. Type A costs Ksh 140 per litre and type B costs Ksh 105 per litre. Find the selling price of the mixture per litre if the trader makes a 20% profit. (4 marks)

- 6 The table below shows the ages of a group of students.

Age in years	14	15	16	17	18
Number of students	2	6	14	16	10

- Draw a pie chart to represent the above information. (3 marks)
- 7 Given that $P = \begin{pmatrix} 1 & -2 \\ -1 & 3 \end{pmatrix}$, $Q = \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$ and $R = P^2Q$, determine R . (3 marks)
- 8 Find the number which must be added to the quadratic expression $x^2 + 6x + 1$ to make it a perfect square. (3 marks)
- 9 A point P is located 10 cm from the centre of a circle of radius 6 cm. Calculate the length of a tangent drawn from P to the circle. (2 marks)
- 10 A bag contains balls of identical size of which 36 are blue and the rest yellow. When a ball is drawn at random from the bag, the probability that it is yellow is $\frac{2}{5}$. Calculate the number of yellow balls in the bag. (3 marks)
- 11 In a triangular plot of land ABC, $BC = 18$ m, $AC = 10$ m and angle $ACB = 80^\circ$. Calculate to 2 decimal places:
(a) the length AB; (2 marks)
(b) the size of angle CAB. (2 marks)
- 12 Below is part of an income tax table for monthly income in a certain year.

Monthly Taxable income in Ksh	Tax Rate in each shilling
Up to Ksh 10 164	10%
From Ksh 10 165 up to Ksh 19 740	15%
From Ksh 19 741 up to Ksh 29 316	20%

- In that year Wambita's monthly taxable salary was Ksh 18 000. He was entitled to a monthly personal relief of Ksh 1162. Calculate the monthly income tax paid. (4 marks)
- 13 Two towns on the equator differ in local time by 6 hours. Find the distance in km, between the two towns. (3 marks)
(Take the circumference of the earth to be 40 000 km)

- 14 The first term of an arithmetic progression (A.P) is 7 and the 17th term is 81. There are 15 other terms between them.
Calculate:

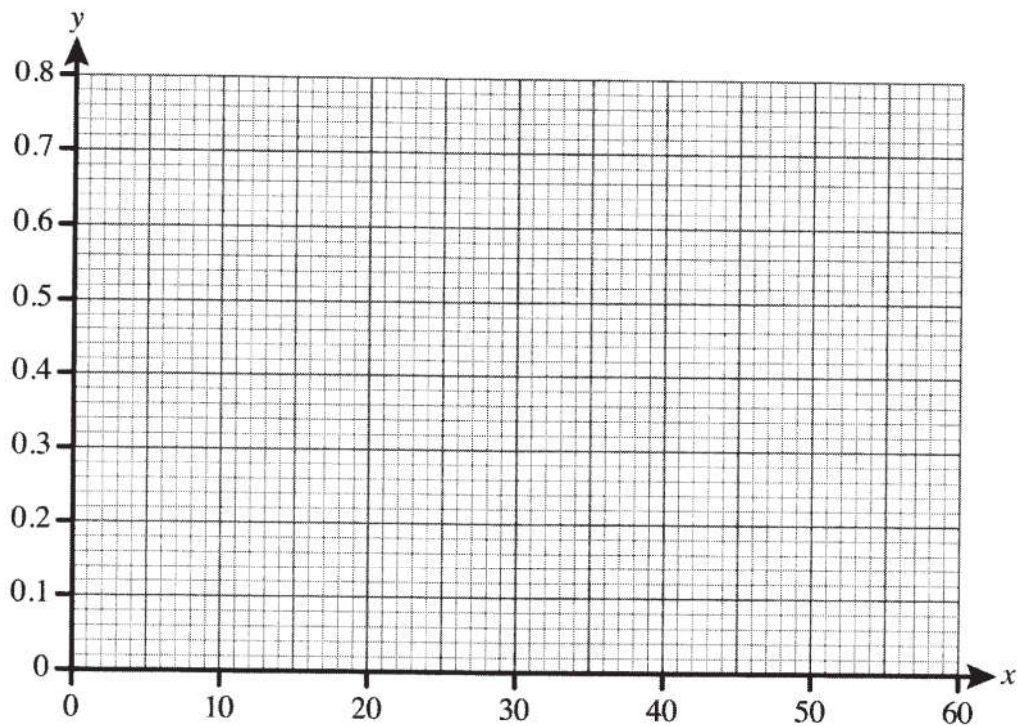
- (a) the sum of the 17 terms; (2 marks)
 (b) the sum of the 15 middle terms of the A.P. (2 marks)

- 15 The matrix $\begin{pmatrix} 4 & 1 \\ 6 & 2 \end{pmatrix}$ maps point P onto its image P'.
Determine the matrix that maps the image P' onto P. (3 marks)

- 16 Corresponding value of x and y in a given relation are as shown in the table below.

x	15	18	23	30	35	40	45	53
y	0.10	0.18	0.23	0.34	0.40	0.50	0.55	0.74

- On the grid provided, plot all the points and draw the line of best fit. (3 marks)



SECTION II (50 marks)

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

- 17 Three machines P, Q and R take 8 hours, 12 hours and 16 hours respectively to complete a task. The three machines were set to work together for $1\frac{1}{2}$ hours. Machine Q was then switched off while machines P and R were left to complete the remaining task.
- (a) Find the fraction of the task done by P, Q and R in the first hour. (2 marks)
- (b) Calculate the fraction of the task:
- (i) done by P, Q and R in $1\frac{1}{2}$ hours; (2 marks)
- (ii) left after $1\frac{1}{2}$ hours. (2 marks)
- (c) Determine the time, in hours and minutes, taken by machines P and R to complete the remaining task. (4 marks)
- 18 The third and the sixth terms of a geometric progression are 18 and 486 respectively. Calculate:
- (a) the common ratio; (3 marks)
- (b) the first term; (2 marks)
- (c) the sum of the ninth and tenth terms; (3 marks)
- 19 The coordinates of points A, B and C are A(2,2), B(5,6) and C(9,8). Point D is such that $\mathbf{AD} = 3 \mathbf{BC}$.
- (a) Find:
- (i) \mathbf{BC} ; (2 marks)
- (ii) the coordinates of point D. (4 marks)
- (b) Given that T is the midpoint of \mathbf{AD} , find:
- (i) the coordinates of point T; (2 marks)
- (ii) the magnitude of \mathbf{TC} , correct to 2 significant figures. (2 marks)
- 20 Two towns, T and U are 36 km apart. A cyclist travelled from town T to town U at an average speed of x km/h. On his journey back from town U to town T his average speed was $(x + 3)$ km/h.
- (a) Write down an expression in terms of x for the time in hours the cyclist took to travel from:
- (i) town T to town U; (1 mark)
- (ii) town U to town T. (1 mark)

- (b) The journey from town T to town U took one hour longer than the journey from town U to town T. Form an equation in x and hence determine the average speed of the cyclist on his journey back from town U to town T. (5 marks)
- (c) Calculate to one decimal place, the cyclists' average speed for the whole journey from town T to town U and back. (3 marks)

21 Matata, a horticulture farmer, carried out the following transactions in the month of April 2010.

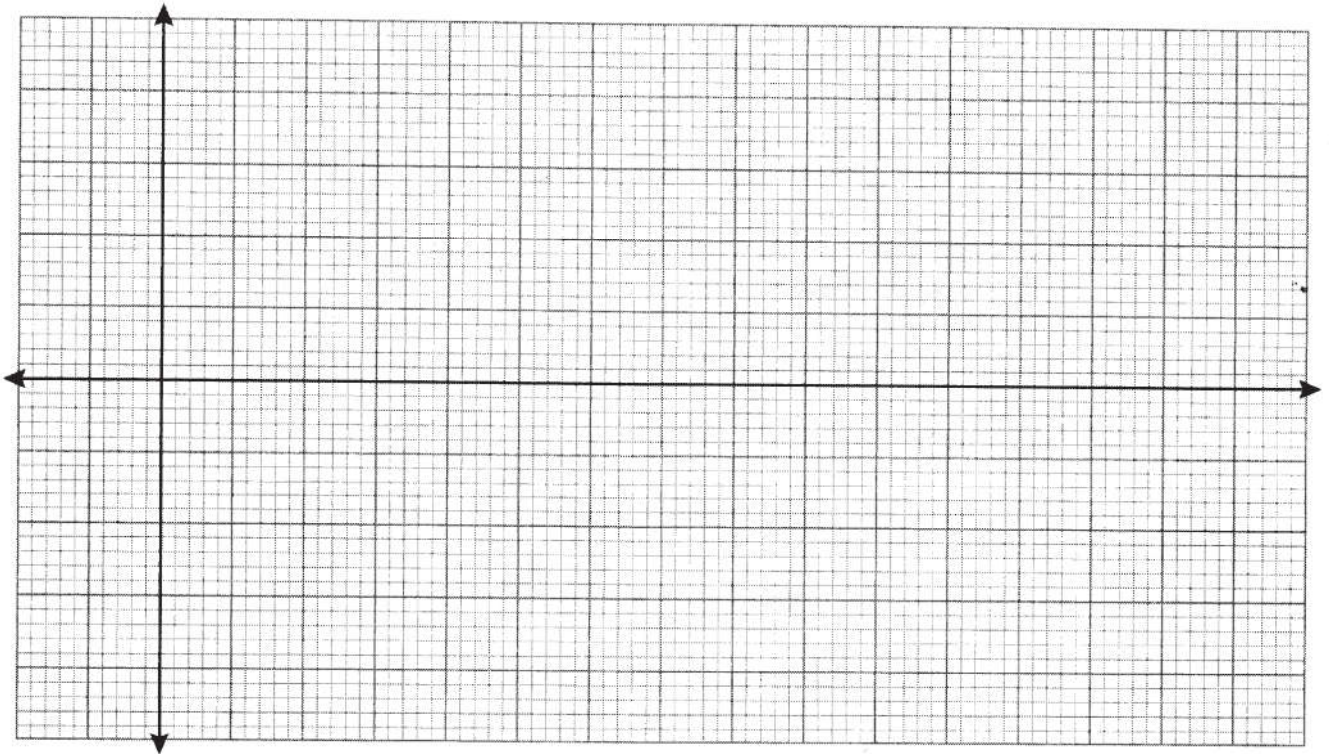
- April 1: Had Ksh 8 000 carried forward from March 2010.
4: Bought 2 bags of fertilizer @Ksh 1 750.
5: Paid Ksh 600 for water.
9: Bought spraying chemicals for Ksh 1 500.
12: Received Ksh 15 000 from the sale of bananas.
15: Sold cabbages for Ksh 5 000.
16: Paid wages to two casual workers at Ksh 1 500 each.
20: Sold tomatoes for Ksh 9 500.
24: Paid Ksh 840 for electricity.
25: Bought seeds for Ksh 450.
28: Sold onions for Ksh 2 500.
30: Bought a spray pump for Ksh 7 500.

Prepare a single column cash book for Matata's transactions and balance it as at 30th April, 2010. (10 marks)

- 22 (a) (i) Complete the table below for $y = 2\sin x^\circ$. (2 marks)

x°	0	30	60	90	120	150	180	210	240	270	300	330	360
$y = 2\sin x^\circ$	0	1			1.73		0	-1				-1	0

- (ii) On the grid below draw the graph of $y = 2\sin x^\circ$ for $0^\circ \leq x \leq 360^\circ$. Use 1 cm for 30° on the x-axis and 2 cm for 1 unit on the y-axis. (4 marks)



- (b) Use the graph to find:
- (i) the values of x for which $y = 1.5$; (2 marks)
- (ii) the range of values of x for which $2\sin x^\circ > 1$. (2 marks)

- 23 The masses in kilograms of forty chicken slaughtered in a restaurant on a certain day are as shown in the table below.

Mass in kg	1.2	1.3	1.4	1.5	1.6	1.7	1.8
Number of chicken	2	4	6	12	8	5	3

Calculate the:

- (a) mean mass, correct to 2 significant figures; (3 marks)
- (b) variance; (5 marks)
- (c) standard deviation, correct to 4 significant figures. (2 marks)
- 24 (a) Complete the table below for the function $y = x^2 + x + 4$. (2 marks)

x	-3	-2	-1	0	1	2	3	4
y								

- (b) (i) On the grid provided, draw the graph of the function $y = x^2 + x + 4$ for $-3 \leq x \leq 4$. (4 marks)
- (ii) Use the trapezium rule with 7 strips of equal width to estimate the area bounded by the curve, the x-axis and the lines $x = -3$ and $x = 4$. (4 marks)