

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  $m = \frac{3}{0.000}$  and  $n = \frac{1}{782.49}$  :

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/cm.  
Calculate the volume of the object in cm<sup>3</sup>. (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.

(Take the circumference of the earth to be 40 000 km)

(3 marks)

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:

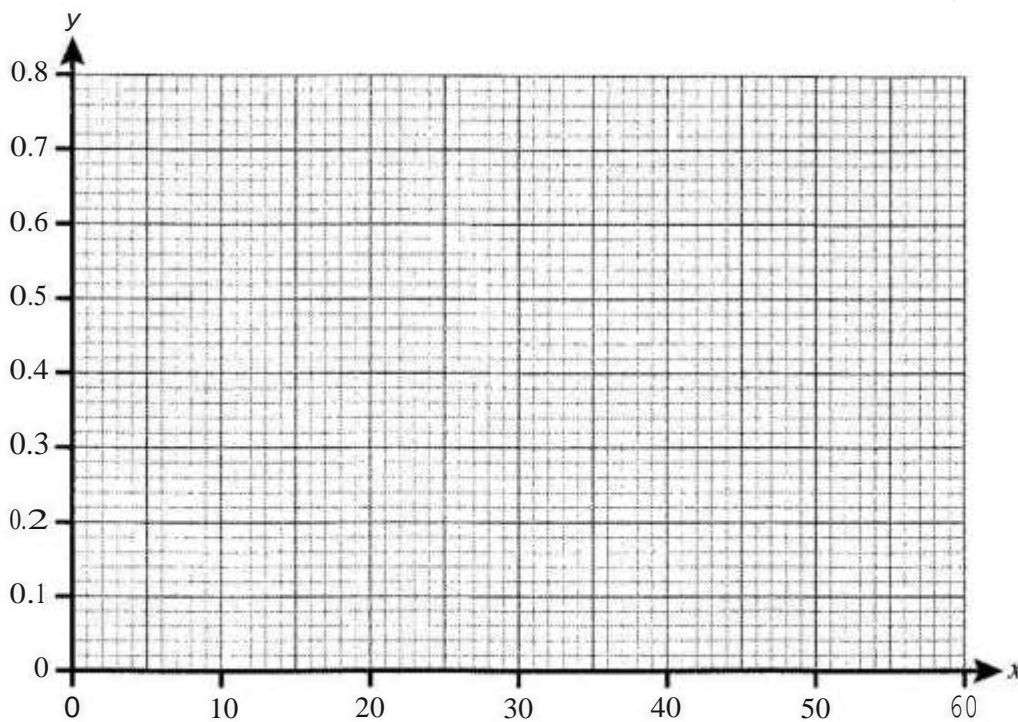
- (a) the sum of the 17 terms; (2 marks)
- (b) the sum of the 15 middle terms of the A.P. (2 marks)

15 The matrix  $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$  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  $\frac{1}{2}$  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  $\frac{1}{2}$  hours; (2 marks)
- (ii) left after  $\frac{1}{2}$  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  $\vec{AD} = 3\vec{BC}$ .
- (a) Find:
- (i)  $\vec{BC}$ ; (2 marks)
- (ii) the coordinates of point D. (4 marks)
- (b) Given that T is the midpoint of  $\vec{AD}$ , find:
- (i) the coordinates of point T; (2 marks)
- (ii) the magnitude of  $\vec{TC}$ , 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  $r$  km/h. On his journey back from town U to town T this average speed was  $(r+3)$  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.

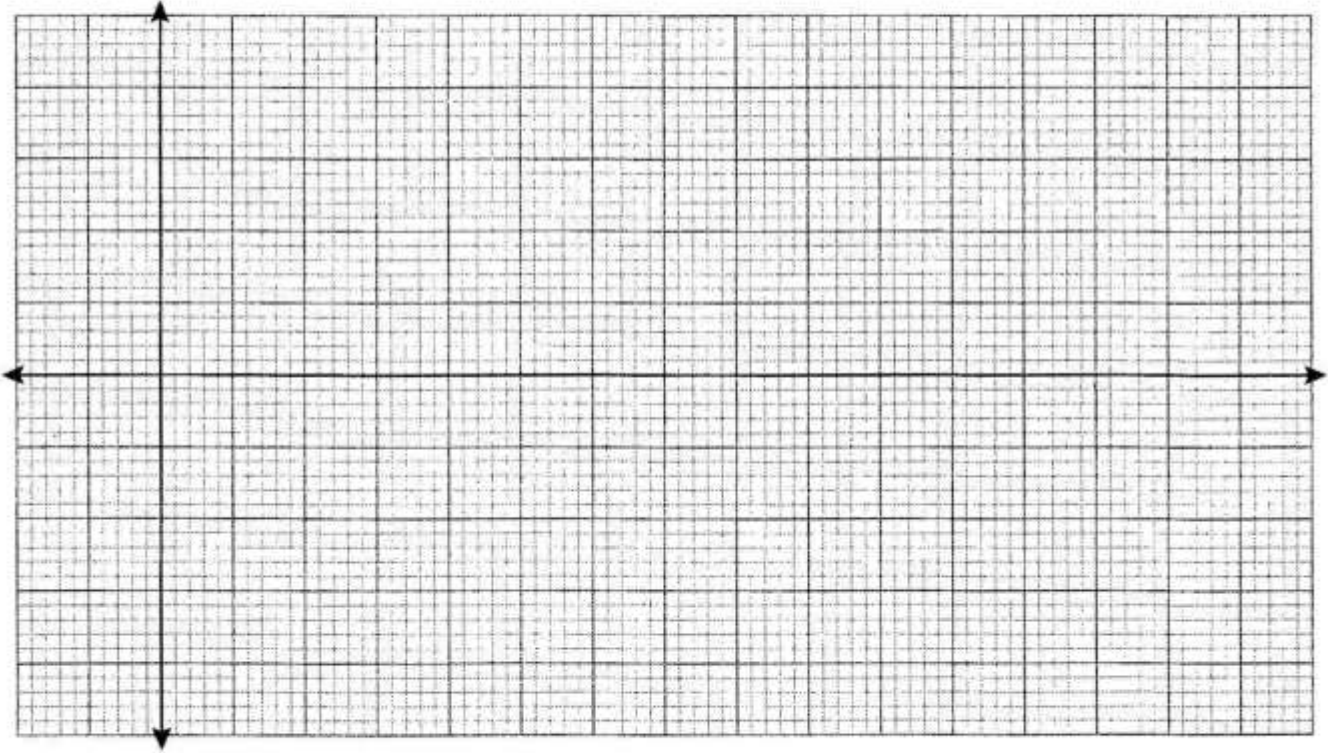
- April 1: Had Ksh 8 000 carried forward from March 2010.  
4: Bought 2 bags of fertilizer @Ksh 1 750.  
5: Paid Ksh 600 for water.  
9: Bought spraying chemicals for Ksh 1 500.  
12: Received Ksh 15 000 from the sale of bananas.  
15: Sold cabbages for Ksh 5 000.  
16: Paid wages to two casual workers 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)

$x^\circ$	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  $0^\circ < x < 360^\circ$ . Use 1 cm for  $30^\circ$  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  $y = X + x + 4$ . (2 marks)

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

- (b) (i) On the grid provided, draw the graph of the function  $y = X + x + 4$  for  $x < 4$ . (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)