### 3.3.4 Mathematics Alt. B Paper 2 (122/2)

SECTION I (50 marks)

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

1   Use a calculator to evaluate $\dfrac{(0.214)^{\frac{1}{2}} - (0.38)^3}{(0.817)^{\frac{1}{4}}}$ giving the answer correct to 4 significant figures.   (2 marks)

2   The third term of a geometric progression is $1\frac{1}{4}$ and the sixth term is $\frac{5}{32}$. Determine:

   (a)   the common ratio;   (2 marks)

   (b)   the first term.   (2 marks)

3   The lengths of the parallel sides of a trapezium are (3a + 3) cm and 3a cm. The perpendicular distance between the parallel sides is 4a cm. If the area of the trapezium is 60cm^2, find the value of a.   (3 marks)

4   The figure below shows a region enclosed by a curve drawn on a 1 cm square grid.
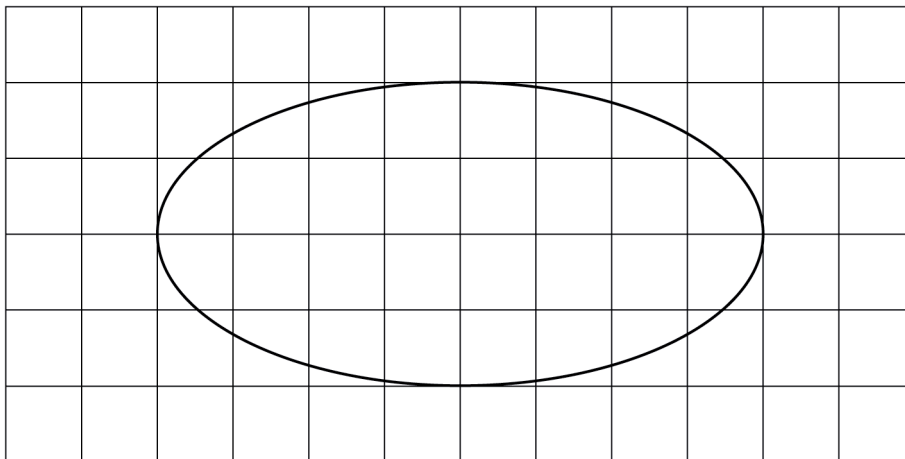
   Estimate the area of the region in square centimetres.   (3 marks)

5   Makena deposited Ksh 48 000 in a fixed account in a bank. The bank paid a compound interest at a rate of 5% p.a. Calculate the interest earned at the end of 3 years.   (3 marks)

6   Three vectors are such that **a** = 4**i** + 5**j**, **b** = 8**i** − 3**j** and **c** = p**i** + 3q**j**, where p and q are scalars. Given that 3**a** − 2**b** = **c**, determine the values of p and q.   (3 marks)

7   Machine A can complete some work in 8 hours while machine B can complete the same work in 10 hours. The two machines were set to do the work at the same time. After 3 hours, machine B broke down. Determine the time taken by machine A to complete the remaining piece of work.
                                                                                                       (4 marks)

8   The figure below shows a curve which passes through point A(1,2).
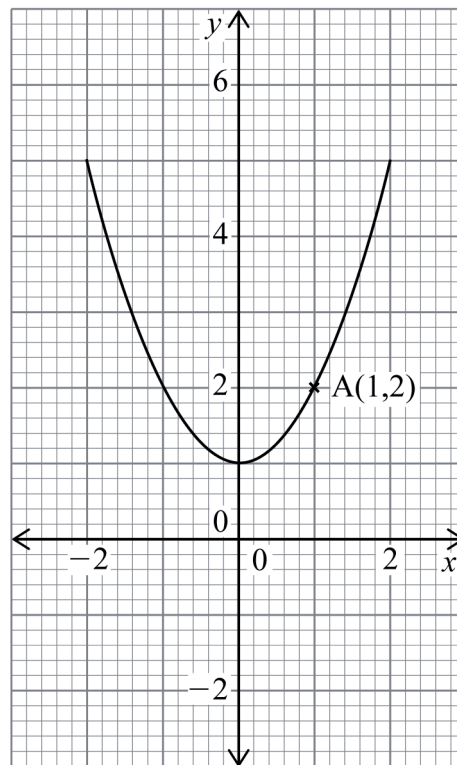
Determine the instantaneous rate of change at A.   (3 marks)

9   Solve the equation, $\tan(2\theta - 30)° = \sqrt{3}$ for $0° \leq \theta \leq 360°$.   (3 marks)

10   Two points, S and T are on the surface of the earth. The position of S is (50° S, 138° E) and that of T is (22° N, 138° E). Determine the shortest distance on the surface of the earth between S and T. (Take radius of the earth to be 6370 km and $\pi = \frac{22}{7}$)   (3 marks)

11   Two matrices **M** and **N** are such that $\mathbf{MN} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$. Given that $\mathbf{M} = \begin{pmatrix} 8 & 3 \\ 4 & 2 \end{pmatrix}$, find **N**.
(3 marks)

12   When Khisa walks for 5 hours at x km/h and Barongo walks for 6 hours at y km/h, they cover a total distance of 50 km. When Khisa walks for 7 hours at x km/h and Barongo walks for 5 hours at y km/h, they cover a total distance of 53 km. Determine the speeds x and y.   (4 marks)

13   Four types of vehicles passed through a particular place on a road, on a certain day as shown in the table below.

| Type of vehicle	Cars	Lorries	Motorcycles	Pick-ups
No. of vehicles	14	11	38	9

Draw a pie-chart to represent the information.   (3 marks)

14   The area of a parallelogram ABCD is 27 cm². A′B′C′D′ is the image of ABCD under a

transformation matrix $\begin{pmatrix} \frac{2}{3} & 0 \\ 0 & \frac{2}{3} \end{pmatrix}$. Find the area of A′B′C′D′.   (3 marks)

15   The volume, V cm³, of a liquid in a vertical tube varies as the height, h cm, of the tube. The table below shows values of h and the corresponding values of V.

h cm	10	13	15	20	22	25
V cm³	12	15.6	18	24	26.4	30

(a)   On the grid provided, draw the graph of V against h.   (2 marks)
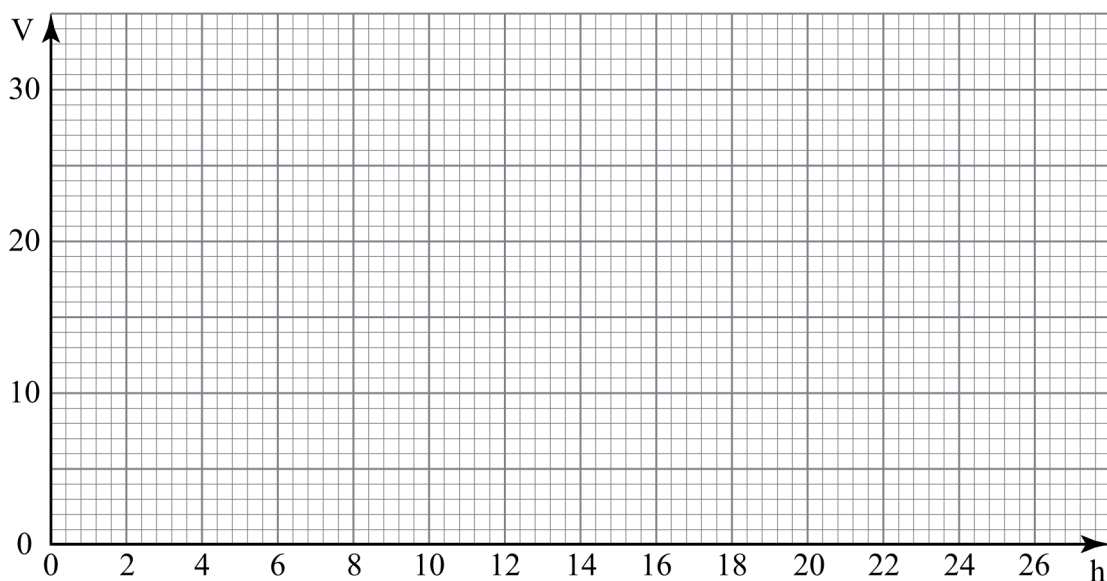
(b)   Use the graph to find the constant of proportionality.   (1 mark)

16   Two chords AB and CD of a circle intersect internally at T. AB = 15 cm, TB = 3 cm and TD = 4 cm. Find the ratio in which T divides CD.   (3 marks)

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

17   A shop offered goods on both cash and hire purchase terms. The cash price of a water pump in the shop was Ksh 40 000.

    (a)   Muiruri purchased the pump on hire purchase terms by paying a deposit equivalent to $20\frac{1}{2}\%$ of the cash price followed by 12 equal monthly instalments of Ksh 4800. Calculate:

        (i)   the amount of deposit Muiruri paid;   (2 marks)

        (ii)   the total hire purchase price;   (2 marks)

        (iii)   the deposit as a percentage of the hire purchase price, correct to 1 decimal place;   (2 marks)

        (iv)   the amount of the hire purchase price Muiruri paid above the cash price.   (1 mark)

    (b)   Bidii purchased an identical water pump whose hire purchase price was the same as that paid by Muiruri. Bidii paid 12 equal instalments of Ksh 4000. Calculate the deposit paid by Bidii as a percentage of the cash price.   (3 marks)

18   A metal dealer cut a wire into pieces and arranged them in an ascending order of their lengths. The shortest piece was 0.5 m and the longest was 15 m. The difference in length of successive pieces was 25 cm.

    (a)   Determine:

        (i)   the total number of pieces cut;   (2 marks)

        (ii)   the length of the tenth piece.   (2 marks)

        (iii)   the total length of all the pieces.   (2 marks)

    (b)   Determine the number of pieces starting from the shortest, that will give a total length of 63 m.   (4 marks)

19 (a) Complete the table below for the equation $y = x^2 + 3x - 5$. (2 marks)

| x	-6	-5	-4	-3	-2	-1	0	1	2	3
y			-1				-5			

(b) (i) On the grid provided, draw the graph of $y = x^2 + 3x - 5$ for $-6 \leq x \leq 3$.
(Use 1 cm to represent 1 unit on the horizontal axis and 2 cm to represent 5 units on the vertical axis) (3 marks)

(ii) From the graph, estimate the values of x when $y = 0$. (2 marks)

(c) (i) On the same grid, draw the line $y = 2x + 2$. (1 mark)

(ii) From the graph determine the points of intersection of the curve $y = x^2 + 3x - 5$ and the line $y = 2x + 2$. (2 marks)

20 The table below shows marks scored by some students in a mathematics test.

Marks	30–39	40–49	50–59	60–69	70–79	80–89	90–99
No. of students	2	4	10	13	14	5	2

(a) Calculate the mean mark. (3 marks)

(b) On the grid provided, draw an ogive to represent the information. (4 marks)

(c) Use the graph to determine:

(i) the median; (2 marks)

(ii) the position of the student who scored 75 marks. (1 mark)

21   The figure below is a quadrilateral ABCD. AB = 6 cm, BD = 9.2 cm and angle BDC = 40°.
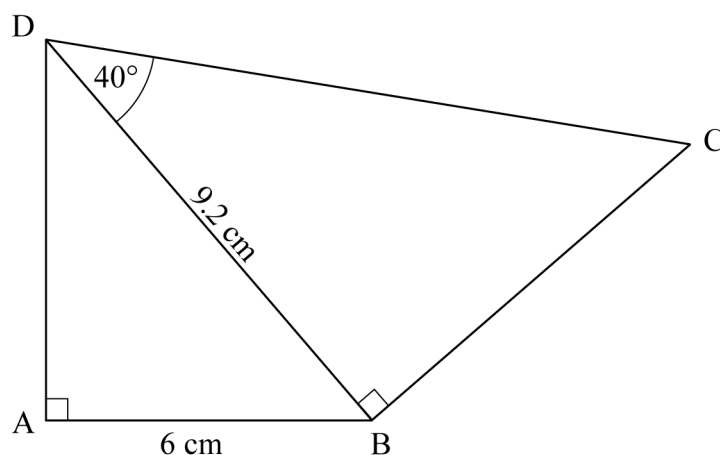
Calculate, correct to one decimal place:

(a)   the length AD;   (2 marks)

(b)   the size of angle ABD;   (2 marks)

(c)   the length BC;   (2 marks)

(d)   the area of triangle ACD.   (4 marks)

22   Daudi goes to work by means of either a train, a bus or a motorcycle. On any given day, the
      probability of using a train is 0.3, the probability of using a bus is 0.5 and the probability of
      using a motorcycle is 0.2. When he uses a train, the probability of being punctual is 0.8. When
      he uses a bus, the probability of being punctual is 0.7 and when he uses a motorcycle, the
      probability of being punctual is 0.9.
       Calculate the probability that Daudi:

(a)   uses a train and is punctual for work;   (2 marks)

(b)   uses a bus and is late for work;   (2 marks)

(c)   is punctual for work;   (3 marks)

(d)   is late for work;   (1 mark)

(e)   uses either a train or a bus and is punctual for work.   (2 marks)

MANYAM FRANCHISE

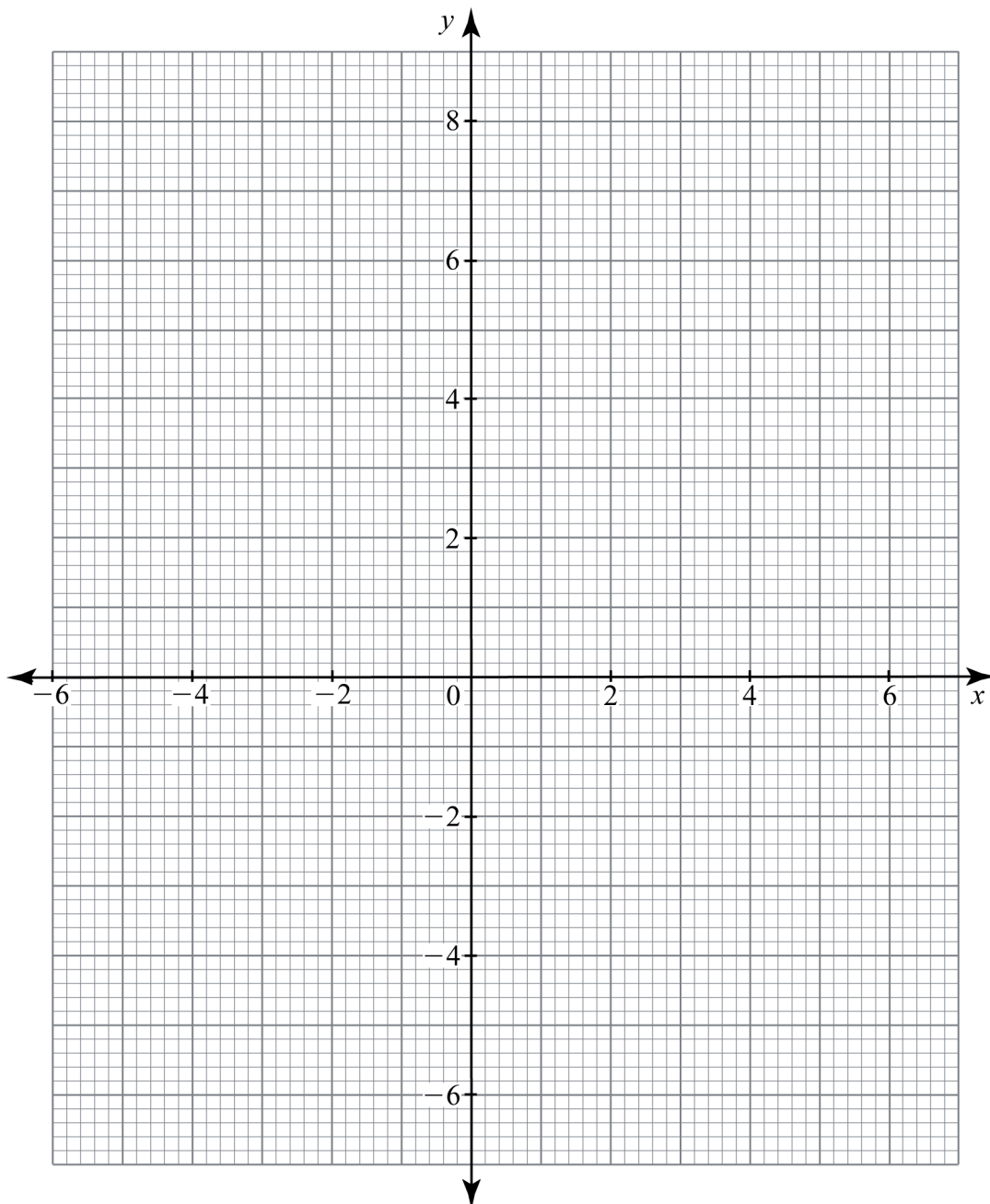**23** The vertices of a triangle ABC are A(2, 4), B(2, 9) and C(6, 2).

(a) On the grid provided:

(i) draw triangle ABC; (1 mark)

(ii) draw triangle A′B′C′, the image of triangle ABC under a transformation

$$\mathbf{T} = \begin{pmatrix} -\dfrac{3}{5} & \dfrac{4}{5} \\ \dfrac{4}{5} & \dfrac{3}{5} \end{pmatrix}.$$ (3 marks)

(b)   Describe transformation **T** fully.   (2 marks)

(c)   The images of the vertices of triangle A′B′C′ under a transformation **H** are A″(−2,−4),
        B″(−6,−7) and C″(2,−6).

        (i)   On the same grid as in (a), draw triangle A″B″C″;   (1 mark)

        (ii)   determine the matrix of transformation **H**.   (1 mark)

(d)   Find a single matrix of transformation that maps A″B″C″ onto ABC.   (2 marks)

24   A fruit vendor carried out the following transactions in January 2014. On January 1st, she had
        a cash balance of Ksh 3250. On January 3rd, she bought 1200 oranges at Ksh 90 for every 12.
        On January 4th, she bought 150 pawpaws at Ksh 11 each, vegetables for Ksh 700 and paid
        Ksh 200 for transport. On January 5th, she sold 1175 oranges at Ksh 10 each. On January 6th,
        she sold 145 pawpaws at Ksh 12.50 each and vegetables for Ksh 1140. On January 8th, she paid
        a market fee of Ksh 150. On January 10th, she paid Ksh 400 to her assistant as wages.
        Prepare a single column cash account for the fruit vendor's transactions and balance it as at
        11th January 2014.   (10 marks)