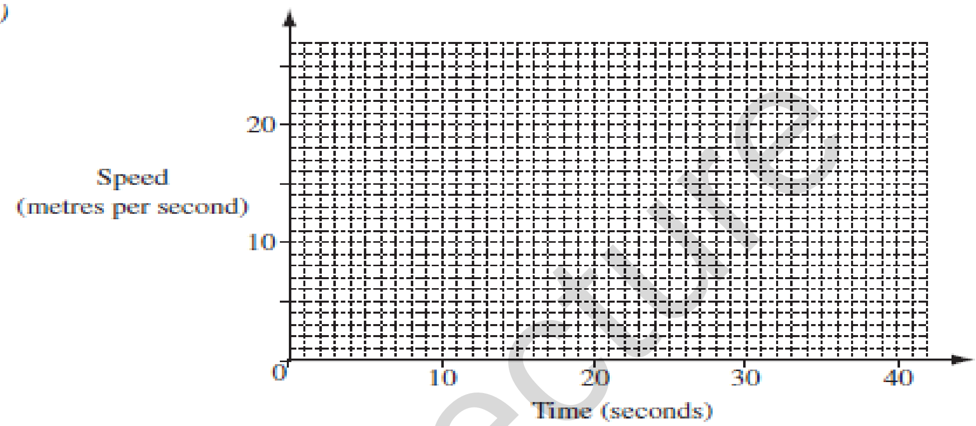
PRACTICE QUESTION GRAPH WORKSHEET # 4

23 A car accelerates uniformly from rest for 30 seconds.
Its speed after 30 seconds is 18 m/s.
The speed remains constant for the next 10 seconds.

(a) Draw the speed-time graph for the first 40 seconds of the journey.

Answer (a)



[1]

(b) Calculate

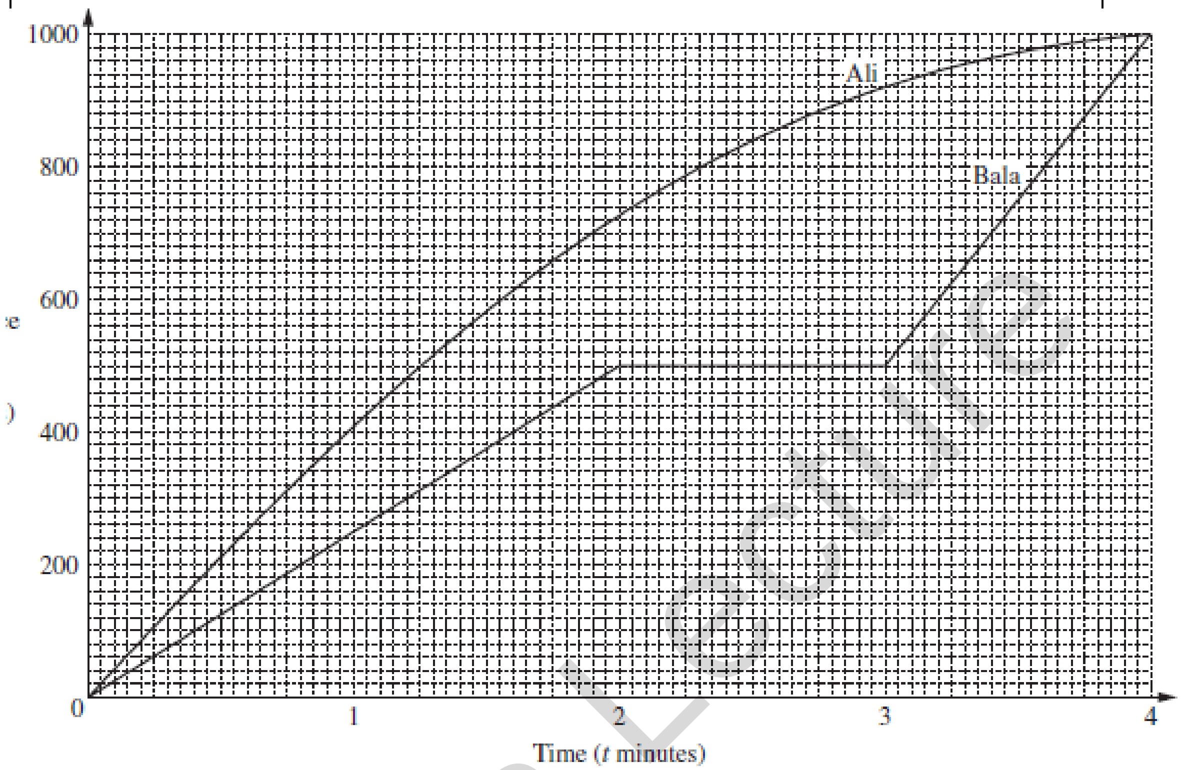
(i) the car's acceleration during the first 30 seconds,

(ii) its average speed for the first 40 seconds.

Answer (b)(i) .... m/s^2 [1]

(ii) .... m/s [2]

21 The diagram shows the distance – time graphs of the journeys of Ali and Bala from home to school.
They leave home together and follow the same route.
Ali runs to school and Bala cycles.



(a) How long does it take Ali to run the first 700 m?

(b) Estimate the distance between Ali and Bala when $t = 3$.

(c) Find Bala's speed when $t = 2.6$.

(d) Find Bala's speed when $t = 3.5$.

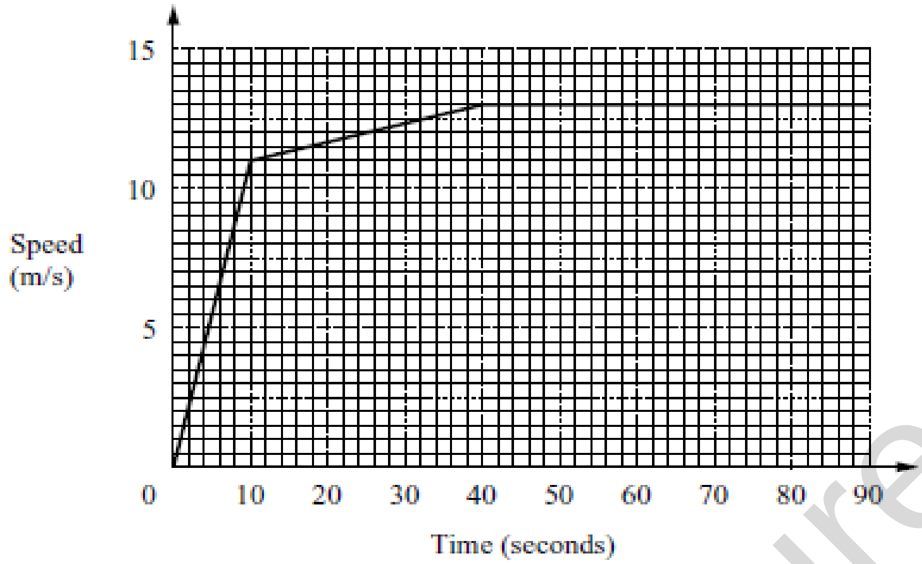
Answer (a) ....minutes [1]

(b) ....m [1]

(c) ....m/minute [1]

(d) ....m/minute [1]

24



The speed–time graph shows the performance of a cyclist during the first 90 seconds of a race.

(a) Calculate the acceleration of the cyclist during the first 10 seconds.

(b) Calculate the distance, in metres, travelled by the cyclist in the first 90 seconds.

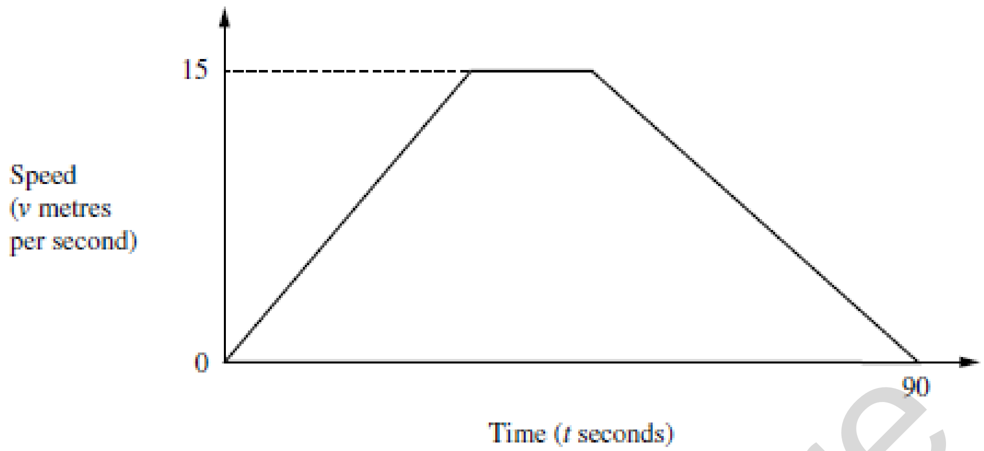
(c) Calculate the time taken for the cyclist to travel 1 kilometre.

Answer (a).. m/s^2 [1]

(*b*).. m [3]

(*c*).. s [2]

22



The diagram shows the speed – time graph of a bus over a period of 90 seconds.
The bus reaches a maximum speed of 15 metres per second.

(a) Express 15 metres per second in kilometres per hour.

(b) Given that the acceleration was $0.5\,\text{m/s}^2$, calculate the time taken, in seconds, to reach its maximum speed.

(c) The total distance travelled during the 90 seconds was 750 metres.
Calculate the length of time that the bus was travelling at its maximum speed.

Answer (*a*) .... km/h [1]

(*b*) .... s [1]

(*c*) .... s [2]

22 A car starts from rest and accelerates at a constant rate to a speed of 20 m/s in 10 seconds.

(a) Find the acceleration.

It then travels at a constant speed of 20 m/s for the next 10 seconds.

(b) Find the total distance travelled in the 20 seconds.

(c) On the axes below, draw

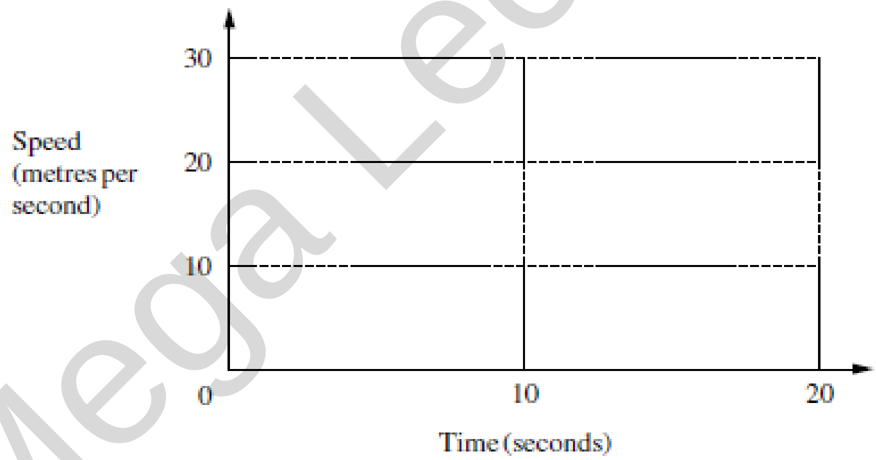
(i) the speed-time graph for the first 20 seconds of the car's journey,

(ii) the distance-time graph for the same 20 seconds.

Answer (a) .... m/s^2 [1]

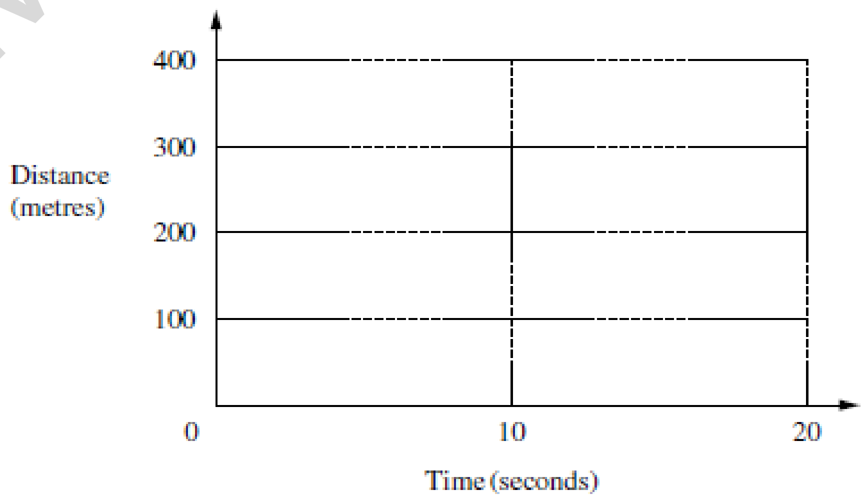
(b) .... m [1]

Answer (c) (i)



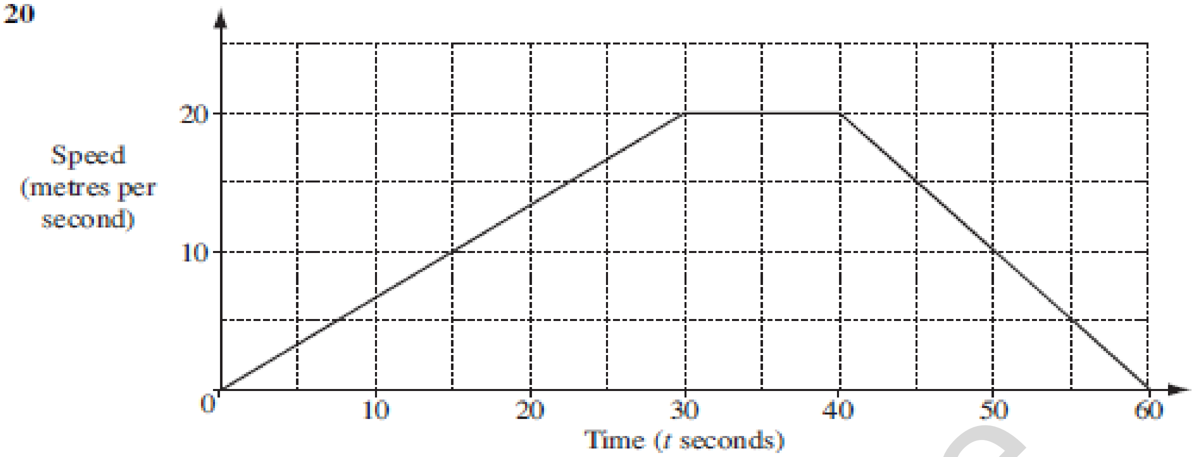
[1]

(ii)



[2]

20



The diagram shows the speed–time graph of a car's journey.

(a) Find the speed when $t = 20$.

(b) Find the acceleration when $t = 20$.

(c) Find the distance travelled in

(i) the first 40 seconds,

(ii) the first 60 seconds.

(d) Part of the distance–time graph for the same journey is shown in the answer space. Complete this graph.

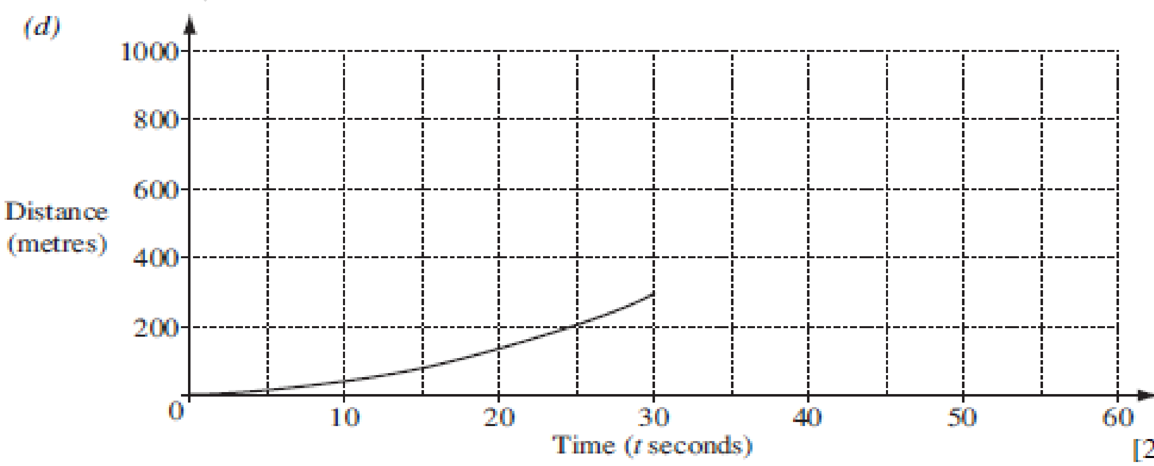
Answer (a) ....m/s [1]

(b) ....m/s^2 [1]

(c)(i) ....m [1]

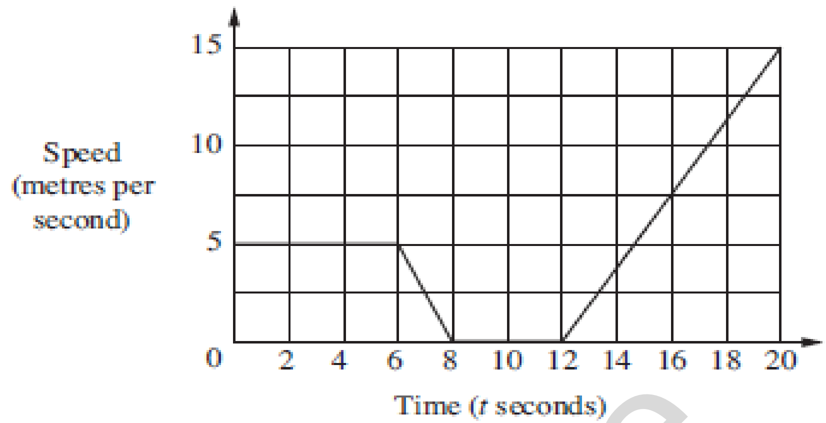
(ii) ....m [1]

(d)



[2]

21



The diagram is the speed-time graph for the first 20 seconds of a journey.

(a) Find

(i) the acceleration when $t = 16$,

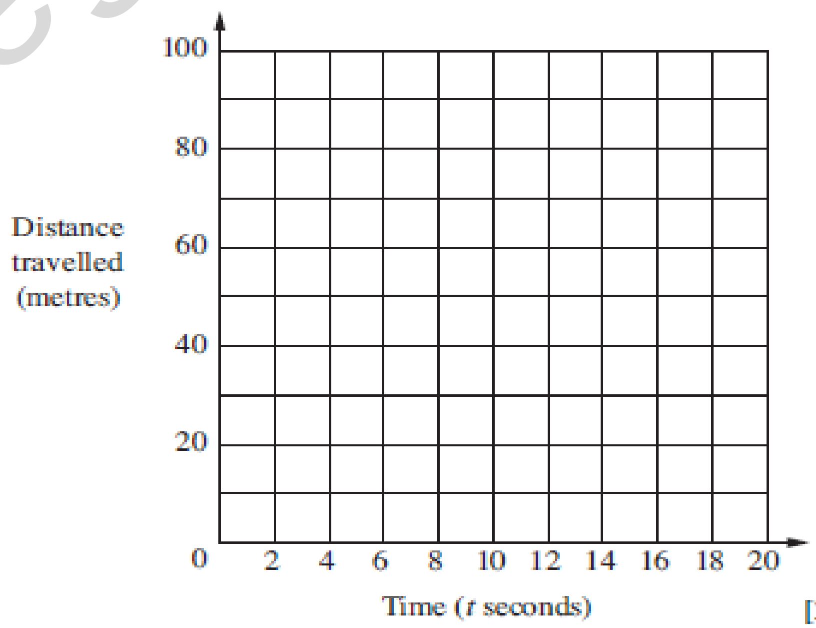
(ii) the distance travelled in the first 20 seconds.

Answer (a) (i) ....m/s^2 [1]

(ii) ....m [1]

(b) On the grid in the answer space, sketch the distance-time graph for the same journey.

Answer (b)



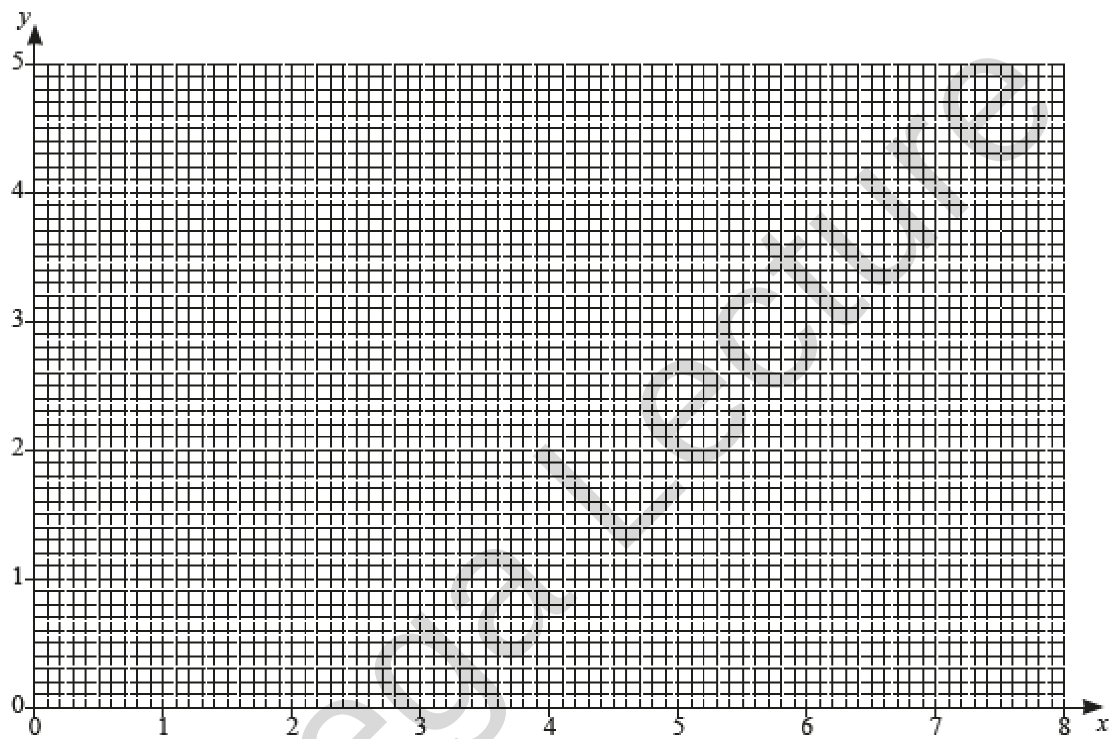
[3]

7 The table shows some values for $y = 1 + \frac{2}{x}$, given correct to 2 decimal places where appropriate.

x	0.5	1	2	3	4	5	6	7	8
y	5	3	2	1.67	1.5	1.4	1.33	1.29	

(a) Complete the table. [1]

(b) Draw the graph of $y = 1 + \frac{2}{x}$ for $0.5 \leqslant x \leqslant 8$.



[2]

(c) The line L crosses the graph of $y = 1 + \frac{2}{x}$ at $x = 2$ and $x = 5$.

Find the equation of L.

.... [3]

(d) A line with gradient $-\frac{1}{3}$ crosses the graph of $y = 1 + \frac{2}{x}$ when $x = 1$ and when $x = k$.

By drawing a suitable line on your grid, find k.

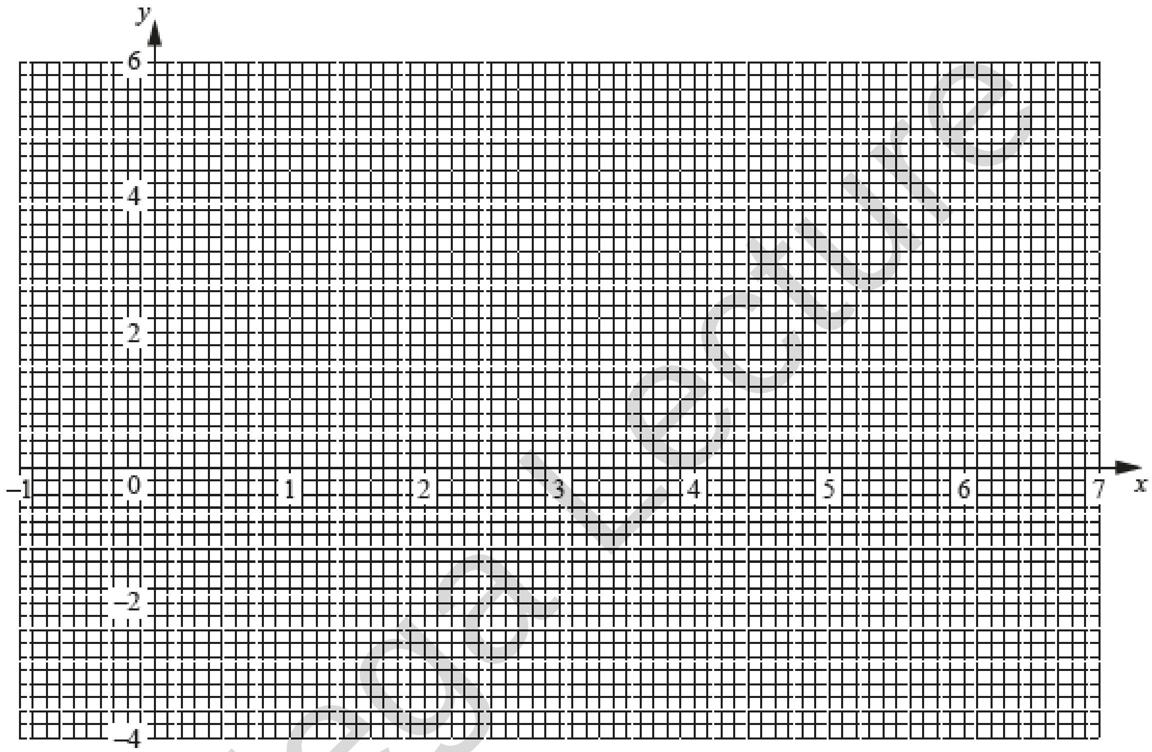
$k =$ .... [2]

6 (a) Complete the table for $y = \frac{x^2}{2} - 3x + 2$.

x	−1	0	1	2	3	4	5	6	7
y		2	−0.5	−2	−2.5	−2	−0.5	2	

[1]

(b) Draw the graph of $y = \frac{x^2}{2} - 3x + 2$ for $-1 \leqslant x \leqslant 7$.



[3]

(c) By drawing a tangent, estimate the gradient of the curve at $x = 1.5$.

Answer .... [2]

(d) Complete these inequalities to describe the range of values of x where $y \geqslant 0$.

Answer $x \leqslant$ ....

$x \geqslant$ .... [2]

(e) **(i)** On the same grid, draw the line $4y + 3x = 12$. [2]

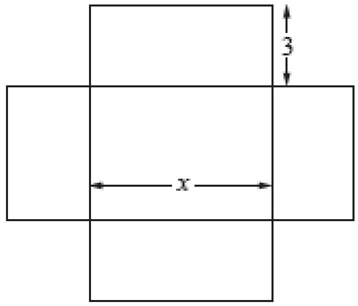
(ii) The x-coordinates of the points of intersection of this line and the curve are the solutions of the equation $2x^2 + Ax + B = 0$.

Find the value of A and the value of B.

Answer $A =$ ....

$B =$ .... [2]

7



The diagram shows the net of an open box of height 3 cm.
The area of the base of the box is 15 cm^2.
The length of the rectangular base is x cm.
The total area of the net is A cm^2.

(a) Show that $A = 15 + 6x + \dfrac{90}{x}$.

[2]

(b) Graham has one of these open boxes.
The total area of the net of his box is 65 cm^2.

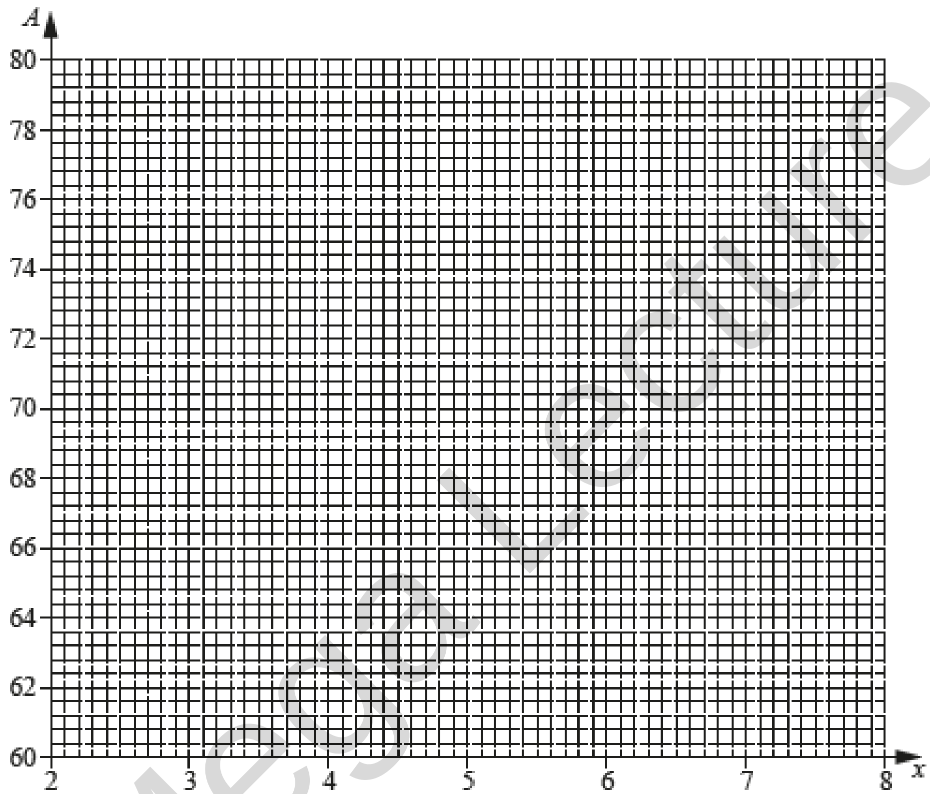
Write down an equation in x and solve it to find the length of the base of Graham's box.
Give your answer correct to 2 decimal places.

(c) **(i)** Complete the table below for $A = 15 + 6x + \dfrac{90}{x}$.

x	2	3	4	5	6	7	8
A	72	63	61.5	63	66	69.9	

[1]

(ii) Draw the graph of $A = 15 + 6x + \dfrac{90}{x}$ for $2 \leqslant x \leqslant 8$.



[2]

(iii) Delilah has one of these open boxes.
The area of the net of her box is $68\,\text{cm}^2$.

Use your graph to find the length and width of Delilah's box.

Answer length .... cm

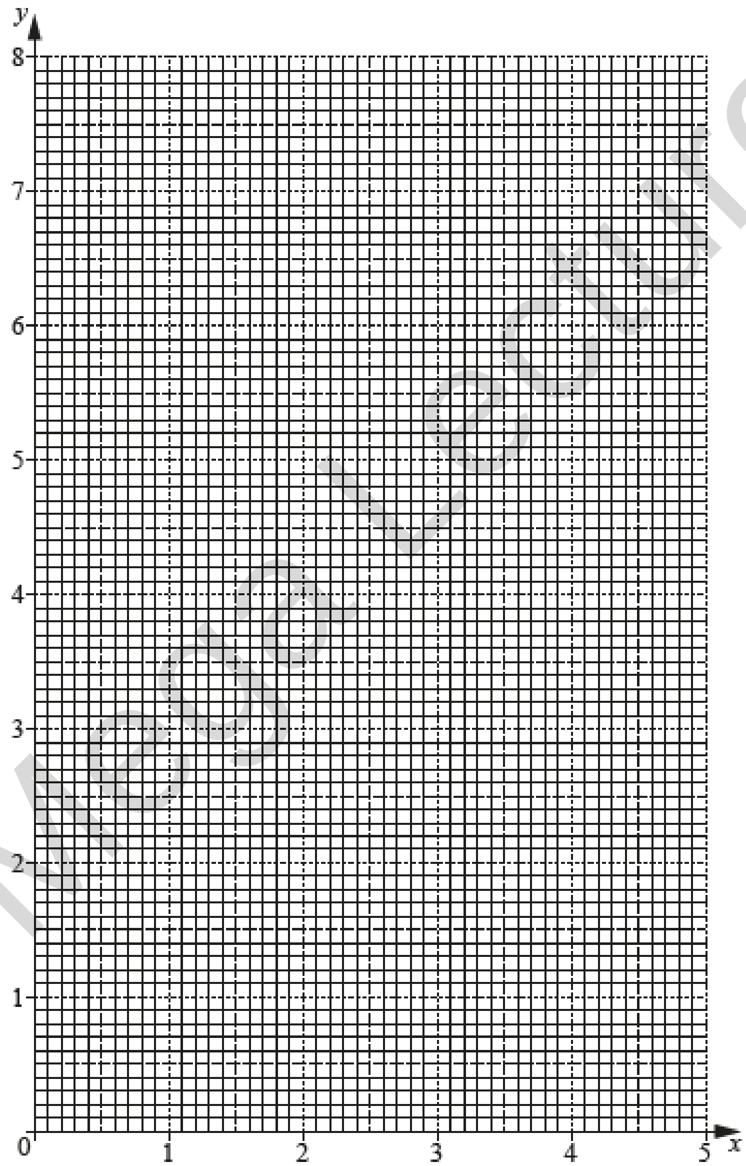
width .... cm [2]

8 The table below shows some values of x and the corresponding values of y for $y = \frac{1}{4} \times 2^x$.

x	0	1	2	3	4	5
y	$\frac{1}{4}$		1	2	4	8

(a) Complete the table. [1]

(b) On the grid below, draw the graph of $y = \frac{1}{4} \times 2^x$.



[2]

(c) By drawing a suitable line, find the gradient of your graph where $x = 4$.

Answer .... [2]

(d) **(i)** Show that the line $2x + y = 6$, together with the graph of $y = \frac{1}{4} \times 2^x$, can be used to solve the equation

$$2^x + 8x - 24 = 0 .$$

[1]

(ii) Hence solve $2^x + 8x - 24 = 0$.

Answer $x =$ .... [2]

(e) The points P and Q are (2, 3) and (5, 4) respectively.

(i) Find the gradient of PQ .

Answer .... [1]

(ii) On the grid, draw the line l, parallel to PQ, that touches the curve $y = \frac{1}{4} \times 2^x$. [1]

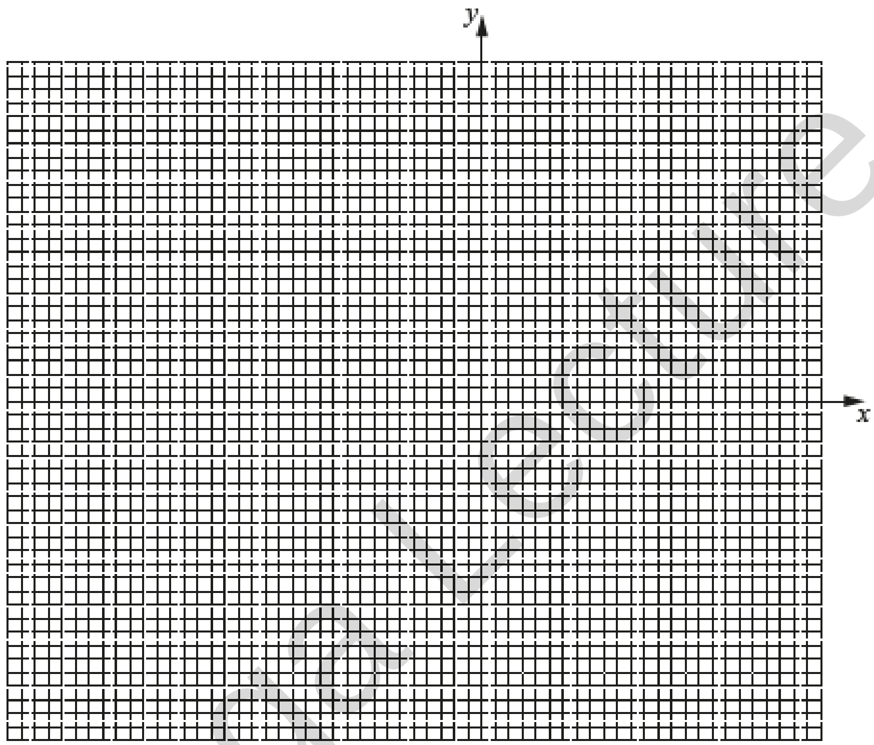
(iii) Write down the equation of l.

Answer .... [2]

3 The table below is for $y = x^2 + x - 3$.

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

(a) Using a scale of 2 cm to 1 unit on the x-axis for $-3 \leqslant x \leqslant 2$
and a scale of 1 cm to 1 unit on the y-axis for $-4 \leqslant y \leqslant 4$,
plot the points from the table and join them with a smooth curve.



[2]

(b) **(i)** Use your graph to estimate the solutions of the equation $x^2 + x - 3 = 0$.

Answer $x =$ .... or .... [1]

(ii) Use your graph to estimate the solutions of the equation $x^2 + x - 5 = 0$.

Answer $x =$ .... or .... [2]

(c) By drawing a tangent, estimate the gradient of the curve at $(1, -1)$.

Answer .... [2]

(d) The equation $x^2 - x - 1 = 0$ can be solved by drawing a straight line on the graph of $y = x^2 + x - 3$.

(i) Find the equation of this straight line.

Answer .... [2]

(ii) Draw this straight line and hence solve $x^2 - x - 1 = 0$.

Answer $x =$ .... or .... [2]

9 The distance, d metres, of a moving object from an observer after t minutes is given by

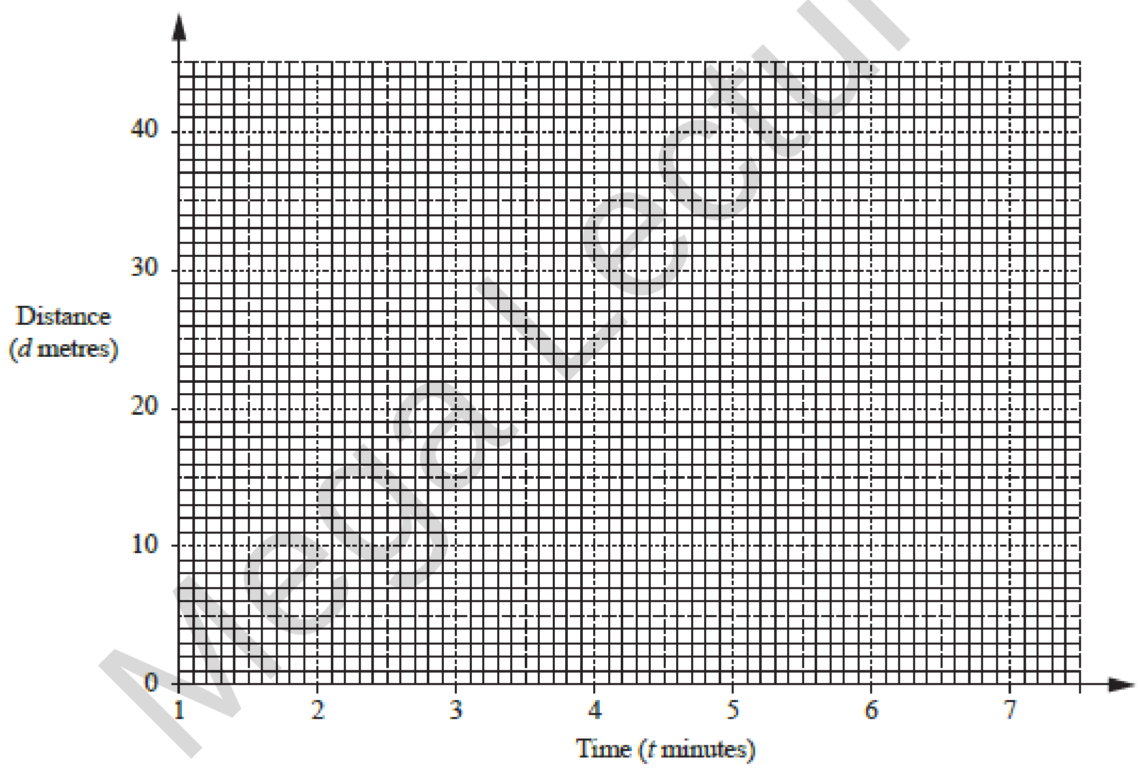
$$d = t^2 + \frac{48}{t} - 20.$$

(a) Some values of t and d are given in the table.
The values of d are given to the nearest whole number where appropriate.

t	1	1.5	2	2.5	3	3.5	4	4.5	5	6	7
d	29	14	8	5	5	6	8	11	15	24	

Complete the table. [1]

(b) On the grid, plot the points given in the table and join them with a smooth curve.



[2]

(c) **(i)** By drawing a tangent, calculate the gradient of the curve when $t = 4$.

Answer .... [2]

(ii) Explain what this gradient represents.

Answer .... [1]

(d) For how long is the object less than 10 metres from the observer?

Answer .... minutes [2]

(e) **(i)** Using your graph, write down the two values of t when the object is 12 metres from the observer.
For each value of t, state whether the object is moving towards or away from the observer.

Answer When t = ..., the object is moving .... the observer.

When t = ..., the object is moving .... the observer. [2]

(ii) Write down the equation that gives the values of t when the object is 12 metres from the observer.

Answer .... [1]

(iii) This equation is equivalent to $t^3 + At + 48 = 0$.

Find A.

Answer A = ... [1]

7 **(a)**

$$f(x) = \frac{2x+7}{3}$$

(i) Find $f^{-1}(x)$.

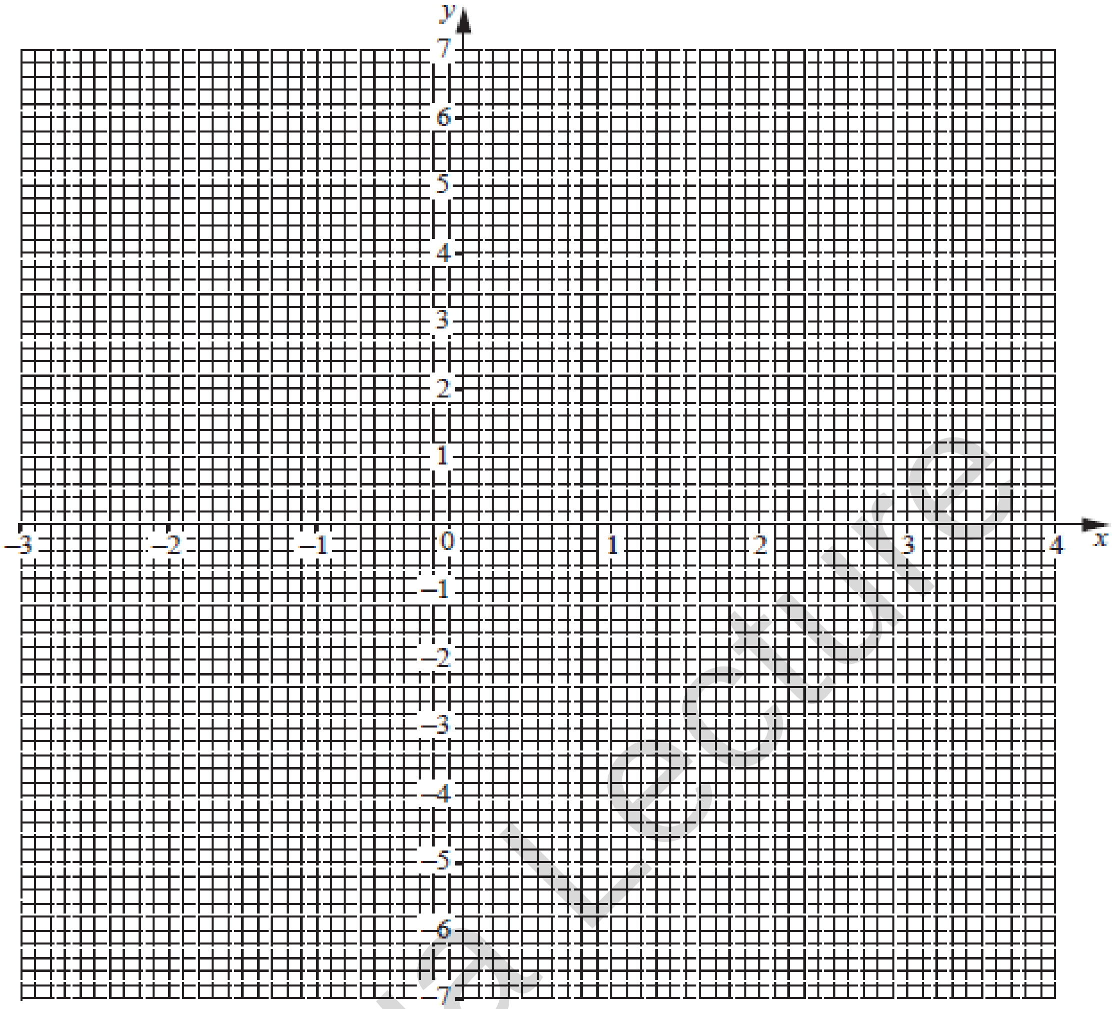
Answer $f^{-1}(x) =$ .... [2]

(ii) Given that $f(m) = \frac{m}{2}$, find m.

Answer .... [2]

(b) **(i)** Complete the table of values for $y = 6 + x - x^2$, and hence draw the graph of $y = 6 + x - x^2$ on the grid opposite.

x	−3	−2	−1	0	1	2	3	4
y	−6	0		6	6		0	−6



[3]

(ii) Use your graph to estimate the maximum value of $6 + x - x^2$.

Answer .... [1]

(iii) By drawing the line $x + y = 4$, find the approximate solutions to the equation

$$2 + 2x - x^2 = 0.$$

Answer $x =$ .... or .... [2]

(iv) The equation $x - x^2 = k$ has a solution $x = 3.5$.

By drawing a suitable line on the grid, find the other solution.
Label your line with the letter *L*.

Answer .... [2]

9 $f(x) = x^3$

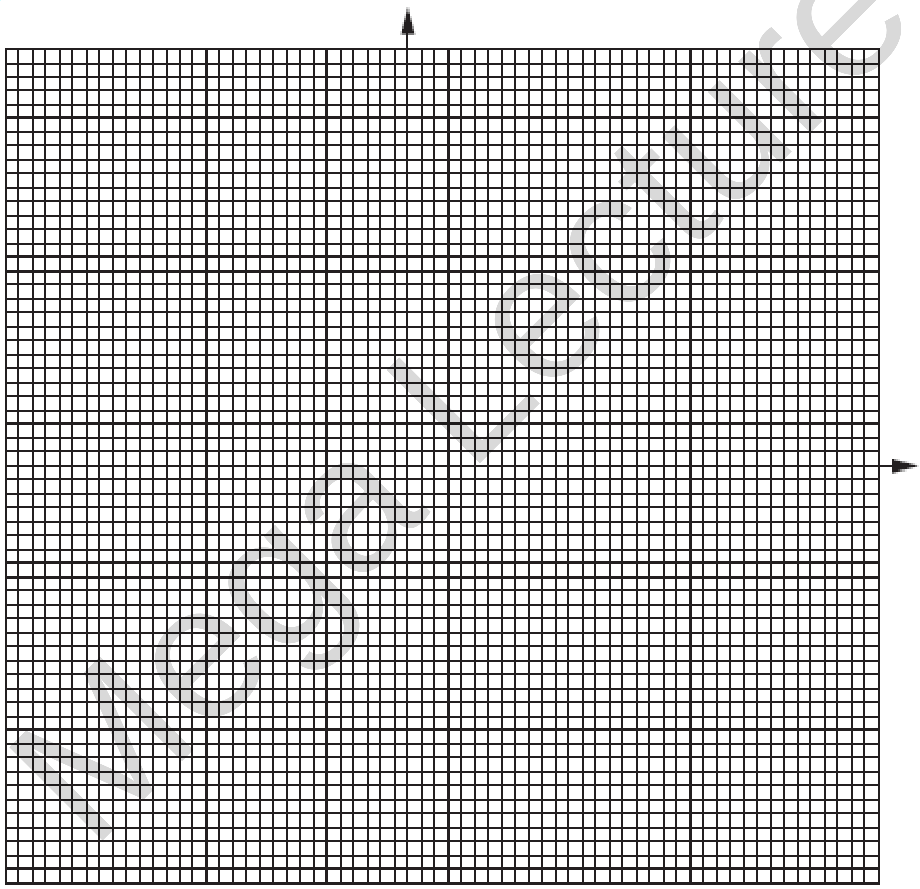
(a) Complete the following table.

x	–3	–2	–1	0	1	2	3
f(x)							

[1]

(b) Using a scale of 2 cm to represent 1 unit, draw a horizontal x-axis for $-3 \leqslant x \leqslant 3$.
Using a scale of 2 cm to represent 10 units, draw a vertical y-axis for $-30 \leqslant y \leqslant 30$.
Using your axes, plot the points in the table and join them with a smooth curve.

Answer



[2]

(c) **(i)** Use your graph to solve f(x) = –15.

Answer .... [1]

(ii) Use your graph to find a such that $f^{-1}(a) = 1.7$.

Answer .... [1]

(iii) Given that $f^{-1}(t) = u$, express t in terms of u.

Answer $t =$ .... [1]

(iv) By drawing a tangent to $y = f(x)$, estimate the gradient of the curve when $x = 2$.

Answer .... [2]

(d) **(i)** Using the same axes draw the line that represents the function $g(x) = 5x + 3$.

[2]

(ii) Hence find the three solutions of the equation $f(x) = g(x)$.

Answer $x =$ .... or .... or .... [2]