Chapter 12: Coordinates And Linear Functions

Elementary Mathematics Worksheet: 12.3 – Linear Functions And Their Graphs

Learning objectives:
- Recognise linear functions in various forms and draw their graphs

For this chapter, tables have been drawn for you. It is not necessary to use all boxes.

Question

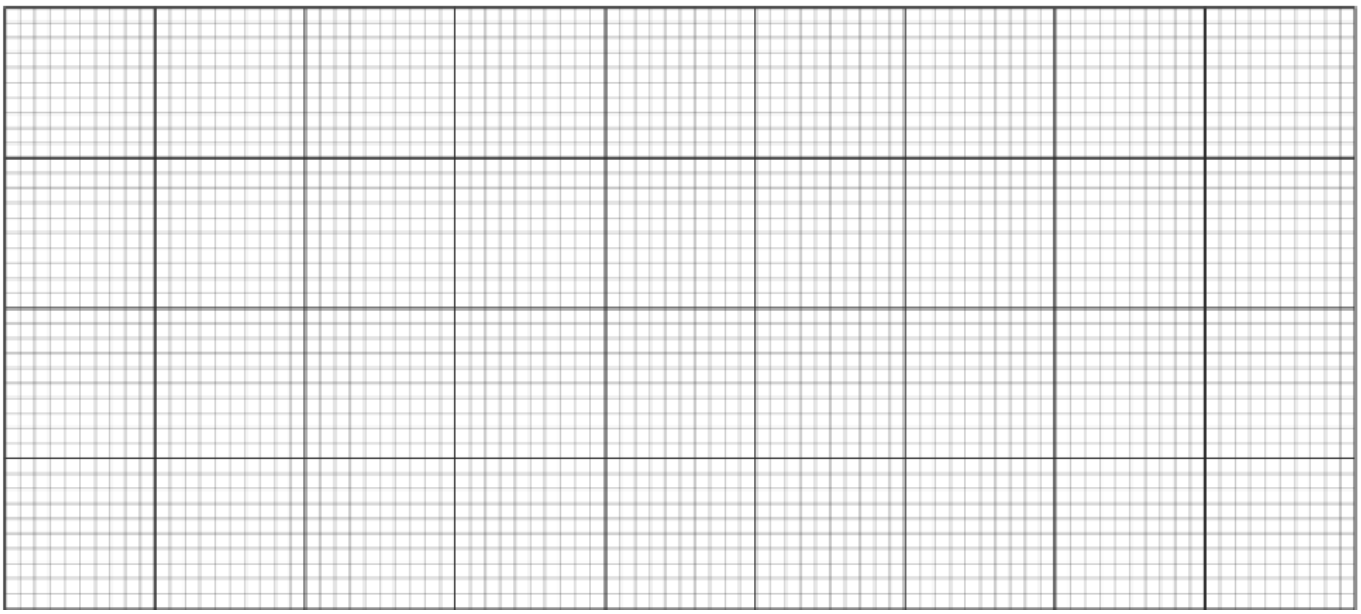
1)

(a) Using a scale of 1 cm to 1 unit on both axes, draw the graph of $y = -\frac{1}{2}x - 1$ for values of x from – 4 to 4.

(b) Does the point B (1, – 1) lie on the graph?

Answer

x									
y									

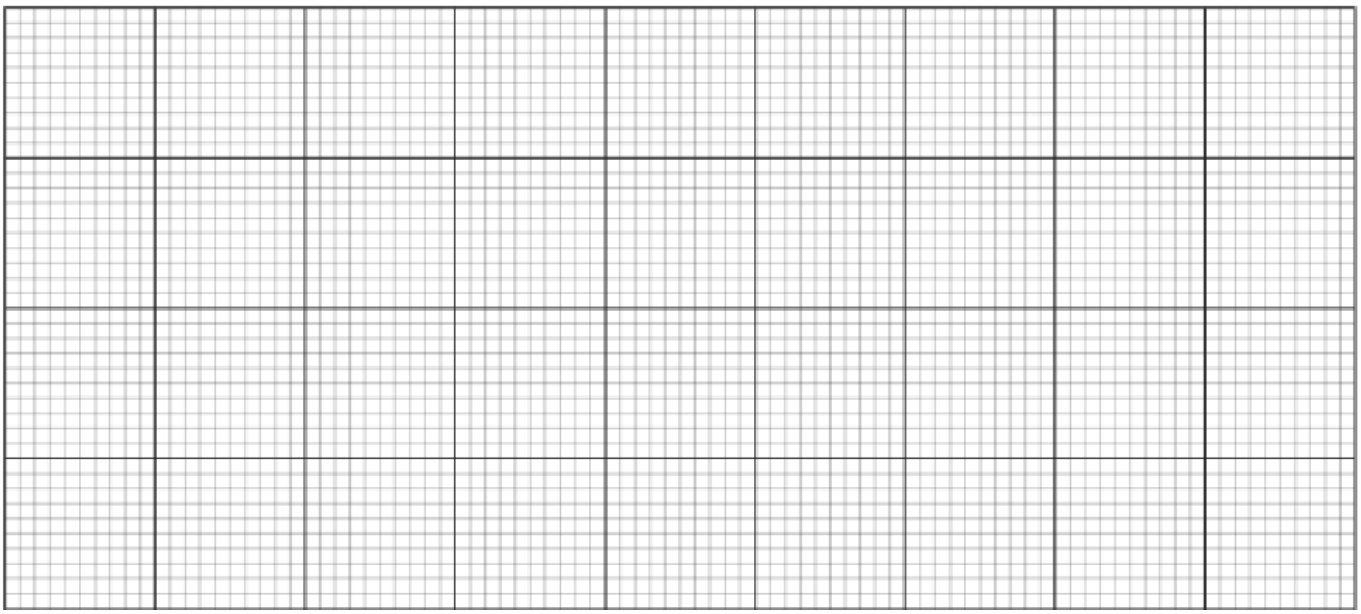


Question

2) Using a scale of 1 cm to 1 unit on both axes, draw the graph of the linear function $y = 2$ for $-3 \leq x \leq 3$.

Answer

x									
y									

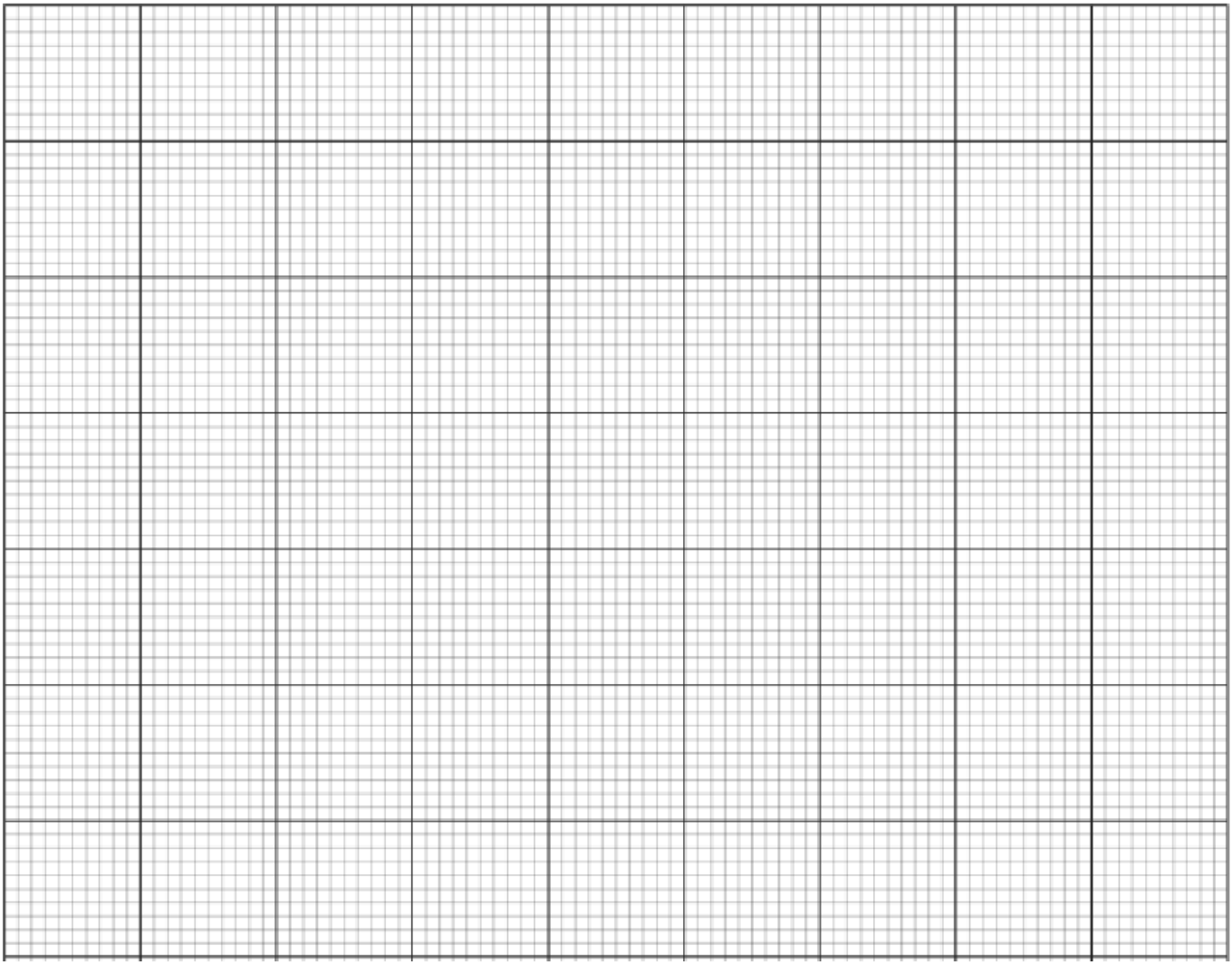


Question

3) Mrs Singh bought x mangoes which cost \$2 each, where $0 \le x \le 5$. She paid the fruit seller with a \$10 note and the change she received was \$$y$.
   (a) Express y as a function of x.
   (b) Using a scale of 1 cm to 1 unit on the x-axis and 1 cm to 2 units on the y-axis, draw the graph of the function in **(a)** for $0 \le x \le 5$.
   (c) Using the graph, find the change Mrs Singh received if she bought 3 mangoes.

Answer

x									
y									

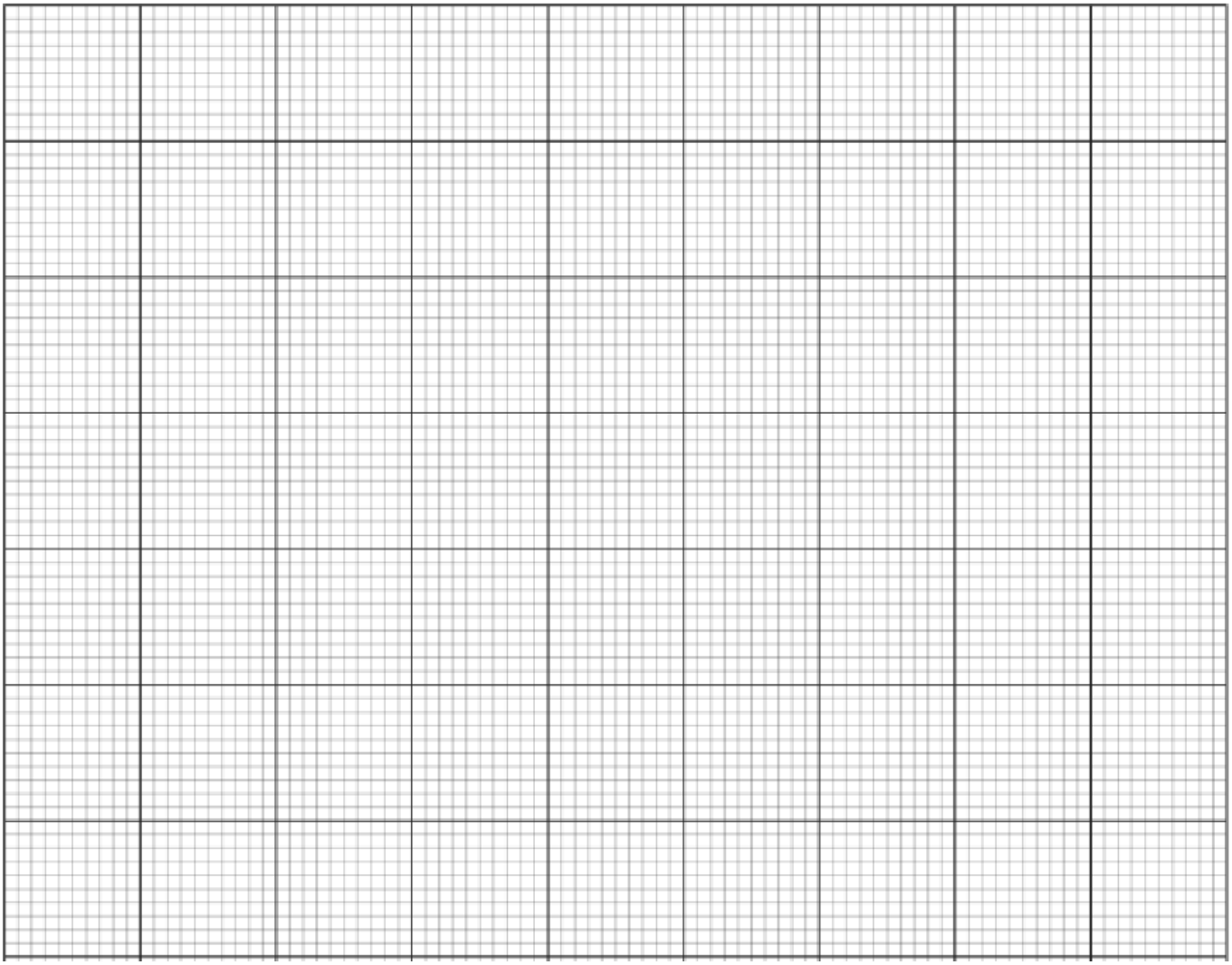


Question

4) Water is being drained from a tank. The water level h cm at time t minutes is given by $h = 40 - 5t$.
   (a) Using a scale of 1 cm to 1 unit on the t-axis and 1 cm to 5 units on the h-axis, draw the graph of $h = 40 - 5t$ from $t = 0$ to $t = 8$.
   (b) Use the graph to find the time when the water level is 15 cm.

Answer

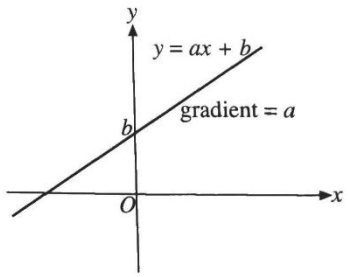
x									
y									



Note

Linear Functions and their Graphs

- A linear function y of x is of the form $y = ax + b$ where a and b are constants.
- The graph of a linear function $y = ax + b$ is a straight line with gradient = a and y-intercept = b.



- The gradient is the rate of change of y with x.

Criteria for success		Check
1	I know how to construct the table of values using the equation given.	
2	I know how to plot the points using the table of values and draw the graph.	
3	I know how to use the graph to determine relationship and solve problems.	

Chapter 12: Coordinates And Linear Functions

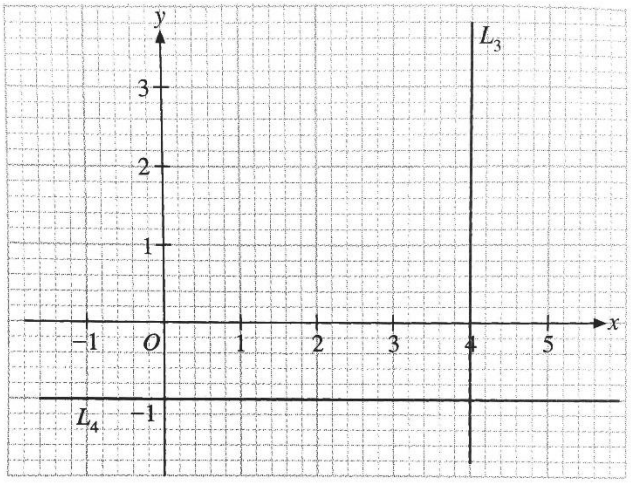
Elementary Mathematics Worksheet: 12.4 – Gradient Of Linear Graphs

Learning objectives:
- Find the gradient of a linear graph as the ratio of the vertical change to the horizontal change

Question

5) In the diagram below, the lines L_3 and L_4 are $x = 4$ and $y = -1$ respectively. State the gradients of the lines L_3 and L_4.

Answer



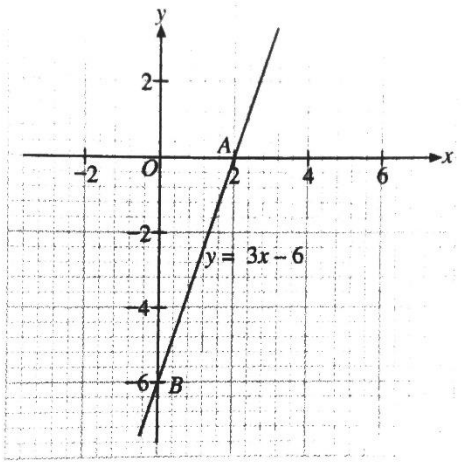
Question

6) The vertices of ΔPQR are P (-2, -1), Q (3, -1) and R (1, 2). Find the gradients of the sides of ΔPQR.

Answer

Question

7) The diagram shows the line $y = 3x - 6$.



(a) State the coordinates of the point *A* at which the line cuts the *x*-axis.

(b) State the coordinates of the point *B* at which the line cuts the *y*-axis.

(c) Draw an appropriate horizontal and vertical change triangle. Use the triangle to find the gradient of the line.

Answer

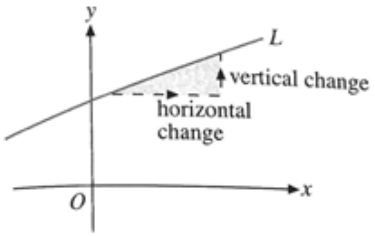
Question

8) The volume, y cm^3, of water in a filter after t minutes is given by the function $y = -2t + 30$, where $0 \le t \le 15$.
   (a) Find the volume of water drained from $t = 10$ to $t = 11$.
   (b) Interpret the physical meaning of the constant term 30.
   (c) Interpret the physical meaning of the gradient -2 in the function.

Answer

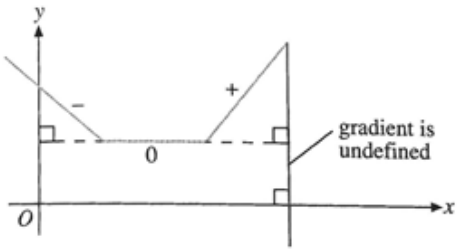
Note

Gradient



Gradient of the line L = $\frac{\text{Vertical change}}{\text{Horizontal change}}$

Signs of Gradients



Criteria for success		Check
1	I know how find the gradient of the graph.	

Chapter 12: Coordinates And Linear Functions

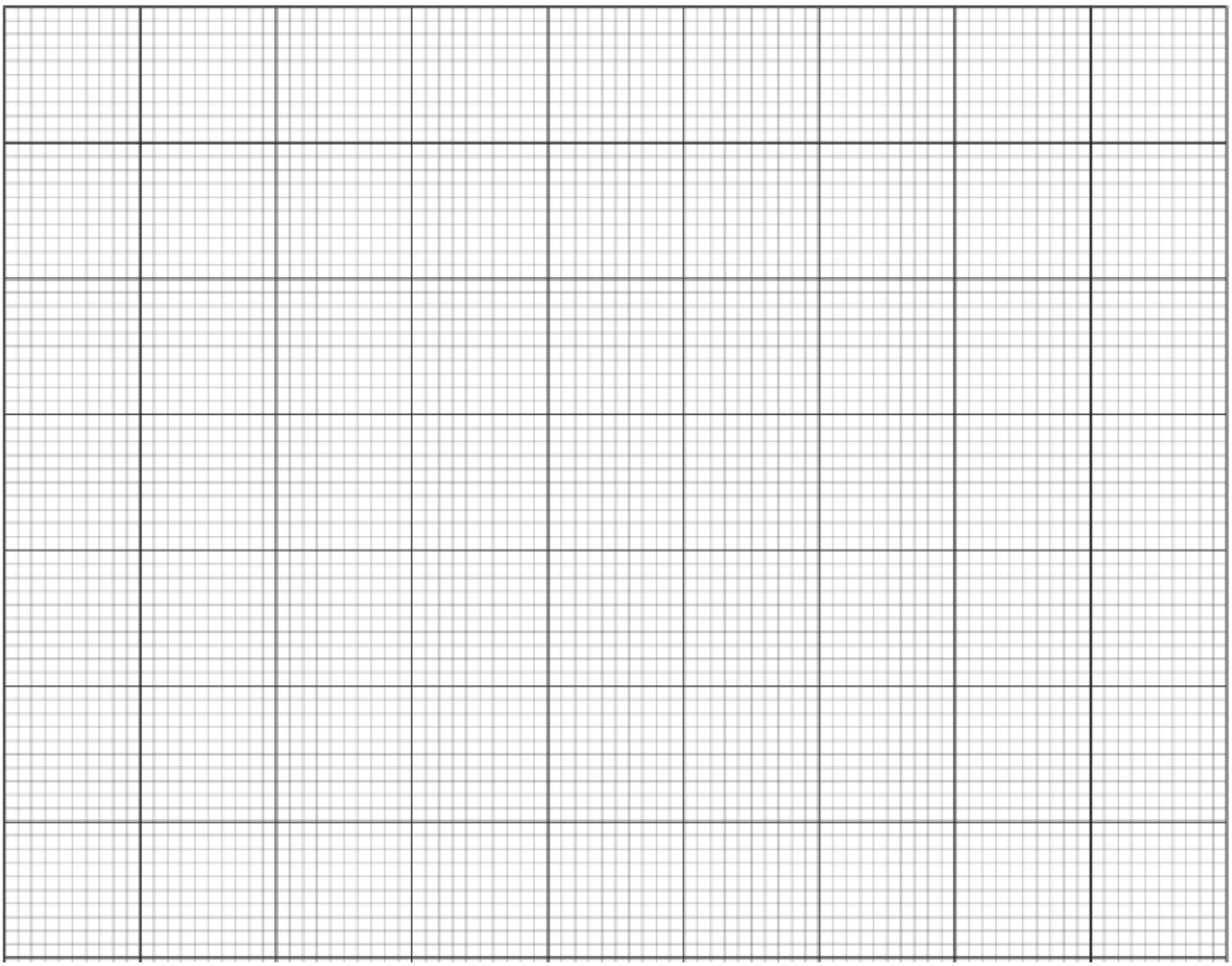
Elementary Mathematics Worksheet: 12.3 – Linear Functions And Their Graphs (Post)

1.

(a) Copy and complete the following table.

x	-4	-2	0	2	4
$y = x - 2$					

(b) Using a scale of 1 unit for both axes, draw the graph of $y = x - 2$ for values of x from -4 to 4.

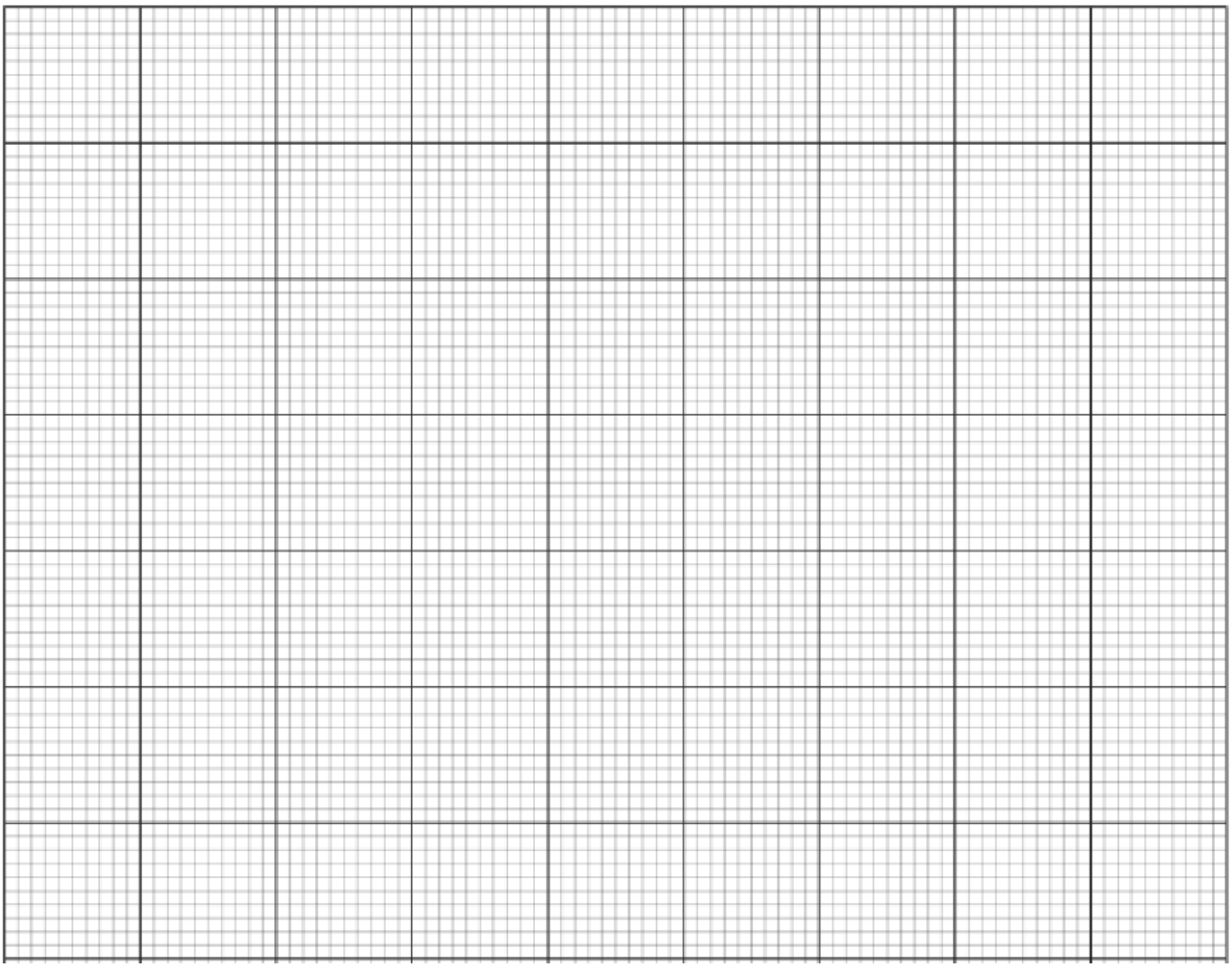


2.

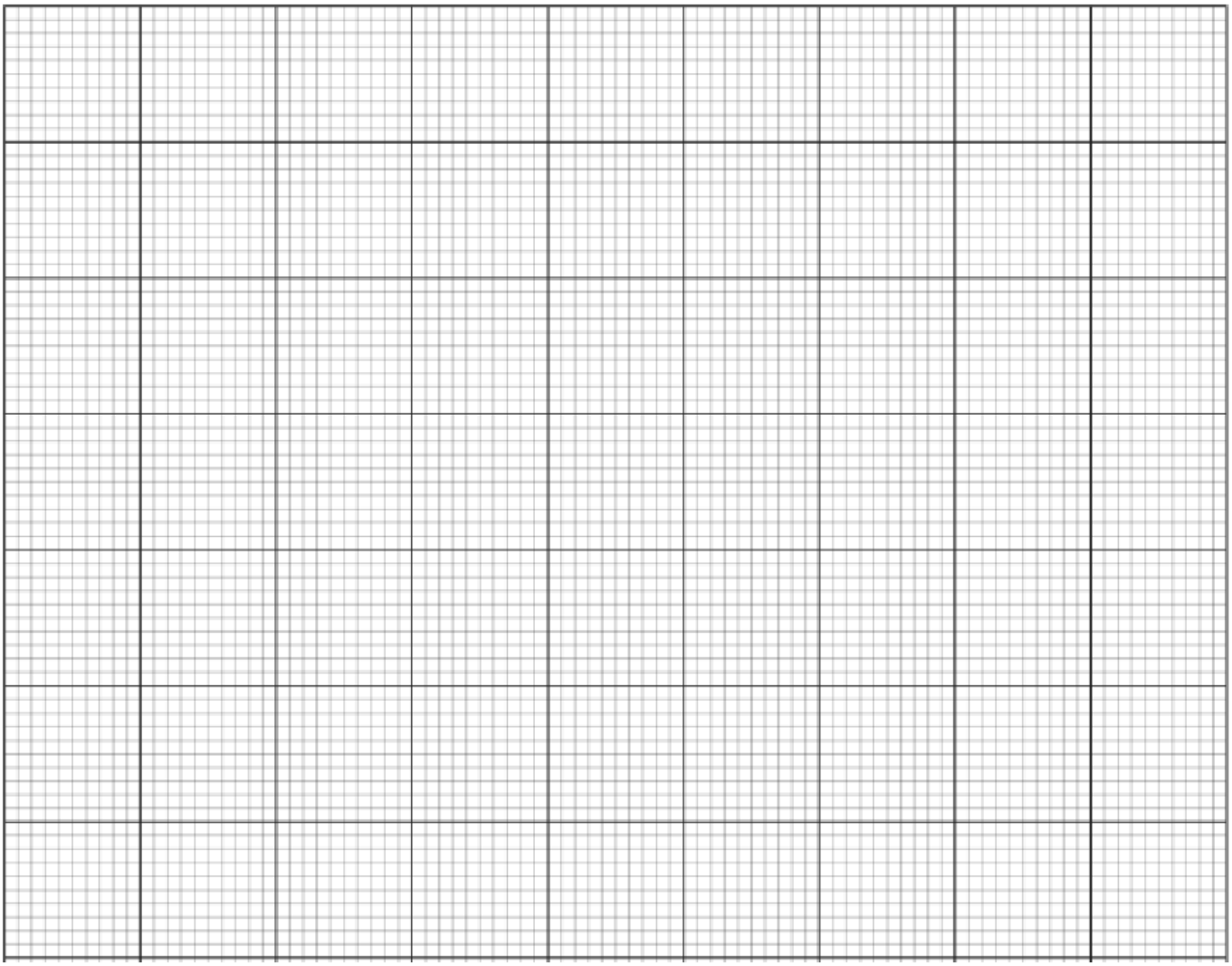
(a) Copy and complete the following table.

x	-4	-2	0	2	4
$y = -2x + 1$	9				

(b) Using a scale of 1 cm to 1 unit on the x-axis and 1 cm to 2 units on the y-axis, draw the graph of $y = -2x + 1$ from x = -4 to x = 4.



3. Draw the following lines on the same diagram.
   (a) $y = 2$
   (b) $y = -3$



4.

(a) Draw the following lines on the same diagram for values of x from -3 to 3.

i) $y = x + 1$

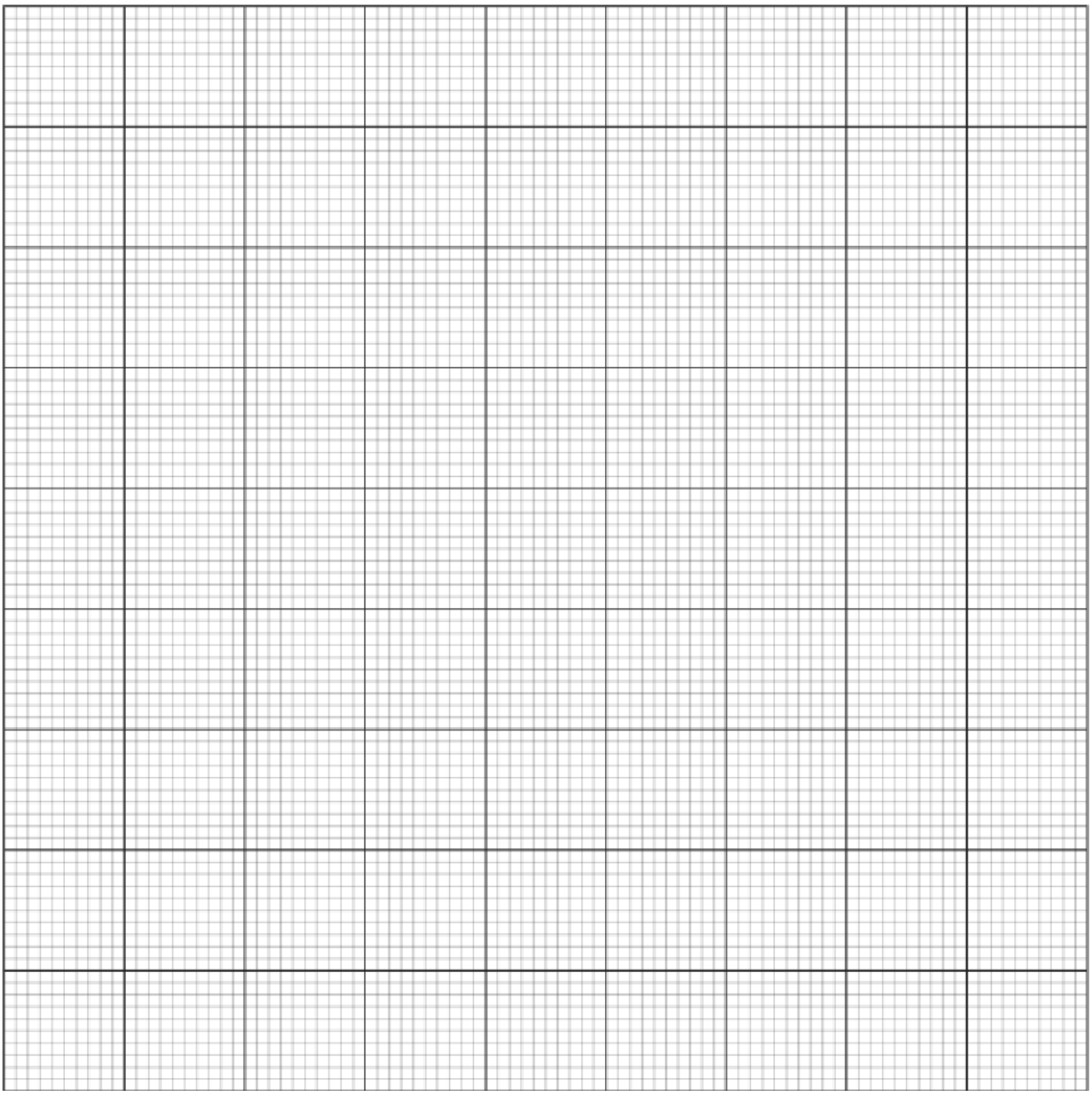
ii) $y = \frac{1}{3}x + 1$

iii) $y = -\frac{1}{2}x + 1$

iv) $y = 1$&

(b) What is the common property of the lines in (a)?

(c) What is the common property of the equations in (a)?



5.

(a) Draw the following lines on the same diagram for values of x from -3 to 3.

i) $y = -x$

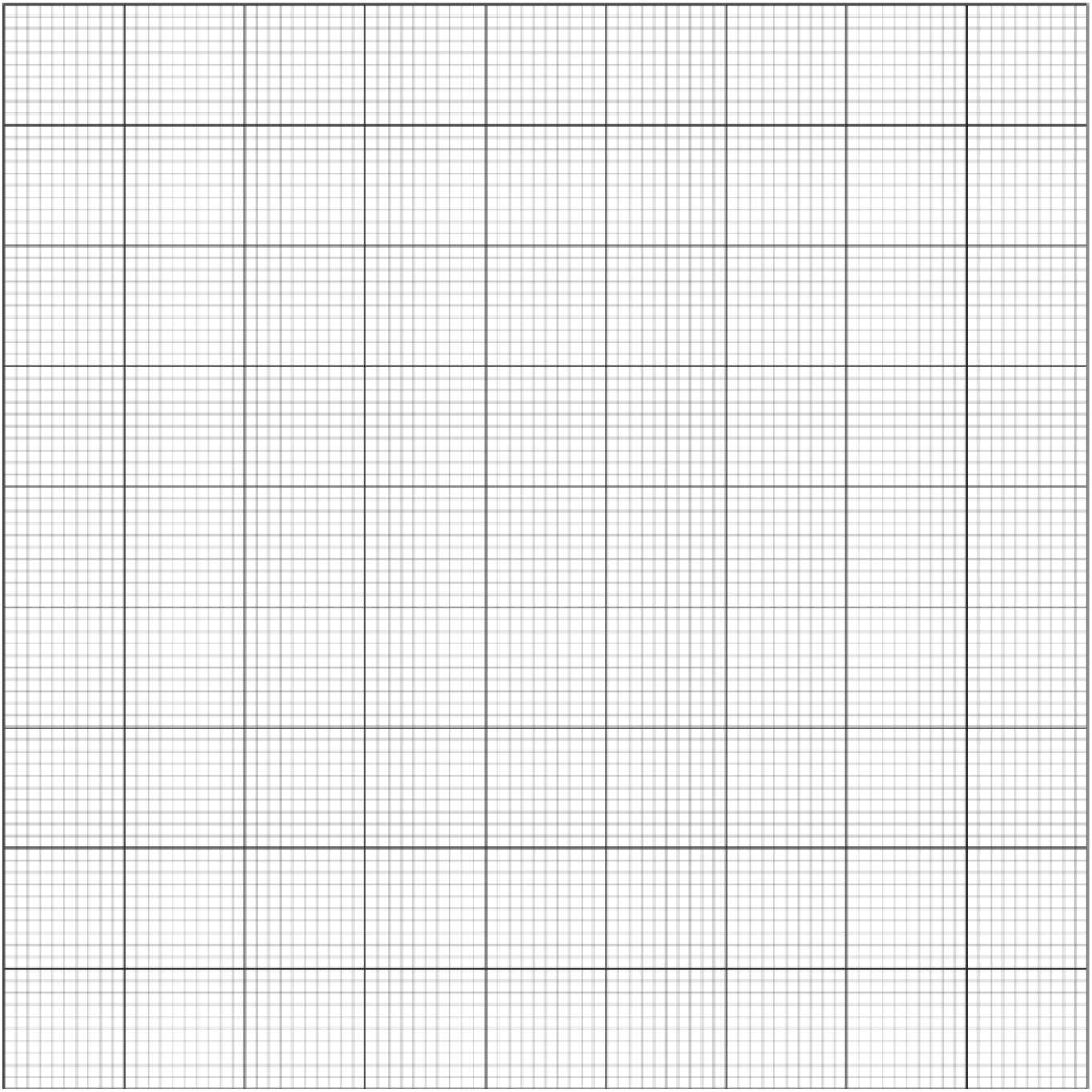
ii) $y = -x + 1$

iii) $y = -x - 2$

iv) $y = -x + 3$

(b) What do you observe about the lines in (a)?

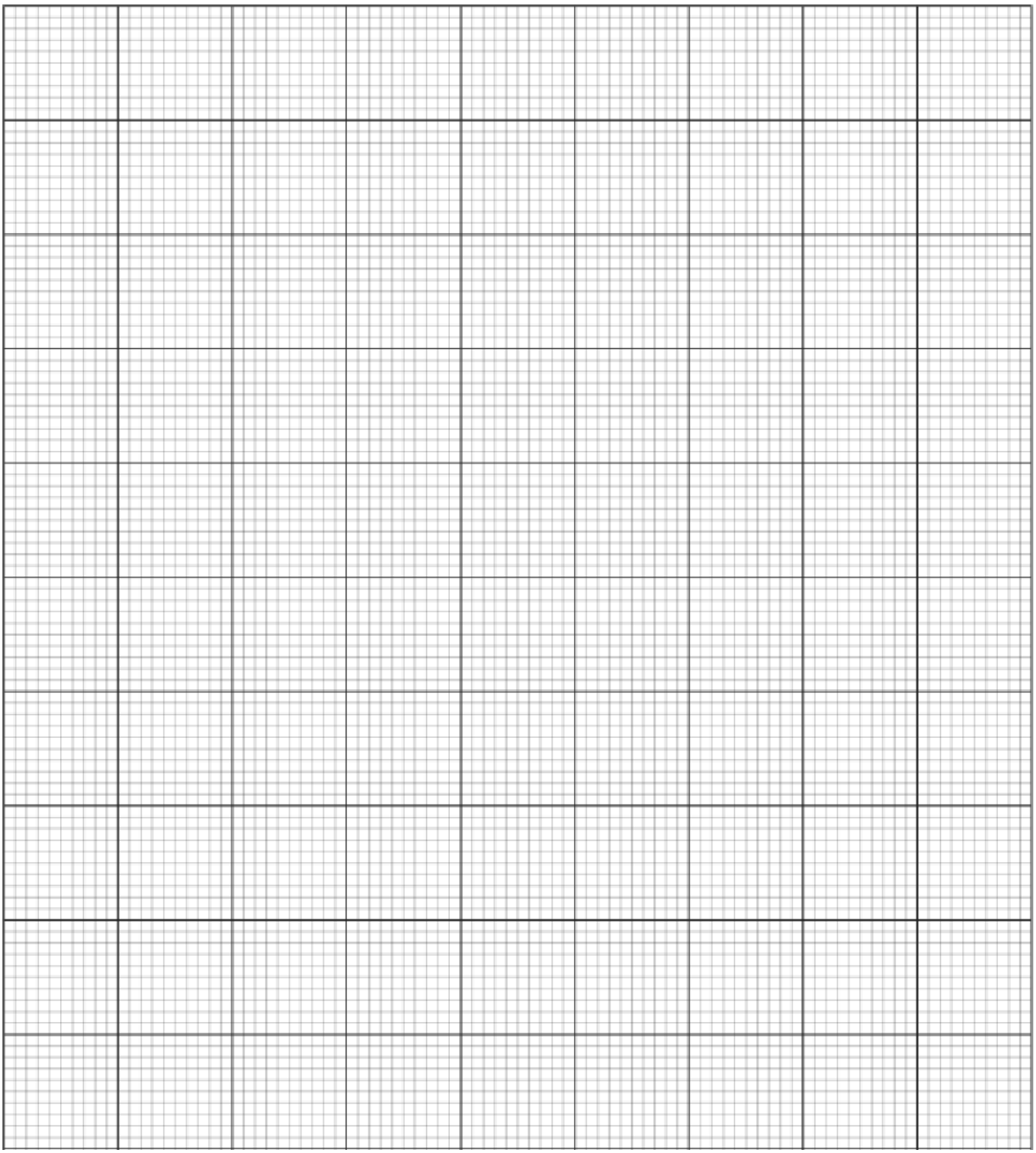
(c) What is the common property of the equations of the lines in (a)?



6.

(a) Draw the graph of $y = 12 - 3x$ from x = -2 to x = 5 using a scale of 1 cm to 1 unit on the x-axis and 1 cm to 5 units on the y-axis.

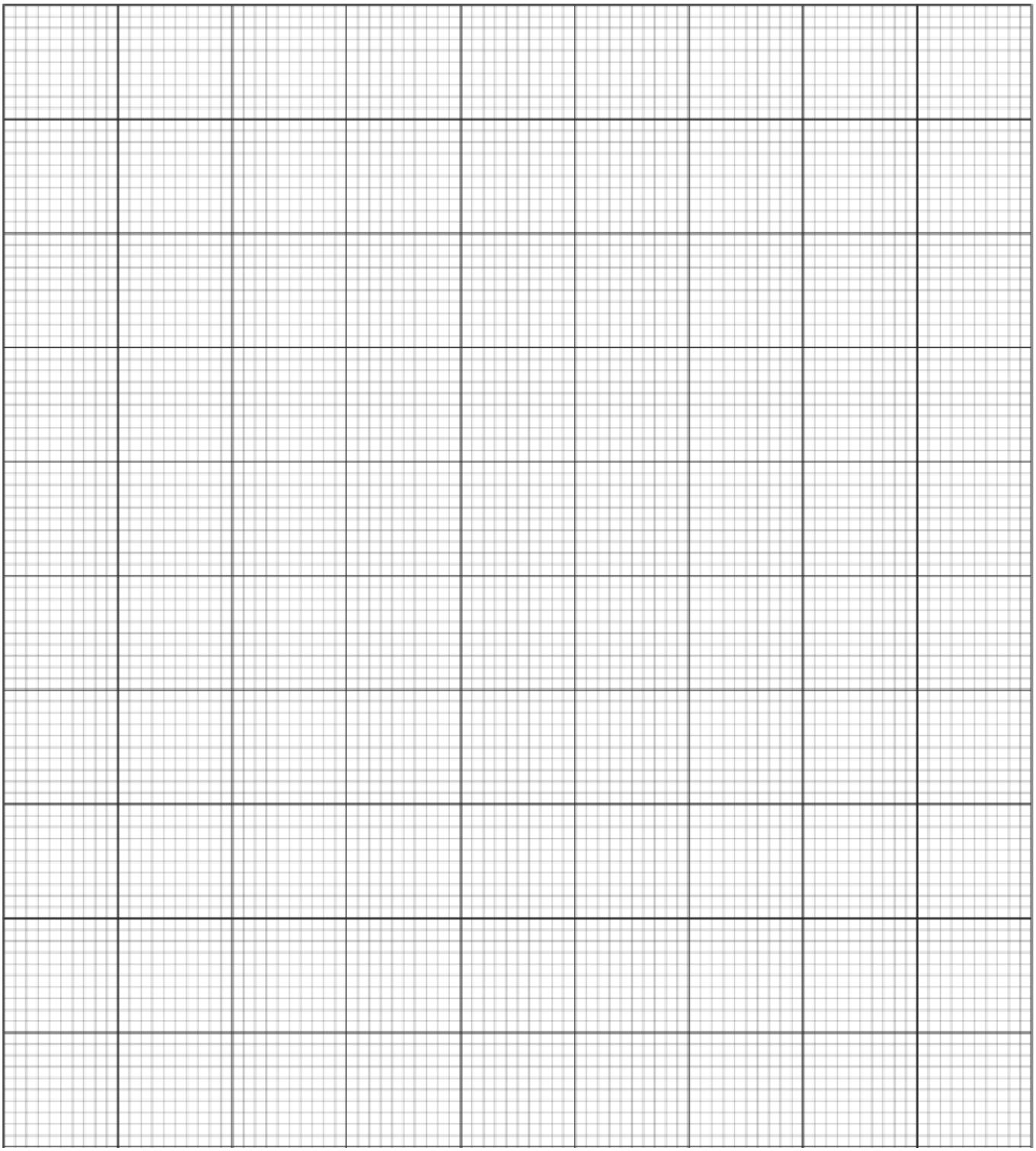
(b) The points $(a, \ 0)$, $(1, \ b)$ and $(c, \ 5)$ are some points on the graph. Use the graph to find the values of a, b and c graphically.



7. The volume V cm^3 of a gas, at 1 atmosphere pressure, formed in a chemical reaction at time t minutes is given by $V = 5t$.

   (a) Using a scale of 1 cm to 1 unit on the t-axis and 1 cm to 5 units on the V-axis, draw the graph of $V = 5t$ from $t = 0$ to $t = 6$.

   (b) Use your graph to find the time taken to produce 20 cm^3 of the gas.



8. The initial temperature of water in a kettle is 20ºC. On heating, the temperature of water increases by 10ºC per minute. Let yºC be the temperature of water after t minutes.

(a) Copy and complete the following table of values of t and y.

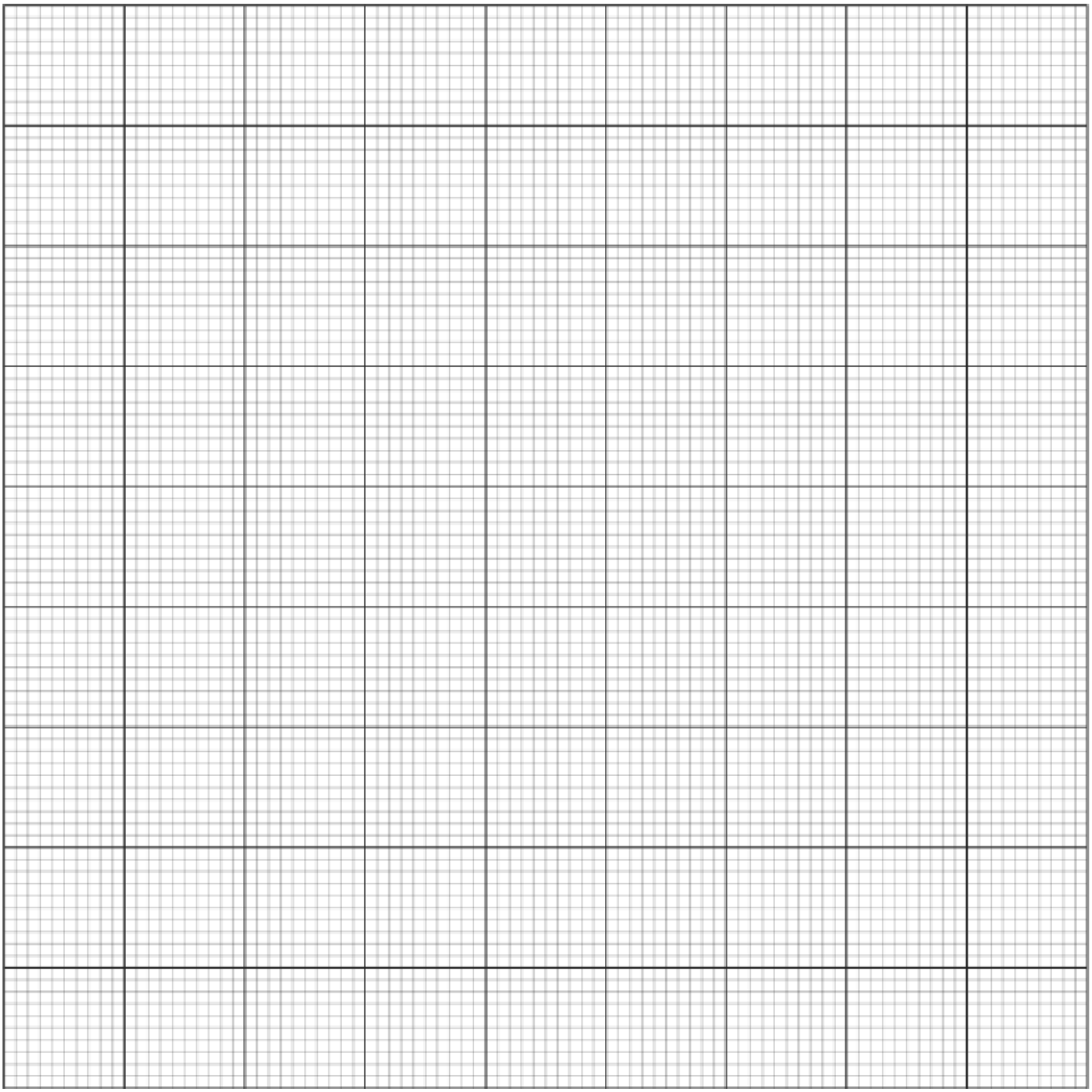
t	0	2	4	6	8
y					

(b) Write down the equation of the function connecting t and y.

(c) Using a scale of 1 cm to 1 unit on the t-axis and 1 cm to 20 units on the y-axis, draw the graph of y against t.

(d) Using the graph, find the time that the temperature of water is 70ºC.

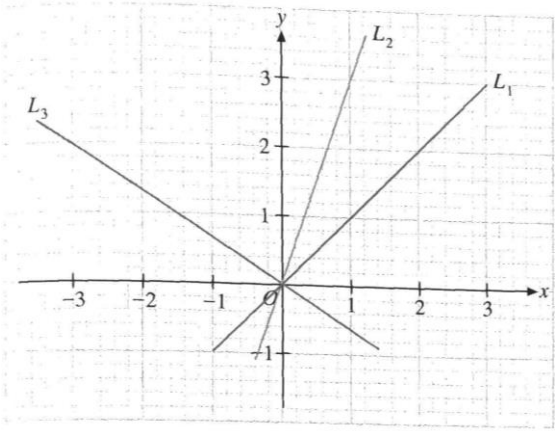
(e) Can we use the equation in (b) to find the temperature of water after 10 minutes? Explain briefly.



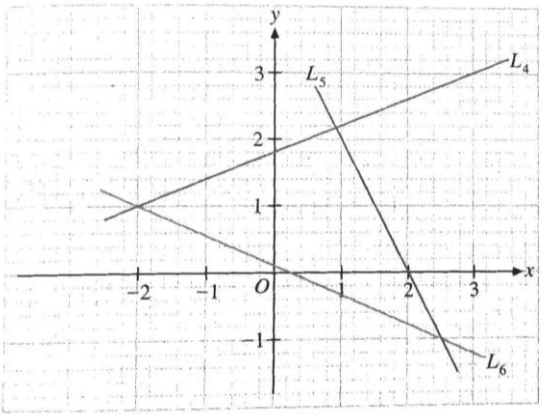
Chapter 12: Coordinates And Linear Functions

Elementary Mathematics Worksheet: 12.4 – Gradient Of Linear Graphs (Post)

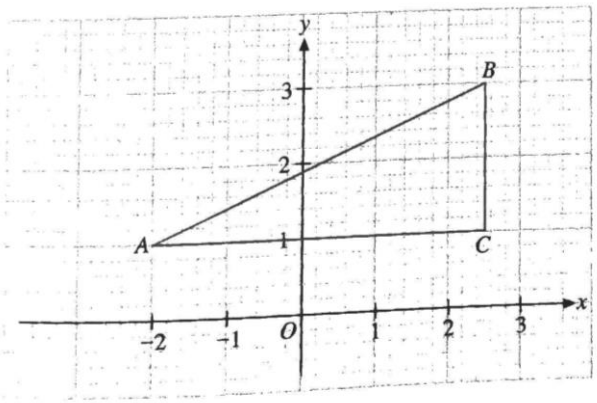
1. Find the gradients of the lines L_1, L_2 and L_3 in the following diagram.



2. Find the gradients of the lines L_4, L_5 and L_6 in the following diagram.



3. Find the gradients of the sides of ΔABC in the following diagram.



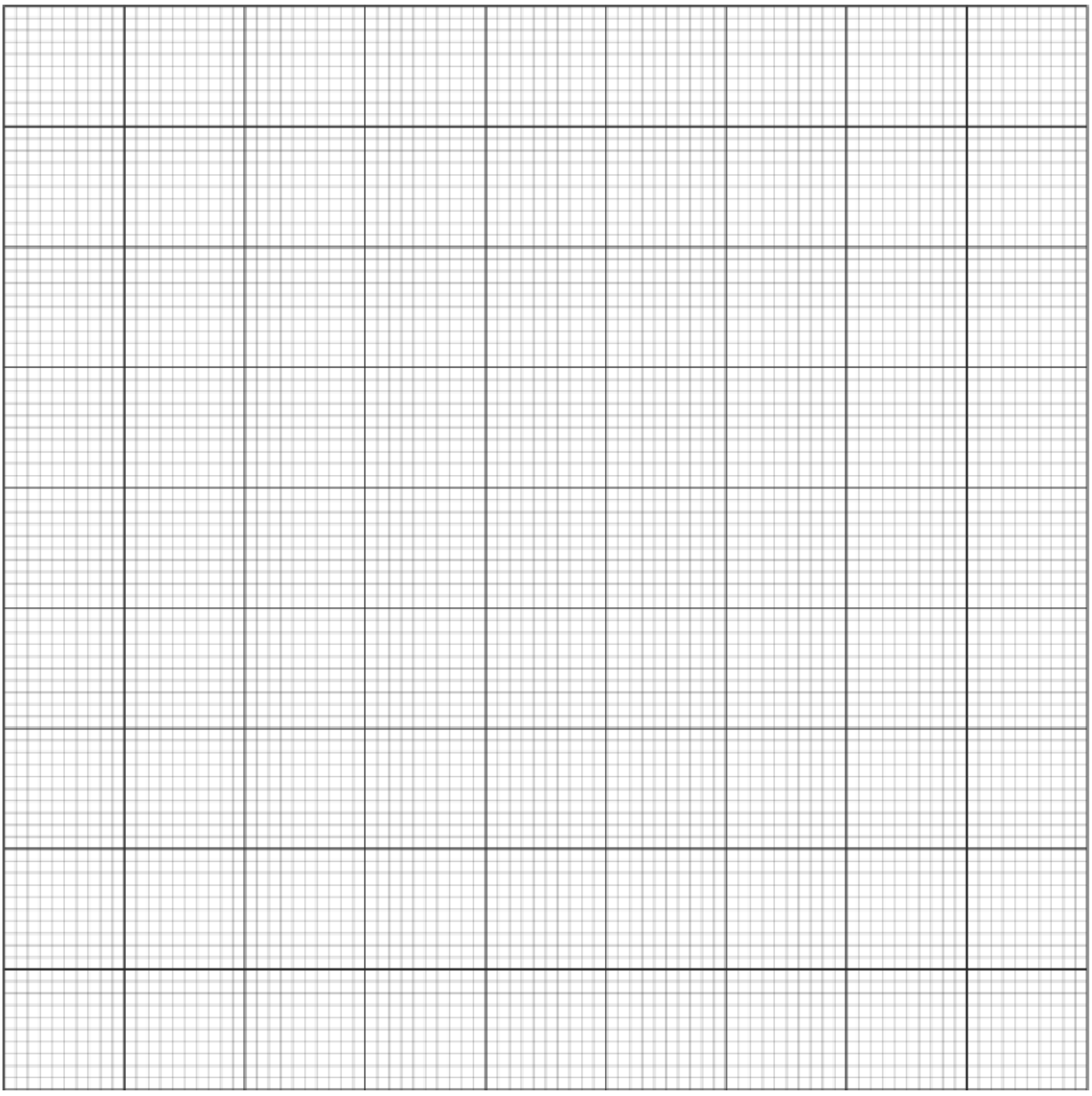
4.

(a) Copy and complete the table for the line $y = -2x + 3$.

x	-2	-1	0	1	2
y					

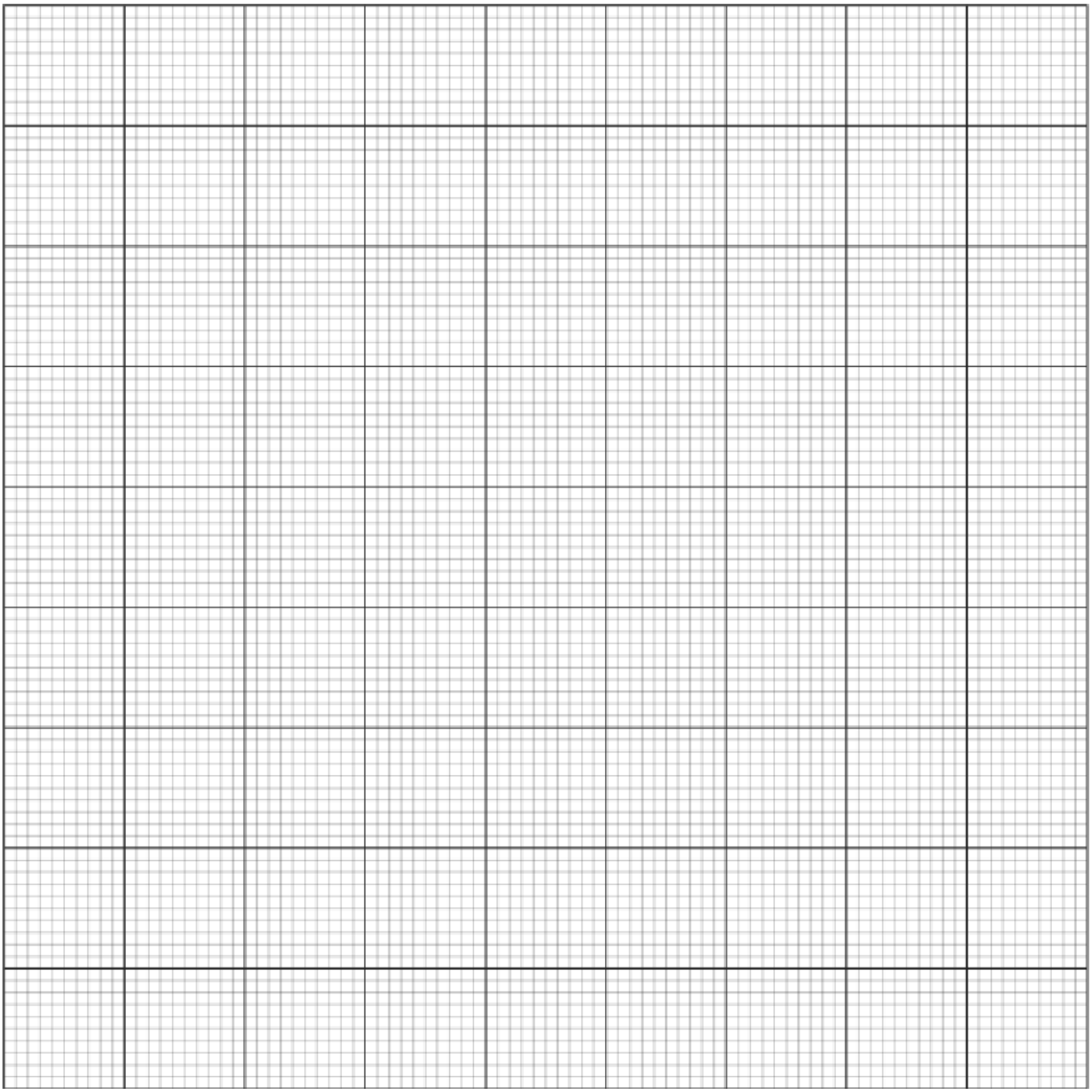
(b) Using a scale of 1 cm to 1 unit on both axes, draw the graph of $y = -2x + 3$ for $-2 \le x \le 2$.

(c) Hence, find the gradient of the line.



For questions 5 to 8, use a scale of 1 cm to 1 unit on both axes.

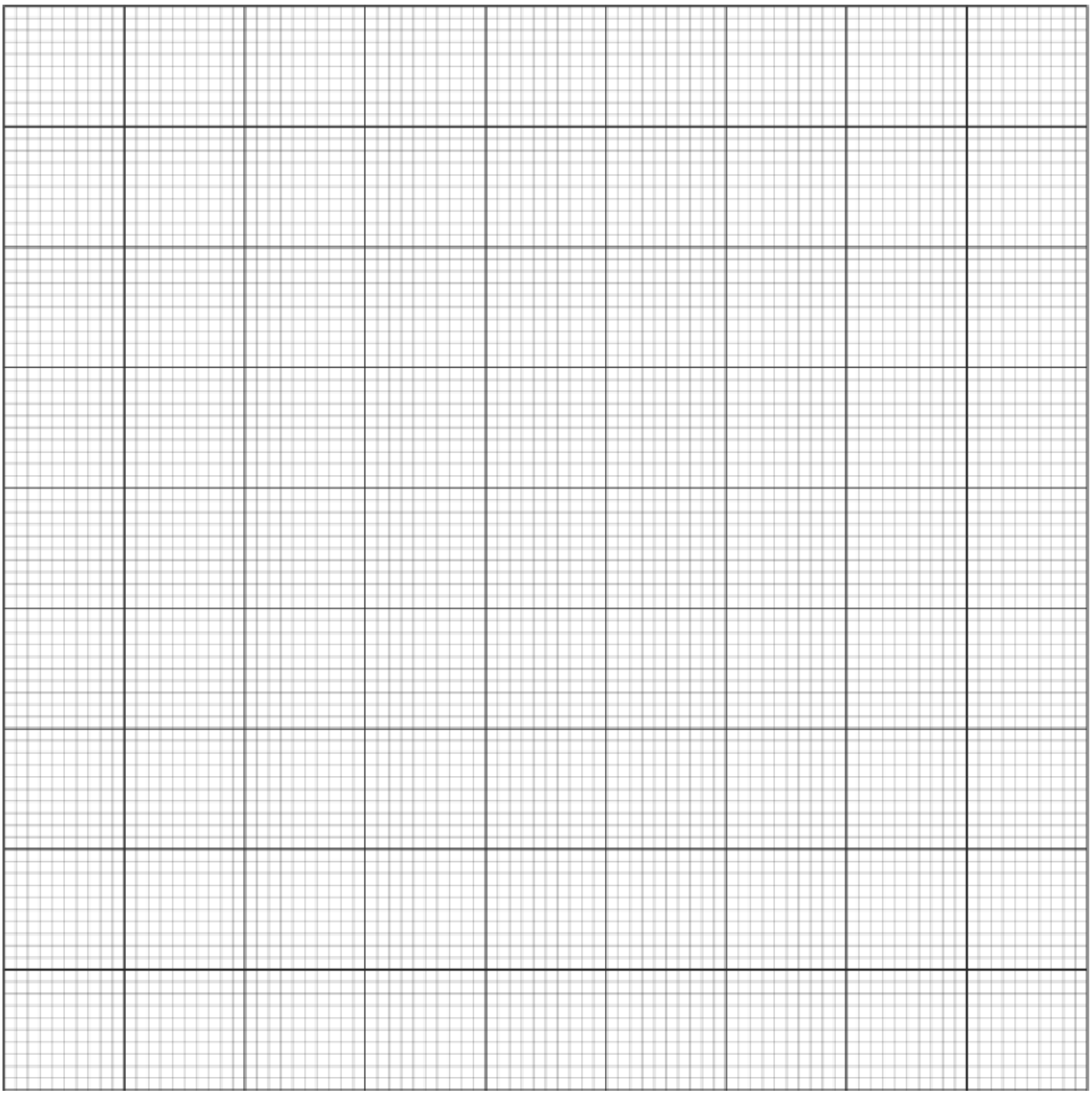
5. Draw the line through the given pair of points and find its gradient.
   (a) $O(0,\ 0)$, $A(2,\ 2)$
   (b) $B(1,\ 2)$, $C(3,\ 3)$
   (c) $D(-2,\ 3)$, $E(2,\ 1)$
   (d) $F(-5,\ 2)$, $G(1,\ -3)$
   (e) $H(-2,\ 1)$, $I(3,\ 1)$
   (f) $J(-3,\ 2)$, $K(-3,\ -2)$



6.

(a) Draw the ΔABC whose vertices are $A(-2,\ 0)$, $B(3,\ -2)$ and $C(0,\ 2)$.

(b) Hence, find the gradients of the sides of ΔABC.

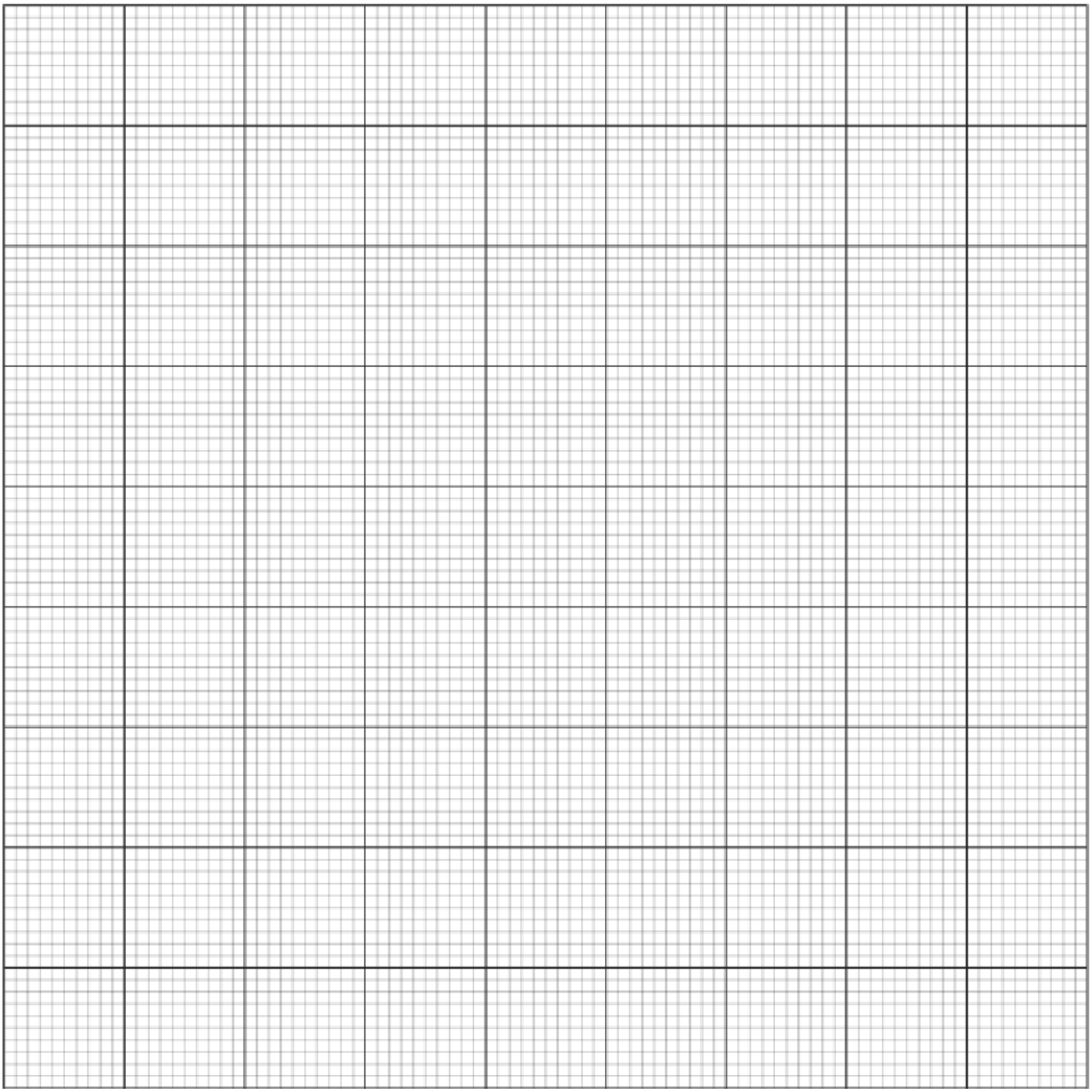


7.

(a) Draw the quadrilateral *ABCD* whose vertices are $A(-1, \ -1)$, $B(7, \ 3)$, $C(4, \ 6)$ and $D(0, \ 4)$.

(b) Hence, find the gradients of the sides of *ABCD*.

(c) What type of quadrilateral is *ABCD*?

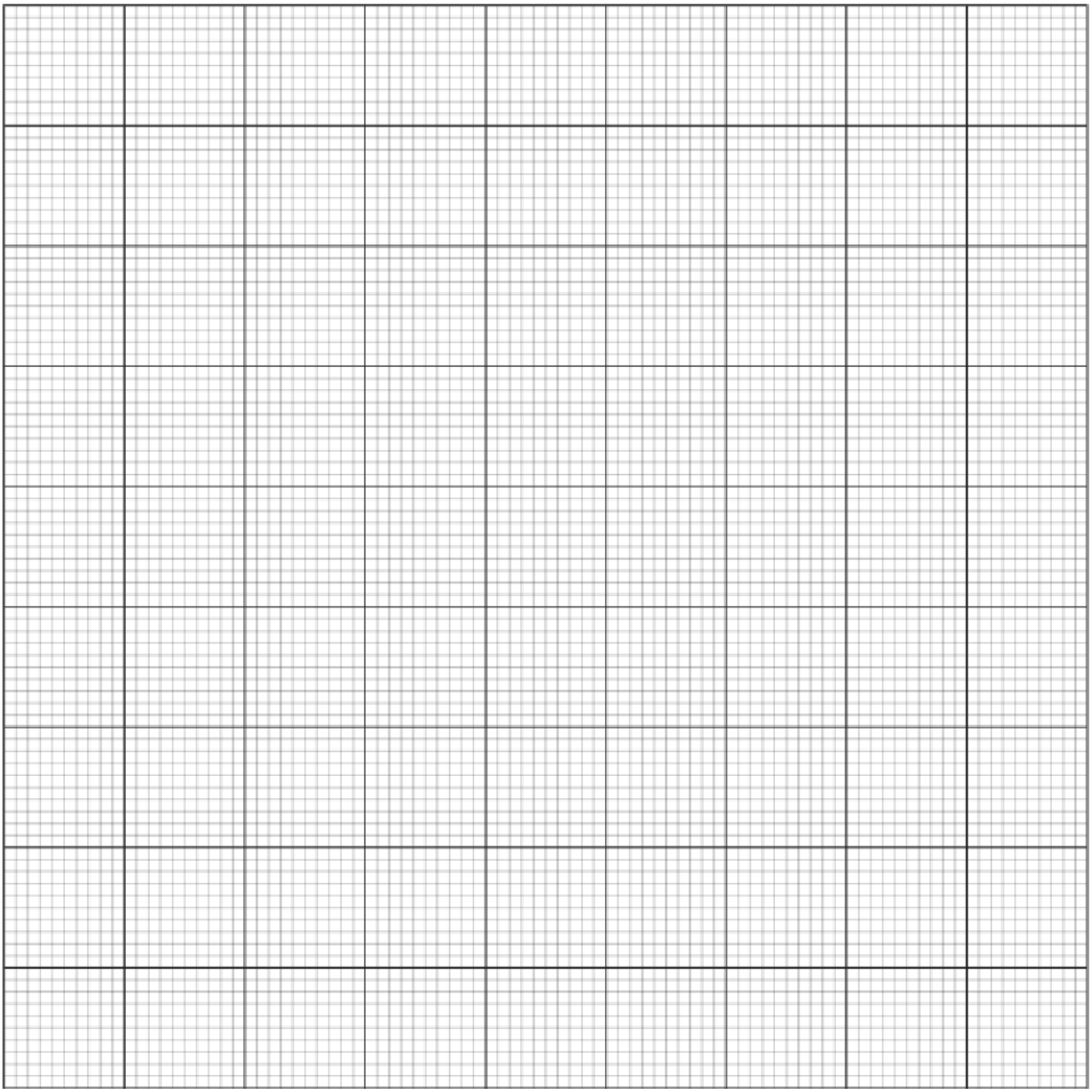


8.

(a) Draw the parallelogram $PQRS$ whose vertices are $P(-4, \ -2)$, $Q(5, \ 1)$, $R(6, \ 4)$ and $S(-3, \ 1)$.

(b) Hence, find the gradients of the sides of $PQRS$.

(c) What can you say about the gradients of the opposite sides of a parallelogram?

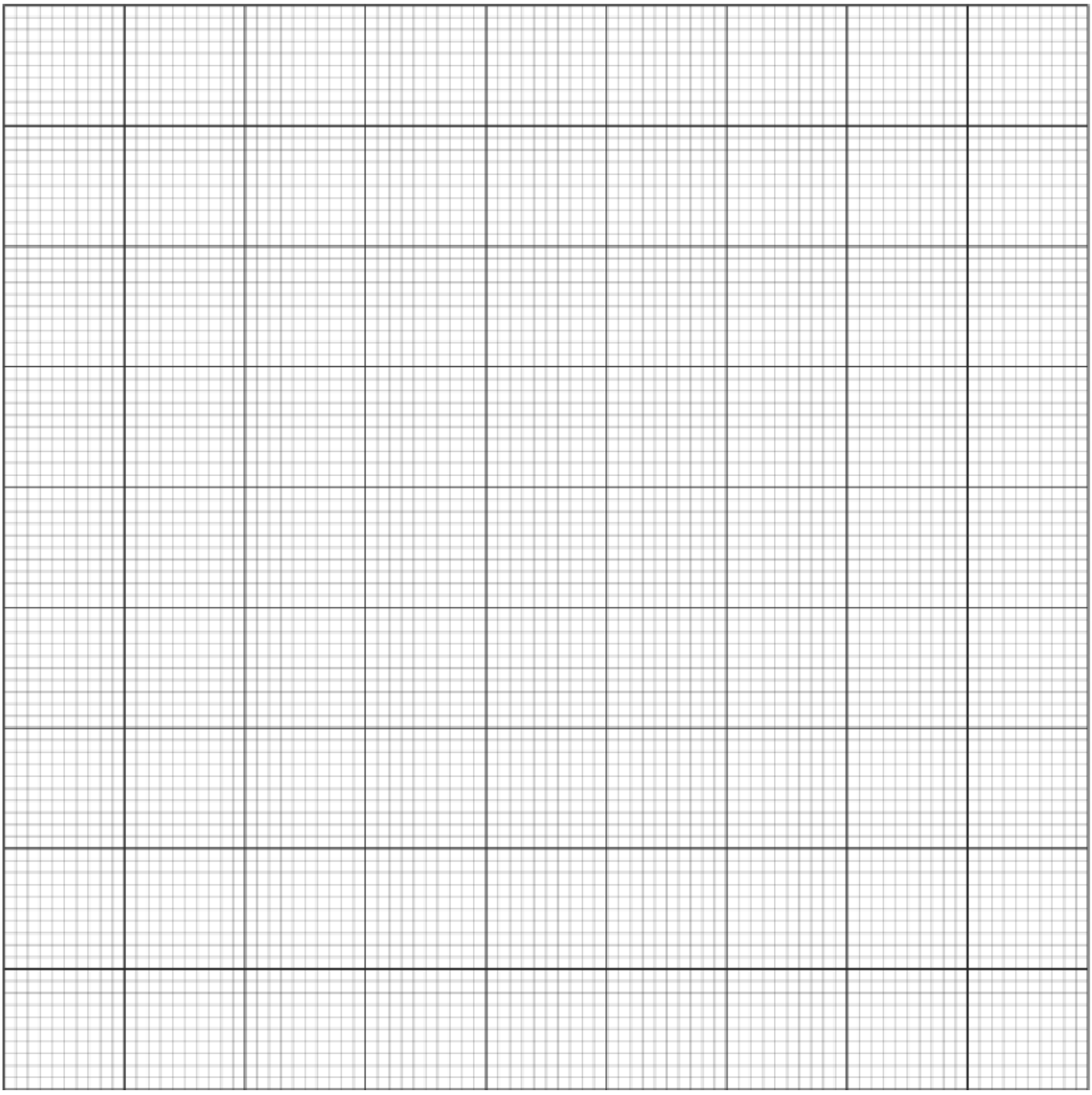


9. Paul is cycling along a horizontal road. His distance, y km, from the starting point after t hours is given by the function $y = 16t$, for $0 \leq t \leq 3$.

   (a) Using a scale of 2 cm to 1 unit on the t-axis and 1 cm to 10 units on the y-axis, draw the graph of $y = 16t$.

   (b) Find the distance travelled by Paul in
      i) The first hour,
      ii) The second hour.

   (c) Interpret the physical meaning of the gradient of the graph.



10. The cost, $*y*, of screen printing *x* T-shirts is given by the function $y = 8x + 150$.
    (a) Find the cost of printing the 100th T-shirt.
    (b) Interpret the physical meaning of the constant term 150.
    (c) Interpret the physical meaning of the gradient 8 in the function.

11. Mr Lee bought a TV set by monthly installments. The total amount still needed to be paid, $*y*, after *x* months is given by the function $y = 3600 - 400x$.
    (a) Interpret the physical meaning of the constant term 3600 in the function.
    (b) Interpret the physical meaning of the gradient -400 in the function.

Find the number of months of installments.