



Linear functions

- Calculating the gradient and y -intercept from a straight line graph
- Interpreting and comparing lines given by equations in the form $y = mx + c$
- Plotting the graph of a linear function given in the form $ay + bx + c = 0$
- Finding the coordinates of the midpoint of a line

Keywords

You should know

explanation 1

1 $y = 4x + 5$ is a linear equation.

- a** Copy and complete a table of x - and y -coordinates like this and plot the graph.

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

- b** Draw a graph for each linear equation by making a table of values like the one above and plotting points.

i $y = 2x + 3$

ii $y = \frac{1}{2}x - 1$

iii $y = 2x - 4$

iv $y = 10 - x$

v $y = \frac{2x}{3} - 4$

vi $y = 5 - 3x$

explanation 2a

explanation 2b

- 2** For each equation, make a table of x - and y -coordinates for the x -values given. Use the table to plot the graph.

- a** $y - 3x = 1$ for x -values $-1, 0$ and 1
b $y - 2x = 3$ for x -values $1, 2, 3$ and 4
c $2y - x = 2$ for x -values $-2, 0, 2$ and 4
d $3y - 2x = 6$ for x -values $0, 2$ and 4

- 3** For each function, make a table of x - and y -coordinates for x -values $-2, -1, 0, 1$ and 2 , and plot the graph.

- a** $2x + y = 3$ **b** $3x - 2y = -1$ **c** $x + 4y = 2$

- 4** For each function, make a table of x - and y -coordinates for x -values between -3 and 3 , and plot the graph. Use the same set of axes for each graph. What do you notice?

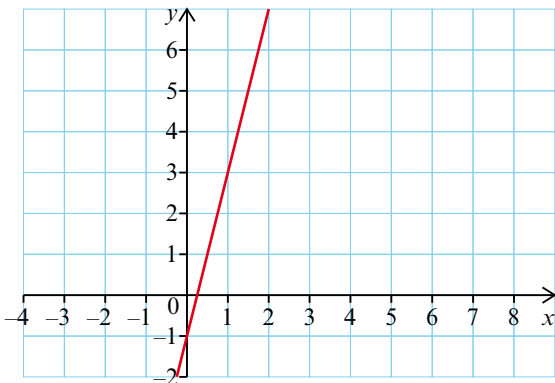
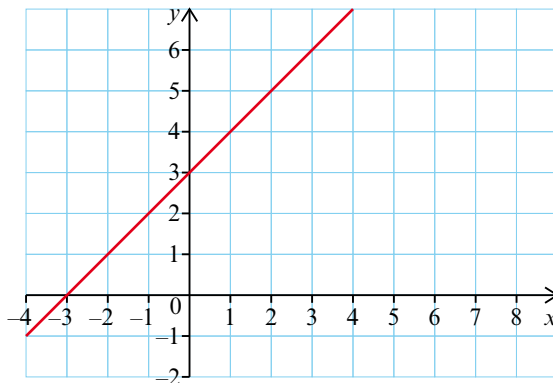
- a** $2x - 3y = 2$ **b** $y = \frac{2x}{3} + \frac{2}{3}$ **c** $-2x + 3y = 6$

explanation 3a

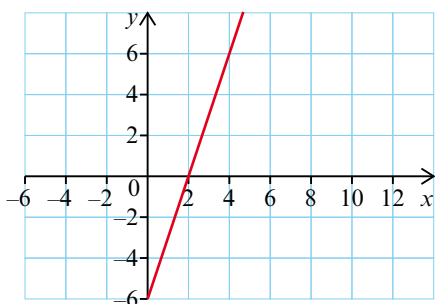
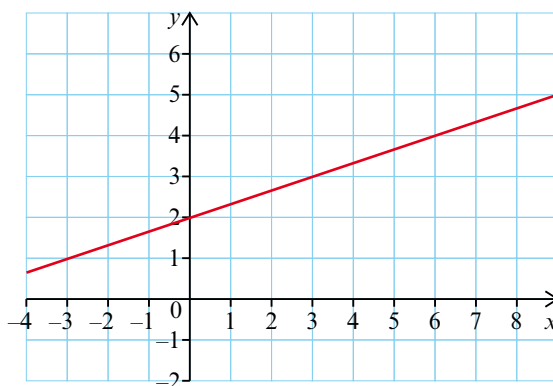
explanation 3b

explanation 3c

- 5** For each straight line, work out the gradient and y -intercept. Give the linear equation in the form $y = mx + c$.

a**b**

- 6** For each straight line, work out the gradient and y -intercept.
Give the linear equation in the form $y = mx + c$.

a**b**

- 7** Look at these linear equations.

A
 $y = 2x$

B
 $y = 2x + 2$

C
 $y = 2x - 5$

D
 $y = 2x - 1$

E
 $y = -2x + 1$

- a** What do you notice about equations A, B, C and D?
- b** What can you say about the graphs of A, B, C and D?
- c** What is different about equation E? How does this affect the graph?
- d** Do any of the graphs go through the same point on the y -axis?
Explain your answer.

8 Here are some linear equations that may be represented as graphs.

A
 $y = x$

B
 $y = 3x$

C
 $y = \frac{1}{3}x$

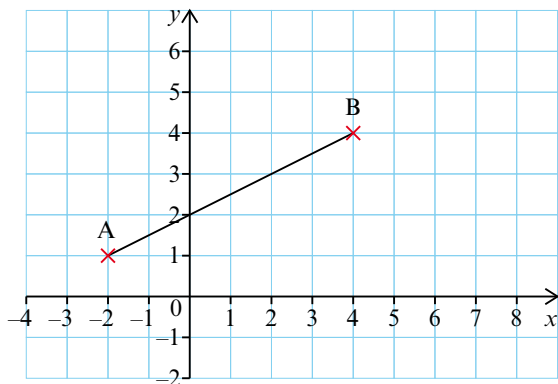
D
 $y = 2x$

E
 $y = \frac{1}{2}x$

- Which equation has the steepest line?
Explain how you can tell this without drawing the graphs.
- Plot the graphs on the same axes.
- Which point do the graphs have in common?
- One graph acts as a mirror line for the other graphs. Which is it?
- Which graph is the reflection of B in the mirror line?
- Which graph is the reflection of E in the mirror line?

explanation 4

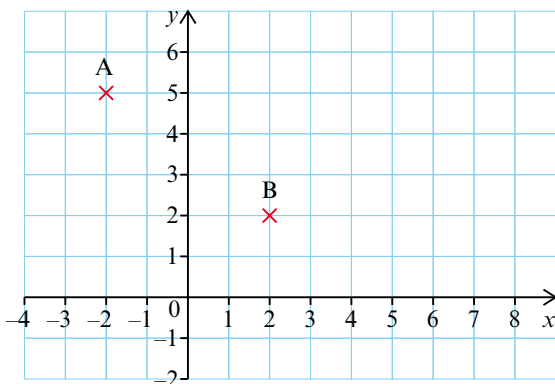
9 Look at the graph.



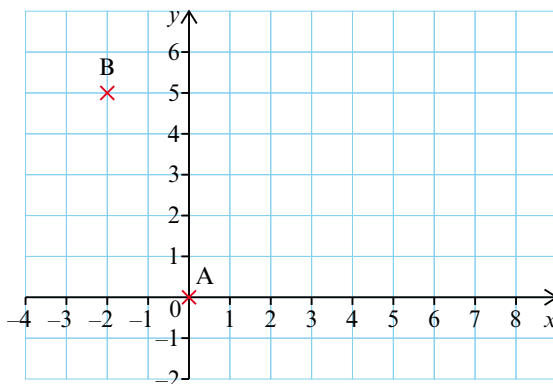
- Write the coordinates of the points A and B.
- Calculate the mean value of the x -coordinates of A and B.
- Calculate the mean value of the y -coordinates of A and B.
- Write the coordinates of M, which is the midpoint of the line AB.
Check whether these coordinates are correct by looking at the graph.

10 Find the midpoint of the line between the pair of points on each graph.

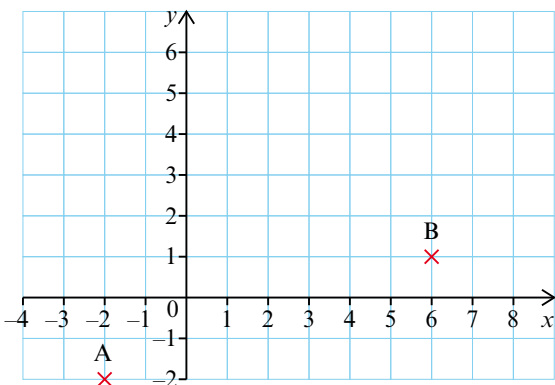
a



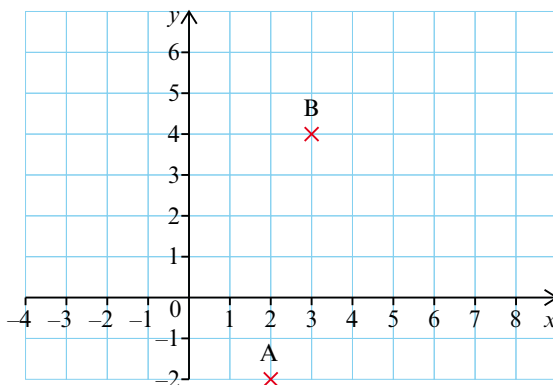
b



c



d



It might help you to draw diagrams for questions **11** to **13**.

11 Find the midpoint of the line between each pair of points.

a (2, 1) and (-3, 4)

b (0, 4) and (8, -2)

c (5, -2) and (1, 2)

d (6, 0.5) and (-1, -1)

12 P is (-3, 1) and Q is (5, -2).

a Find the midpoint of the line PQ.

b R is (-2, 1). What is the midpoint of QR?

c The midpoint of QS is (0, 1). What are the coordinates of S?

13 The midpoint of a line AB is (3, 2).

Give the coordinates of three possible pairs of points A and B.