Student Name

Mathematics Stage 5 Core

LINEAR RELATIONSHIPS A

Book 4 Examine parallel, horizontal, and vertical lines

Version: 260207

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CONTENTS

OVERVIEW

SYLLABUS CONTENT

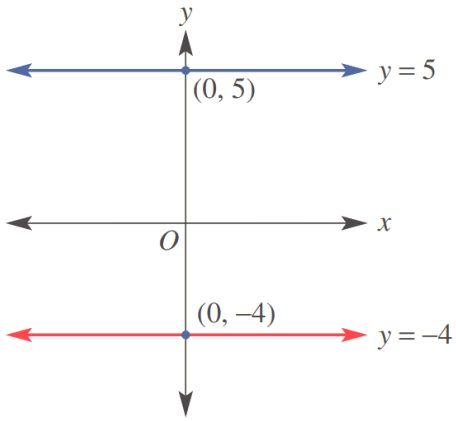
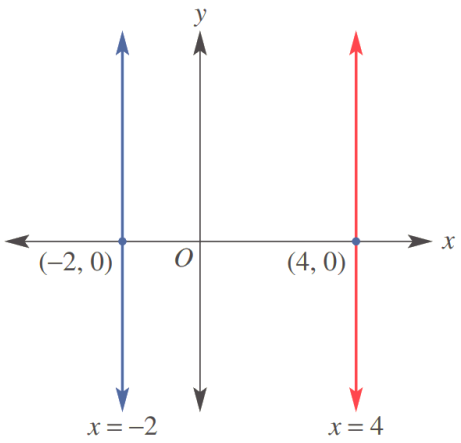
MA4-LIN-C-01 determines the midpoint, gradient and length of an interval, and graphs linear relationships, with and without digital tools

Examine parallel, horizontal and vertical lines

- Explain that parallel lines have equal gradients/slopes
- Explain why the x-axis has the equation $y = 0$ and the y-axis has the equation $x = 0$
- Recognise $y = c$ as a line parallel to the x-axis and $x = k$ as a line parallel to the y-axis
- Graph vertical and horizontal lines

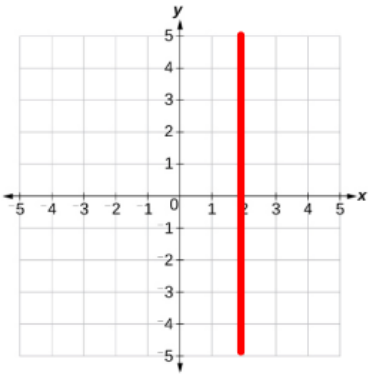
HORIZONTAL AND VERTICAL LINES

- Parallel lines have the same gradient. They never meet, even if extended forever.

Horizontal lines	Vertical lines
$y = c$	$x = k$
Every y coordinate is c.	Every x coordinate is k.
Parallel to the x axis	Parallel to the y axis
The x axis has equation $y = 0$	The y axis has equation $x = 0$
	
The gradient of a horizontal line is **0**:	The gradient of a vertical line is **undefined**:
$m = \frac{0}{\text{run}} = 0$	$m = \frac{\text{rise}}{0}$ undefined
https://www.geogebra.org/m/gptk5shk	https://www.geogebra.org/m/ehumj59s

Example Identify equation of horizontal and vertical lines.

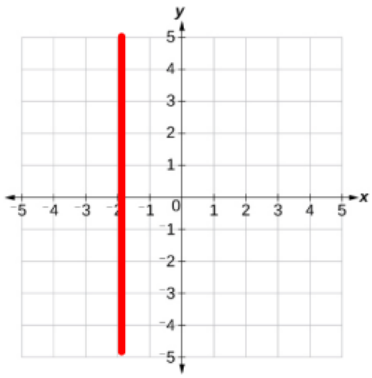
Identify the equation of these lines and state the gradient.



Equation: .....

Gradient: .....

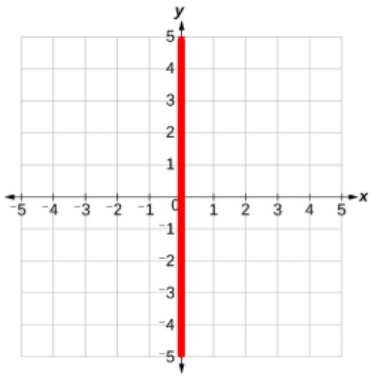
$x = 2$, undefined gradient



Equation: .....

Gradient: .....

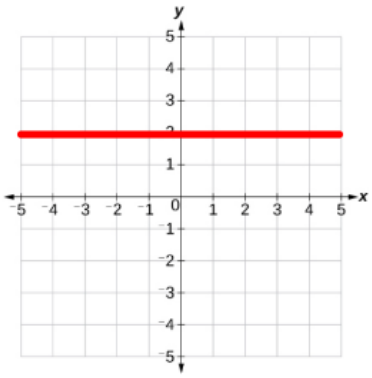
$x = -2$, undefined gradient



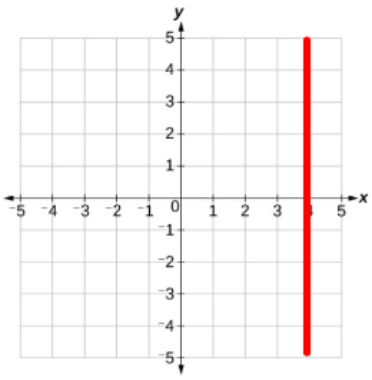
Equation: .....

Gradient: .....

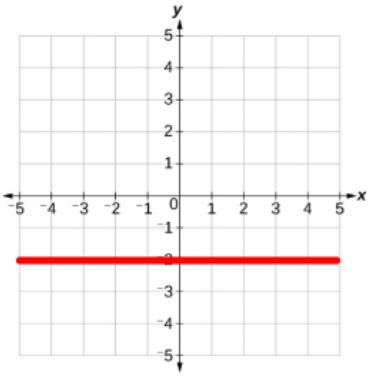
$x = 0$, undefined gradient



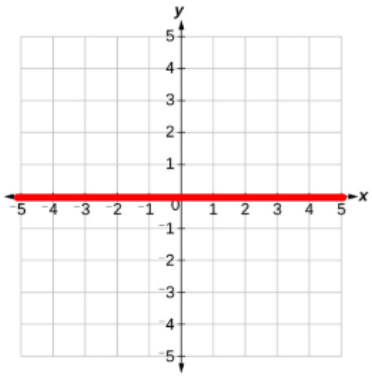
$y = 2$, gradient = 0



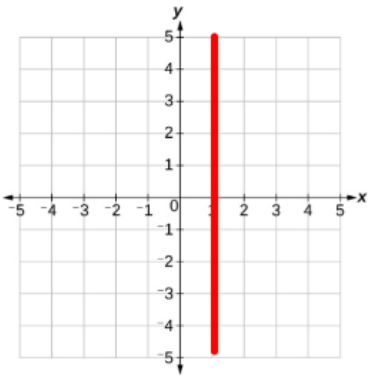
$x = 4$, undefined gradient



$y = -2$, gradient = 0



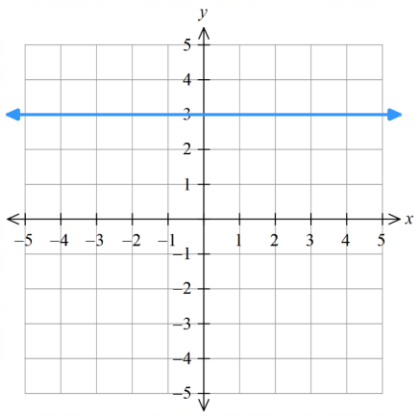
$y = 0$, gradient = 0



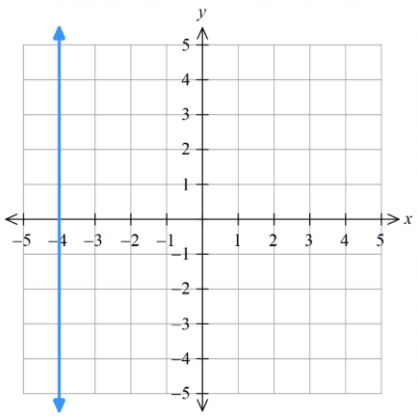
$x = 1$, undefined gradient

Example Sketch horizontal and vertical lines.

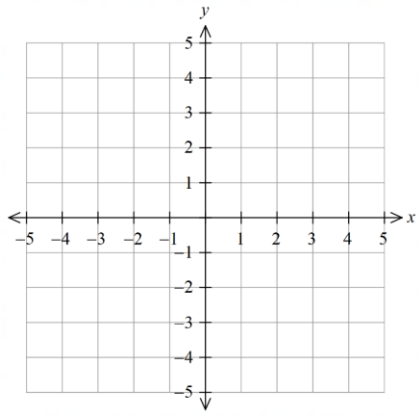
Sketch $y = 3$



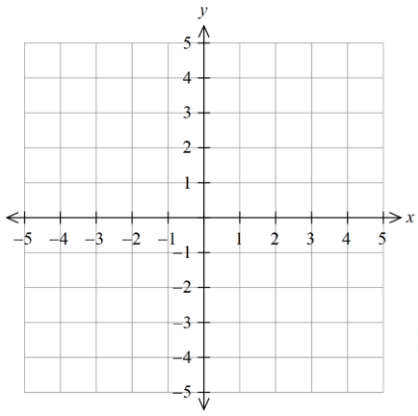
Sketch $x = -4$



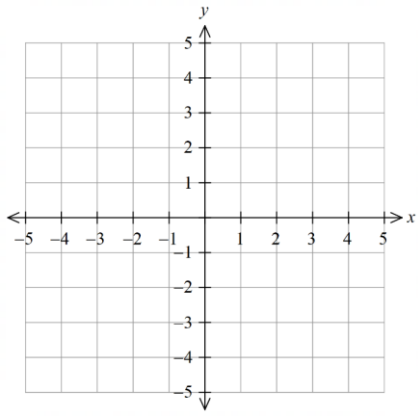
Sketch $y = 5$



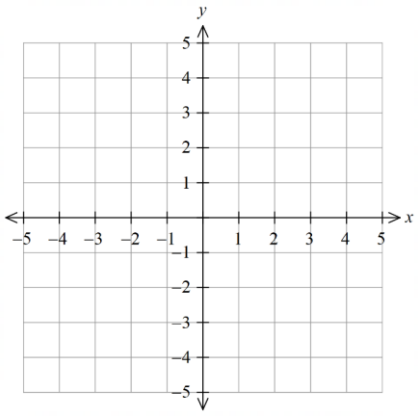
Sketch $x = -3$



Sketch $x = 3.5$



Sketch $y = -2.25$

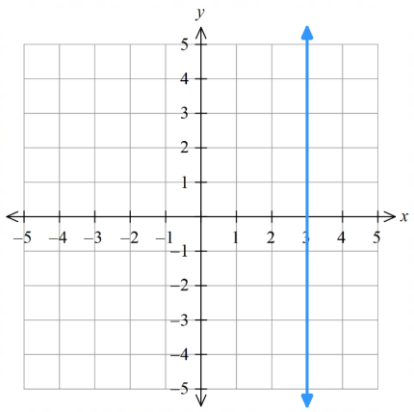


Key ideas

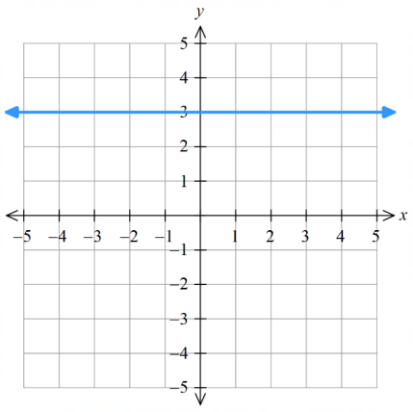
1. A ..... line has an equation of the form $y = c$
2. A ..... line has an equation of the form $x = k$
3. The gradient of a horizontal line is .....
4. The gradient of a vertical line is .....

1 Sketch the following lines.

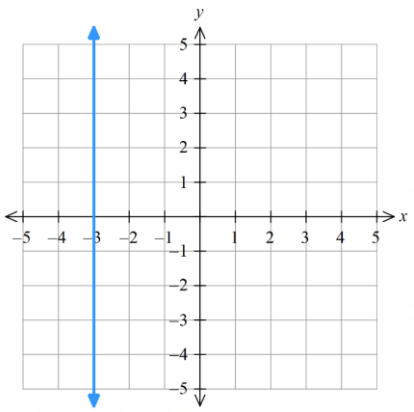
a $x = 3$



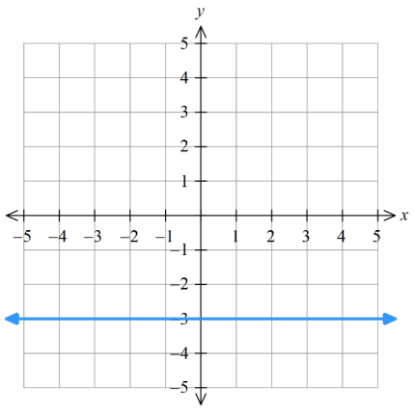
b $y = 3$



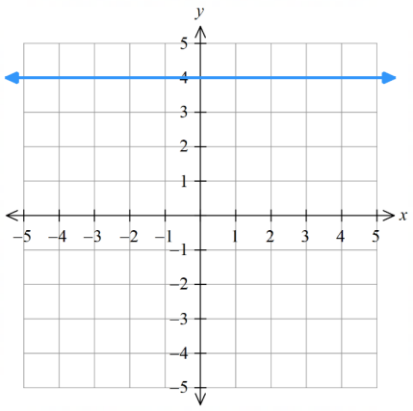
c $x = -3$



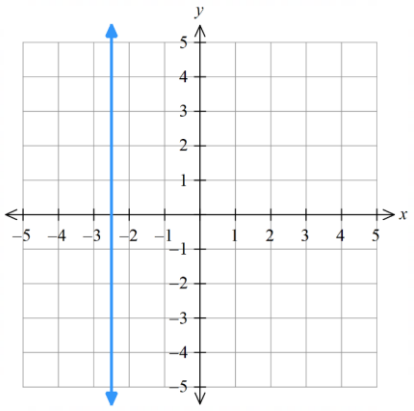
d $y = -3$



e $y = 4$

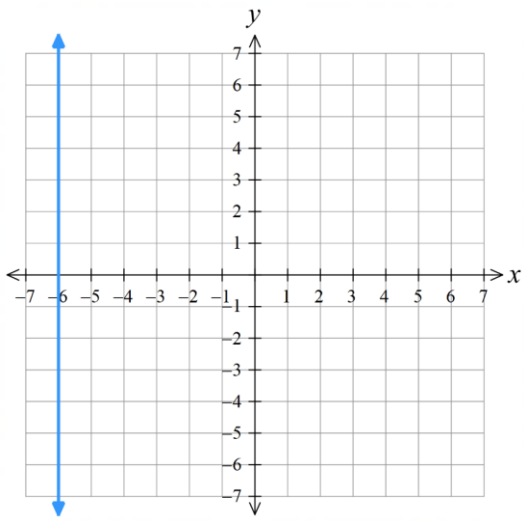


f $x = -2.5$



2 Plot the points and draw a straight line through the points.

a (-6, 2), (-6, 3), (-6, 0) and (-6,-5).



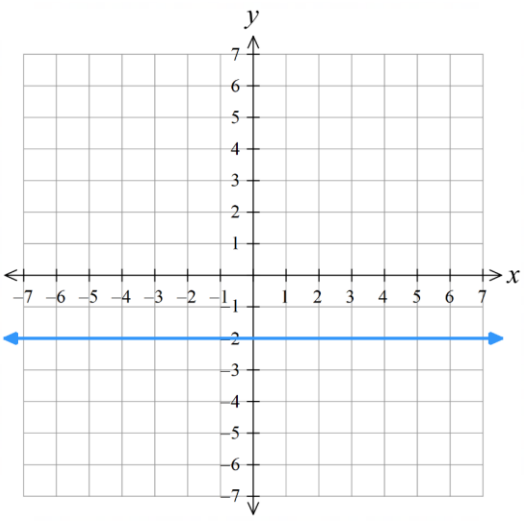
This is the line $x =$ ……

At every point on the line,

the ……-coordinate is equal to ……

–6, x, –6

b (-7,-2), (-5,-2) (0,-2) and (6,-2)



This is the line $y =$ ……

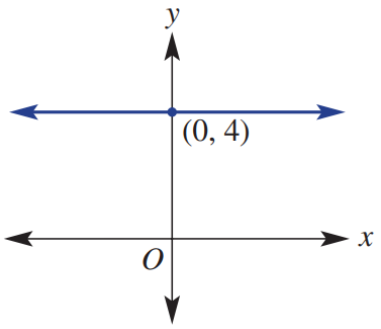
At every point on the line

the ……-coordinate is equal to ……

–2, y, –2

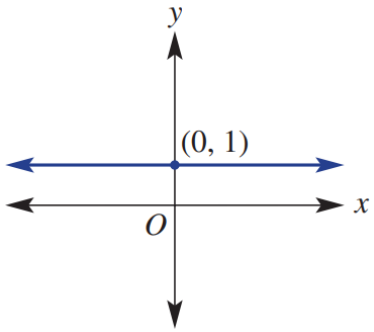
3 Write the equation of these horizontal and vertical lines.

a



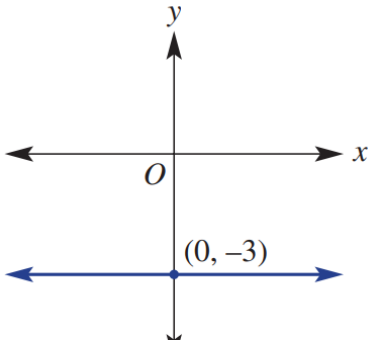
$y = 4$

b



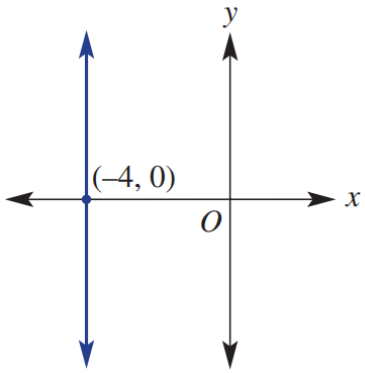
$y = 1$

c



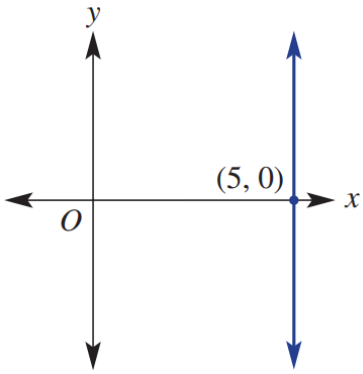
$y = -3$

d



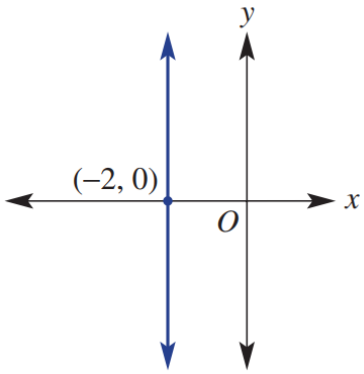
$x = -4$

e



$x = 5$

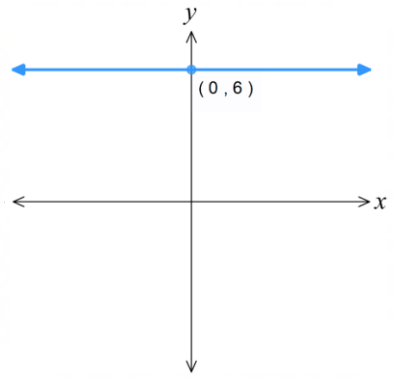
f



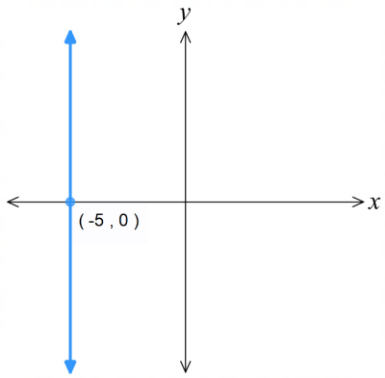
$x = -2$

4 Sketch the following lines, showing clearly the intercept.

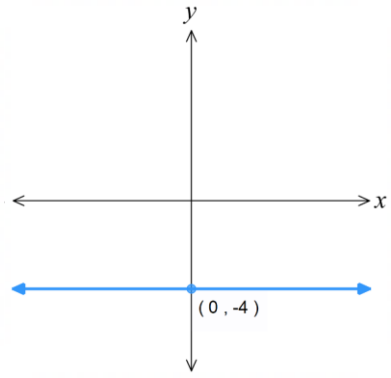
a $y = 6$



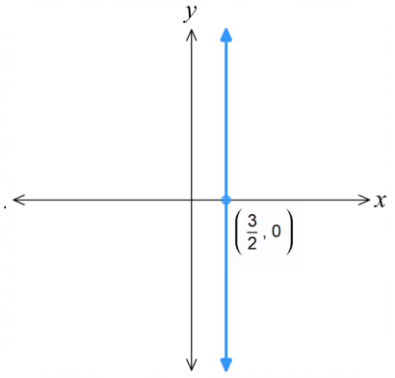
b $x = -5$



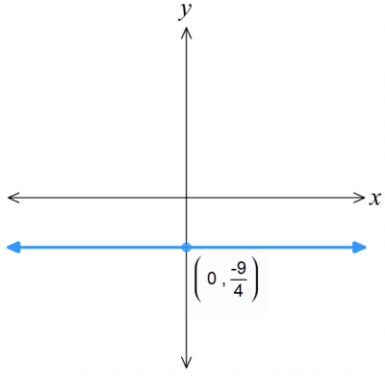
c $y = -4$



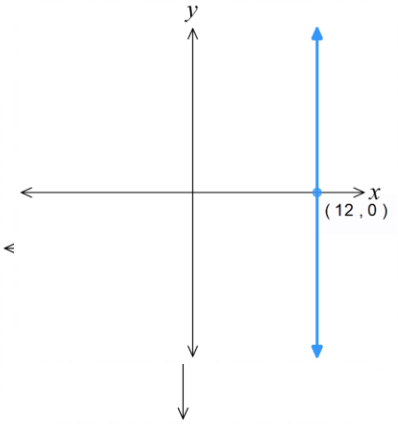
d $x = 1.5$



e $y = -\frac{9}{4}$



f



5 Write the equation of the line that is:

a parallel to the x-axis and passes through the point (1, 3)

$y = 3$

b parallel to the y-axis and passes through the point (5, 4)

$x = 5$

c parallel to the y-axis and passes through the point (−2, 4)

$x = -2$

d parallel to the x-axis and passes through the point (0, 0)

$y = 0$

6

a What is another name for the line $y = 0$?

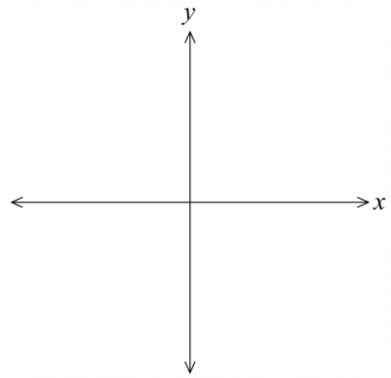
x axis

b What is another name for the line $x = 0$?

y axis

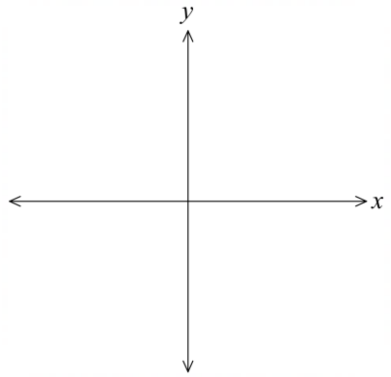
7 Find the area of the rectangle contained within the following four lines.
(Hint: sketch the 4 lines on the same axis first).

a $x = 1,\ x = -2,\ y = -3,\ y = 2$



15 u²

b $x = 0,\ x = 17,\ y = -5,\ y = -1$



68 u²

8 The lines $x = -1, x = 3$ and $y = -2$ form three sides of a rectangle.
Find the possible equation of the fourth line if:

a The area is 12 square units.

$y = 1$

b The area is 8 square units.

$y = 0$

c The perimeter is 14 units.

$y = 1$

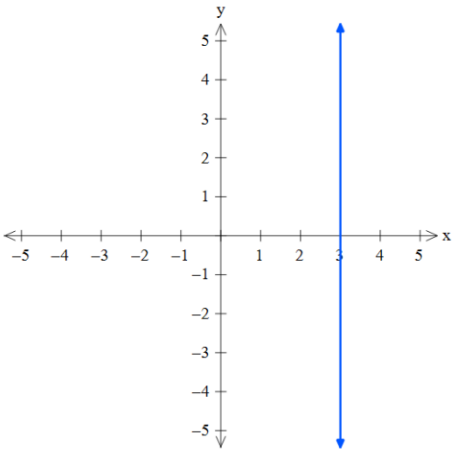
d The perimeter is 31 units.

$y = \frac{19}{2}$

CHECK YOUR UNDERSTANDING

Horizontal and vertical lines

1 What is the equation of this line?



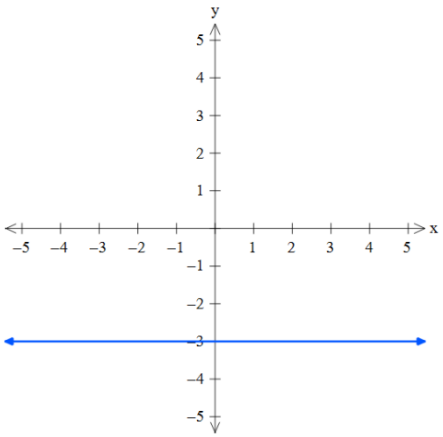
a $x = 3$

b $y = 3$

c $xy = 3$

d $y = 3x$

2 What is the equation of this line?



a $x = -3x$

b $y = -3$

c $x = -3$

d $x = -3y$

3 What is the equation of the x axis?

a $x = 1$ **b** $x = 0$ **c** $x = y$ **d** $y = 0$

4 What is the equation of the y axis?

a $x = 1$ **b** $x = 0$ **c** $x = y$ **d** $y = 0$