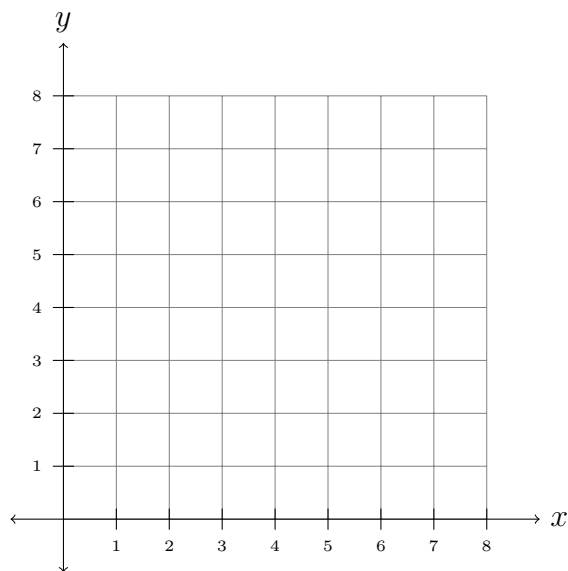


Name: \_\_\_\_\_

## Quiz on 1.2: Lines



Does  $(2, 7)$  satisfy the equation  $y - 5 = 2(x - 1)$ ?

Does  $(3, 3)$  satisfy the equation  $y - 5 = 2(x - 1)$ ?

What is another point that satisfies that equation?

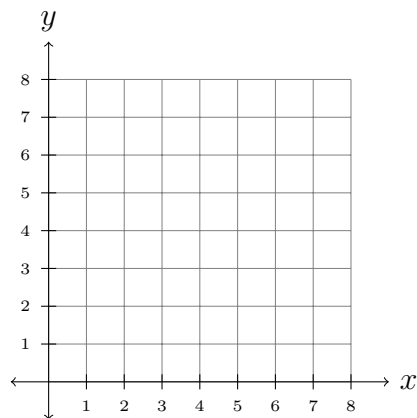
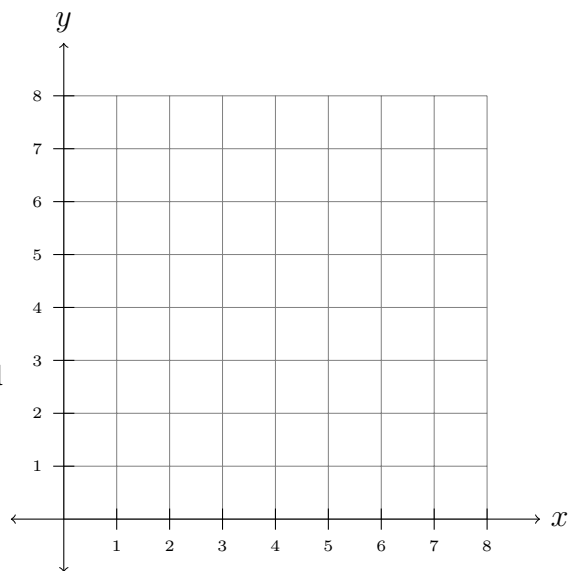
Draw both points and the line between them.

What is the slope of the line with equation  $y - 5 = 2(x - 1)$ ?

What is the slope of a line perpendicular to that line?

What is the equation of the line perpendicular to the first and passing through the point  $(1, 5)$ ?

Draw both lines.



A triangle has corners  $(1, 5)$ ,  $(2, 7)$  and  $(5, y)$ , with a right angle at  $(1, 5)$ . What is  $y$ ? Draw the points and the triangle.

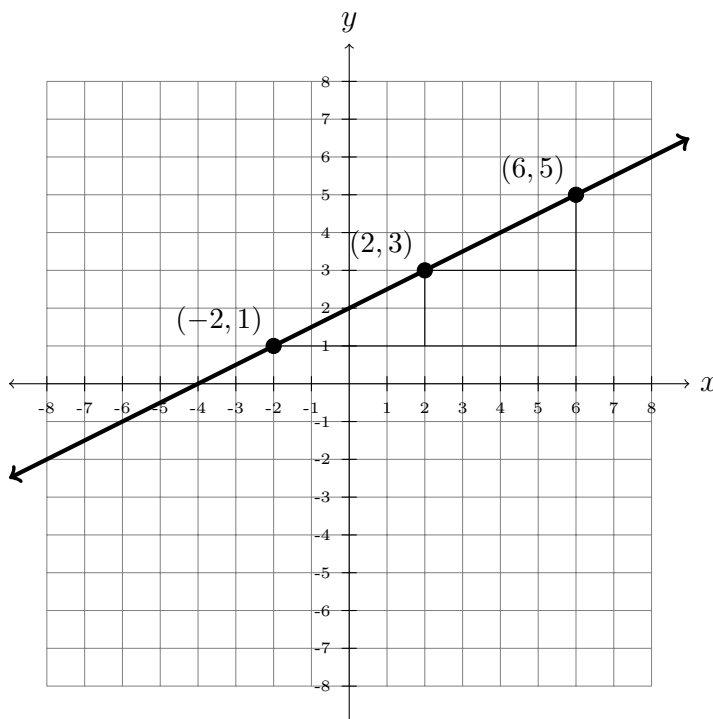
## Examples for 1.2: Slope

A line is determined by two points on the line. Make sure that you can graph a line through two points. Given any two points on a line, you can make a right triangle with sides parallel to the axes. The ratio of the side lengths only depends on the line, not on the points chosen. The **slope** is a number that represents this ratio:

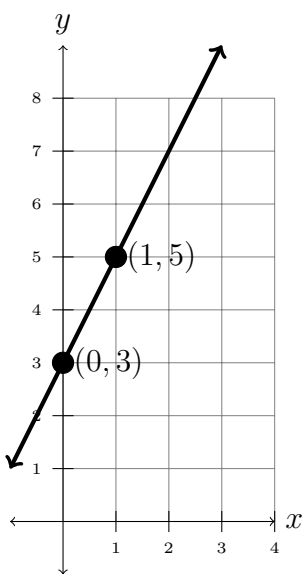
$$\text{slope} = m = \frac{\Delta y}{\Delta x} = \frac{y_1 - y_2}{x_1 - x_2}$$

where  $(x_1, y_1)$  and  $(x_2, y_2)$  are two points on the line.

For example, the slope between  $(-2, 1)$  and  $(2, 3)$  is  $(3 - 1)/(2 - (-2)) = \frac{2}{4} = \frac{1}{2}$ . The slope between  $(-2, 1)$  and  $(6, 5)$  is  $(5 - 1)/(6 - (-2)) = \frac{4}{8} = \frac{1}{2}$  has not changed. The slope of the line does not depend on which two points on the line you choose.



## Examples for 1.2: Equations of lines



The slope of a line does not change, so if we have one point  $(x_1, y_1)$  on the line and we have the slope  $m$  of the line, then for every other point  $(x, y)$  on the line we have the equation:

$$m = \frac{y - y_1}{x - x_1}$$

Some people prefer to solve for  $y$  to get the **point-slope form**

$$y - y_1 = m(x - x_1) \quad \text{or} \quad y = m(x - x_1) + y_1$$

Things are easier if we have  $x_1 = 0$ . The point  $(0, b)$  on the line is called the **y-intercept** and gives the **slope-intercept form** of the line:

$$y = mx + b$$

For instance on the left we have the points  $(0, 3)$  and  $(1, 5)$ , so the slope is  $m = \frac{5-3}{1-0} = 2$ . The equation then is  $y - 5 = 2(x - 1)$  or  $y = 2x + 3$ .

## Parallel and perpendicular:

**Parallel** lines have the same slope. The line **perpendicular** to the line with slope  $m$  has slope:

$$m_{\text{perp}} = \frac{-1}{m}$$

