Find and Use Slopes of Lines

Unit 3 Lesson 4

FIND AND USE SLOPES OF LINES

Students will be able to:

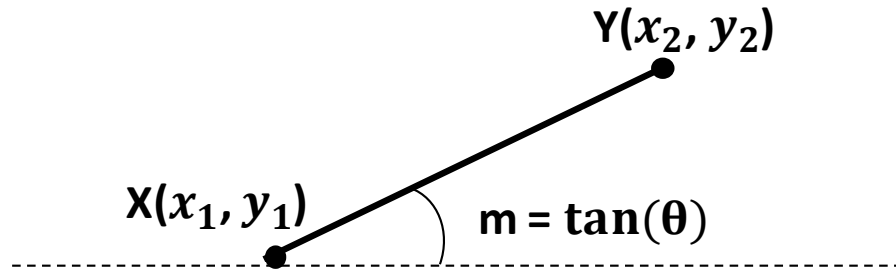Find the slopes of lines given two points and use the slope to write the equation of lines.

Key Vocabulary

- **Slope and gradient**
- **Equation of line**
- **Slope of parallel and perpendicular lines**
- **Rate of change**

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FIND AND USE SLOPES OF LINES

What is the slope?

Slope is the measure of steepness of a line or a line segment passing through two points.

Y(x_2, y_2)

X(x_1, y_1)

$m = \tan(\theta)$

Slope is the steepness of this line segment passing through **X** and **Y**. The slope is also referred as the gradient or the rate of change while going from one value to another. The slope is represented by **m.**

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FIND AND USE SLOPES OF LINES

How to find slope given the two points?

Slope can be found given the two points on a line or a line segment.

$$\textbf{Slope m} = \textbf{tan}(\boldsymbol{\theta}) = \frac{y_2 - y_1}{x_2 - x_1}$$

$Y(x_2, y_2)$

m = tan(θ)

$X(x_1, y_1)$
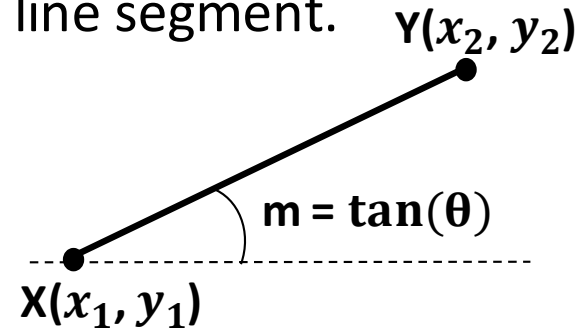
Where (x_1, y_1) is the coordinate of the first point and (x_2, y_2) is the coordinate of the second point.
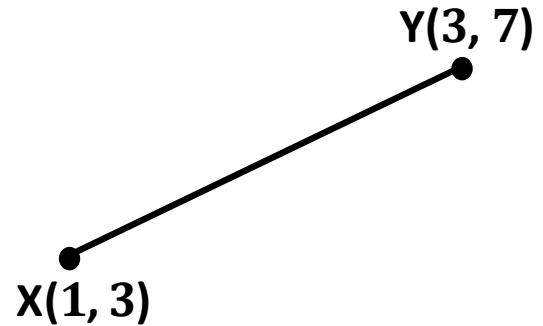
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FIND AND USE SLOPES OF LINES

PROBLEM: 1

What is the slope of the line segment XY?

$$\text{Slope m} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - 3}{3 - 1}$$

or $\qquad m = \frac{4}{2} = 2$

Hence the slope of line segment XY is **2.**

Y(3, 7)

X(1, 3)

FIND AND USE SLOPES OF LINES
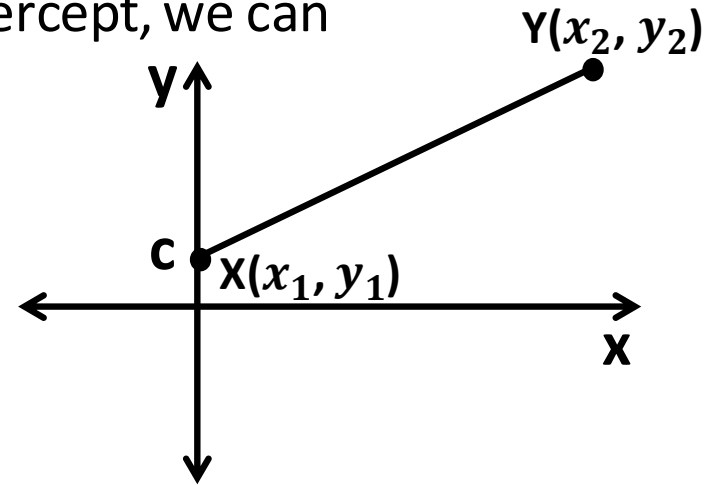
<u>Slope-intercept form of a line</u>

If we are given the slope of the line and its y-intercept, we can write the equation of that line.

$$\mathbf{y \ = \ mx \ + \ c}$$

Where,

m = slope of the line (or the line segment)
c = y-intercept (the point where the line meets y-axis)

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FIND AND USE SLOPES OF LINES

PROBLEM: 2

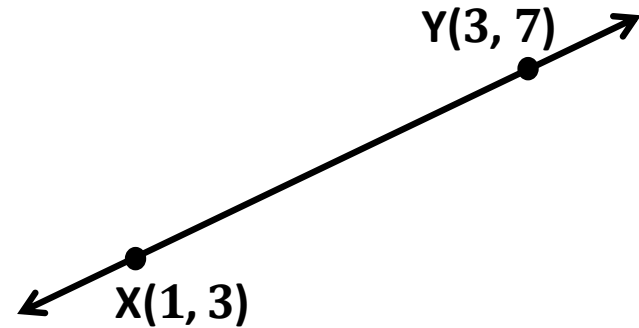**Write an equation of the line passing through X and Y. Consider the y-intercept to be zero.**

$$\textbf{Slope m} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - 3}{3 - 1}$$

Y(3, 7)

or $\qquad m = \frac{4}{2} = 2$

X(1, 3)

Equation of line is:

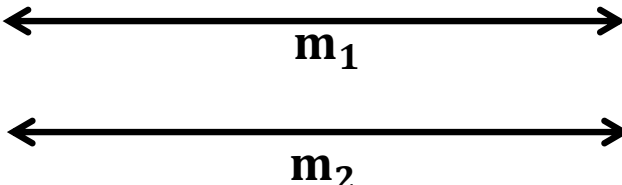$\qquad$ y = mx + c $\rightarrow$ y = 2x + 0

or $\qquad\qquad$ y = 2x
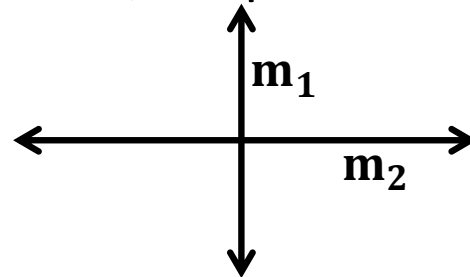
FIND AND USE SLOPES OF LINES

Slopes of Parallel and Perpendicular Lines

- If two lines are parallel, their slopes are equal. So given the slope of a line, we can always find the slope of any line parallel to it.

$$m_1$$

$$m_2$$

$$m_1 = m_2$$

- If two lines are perpendicular, the product of their slopes is -1.

$$m_1 \times m_2 = -1$$

$$m_1$$

$$m_2$$

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FIND AND USE SLOPES OF LINES

PROBLEM: 3

What will be the slope of line J if:
a) Line K with slope = 2 is parallel to Line J
b) Line K with slope 3 is perpendicular to Line J

a)   Since the two lines are parallel, their slopes are equal.

Slope of J = Slope of K = 2

b)   Since the two lines are perpendicular, the product of their slopes is -1.

Slope of J x Slope of K = -1

or,   **Slope of J = $-\dfrac{1}{3}$**