Warm-Up | Rate of Change and Introduction to Slope

Lesson Question

Lesson Goals

Examine _____ and graphs.

Determine positive slopes.

Compare _____ in different real-world scenarios.

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

	a visual representation of data
	in a function, the ratio of the change in the dependent value with respect to the change in the independent value
	the ratio of the change in the dependent values (outputs) to the change in the independent values (inputs) between two points on a line
	to infer; to draw a conclusion

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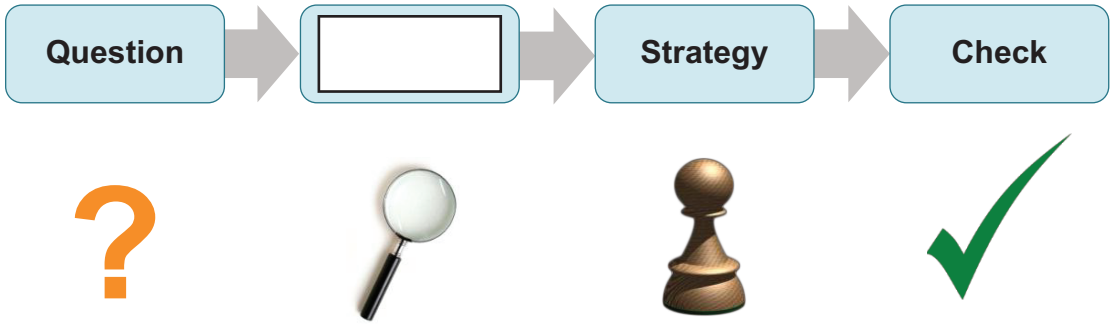
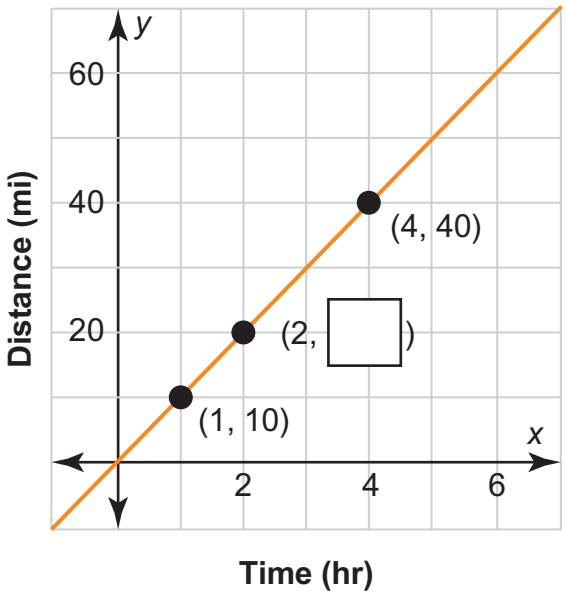
The Problem Solving Process



Rate of Change

EXAMPLE

The **graph** shows the distance Andrea bicycled over time. Is she traveling at a constant **rate of change**?



- Find the rate of change from 1 hour to 2 hours.

$$\frac{\text{Rise}}{\text{Run}} = \frac{10}{1} = \square \frac{\text{mi}}{\text{hr}}$$

- Find the rate of change from 1 hour to 4 hours.

$$\frac{\text{Rise}}{\text{Run}} = \frac{30}{3} = 10 \frac{\text{mi}}{\text{hr}}$$

Is she traveling at a constant rate of change? ☐

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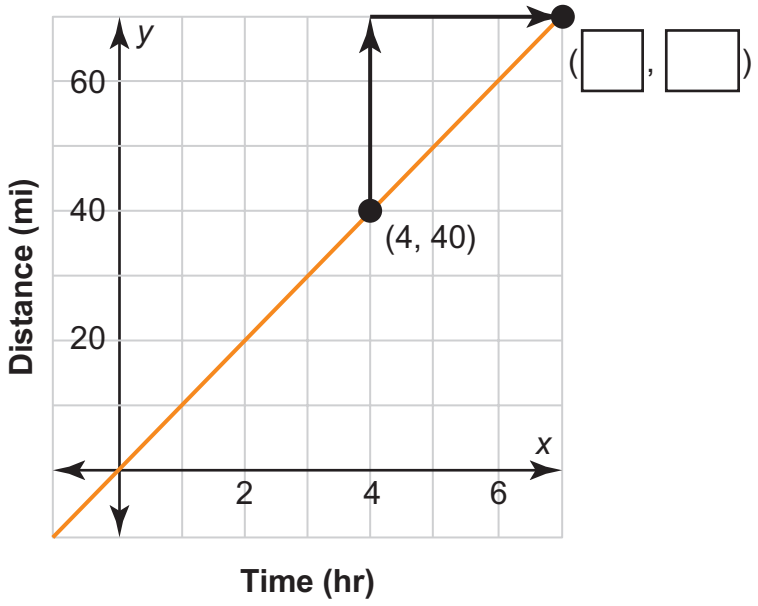
Rate of Change

What would you deduce Andrea's rate of change to be from 4 hours to 7 hours?

1–2 hours: ROC = $10 \frac{\text{mi}}{\text{hr}}$

1–4 hours: ROC = $10 \frac{\text{mi}}{\text{hr}}$

4–7 hours: $\frac{\text{rise}}{\text{run}} = \frac{30}{3} =$ [ ] $\frac{\text{mi}}{\text{hr}}$



Does it matter what interval you use when finding the rate of change of a linear equation?

[ ] it does not matter the interval you use because the rate of change is constant.

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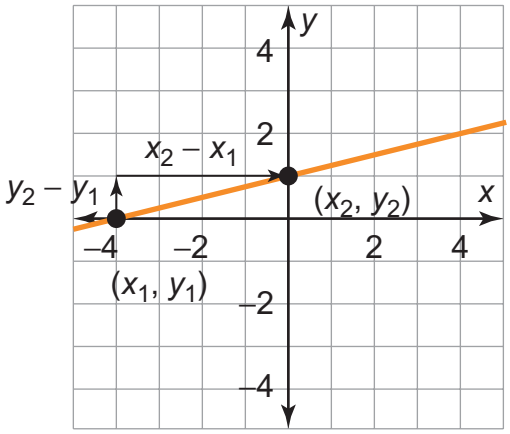
Slope = Rise / Run

The constant rate of ☐ is called the **slope** of the line.

The slope of a line is the ☐ of the change in *y*-values (rise) for a segment of the graph to the corresponding change in *x*-values (run).

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$



Finding Slope from a Graph

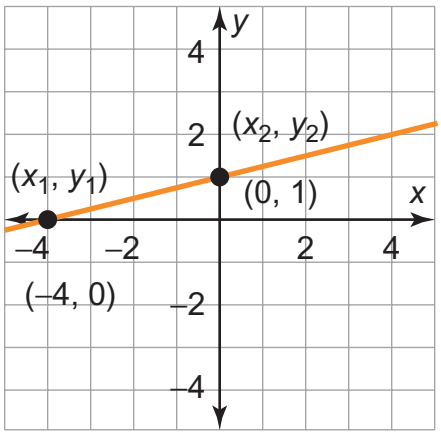
EXAMPLE

Find the slope of the line.

- $\text{Slope} = \dfrac{\text{rise}}{\square} = \dfrac{y_2 - y_1}{x_2 - x_1}$

$$\frac{\text{rise}}{\text{run}} = \frac{\square - 0}{0 - \square} = \frac{1}{4}$$

$$\text{Slope} = \square$$



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Finding Slope from a Table

EXAMPLE

Find the slope of the line that runs through the points given in the table.

x	*y*
–1	6
–3	0

$$\text{Slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$(-1, 6)\ (-3, 0)$

$(x_1, y_1)\ (x_2, y_2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\square - 6}{-3 - \square} = \frac{-6}{-2} = \square$$

You can choose either point for (x_1, y_1), but you must use the same order in the numerator and denominator.

Slope = 3

Positive slope means that this line is increasing as we go from left to right.

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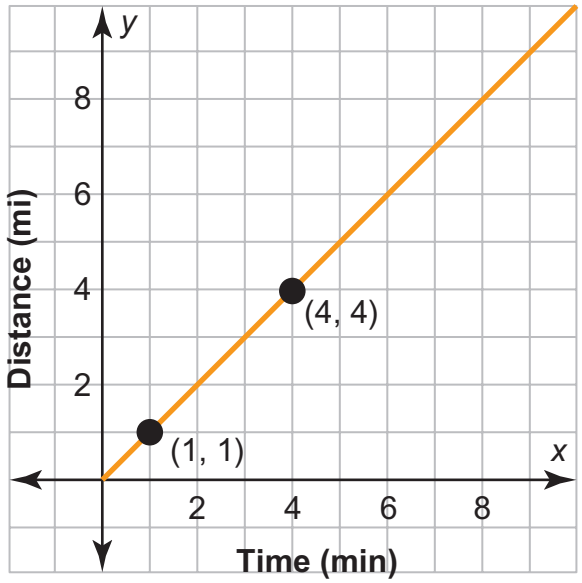
Using Slope to Find How Fast a Car Is Going

The graph represents the linear relationship between Car 1's time and distance. What do you notice about the speed of the car?



- Constant speed
  - Straight line on the graph
  - Distance on *y*-axis / Time on *x*-axis

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - \square}{\square - 1} = \frac{3}{3} = \square \ \frac{\text{mi}}{\text{min}}$$

The speed of the car is $1 \frac{\text{mi}}{\text{min}}$.

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Using Slope to Find How Fast a Car is Going

This table represents the linear relationship between Car 2's time and distance. What do you notice about the speed of the car?

- Constant speed
  - Slope $= \frac{y_2 - y_1}{x_2 - x_1}$

$\left(1, \frac{1}{2}\right)$ $\left(7, 3\frac{1}{2}\right)$

(x_1, y_1) (x_2, y_2)

Time Gone By (min) (x)	Distance Traveled (miles) (y)
1	$\frac{1}{2}$
2	1
4	2
7	$3\frac{1}{2}$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3\frac{1}{2} - \frac{1}{2}}{\square - \square} = \frac{3}{6} = \frac{1}{2}\frac{\text{mi}}{\text{min}}$$

The speed of the car is $\frac{1}{2}\frac{\text{mi}}{\text{min}}$.

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Comparing Slopes on a Graph

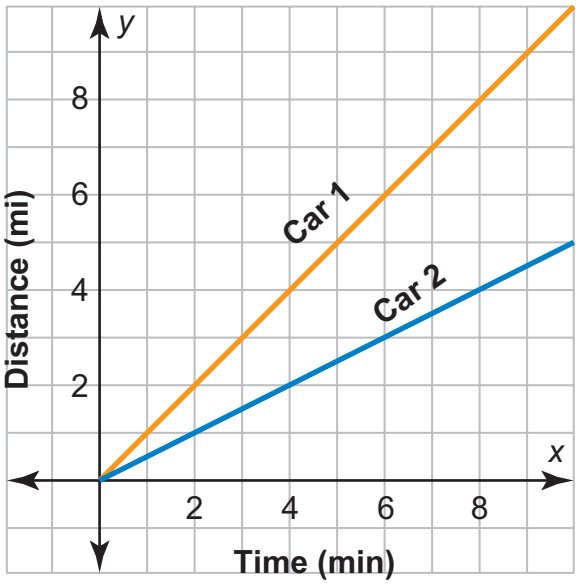
This graph represents the linear relationship between time and distance for both Car 1 and Car 2.

Slope of Car 1 = 1

Speed of Car 1 $= 1 \frac{\text{mi}}{\text{min}}$

Slope of Car 2 $= \frac{1}{2}$

Speed of Car 2 $= \frac{1}{2} \frac{\text{mi}}{\text{min}}$



How can you determine by looking at the graph which car is moving at a faster rate?

The _____ the line, the _____ the slope.

Car 1 is moving at a _____ speed than car 2.

Summary | Rate of Change and Introduction to Slope

Lesson Question

How can you find the slope of a line and use it to solve problems?

Answer

Use this space to write any questions or thoughts about this lesson.