

Chapter 2 Study Guide

Rate of Change and Slope

Rate of Change Rate of change is a ratio that compares how much one quantity changes, on average, relative to the change in another quantity.

Example: Find the average rate of change for the data in the table.

$$\begin{aligned} \text{Average Rate of Change} &= \frac{\text{change in } y}{\text{change in } x} \\ &= \frac{\text{change in Elevation of the Sun}}{\text{change in Time}} \\ &= \frac{84^\circ - 6^\circ}{11:00 \text{ A.M.} - 7:00 \text{ A.M.}} \\ &= \frac{78^\circ}{4 \text{ hours}} \\ &= 19.5 \text{ degrees per hour} \end{aligned}$$

Elevation of the Sun (in degrees)	Time
6°	7:00 A.M.
26°	8:00 A.M.
45°	9:00 A.M.
64°	10:00 A.M.
84°	11:00 A.M.

Exercises

Find the rate of change for each set of data.

1.

Time P.M.	People in Auditorium
7:15	26
7:22	61
7:24	71
7:30	101
7:40	151

2.

Time (minutes)	Altitude of balloon (meters)
3	520
8	1,220
11	1,640
15	2,200
23	3,320

3.

Time (minutes)	Vehicles through Tunnel
4	1,610
11	2,131
19	2,746
22	2,970
28	3,432

4.

Time (seconds)	Depth of sinking stone (meters)
0	3.51
7	4.77
11	5.49
21	7.29
29	8.73

5.

Time (seconds)	Water through Channel (liters)
6	22,172
13	24,706
15	25,430
23	28,326
47	37,014

6.

Time (seconds)	Distance between Two Sleds (meters)
0	37.3
3	30.2
4	27.7
7	20.8
13	7.2

2-3 Study Guide and Intervention (continued)

Rate of Change and Slope

Slope

Slope m of a Line	For points (x_1, y_1) and (x_2, y_2) , where $x_1 \neq x_2$, $m = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$
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Example 1: Find the slope of the line that passes through $(2, -1)$ and $(-4, 5)$.

$$\begin{aligned}
 m &= \frac{y_2 - y_1}{x_2 - x_1} && \text{Slope formula} \\
 &= \frac{5 - (-1)}{-4 - 2} && (x_1, y_1) = (2, -1), (x_2, y_2) = (-4, 5) \\
 &= \frac{6}{-6} = -1 && \text{Simplify.}
 \end{aligned}$$

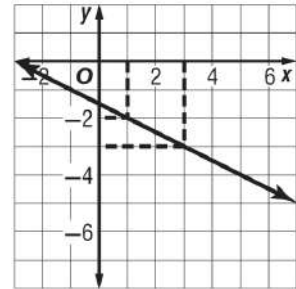
The slope of the line is -1 .

Example 2: Find the slope of the line.

Find two points on the line with integer coordinates, such as $(1, -2)$ and $(3, -3)$. Divide the difference in the y -coordinates by the difference in the x -coordinates:

$$\frac{-3 - (-2)}{3 - 1} = -\frac{1}{2}$$

The slope of the line is $-\frac{1}{2}$



Exercises

Find the slope of the line that passes through each pair of points. Express as a fraction in simplest form.

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|----------------------------|-----------------------------|------------------------------|
| 1. $(4, 7)$ and $(6, 13)$ | 2. $(6, 4)$ and $(3, 4)$ | 3. $(5, 1)$ and $(7, -3)$ |
| 4. $(5, -3)$ and $(-4, 3)$ | 5. $(5, 10)$ and $(-1, -2)$ | 6. $(-1, -4)$ and $(-13, 2)$ |
| 7. $(7, -2)$ and $(3, 3)$ | 8. $(-5, 9)$ and $(5, 5)$ | 9. $(4, -2)$ and $(-4, -8)$ |

Determine the rate of change of each graph.

