

### Slope and Rate of Change

- The term "slope" means the same thing as "rate of change."
- A unit rate is a slope with 1 in the denominator.
- Slope means rise over run so y-values go in the numerator and x-values go in the denominator.

Solve each problem. Show all work.

1) Find the rate of change from the scenario. Then write it as a unit rate. Include appropriate units.

T-Shirts.com charges a \$3.50 shipping fee and \$11 for every 2 shirts you order.

$$\frac{\$11}{2 \text{ shirts}} = m \text{ (rate of change)}$$

$$\frac{11}{2} = \frac{5.50}{1 \text{ shirt}} \quad \$5.50/1 \text{ shirt is unit rate}$$

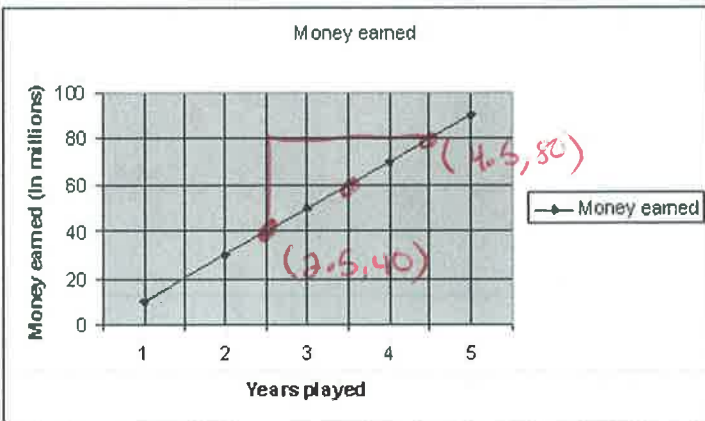
2) Find the rate of change from the scenario. Then write it as a unit rate. Include appropriate units.

Tim has already read 7 pages. He reads 15 more pages in 5 minutes.

$$\frac{15 \text{ pages}}{5 \text{ minutes}} = m \text{ (rate of change)}$$

$$\frac{15}{5} = \frac{3 \text{ pages}}{1 \text{ min}} \quad 3 \text{ pages} / 1 \text{ minute is unit rate}$$

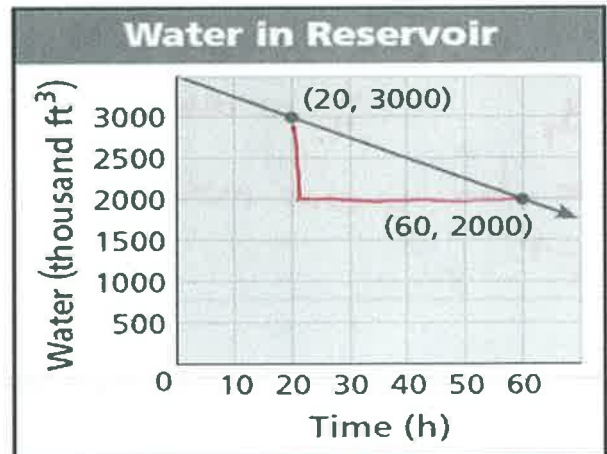
3) Find the rate of change from the graph. Then write it as a unit rate. Include appropriate units.



$$\frac{\$40 \text{ million}}{2 \text{ years}} \text{ is slope / rate of change}$$

$$\frac{40}{2} = \frac{\$20 \text{ million}}{1 \text{ yr}} \quad \$20 \text{ million} / 1 \text{ year is unit rate}$$

4) Find the rate of change from the graph. Then write it as a unit rate. Include appropriate units.



$$\frac{\text{rise}}{\text{run}} = \frac{-1000 \text{ thousand ft}^3}{40 \text{ hr}} \text{ is rate of Change}$$

$$\frac{-1000}{40} = \frac{-25 \text{ thou ft}^3}{1 \text{ hr}} \text{ Loss of } 25 \text{ thousand ft}^3 \text{ of water} / 1 \text{ hour is unit rate}$$

5) Find the rate of change from the table. Then write it as a unit rate. Include appropriate units.

| Hours spent studying per week | Grade Point Average (GPA) |
|-------------------------------|---------------------------|
| 1                             | 0.8                       |
| 3                             | 1.2                       |
| 10                            | 2.6                       |
| 14                            | 3.4                       |
| 17                            | 4.0                       |

$$\frac{\Delta y}{\Delta x} = \frac{0.4 \text{ pts}}{2 \text{ hrs}} \text{ is rate of change}$$

$$\frac{0.4}{2} = \frac{0.2 \text{ pts}}{1 \text{ hr}}$$

0.2 GPA points / 1 hour of studying is the unit rate

6) Find the rate of change from the table. Then write it as a unit rate. Include appropriate units.

| Seconds             | 0   | 10  | 15  | 28  | 100 |
|---------------------|-----|-----|-----|-----|-----|
| Feather height (ft) | 500 | 480 | 470 | 444 | 300 |

$$\frac{\Delta y}{\Delta x} = \frac{-20 \text{ ft}}{10 \text{ s}} \text{ is rate of change}$$

$$\frac{-20}{10} = \frac{-2 \text{ ft}}{1 \text{ sec}}$$

-2 ft / 1 sec (or, dropping 2 feet per second) is unit rate

7) Find the rate of change from the ordered pairs. Then write it as a unit rate. Hint: Make a table if you need to!

$$(x_1, y_1) \text{ and } (x_2, y_2)$$

$$(-14, 4) \text{ and } (-18, 8)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 4}{-18 - (-14)} = \frac{4}{-4} \text{ or } -\frac{4}{4}$$

$$-\frac{4}{4} = -\frac{1}{1} \text{ is unit rate}$$

8) Find the rate of change from the ordered pairs. Then write it as a unit rate. Hint: Make a table if you need to!

$$(x_1, y_1) \text{ and } (x_2, y_2)$$

$$(3, 2) \text{ and } (7, 2)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 2}{7 - 3} = \frac{0}{4}$$

$\frac{0}{4}$  is rate of change

$$\frac{0}{4} = \frac{0}{1} \text{ or } 0 \text{ is unit rate}$$

Quick Write: How are slope and rate of change related? How are slopes and unit rates related?

Slope and rate of change mean the same thing. Slope and rate of change both represent the steepness of a graphed line. A unit rate is a slope with a 1 in the denominator. Also "rate of change" often indicates that units (time, distance, money, etc) are involved.