

15

Function Example

The average daily income of an occupational therapist can be modeled by the function

$$f(p) = 25p - 18$$



where p is the number of daily patients.

Assume that no more than 16 patients can be seen in one day.

Determine a reasonable domain and range for $f(p)$ and calculate $f(8)$.

Domain: What values make sense for p (# patients)?

$$0 \leq p \leq 16$$

Range: What values make sense for $f(p)$ (income)?

$$-18 \leq f(p) \leq 382$$

$$f(8) = 25(8) - 18 = 200 - 18 = \$182$$

For what number of patients will $f(x) = 157$?

$$157 = 25p - 18$$

$$175 = 25p$$

$$7 = p \quad 7 \text{ patients}$$

Slope

The slope between two points (x_1, y_1) and (x_2, y_2)

vertical change
horizontal change

$$\frac{\text{Rise}}{\text{Run}} \quad \text{or} \quad \frac{y_2 - y_1}{x_2 - x_1} \quad \text{or} \quad \frac{\Delta y}{\Delta x}$$

Delta Δ :
Means
"Change in"

Example: $(8, 3)$ and $(-2, 7)$

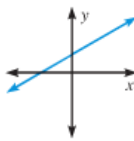
$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7 - 3}{-2 - 8} = \frac{4}{-10} = -\frac{2}{5}$$

KEY CONCEPT

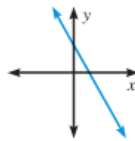
For Your Notebook

Classification of Lines by Slope

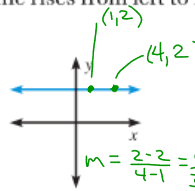
The slope of a line indicates whether the line rises from left to right, falls from left to right, is horizontal, or is vertical.



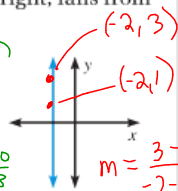
Positive slope
Rises from
left to right



Negative slope
Falls from
left to right



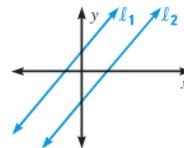
Zero slope
Horizontal



Undefined slope
Vertical

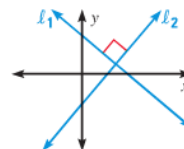
Parallel Lines - The lines are parallel if and only if they have the same slope.

$$m_1 = m_2$$



Perpendicular Lines - The lines are perpendicular if and only if their slopes are opposite reciprocals of each other.

$$m_1 = -\frac{1}{m_2}, \text{ or } m_1 m_2 = -1$$



$$\frac{2}{5} \neq -\frac{5}{2}$$

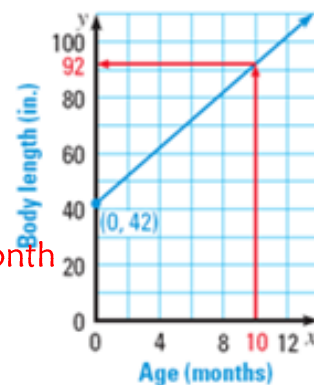
$$\frac{2}{5} \cdot -\frac{5}{2} = -\frac{10}{10} = -1$$

Meaning of Slope & y-intercept

The body length y (in inches) of a walrus calf can be modeled by $y = 5x + 42$ where x is the calf's age (in months).



- Graph the equation.
- Describe what the slope and y-intercept represent in this situation. $5 = \text{slope} = \text{grows 5 inches per month}$
 $42 = \text{y-int} = 42 \text{ inches at birth (when } x=0)$
- Use the graph to estimate the body length of a calf that is 10 months old.



About 92 in.

Suppose the equation was actually $y = 6x + 42$

Explain what the slope and y-intercept mean.
 $6 = \text{slope} = \text{grows 6 inches per month}$

$42 = \text{y-int} = 42 \text{ inches at birth (when } x=0)$

Suppose the equation was actually $y = 5x + 40$

$5 = \text{slope} = \text{grows 5 inches per month}$

Explain what the slope and y-intercept mean.

$40 = \text{y-int} = 40 \text{ inches at birth (when } x=0)$

The value y of a printer x years after it was purchased can be modeled by the equation $y = 4000 - 600x$.

Identify the y-intercept and slope and explain what they represent in this situation. $\text{slope} = -600 = \text{losing } \$600 \text{ in value every year}$

$\text{y-int} = 4000 = \text{it cost } \$4000 \text{ when new (} x=0 \text{ years)}$

Suppose the equation was $y = 2500 - 150x$. Identify the y-intercept and slope and explain what they represent in this situation. $\text{slope} = -150 = \text{losing } \$150 \text{ in value every year}$

$\text{y-int} = 2500 = \text{it cost } \$2500 \text{ when new (} x=0 \text{ years)}$