

NOTES

Section 7.25: Linear Modeling

slope = rate of change

650 ft ← dependent Δy
 mile ← independent Δx

1) A trail up a mountain gains elevation at a rate of 650 feet per mile.

2) What are the independent and dependent variables?

$x =$ independent variable: distance traveled in miles

$y =$ dependent variable: elevation in feet.

3) What's the rate of change?

$$\frac{650 \text{ ft}}{\text{mile}}$$

$$y = 650x$$

4) If you hike 4 miles up the mountain, what will be the change in elevation?

$$\underset{m}{650} (\underset{x}{4}) = \underset{y}{2600} \text{ ft}$$

5) If your change in elevation is 1500 feet, then how many miles have you hiked?

$$\underset{y}{1500} = \underset{m}{650} \underset{x}{x}$$

$$x = 2.3 \text{ miles.}$$

General Equation for a Linear Function

Dependent Variable = initial value + (rate of change x independent variable)

↑
of dependent variable

*Also known as $y = b + mx$

6) The cost of a cab ride is \$3.00 plus 2.25 per mile,

a) What are the independent and dependent variables?

$m =$ independent variable: # of miles (distance)

$C =$ dependent variable: cost of the cab ride

b) What's the rate of change?

$$\frac{\$2.25}{\text{mile}}$$

c) What's the value of the initial dependent variable? (y_0)

$$\$3.00$$

d) Write a linear equation for this function.

$$C = 3 + 2.25m$$

e) How much will it cost to take a cab to the airport which is 26 miles away?

$$C = 3 + 2.25(26)$$

$$3 + 58.5 = \$61.50$$

7) The height of an average 60 year old woman is 65 inches. After the age of 60, women lose an average of one inch in their height every 5 years.

a) What are the independent and dependent variables?

$n =$ # years after 60 $h \Rightarrow$ height in inches

b) What's the rate of change?

$$-\frac{1 \text{ in}}{5 \text{ yrs}} = -0.2 \text{ in/year}$$

c) What's the value of the initial dependent variable?

65 in

0.2

d) Write a linear equation for this function.

$$h = 65 - 0.2n$$

e) How many inches shorter will an average 76 year old woman be? 76 yrs old is 16 yrs after 60 yrs old.

$$h = 65 - 0.2(16) \\ = 61.8 \text{ in}$$

$$65 - 61.8 = \boxed{3.2 \text{ in shorter}}$$

8) A new car cost \$23,000. After 2 years the car is worth \$15,075.

a) What are the independent and dependent variables?

time in years

Cost

b) What's the rate of change?

$$-\frac{7925}{2}$$

$$23000 - 15075 = 7925$$

car depreciates \$3962.50/yr

c) What's the value of the initial dependent variable?

\$23000

d) Write a linear equation for this function.

$$C = 23000 - 3962.50t$$

e) How old is the car when it is worth \$8000?

$$8000 = 23000 - 3962.5t$$

$$\boxed{3.785 \text{ yrs} = t}$$