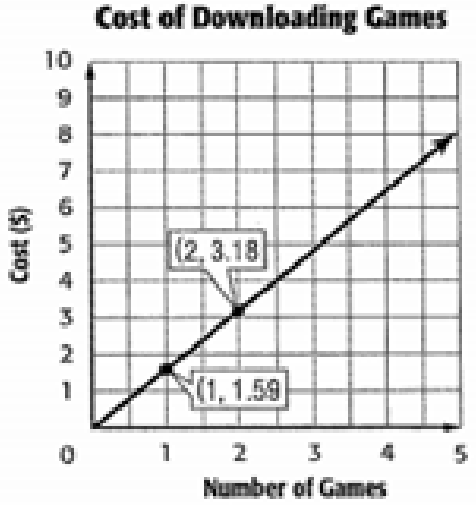
Get out homework and have it ready to check.

Classwork - Constructing Functions

1. Cassie is downloading music and games onto her phone. It costs \$0.99 to download a song to her phone. The costs of downloading games are shown in the graph. Compare the functions for each kind of download by comparing the costs.



Rate of Change of music = \$0.99/song

Rate of Change of games = \$1.59/game

Compare the rates: It costs more to download a game.

2. The number of gallons y a pool drains in x minutes is represented by the function $y = 20x$. The table shows the time it takes to fill up a pool. Compare the functions for each process by comparing the times.

Number of Minutes	Number of Gallons
1	15
2	30
3	45

Rate of Change for filling = 15 gal/min

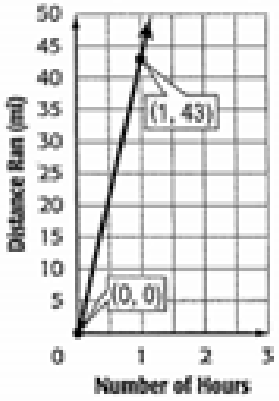
Rate of Change of draining = 20 gal/min

Compare the rates: The pool drains faster than it fills up.

3. The speeds of a coyote and giraffe are shown in the graph and table below.

a. Compare the functions by comparing the rates of change.

Land Speed of a Coyote



Land Speed of a Giraffe	
Number of Hours	**Distance Ran (mi)**
0.5	16
1	32
1.5	48

Rate of Change of Coyote = 43 mi/h

Rate of Change of Giraffe = 32 mi/h

Compare the rates:
The coyote runs faster than the giraffe.

b. How much farther does a coyote run than a giraffe after 3 hours?

Coyote → 43(3) = 129 miles Giraffe → 32(3) = 96 miles

129 − 96 = 33 miles

4. **COMMISSION** Joshua earns a salary plus a commission for every painting he sells. The equation $c = 40p + 75$, where c is the commission in dollars and p is the number of paintings, represents how much he earns. Martin's commissions are shown in the table. Compare the functions by comparing their y-intercepts and rates of change.

Joshua's

Rate of change = $40 per painting

y-intercept = $75

Number of Paintings Sold	1	2	3
Commission ($)	115	150	185

Martin's

Rate of change = $35 per painting

y-intercept = $80

Compare: Joshua makes more money per painting than Martin, but Martin has a higher salary (y-intercept).

Real-World Link

Parties Dylan is planning to have his birthday party at a skating rink. The rink charges a party fee plus an additional charge for each guest.

Number of Guests, x	Total Cost ($), y
1	53
2	56
3	59
4	62
5	65
6	68

0 → 50 (+3)

x: +1, +1, +1 (+3, +3, +3)

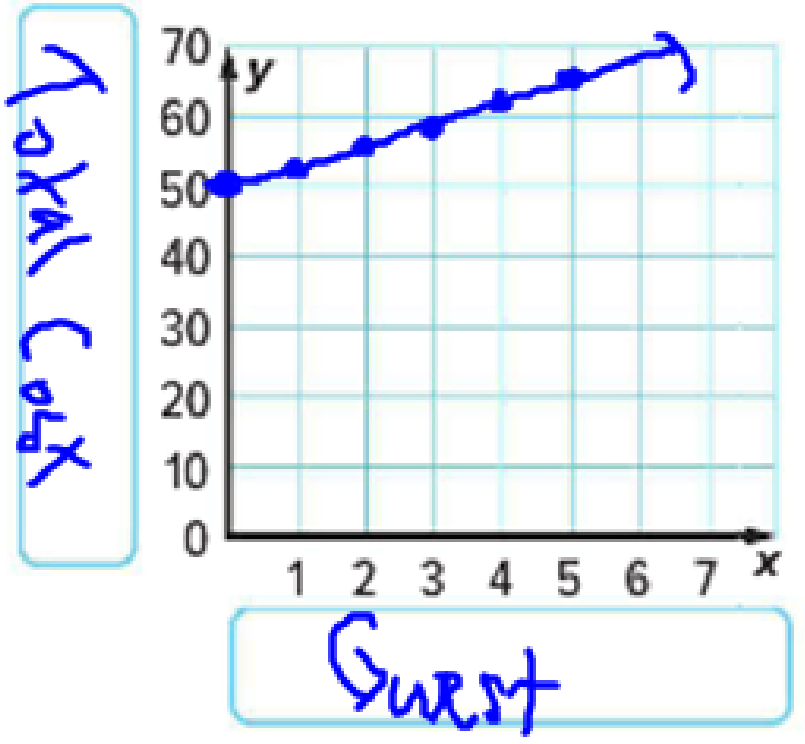
1. Choose two points from the table and find the rate of change.

$3 per guest

2. Write a function to represent this situation.

$y = 3x + 50$

3. Graph the ordered pairs. Then extend the line of the graph until it crosses the y-axis.



4. Use the function to find the amount the skating rink charges for the party fee.

$50 → y-int

p. 319

x y

(1, 53) m = 3

$53 = 3(1) + b$

$53 = 3 + b$

$-3 \quad -3$

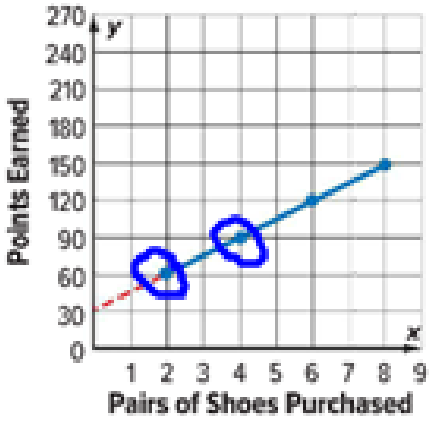
$50 = b$

Analyze Graphs, Words, and Tables

The *initial value of a function* is the corresponding *y*-value when *x* equals 0. You can find the initial value of a function from graphs, words, and tables.

Example

1. **A shoe store offers free points when you sign up for their rewards card. Then, for each pair of shoes purchased, you earn an additional number of points. The graph shows the total points earned for several pairs of shoes. Find and interpret the rate of change and initial value.**



To find the rate of change, choose two points from the graph.

$$\frac{\text{change in points}}{\text{change in pairs}} = \frac{(90 - 60)\text{ points}}{(4 - 2)\text{ pairs}}$$

$$= \frac{15\text{ points}}{1\text{ pair}}$$

The rate of change is 15, so the number of points earned per pair of shoes is 15.

Next find the initial value or the *y*-value when $x = 0$. Recall this value is called the *y*-intercept. Extend the line so it intersects the *y*-axis. The value for *y* when $x = 0$ is 30. So, the initial number of points earned is 30.

$y = mx + b$

$m = 15$

(x, y)

$(2, 60)$

$60 = 15(2) + b$

$60 = 30 + b$

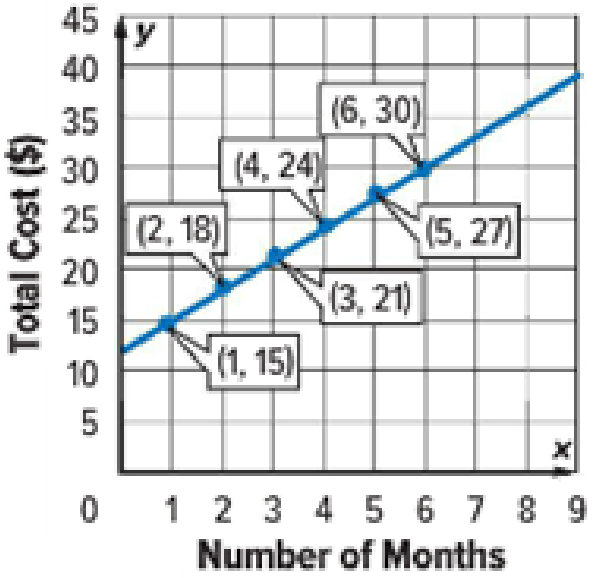
$-30 \quad -30$

$30 = b$

Got it? **Do this problem to find out.**

m → rate of change
b → initial value

a. Music Inc. charges a yearly subscription fee plus a monthly fee. The total cost for different numbers of months, including the yearly fee, is shown in the graph. Find and interpret the rate of change and initial value.



rate = $3/month

initial value = $12

$m = \frac{18-15}{2-1} = \frac{3}{1}$

$m = 3$ (1, 15)

$15 = 3(1) + b$

$15 = 3 + b$

$-3 \quad -3$

$12 = b$

Example

2. **Joan has some photos in her photo album. Each week she plans to add 12 photos. Joan had 120 photos after 8 weeks. Assume the relationship is linear. Find and interpret the rate of change and initial value.**

Since each week Joan adds 12 photos to her photo album the rate of change is 12. To find the initial value, use slope-intercept form to find the *y*-intercept.

$y = mx + b$	Slope-intercept form
$y = 12x + b$	Replace m with the rate of change, 12.
$120 = 12(8) + b$	Replace y with 120 and x with 8
$24 = b$	Solve for b.

The *y*-intercept is 24. So, the initial number of photos is 24.

$m = 12$ $(8, 120)$ (x, y)

Got it? **Do this problem to find out.**

Function: $y = 2x + 3$

b. A zoo charges a rental fee plus \$2 per hour for strollers. The total cost of 5 hours is \$13. Assume the relationship is linear. Find and interpret the rate of change and initial value.

rate = \$2/hour

initial value = \$3

$m = 2$ $(5, 13)$

$13 = 2(5) + b$

$13 = 10 + b$

$-10 \quad -10$

$b = 3$

Example

3. **The table shows how much money Ava has saved. Assume the relationship between the two quantities is linear. Find and interpret the rate of change and initial value.**

Number of Months, x	Money Saved ($), y
3	110
4	130
5	150
6	170

+1 +20

Choose any two points from the table to find the rate of change. The rate of change is $\frac{150 - 110}{5 - 3}$ or 20, so Ava saves $20 each month. To find the initial value, use the slope-intercept form to find the y-intercept.

$y = mx + b$	Slope-intercept form
$y = 20x + b$	Replace m with the rate of change, 20.
$110 = 20(3) + b$	Use the point (3, 110). $x = 3, y = 110$
$50 = b$	Solve for b.

The y-intercept is 50, so Ava had initially saved $50.

Got it? Do this problem to find out.

c. The table shows the monthly cost of sending text messages. Assume the relationship between the two quantities is linear. Find and interpret the rate of change and intial value.

Number of Messages, x	Cost ($), y
5	10.50
6	10.60
7	10.70

+1 +0.10
+1 +0.10

Rate = $0.10/message

Initial Value = $10

Function: $y = 0.10x + 10$

$m = 0.10$ $(5, 10.50)$

$10.50 = 0.10(5) + b$

$10.50 = 0.5 + b$

$-0.5 \quad -0.5$

$10 = b$