

EXERCISES

For more practice, see *Extra Practice*.

Practice and Problem Solving

A Practice by Example

Example 1
(page 241)

Find the domain and range of each relation.

- $\{(4, 6), (6, 7), (4, 3), (5, 19), (5, 7)\}$
- $\{(-3, 5), (-2, 8), (0, 7), (4, 22), (0, 5)\}$
- $\{(2, -3), (-2, 3), (2, 3), (-2, -3), (3, -2)\}$
- $\{(1, 0), (1, 5), (1, -7), (1, 6.1), (1, 10)\}$
- $\{(1.2, 4), (-3.1, -5.2), (8.4, 0), (-3.1, 0)\}$
- $\{(\frac{1}{2}, -1), (-\frac{2}{3}, -1), (4, \frac{3}{5}), (5, 0)\}$

Example 2
(page 242)

Use the vertical-line test to determine whether each relation is a function.

- $\{(2, 5), (3, -5), (4, 5), (5, -5)\}$
- $\{(5, 0), (0, 5), (5, 1), (1, 5)\}$
- $\{(3, -1), (-2, 3), (-1, -5), (3, 2)\}$
- $\{(-2, 9), (3, 9), (-0.5, 9), (4, 9)\}$

Example 3
(page 242)

Use a mapping diagram to determine whether each relation is a function.

- $\{(3, 7), (3, 8), (3, -2), (3, 4), (3, 1)\}$
- $\{(6, -7), (5, -8), (1, 4), (5, 5)\}$
- $\{(0.04, 0.2), (0.2, 1), (1, 5), (5, 25)\}$
- $\{(4, 2), (1, 1), (0, 0), (1, -1), (4, -2)\}$

Example 4
(page 243)

Evaluate each function rule for $x = -3$.

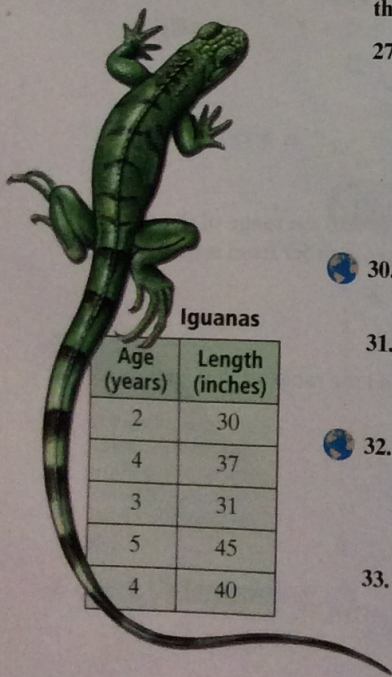
- $y = x + 7$
- $y = 11x - 1$
- $f(x) = x^2$
- $f(x) = -4x$
- $f(x) = 15 - x$
- $y = 3x + 2$
- $y = \frac{1}{4}x$
- $f(x) = -x + 2$

Example 5
(page 243)

Find the range of the function rule $y = 5x - 2$ for each domain.

- $\{0.5, 11\}$
- $\{-1.2, 0, 4\}$
- $\{-5, -1, 0, 2, 10\}$
- $\{-\frac{1}{2}, \frac{1}{4}, \frac{2}{5}\}$

B Apply Your Skills



Iguanas

Age (years)	Length (inches)
2	30
4	37
3	31
5	45
4	40

Determine whether each relation is a function. If the relation is a function, state the domain and range.

27.

x	y
1	-3
6	-2
9	-1
1	3

28.

x	y
0	2
3	1
3	-1
5	3

29.

x	y
-4	-4
-1	-4
0	-4
3	-4

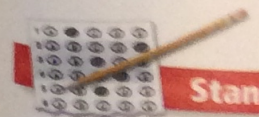
- Iguanas** Use the data in the table at the left. Is an iguana's length a function of its age? Explain.
- Error Analysis** A student thinks that the relation $\{(2, 1), (3, -2), (4, 5), (5, -2)\}$ is not a function because two values in the domain have the same range value. What is the student's error?
- a. Profit** A store bought a case of disposable cameras for \$300. The store's profit p on the cameras is a function of the number c of cameras sold. Find the range of the function $p = 6c - 300$ when the domain is $\{0, 15, 50, 62\}$.
b. Critical Thinking In this situation, what do the domain and range represent?
- Open-Ended** Create a data table for a relation that is *not* a function. Describe what your data might represent.



Real-World Connect

A telecommunications device for the deaf (TDD) includes a keyboard and a visual display of the conversation. This is used by a hearing-impaired person to use a telephone.

C Challenge

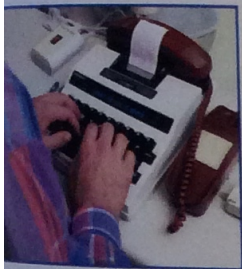
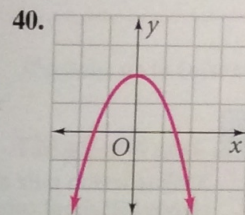
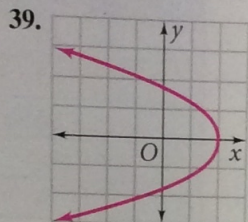
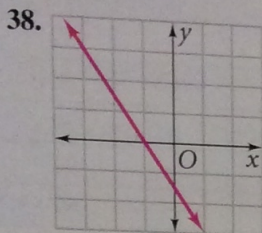


Gridded Response

Find the range of each function for the domain $\{-1, 0.5, 3.7\}$.

34. $f(x) = 4x + 1$ 35. $g(x) = -4x + 1$ 36. $y = |x| - 1$ 37. $s(t) = t^2 - 1$

Use the vertical-line test to determine whether each graph is the graph of a function.



Real-World Connection

Telecommunications device for the deaf (TDD) includes a keyboard and a visual display of the conversation. This lets a hearing-impaired person use a telephone.

41. **Telephone Bill** The cost of a long-distance telephone call c is a function of the time spent talking t in minutes. The rule $c(t) = 0.09t$ describes the function for one service provider. At the right, a student has calculated how much a 2-hour phone call would cost.

$c = 0.09 \times 2$
 $= 0.18$
 \$.18 for 2 hours

- a. **Writing** Why does the student's answer seem unreasonable?
 b. **Error Analysis** What mistake(s) did the student make?
 c. How much would it cost to make a 2-hour phone call?
 d. **Critical Thinking** What set of numbers is reasonable for the domain values? For the range values?

42. **Physics** Light travels about 186,000 miles per second. The rule $d = 186,000t$ describes the relationship between distance d in miles and time t in seconds.
 a. How far does light travel in 20 seconds?
 b. How far does light travel in 1 minute?

Challenge

Use the functions $f(x) = 2x$ and $g(x) = x^2 + 1$ to find the value of each expression.

43. $f(3) + g(4)$ 44. $g(3) + f(4)$ 45. $f(5) - 2g(1)$ 46. $f(g(3))$

47. **Critical Thinking** Can the graph of a function be a horizontal line? A vertical line? Explain why or why not.
 48. The function $y = [x]$ is called the *greatest-integer function*. $[x]$ is the greatest integer less than or equal to x . For example, $[2.99] = 2$ and $[-2.3] = -3$.
 a. Evaluate the function for 0.5, -0.1, -1.99, and -5.2.
 b. The domain of $y = [x]$ is all real numbers. What is the range of $y = [x]$?



Standardized Test Prep

Gridded Response

49. Evaluate the function rule $f(x) = 7x$ for $x = 0.75$.
 50. Evaluate the function rule $f(x) = 9 - 0.2x$ for $x = 1.5$.
 51. What is the greatest value in the range of $y = x^2 - 7$ for the domain $\{-2, 0, 1\}$?