SOLUTION

a) The volume of gas remaining in a vehicle's tank is a function of the distance travelled. In function notation:
$V(d) = -0.08d + 50$

b) To determine $V(600)$, use:

$V(d) = -0.08d + 50$ Substitute: $d = 600$
$V(600) = -0.08(600) + 50$
$V(600) = -48 + 50$
$V(600) = 2$

$V(600)$ is the value of V when $d = 600$.
This means that when the car has travelled 600 km, the volume of gas remaining in the vehicle's tank is 2 L.

c) To determine the value of d when $V(d) = 26$, use:

$V(d) = -0.08d + 50$ Substitute: $V(d) = 26$
$26 = -0.08d + 50$ Solve for d.
$-24 = -0.08d$ Divide each side by -0.08.
$d = 300$

$V(300) = 26$ means that when $d = 300$, $V = 26$; that is, after the car has travelled 300 km, 26 L of gas remains in the vehicle's tank.

b) Determine the value of $C(100)$. What does this number represent?

c) Determine the value of n when $C(n) = 5000$. What does this number represent?

[Answers: a) $C(n) = 25n + 1000$ b) \$3500 c) 160]

What values of d do not make sense as possible domain values?

Discuss the Ideas

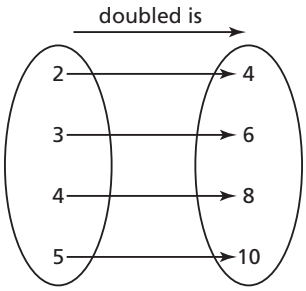
1. How can you tell whether a set of ordered pairs represents a function?
2. When a function is completely represented using a set of ordered pairs or a table of values, how can you determine the domain and range of the function?
3. Why are some relations not functions? Why are all functions also relations?

Exercises

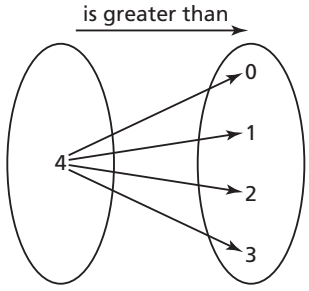
A

4. Which arrow diagrams represent functions?

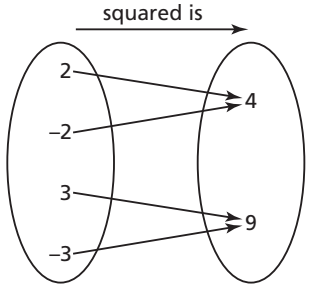
a)



b)



c)



5. Which sets of ordered pairs represent functions? Identify the domain and range of each set of ordered pairs.

a) $\{(1, 3), (2, 6), (3, 9), (4, 12)\}$

b) $\{(1, 0), (0, 1), (-1, 0), (0, -1)\}$

c) $\{(2, 3), (4, 5), (6, 7), (8, 9)\}$

d) $\{(0, 1), (0, 2), (1, 2), (0, 3), (1, 3), (2, 3)\}$

6. Write in function notation.

a) $C = 20n + 8$

b) $P = n - 3$

c) $t = 5d$

d) $y = -x$

7. Write as an equation in two variables.

a) $d(t) = 3t - 5$

b) $f(x) = -6x + 4$

c) $C(n) = 5n$

d) $P(n) = 2n - 7$

B

8. For each relation below:

- Determine whether the relation is a function. Justify your answer.
- Identify the domain and range of each relation.

a) $\{(1, 1), (2, 8), (3, 27), (4, 64)\}$

b) $\{(3, 4), (3, 5), (3, 6), (3, 7)\}$

9. For each table of values below:

i) Explain why the relation is a function.

ii) Identify the independent variable and the dependent variable. Justify your choices.

iii) Write the domain and range.

a)

Number of Cans of Juice Purchased, n	Cost, C ($)
1	2.39
2	4.00
3	6.39
4	8.00
5	10.39
6	12.00

b)

Altitude, A (m)	Temperature, T (°C)
610	15.0
1220	11.1
1830	7.1
2440	3.1
3050	−0.8
3660	−4.8

10. This set of ordered pairs associates a number with a polygon that has that number of sides:
{(3, isosceles triangle), (3, equilateral triangle), (3, right triangle), (3, scalene triangle), (4, square), (4, rectangle), (4, rhombus), (4, trapezoid), (4, parallelogram), (5, pentagon), (6, hexagon)}

a) Does the set of ordered pairs represent a function? Explain.

b) Suppose the elements in the ordered pairs were reversed. Use the association "has this number of sides." Would the new relation be a function? Explain.

c) Identify the domain and range of each relation in parts a and b.

11. The Rassemblement jeunesse francophone in Alberta brings together French language high school students from all over the province for a day of activities. Use two columns in this table to represent a relation.

a) Name two relations that are functions.

b) Name two relations that are not functions.

Justify your answers.

Name	From	Age	Gender
Marie	Edmonton	13	F
Gabriel	Falher	16	M
Élise	Bonnyville	14	F
Christophe	Calgary	13	M
Jean	Edmonton	15	M
Mélanie	Edmonton	15	F
Nicole	Red Deer	17	F
Marc	Légal	13	M

12. Which statement is true? Give an example to justify your choice.

a) All functions are relations, but not all relations are functions.

b) All relations are functions, but not all functions are relations.

13. In a crossword game, each letter is worth a certain number of points. Here are some letters and their points.

a) Create two different tables to represent relations that associate these letters and their points.

b) Which table in part a represents a function? Justify your choice.

14. For the function $f(x) = -5x + 11$, determine:

a) $f(1)$ **b)** $f(-3)$

c) $f(0)$ **d)** $f(1.2)$

15. **a)** For the function $f(n) = 2n - 7$, determine n when:

i) $f(n) = 11$ **ii)** $f(n) = -6$

b) For the function $g(x) = -5x + 1$, determine x when:

i) $g(x) = 41$ **ii)** $g(x) = -16$

16. The function $C(i) = 2.54i$ converts a measurement of i inches to a measurement of C centimetres.

a) Write the function as an equation in 2 variables.

b) Determine the value of $C(12)$. What does this number represent?

c) Determine the value of i when $C(i) = 100$. What does this number represent?

17. A car is travelling toward Meadow Lake Park, Saskatchewan. The equation $D = -80t + 300$ represents the distance, D kilometres, to Meadow Lake after t hours of driving.

a) Describe the function.
Write this equation in function notation.

b) How far away from Meadow Lake Park was the car at the start of its journey?
How do you know?

18. Anthropologists who study human remains have developed equations for estimating the height of a person from a measure of her or his bones. The height in centimetres is a function of the length, l centimetres, of the humerus (the upper arm bone).

For a female: $f(l) = 2.754l + 71.475$
For a male: $m(l) = 2.894l + 70.641$

a) Determine each value. What does each number represent?

i) $f(15)$ **ii)** $m(20)$

b) Determine each value of l. What does each number represent?

i) $f(l) = 142$ **ii)** $m(l) = 194$

c) Measure the length of your humerus. Use an equation to estimate your height. How close was your answer to your actual height?

19. The function $C(f) = \frac{5}{9}(f - 32)$ converts a temperature, f degrees Fahrenheit, to C degrees Celsius.

a) Determine:

i) $C(50)$ **ii)** $C(-13)$

b) Determine each value of f when:

i) $C(f) = 20$ **ii)** $C(f) = -35$

c) Write an equation in function notation to relate the temperatures in each fact.

i) Pure water freezes at 0°C or 32°F.

ii) Pure water boils at 100°C or 212°F.

iii) Cookies are baked at 180°C or 356°F.