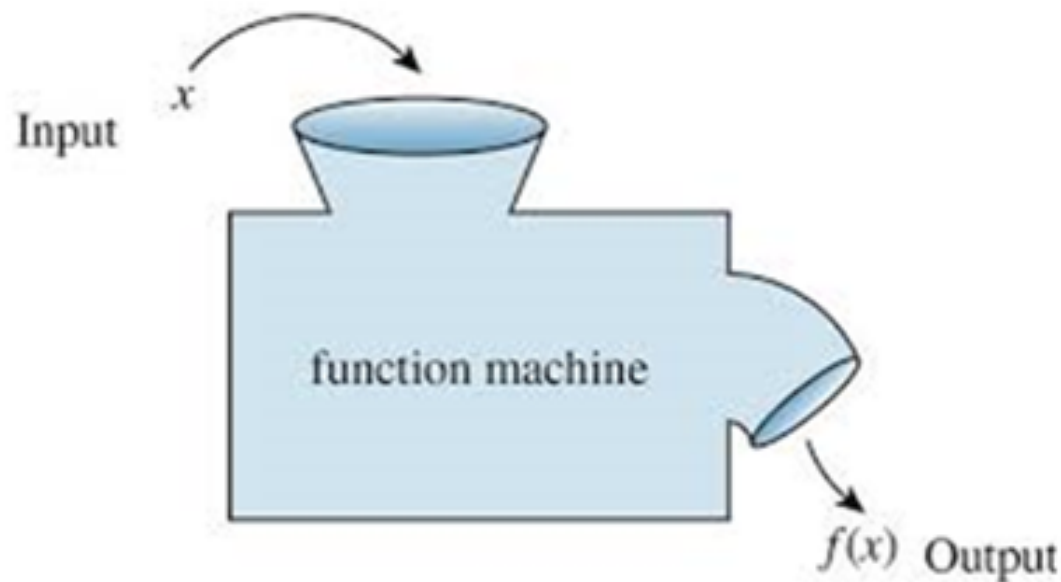


5.2 Properties of Functions

Lesson Focus

Develop the concept of a function

Function Machine!



Domain – first set of elements

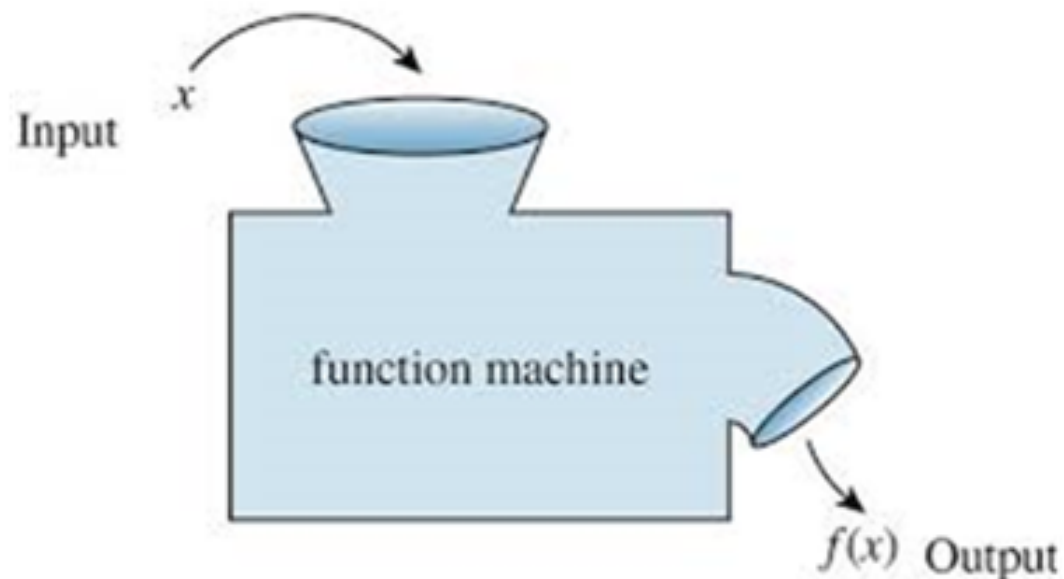
What goes into the machine (input)

Range – second set of elements

What comes out of the machine (output)

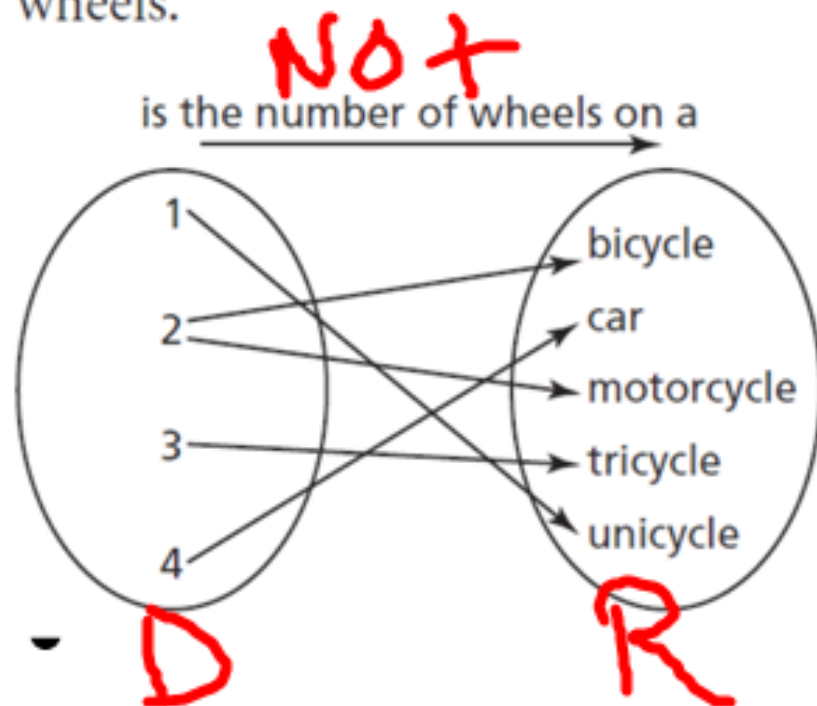
Function

Function – is a special type of **relation** where each element in the domain is associated with exactly one element in the range

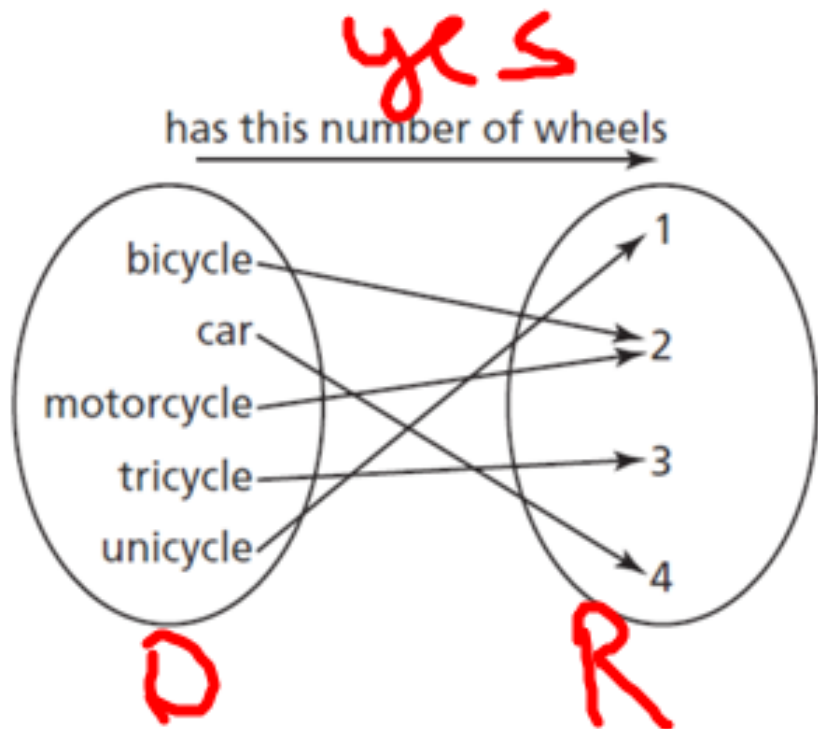


Example

This relation associates a number with a vehicle with that number of wheels.



This relation associates a vehicle with the number of wheels it has.



*Which of these relations represents a **function**?*

Example 1

For each relation:

Determine whether the relation is a function. Justify the answer.

Identify the domain and range of each relation that is a function.

A relation that associates given shapes with the number of right angles in the shape: $\{(\text{right triangle}, 1), (\text{acute triangle}, 0), (\text{square}, 4), (\text{rectangle}, 4), (\text{regular hexagon}, 0)\}$

D: { right Δ , acute Δ , square
rectangle, regular hexagon }

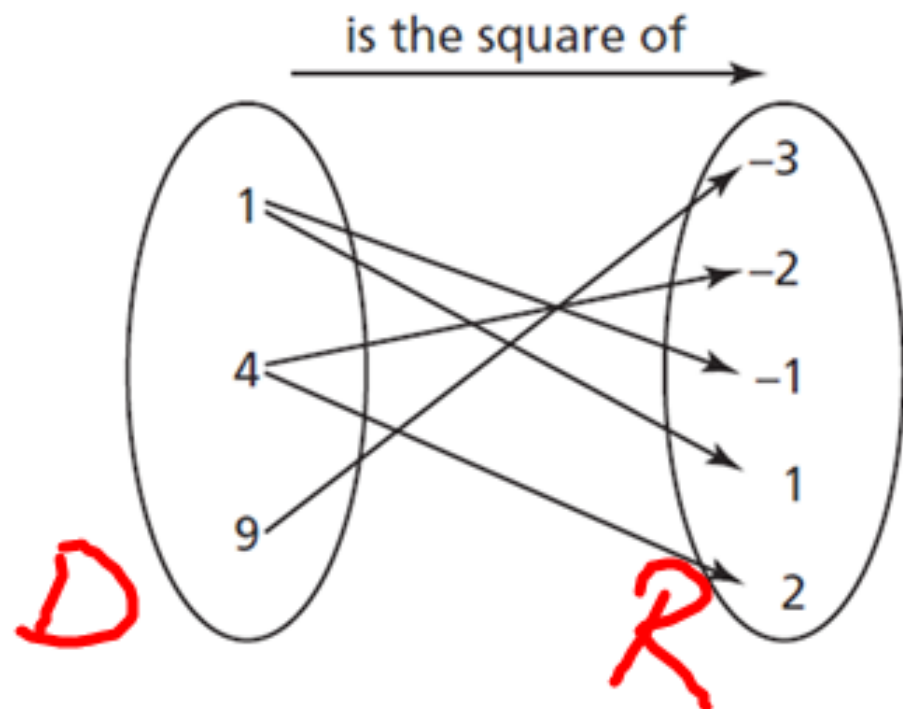
R: { 0, 1, 4 }

Example 2

For each relation:

Determine whether the relation is a function. Justify the answer.

Identify the domain and range of each relation that is a function.



Example – Your Turn

For each relation:

Determine whether the relation is a function. Justify the answer.

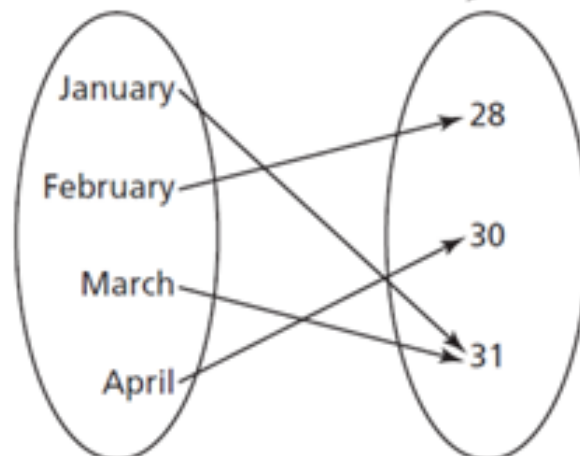
Identify the domain and range of each relation that is a function.

- a) A relation that associates a number with a prime factor of the number:

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

NO

- b) has this number of days



Yes

Homework

P. 270-273

2, 3, 4, 5, 8, 13

Dependent vs. Independent

- Often when you have a job, you get paid for the hours worked
- The amount of money earned **depends** on how many hours worked
- The money earned represents the **dependent variable**
- The hours worked represents the **independent variable**

• **Dependent variable (output)**

- a variable whose value is determined by the value of another variable

• **Independent variable (input)**

- a variable whose value is not determined by the value of another
- the value of this variable determines the value of another

Example

• Assume Jonny makes \$12.00 per hour. Create an equation for Jonny's pay for a week of work (define your variables)

$$P = 12h$$

equation

$$P(5) = 12(5) \\ = 60$$

<u>Hours Worked, h</u>	<u>Gross Pay, P</u> (\$)
1	12
2	24
3	36
4	48
5	60

Function
Notation

$$P(h) = 12h$$

$$y = 3x + 7$$

$$f(x) = 3x + 7$$

$$F(x) = \sin(3x^2 + e^x)$$

Example

$$C(n) = 1.75n$$

What equation does this table represent?

$$C = 1.75n$$

The table shows the costs of student bus tickets, C dollars, for different numbers of tickets, n .

Number of Tickets, n	Cost, C (\$)
1	1.75
2	3.50
3	5.25
4	7.00
5	8.75

Identify the independent variable

tickets

Identify the dependent variable

Cost

Why is this relation also a function?

yes # tickets don't repeat

Write the domain and the range.

$$D: \{1, 2, 3, 4, 5\}$$

$$R: \{1.75, 3.50, 5.25, 7.00, 8.75\}$$

Example – Your Turn

What equation does this table represent?

Number of Marbles, n	Mass of Marbles, m (g)
1	1.27
2	2.54
3	3.81
4	5.08
5	6.35
6	7.62

$$m = 1.27n$$

Identify the independent variable

marbles

Identify the dependent variable

Mass

Why is this relation also a function?

marbles do not repeat

Write the domain and the range.

D

R

Function Notation

- **Function Notation** – notation used to show the independent variable in a function
 - *A different way to write an equation*
- *Example: Jonny makes \$12.00 per hour*

$$P = 12(h)$$

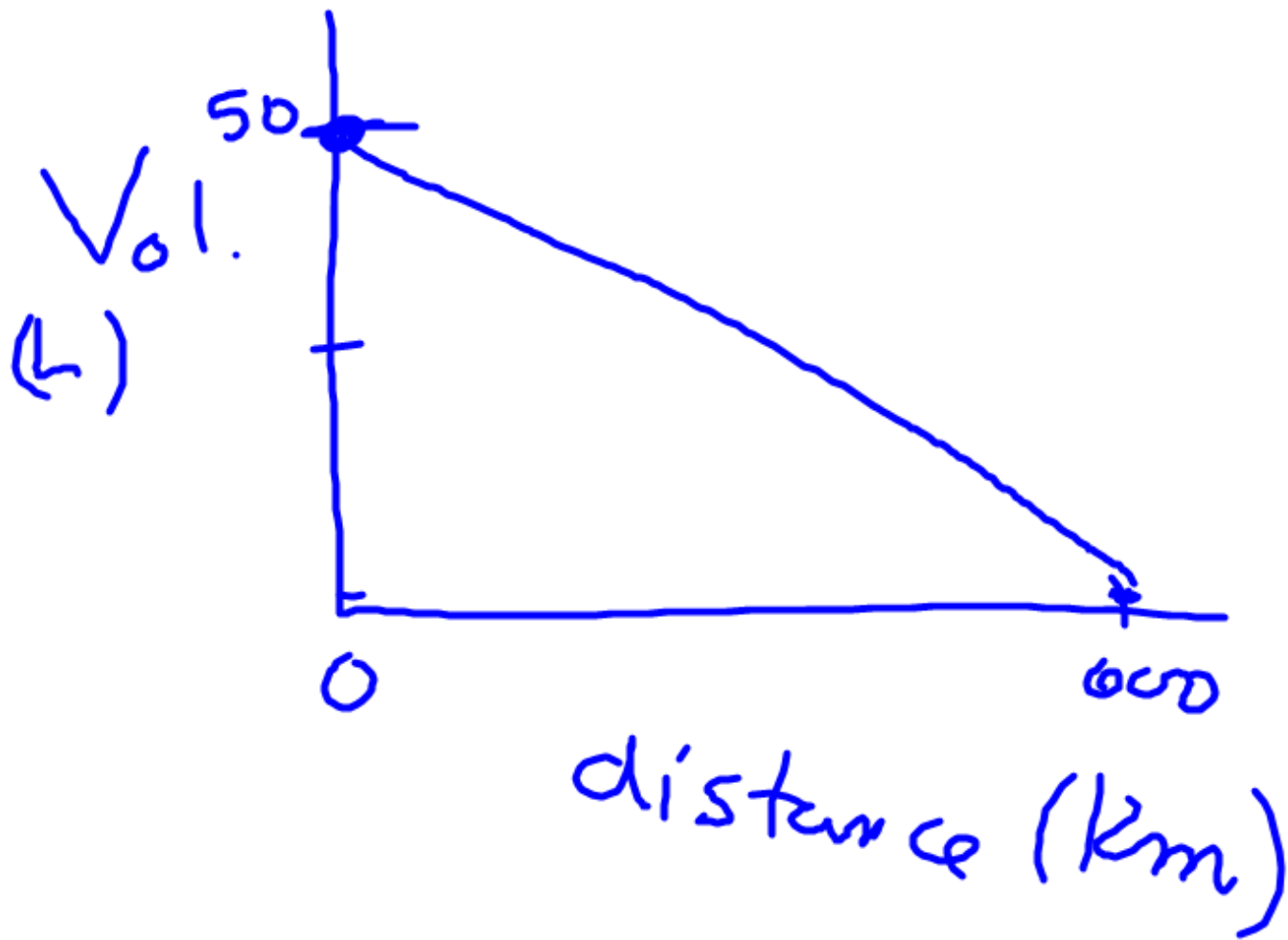
$$P(h) = 12(h)$$

Example

The equation $V = -0.08d + 50$ represents the volume, V litres, of gas remaining in a vehicle's tank after travelling d kilometres. The gas tank is not refilled until it is empty.

- a) Describe the function. $V(d) = -0.08d + 50$
Write the equation in function notation.
- b) Determine the value of $V(600)$. $= -0.08(600) + 50$
What does this number represent? $= -48 + 50 = 2$
- c) Determine the value of d when $V(d) = 26$.
What does this number represent?

$$V(600) = 2$$



$$b) \quad 26 = -0.08d + 50$$

$$\frac{-24}{-0.08} = \frac{\cancel{-0.08}d}{\cancel{-0.08}}$$

$$300 \text{ km} = d$$

Example – Your Turn

$$(100, 3500)$$

The equation $C = 25n + 1000$ represents the cost, C dollars, for a feast following an Arctic sports competition, where n is the number of people attending.

$$a) C(n) = 25n + 1000$$

$$b) C(100) = 25(100) + 1000 \\ = 3500$$

$$C(100) = 3500$$

- Describe the function. Write the equation in function notation.
- Determine the value of $C(100)$. What does this number represent?
- Determine the value of n when $C(n) = 5000$. What does this number represent?

$$C(7) = 35$$

$$(7, 35)$$

$$C(\text{tree}) = \text{pumpkin}$$

$$(\text{tree}, \text{pumpkin})$$

$$c) 5000 = 25n + 1000$$

$$4000 = 25n$$

$$160 = n$$

160 people attending

Homework

P. 270-273

2, 3, 4, 5, 8, 13

6, 9, 14, 15, 17, 18, 20, 23

Handout