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CHAPTER 1 Identifying Functions

A function is often described by a rule that tells you how to assign each input its output value.

EXAMPLE 1 Identify and use a description of a function

When new students arrive for school orientation, they must get into a line to register and pick up their orientation packets. Each student is assigned a line according to the first letter of his or her last name as shown in the table at the right. Is the process of assigning each student to a line a function? To which lines will new students named Tom Carville and Leslie Yarborough be assigned?

Line Assignment by First Letter of Last Name

Letter	Line
A–F	1
G–L	2
M–S	3
T–Z	4

Solution:

In this situation, the domain is the set of new students and the range is the set of lines. The table describes a rule for assigning each new student to a line. The rule describes a function if each new student is assigned to exactly one line. Since every letter is represented in the table and no letter is assigned to more than one line, each new student will be assigned to exactly one line. This process is a function.

Since the first letter in Tom Carville's name is C, he will be assigned to Line 1. Since the first letter in Leslie Yarborough's last name is Y, she will be assigned to Line 4. ■

KEY CONCEPT

Conditions for a Rule to Describe a Function

In order for a rule to describe a function, all of the following must be true:

- There must be a clearly defined domain (set of inputs).
- There must be a clearly defined range (set of outputs).
- The rule must clearly state how to assign an output to each input.
- The rule must assign only one output to each input.

Notice that the rule in Example 1 satisfies all four conditions stated in the Key Concept. Let's look at some rules that do not satisfy the conditions.

EXAMPLE 2 Identify a rule that does not describe a function

The legislature has decided that all families with children under 18 years old should receive a tax credit. Families with one child will receive a $500 credit, families with two children will receive a $900 tax credit, and families with three children will receive a $1200 tax credit. Does this rule for assigning tax credits define a function? Explain.

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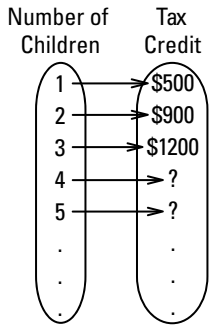
CHAPTER 1

Identifying Functions *continued*

Solution:

The domain is clearly stated in the first sentence as the set of all families with children under 18 years old. However, the rule only assigns a tax credit to families with one, two, or three children. It is not clear what tax credit a family with four or more children would receive. This rule does not fully describe a function. ■



EXAMPLE 3 Identify a rule that does not describe a function

Mrs. Jenkins is using the following rule to assign research topics to the students in her class.

- If your first name begins with A–M, write a paper on photosynthesis.
- If your first name begins with N–Z, write a paper on paleontology.
- If you have blue eyes, write a paper on ontology.

Does this rule for assigning research topics describe a function? Explain.

Solution:

The domain is clearly stated as the set of students in Mrs. Jenkins's class. However, this rule is not a function because students with blue eyes will be assigned more than one topic. For example, if Ken is a student in the class and he has blue eyes, then according to the rule he is assigned two topics, photosynthesis and ontology. ■

Practice

Identify the domain and the range of each rule.

1. Mr. Brown is giving cash bonuses to his employees. Employees who have worked for him five years or less will receive $1000. Employees who have worked for him more than five years will receive $2000.
2. Candace is giving gifts to her friends. She is giving each male friend a video game and each female friend a CD.
3. The students at Woodruff High School are being assigned locations for their class meetings. All freshmen will go to the gymnasium, sophomores will go to the auditorium, juniors will go to the cafeteria, and seniors will go to the football field.
4. Mrs. Childress is assigning research topics to the students in her art classes. Students who have chosen to paint a portrait as their final project will research van Gogh. Students who have chosen to make a sculpture as their final project will research Rodin.

Problem Solving

5. When customers arrive at a buffet restaurant, they must pay for their meals as they enter. The price that a customer pays is determined by age as shown in the table at the right. Does this rule of assigning a price by age represent a function? Explain. If Jared is 16 years old, how much will he pay for his meal?

Price of Buffet

Age	Price
12 or under	$6.95
13–64	$12.95
65 or over	$8.95

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CHAPTER 1

Identifying Functions *continued*

6. Mrs. Dietrich assigns each of the 20 students in her class to one of four groups for their laboratory experiment. The groups are named A, B, C, and D. She writes the letter A on five slips of paper, the letter B on five slips of paper, and so on. As the students enter the classroom, each one draws a slip of paper from a box. The student is assigned to the group designated by the letter on his or her slip of paper. Does this rule of assigning students to lab groups describe a function? Explain.

7. Patients who require a certain medication are prescribed dosages according to several factors as shown in the table at the right. Does this rule of assigning dosages to patients describe a function? Explain.

Dosage of a Medication

Factor	Dosage
Under age 40	200 mg
Age 40 or older	300 mg
Over 150 pounds	400 mg

8. A congressman proposed a new tax plan where each individual taxpayer's deadline for filing an annual tax return will be his or her birthday. Does this rule for assigning a deadline to each taxpayer describe a function? Explain.

9. An auto insurance company has decided to give all of its customers a rebate. Each customer who drove no more than 5,000 miles in the past year will receive a $200 rebate, and each customer who drove more than 5,000 miles but no more than 10,000 miles will receive a $150 rebate. Does this rule for assigning a rebate to each customer describe a function? Explain.

10. Coach Johnson is using the following rule to divide the football team into four groups.

- If a player was born in January, February, or March, then the player belongs to Group 1.
- If a player was born in April, May, or June, then the player belongs to Group 2.
- If a player was born in July, August, or September, then the player belongs to Group 3.
- If a player was born in October, November, or December, then the player belongs to Group 4.

Does this rule for assigning each football player to a group describe a function? Explain.