Discrete Quantitative Variables

**Goal**
Understand the use of discrete quantitative variables.

**Learn about the Math**

Variables that can be measured in terms of numbers, such as height, mass, and shoe size, are called **quantitative variables**.

A quantitative variable with possible values of only specific points on a scale is called a **discrete variable**. For example, a family might have 3 children or 4 children, but could not have 3.534 children. Only discrete points on a scale are possible values for a variable representing the number of children in a household; therefore, it would be a discrete variable.

Rodrigo’s favourite sport is hockey. He is writing a report on his five favourite goalies. Rodrigo created a chart containing the following information about these five goalies: goalie’s name, team city, team name, number of wins, number of shutouts, goals against average, and save percentage.

**Question:** How can Rodrigo determine if the variables in his list are qualitative or quantitative?

**Example 1: Determining if a variable is qualitative or quantitative**

Is each of the variables in Rodrigo’s list qualitative or quantitative?

**Rebecca’s Solution**

To determine if a variable is qualitative or quantitative, I need to refer to the definitions for these two terms. A qualitative variable is a variable that expresses a qualitative attribute, and the values do not have a numerical meaning or order. A quantitative variable is a variable that is measured in terms of numbers.
Next, I will examine Rodrigo’s list and determine which variables have a numerical meaning or order. I can determine that number of wins, number of shutouts, goals against average, and save percentage are all measured in terms of numbers. These variables are quantitative.

Goalie’s name, team city, and team name are not measured in terms of numbers; therefore, these variables are qualitative.

<table>
<thead>
<tr>
<th>Qualitative Variables</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td>goalie’s name</td>
<td>number of wins</td>
</tr>
<tr>
<td>team city</td>
<td>number of shutouts</td>
</tr>
<tr>
<td>team name</td>
<td>goals against average</td>
</tr>
<tr>
<td></td>
<td>save percentage</td>
</tr>
</tbody>
</table>

Reflecting

1. What are the differences between a qualitative variable and a quantitative variable?

2. Give two examples of discrete quantitative variables.

Work with the Math

Example 2: Identifying discrete quantitative variables

Tom gathered the following information about the sprinters in a recent school track meet: name, age, grade, height, number of events, time in the 100 m race, and time in the 200 m race. Which variables are quantitative variables? Of the quantitative variables, which variables are discrete?
Isabella’s Solution

Using the definition of a quantitative variable, I can determine that age, grade, height, number of events, time in the 100 m race, and time in the 200 m race are all quantitative variables. Name is the only variable that is qualitative rather than quantitative, because it is not measured in terms of numbers.

To determine which of these quantitative variables is a discrete variable, I will refer to the definition of a discrete variable. A discrete variable is a variable with possible values of only discrete points on the scale. Grade and number of events are discrete variables, because all possible values are distinct points on a scale. For example, the number of events can be counted as 1, 2, 3, … . Values between points for these numbers do not have meaning.

Age, height, and time in the 100 m or 200 m race are not discrete, because any value between distinct points on a scale has meaning. For example, any length of time is possible, not just distinct points on a scale.

A Checking

3. John is taking a survey to determine how well students enjoyed their field trip. His questionnaire listed several aspects of the field trip, and he asked the students to rate each statement, using the following scale:

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>really liked</td>
</tr>
<tr>
<td>2</td>
<td>liked</td>
</tr>
<tr>
<td>3</td>
<td>neither liked nor disliked</td>
</tr>
<tr>
<td>4</td>
<td>disliked</td>
</tr>
<tr>
<td>5</td>
<td>really disliked</td>
</tr>
</tbody>
</table>

Would the values on this rating scale be discrete variables?

B Practising

4. A local greenhouse is creating an inventory of all of their flowers and plants. The list includes: type of flower, colour, greenhouse location, and number in stock. Of these variables, which variable is a discrete quantitative variable?
5. Kyle and Samantha are considering buying a new automobile. They narrowed their search to five different vehicles. To help them make a decision, Kyle created a table listing the following information about each automobile on their list: type, manufacturing company, model name, cost, kilometres per litre, and available options. From his list, which categories would contain qualitative data, and which would contain quantitative data?

6. Fill in each blank with a word that will make the statement true.
   a) A ______ variable is a variable whose values do not have numerical meaning.
   b) ______ variables are variables measured in terms of numbers.
   c) A ______ variable is a variable with possible values of only specific points on a scale.

7. Answer each question true or false.
   a) Shoe size is a discrete variable.
   b) Time to run a marathon is a qualitative variable.
   c) Goals scored per game is a quantitative variable.
   d) The amount of flour used in a cookie recipe is a qualitative variable.
   e) Temperature is a discrete variable.

8. Qi is making a chart of the 10 best Little League baseball players in his area. The chart includes each player’s name, team, age, and number of times at bat. List the quantitative variables, and then identify those which are discrete quantitative variables.

9. For each of the following, state if the variable is qualitative or quantitative.
   a) country’s population
   b) salary
   c) temperature
   d) gender
   e) name
   f) air pollution index
   g) hair colour
   h) science test score

10. Determine your own list of three quantitative variables. Select one of those variables and create a list of at least 10 possible data values. Once the data values are created, make a frequency table to summarize this data. Then create a bar graph to display the data from your frequency table.