Frequency Tables and Histograms

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10.10 Frequency Tables and Histograms

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[Figure 1]

The coach of the Markwell Cougars track team wants to compare the heights of his team to that of their rivals, the Sampson Hawks. He was wondering if there is a correlation between speed and height.

The coach wrote the following heights from smallest to largest.

Markwell Cougars:

170, 172, 175, 176, 176, 176, 178, 181, 182, 183, 183, 183, 185, 185, 187, 188, 188, 189, 190, 195

Sampson Hawks:

169, 175, 176, 176, 178, 179, 180, 183, 183, 186, 186, 186, 187, 187, 187, 187, 187, 188, 190, 191, 192

Create a visual display of this data.

In this concept, you will learn to use frequency tables and histograms.

Frequency

A visual display is used to show data. Each type of visual tool has advantages and the best type of plot or graph depends on the situation. Indeed, sometimes it is a matter of

preference as many different graphs could be used to illustrate the same data.

Let's take a look at frequency tables and histograms.

Frequency is a measure of how often something occurs. A **frequency table** is used to measure and visually show how often a data value occurs.

Let's look at an example.

A teacher is preparing for parent conferences. In order to provide parents with the most information possible about their children, he wants to organize the grades of the class so that they can compare the grades to the rest of the class.

The math percentages have been calculated and his students earned the following grades:

88, 86, 92, 65, 72, 75, 81, 84, 85, 93, 99, 50, 78, 80, 86, 76, 74, 95, 81, 87, 90, 72, 76, 61, 85, 84, 78, 83.

Grades are determined by percent where 0-59% is an F, 60-69% is a D, 70-79% is a C, 80-89% is a B, and 90-100% is an A. These values make the most logical intervals. **Intervals** are always chosen depending on the range of the data. He will make a frequency table to illustrate the information.

First, for each student who scored in the given range, he puts an X. Sometimes, frequency tables use X's and other times, they can use lines for tally marks.
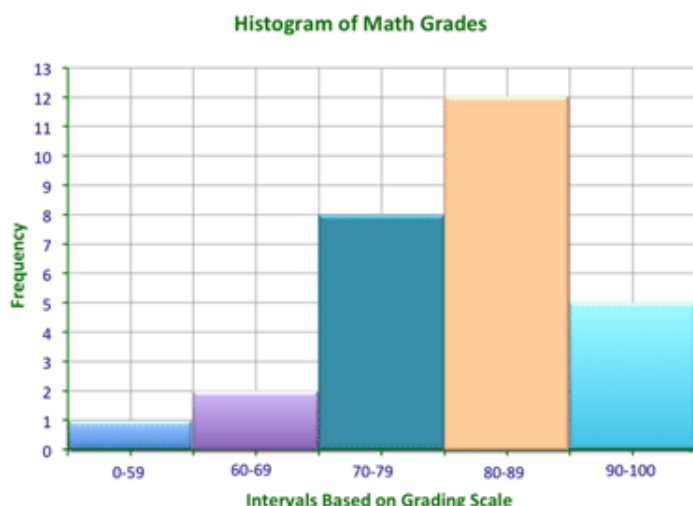
Frequency Tables of Grades

Interval	Tally	Frequency
90 - 100	XXXXX	5
80 - 89	XXXXXXXXXXXX	12
70 - 79	XXXXXXXX	8
60 - 69	XX	2
0 - 59	X	1

This tally is useful in the sense that it communicates to parents how many students in the class scored in the A range, B range, etc. It would not be as important for the parents to see the individual scores of each student as it would be to see the total number of students in each interval. That way, if their child earned a B, then they would know that the child falls in a category that most other students scored in. If a child earned a D, for example, it would indicate that they are below the general level of the other students and might need additional help.

Next, he creates a **histogram**. A **histogram** is similar to a bar graph in that it uses columns to illustrate data on x- and y-axes. In a histogram, you can use the same intervals as you did

for the frequency table. The bars in the histogram will have no space between them.

Histogram of Math Grades

[Figure 2]

The histogram shows the same information as the frequency table does. However, the histogram is a type of graph, meaning that it is visual representation. The bars on the histogram are interpreted more easily by size than numerical data.

Examples

Example 1

Earlier, you were given a problem about the track teams and the heights of the runners.

The coach is comparing the heights of his team, the Markwell Cougars to the rival team, the Sampson Hawks. You need to create a double histogram for the data. The data collected is:

Markwell Cougars:

170, 172, 175, 176, 176, 176, 178, 181, 182, 183, 183, 183, 185, 185, 187, 188, 188, 189, 190, 195

Sampson Hawks:

169, 175, 176, 176, 178, 179, 180, 183, 183, 186, 186, 186, 187, 187, 187, 187, 187, 188, 190, 191, 192

First, create a frequency table for the data. Since you are comparing two sets of data, you have to put both data sets into the frequency table.

Interval	Markwell Cougars Tally	Frequency	Sampson Hawks Tally	Frequency
160 - 169					1
170 - 179	卌 ||	7	卌	5
180 - 189	卌 卌		11	卌 卌 ||	12
190 - 199	||	2	|||	3

Next, use this data to create a histogram that compares the data.

[Figure 3]
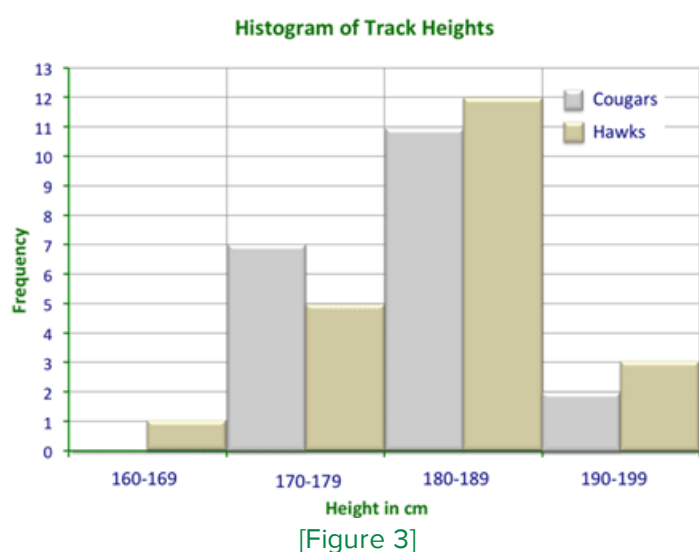
You can see from the histogram that both teams have more players in the 180 - 189 interval. However, while the Cougars have more players in the 170 - 179 interval, the Hawks have slightly more in the taller interval. The Hawks have a slight height advantage.

Example 2

Create a histogram of the mass of geodes found at a volcanic site. Scientists measured 24 geodes in kilograms and got the following data:

0.8, 0.9, 1.1, 1.1, 1.2, 1.5, 1.5, 1.6, 1.7, 1.7, 1.7, 1.9, 2.0, 2.3, 5.3, 6.8, 7.5, 9.6, 10.5, 11.2, 12.0, 17.6, 23.9, and 26.8.

First, let's think about intervals.

The minimum item is 0.8 kg and the maximum is 26.8. To get a good idea of the data, you could use intervals that encompass perhaps 4 kg intervals, 5 kg intervals, or 6 kg intervals. Let's try intervals of 5 kg.

Begin with a frequency table.

Interval	Tally	Frequency
0 - 5	ⅧⅡ ⅧⅡ ‖‖	14
5.1 - 10	‖‖‖	4
10.1 - 15	‖‖	3
15.1 - 20	‖	1
20.1 - 25	‖	1
25.1 - 30	‖	1

Next, create a histogram for this data.

[Figure 4]
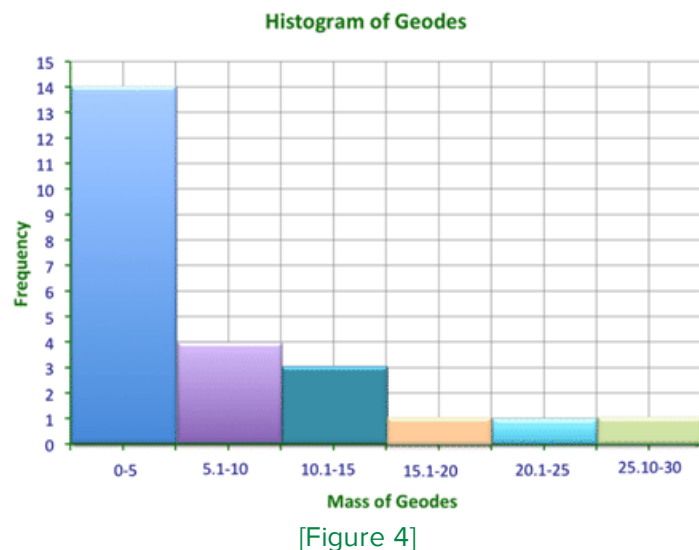
Example 3

True or false: An interval is the frequency that an event happens.

The answer is false.

Intervals are always chosen depending on the range of the data.

Example 4

True or false: To create a histogram, you first need a frequency table.

The answer is true.

Example 5

True or false: If I wanted to create a histogram on the number of people who went to the town movie theater on the weekend, I would first need to figure out how many people went to the movies on each weekend day and night.

The answer is true.

The data collected would help create a frequency table and then you could create your histogram.

Review

Use what you have learned about histograms to answer each question.

Hours Slept Each Night

Number of Hours Slept	Tally	Frequency
5	I	1
6	I I	2
7	I I I I	4
8	I I I	3
9	I I I	3
10	I I I	3
11	I I	2
12	I I	2

1. Create a histogram that illustrates this data.

2. What can you interpret from your histogram?

Compare the stem-and-leaf plot to the histogram of Melanie's Christmas gift expenses below. She told her husband, "Most of the gifts cost more than $60."
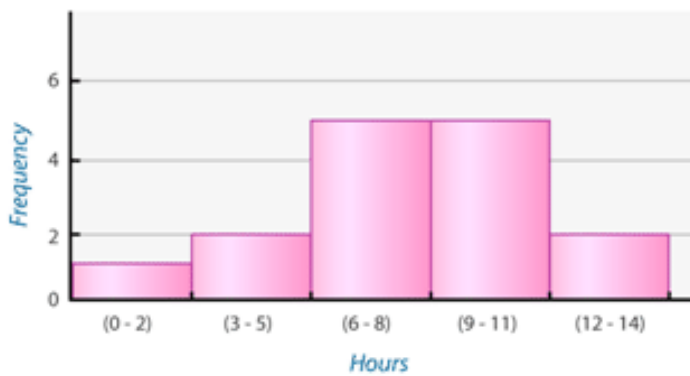
3. Is she telling the truth?

4. Which tool is more useful in making a decision about her truthfulness?

$$
\begin{array}{c|cccccc}
4 & 1, & 6 \\
5 & 3, & 2 \\
6 & 8, & 8, & 9, & 9 \\
7 & 7, & 8, & 9, & 9, & 9, & 9
\end{array}
$$
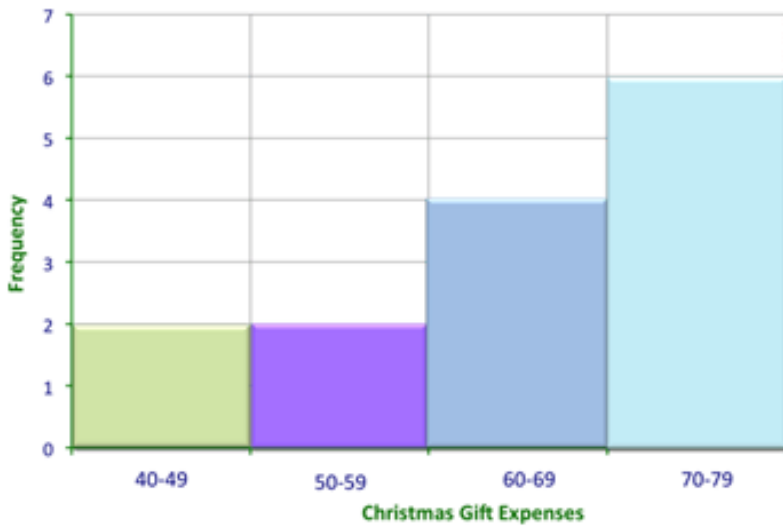
[Figure 5]

Hours of Exercise

[Figure 6]

5. Looking at this histogram, can you conclude that most people exercise between 6 - 11 hours per week?

6. What is the fewest number of hours?

7. What is the range of hours?

8. Conduct your own survey and collect data. Choose attendance rates in your class or vacation days per year for example. Then create a frequency table, histogram and analyze your data. Explain why you chose the interval that you did and which data set had the greatest and least results.

Review (Answers)

To see the review answers, return to the Table of Contents and select 'Other Versions' or 'Resources'.

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1.0 REFERENCES

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