You will need
• a ruler
• centimetre grid paper

3.5 Frequency Tables and Stem-and-Leaf Plots

▶ **GOAL**

Organize data using frequency tables and stem-and-leaf plots.

Learn about the Math

The students in Tonya's gym class were practising their standing long jumps. They jumped the following distances, in centimetres:

187	205	221	186	185	212	222	215	198
200	205	207	193	186	172	208	223	175
206	215	227	228	230	218	188	173	196
202	221	214	220	229	189	193	212	212

The students want to sort the data into levels of achievement. One group of students decides to create a **frequency table** . Another group thinks that a **stem-and-leaf plot** will show the levels better. A third group wants to use a bar graph. Each group has to decide on appropriate **intervals** to use.

? **How can you compare the data in different achievement levels?**

frequency table

a count of each item, organized by categories or intervals

stem-and-leaf plot

an organization of numerical data into categories based on place values; the digits representing greater values are the stems, and the other digits are the leaves

interval

the space between two values; for example, 0–9 represents the interval from 0 to 9, including 0 and 9

Example 1: Organizing data in a frequency table

Organize the data for standing long jumps in a frequency table.

Group 1's Solution

Interval (cm)	Frequency
170–179	3
180–189	6
190–199	4
200–209	7
210–219	7
220–229	8
230–239	1

We noticed that the longest jump is 230 cm and the shortest jump is 172 cm.

If we use every possible whole number length in centimetres from 172 to 230, the frequency table will be too large.

We decided to organize the data in intervals of 10.

NEL

Organize the data for standing long jumps using each type of display.

a) a stem-and-leaf plot **b)** a bar graph

a) Group 2′s Solution

Long Jump Distances (cm)	
Stem	**Leaf**
17	2 3 5
18	5 6 6 7 8 9
19	3 3 6 8
20	0 2 5 5 6 7 8
21	2 2 2 4 5 5 8
22	0 1 1 2 3 7 8 9
23	0

We used intervals of 10 to organize the data in a stem-and-leaf plot.

We used the hundreds and tens digits as the stems, and the ones digits as the leaves.

b) Group 3′s Solution
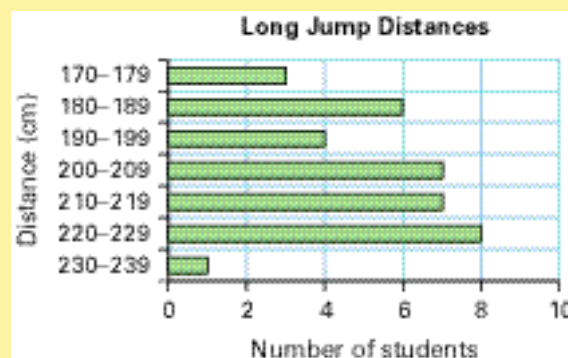
Since we are graphing long jumps, we decided to put the bars horizontally.

We used intervals of 10 rather than including all the distances, because we think this will make the graph easier to read.

Reflecting

1. a) How is a stem-and-leaf plot like a frequency table?

   b) How is a stem-and-leaf plot like a bar graph?

2. When making a frequency table, stem-and-leaf plot, or bar graph, how do you choose appropriate intervals?

3. Which method is easiest for you to use to organize the data and visually compare the count in each category? Justify your choices.

4. Which method can be used to organize data without losing individual values?

Example 3: Changing a stem-and-leaf plot into a frequency table

A company cafeteria has two lunch shifts. The second shift starts 1 h after the first shift. The cafeteria staff needs 10 min after the first shift to clean the tables and prepare for the second shift. To do this, at least 90% of the tables must be empty within 50 min.

The cafeteria staff records how much time the employees in the first shift take to finish lunch and leave the tables during one shift. Are 90% of the tables empty within 50 min, or do the lunch times have to change?

Amount of Time the Tables Are Occupied by First-Shift Employees (min)

37	45	28	45	52	38	30	25	46	43
27	39	47	44	29	30	35	45	44	56
60	36	33	25	25	43	27	30	45	42

Kwami's Solution

Time at Tables (min)	
Stem	**Leaf**
2	5 5 5 7 7 8 9
3	0 0 0 3 5 6 7 8 9
4	2 3 3 4 4 5 5 5 5 6 7
5	2 6
6	0

Interval (min)	Frequency
20–29	7
30–39	9
40–49	11
50–59	2
60–69	1

There are 30 tables, and 90% must be empty within 50 min. So, this means that 27 of the 30 tables must be empty within 50 min. Only 3 tables were occupied for 50 min or more. So, the lunch times can stay as they are.

Ⓐ Checking

5. Choose appropriate intervals to organize each set of data in a frequency table.

   a) lengths of short stories (number of words): 120, 173, 287, 599, 183, 298, 376, 922

   b) times for candles to burn completely (min): 120, 125, 129, 128, 125, 122, 120, 123

   c) attendance at shows (number of people): 120, 4989, 2998, 2774, 1487, 159, 3992

   d) heights of plants (cm): 120, 387, 428, 127, 287, 125, 332, 487

Ⓑ Practising

6. Would you use a stem-and-leaf plot, a frequency table, or either to organize each set of data? Explain your choice.

   a) the absences in each class in a school

   b) the heights of NBA basketball players

   c) an inventory of textbooks in a classroom

7. a) If you were collecting data on the colours of vehicles in a parking lot, why would a stem-and-leaf plot not be appropriate?

   b) Could you use a frequency table? Explain your answer.

8. Use this stem-and-leaf plot to answer the questions below.

Vehicle Speed on Highway (km/h)	
Stem	**Leaf**
8	0 5 5 7 7 7 9 9 9 9 9
9	2 3 3 4 4 6 6 6 8 8 9 9 9 9 9
10	0 1 1 1 1 4 6 8 8 8 9

a) How many vehicles had their speeds measured?

b) How many vehicles were travelling over 90 km/h?

c) If the speed limit on the highway is 100 km/h, how many vehicles were speeding?

d) What percent of vehicles were speeding?

9. If you collected the sets of data in question 6, which would be primary data and which would be secondary data? Explain your thinking.

10. Rosa is in a bowling league. These are her scores for the season.

132 118 122 106   94   94 112 118
104 120 108 104   96 122 130 116
104 118 106 124

a) Display Rosa's scores in a stem-and-leaf plot.

b) What is the range of scores? The range is the difference between the highest and lowest score.

c) The team's mean score was 110. In what percent of her games did Rosa score above 110 points?

d) Create a bar graph to show Rosa's scores. Label the horizontal axis "Game number" and the vertical axis "Points scored."

11. The quality control engineers at a potato chip factory want to ensure a consistent product. They count the number of chips in every 100th bag. Their results are shown below.

Number of Potato Chips per Bag

135 154 188 137 123 151 122 134
123 119 108 119 143 150 132 128
129 144 123 145 127 126 107 150
127 132 133 127 142 117 108 125
122 137   96   99

a) Organize these results in a stem-and-leaf plot.

b) Use your stem-and-leaf plot to create a bar graph that the company can display in the employee cafeteria.

12. The following stem-and-leaf plot shows the number of passengers who rode a train along a certain route during a one-month period. Record the data in a frequency table using intervals of 5.

Number of Monthly Passengers on Train	
Stem	**Leaf**
9	5 7 9
10	0 0 3 5 8 9
11	2 4 4 6 8 8 8
12	3 4 7 7 9 9 9 9
13	2 4 4 6 8
14	2 3 3 3 5
15	0 1

ⓖ Extending

13. The points scored for and against a basketball team are listed below. Create a two-sided stem-and-leaf plot to show the points scored for and against the team.

Points scored for team: 129, 108, 114, 125, 132, 107, 97, 127, 108, 124, 117, 94, 99, 108

Points scored against team: 113, 127, 132, 109, 101, 90, 88, 112, 109, 122, 119, 102, 110, 97