

UNIT

5

Data Management



David and his friend surveyed their classmates. They wanted to find out which outdoor winter activities the students participated in. They recorded the results in a tally chart.

Outdoor Winter Activities	
Activity	Tally
Skating	### ## ### ##
Skiing	### ## ##
Snowboarding	### ##
Tobogganing	### ## ## ## ## ##



- What survey question might the students have asked to get the data in the chart?
- How could you graph the data?
- Which graph is most suitable for the data?

What You'll Learn

- Collect and organize data on tally charts and stem-and-leaf plots.
- Display data on frequency tables, bar graphs, pictographs, line graphs, and circle graphs.
- Describe and evaluate data presented on charts, tables, and graphs, and solve related problems.
- Use databases and spreadsheets.
- Calculate and use mean, median, and mode.
- Identify and describe trends in graphs.
- Use technology to draw graphs.

Why It's Important

- You see data and their interpretations in newspapers, magazines, and on TV. You need to understand how to interpret these data.



Key Words

- mean
- median
- mode
- primary data
- secondary data
- biased
- database
- fields
- Statistics Canada (Stats Can)
- frequency table
- stem-and-leaf plot
- cluster
- trend
- line graph
- spreadsheet

Skills You'll Need

Calculating Mean, Median, and Mode

For any set of numbers:

- The **mean** is the sum of all the numbers divided by the number of numbers.
- The **median** is the middle number when the numbers are arranged in order. When there is an even number of numbers, the median is the mean of the two middle numbers. Half the numbers are above the median and half are below.
- The **mode** is the number that occurs most often. There may be more than one mode. There may be no mode.

Example

Calculate the mean, median, and mode of these numbers:

7, 13, 10, 12, 14, 8, 9, 7, 11, 6

Solution

There are 10 numbers in the set.

- For the mean, add the numbers, then divide by 10.

$$\begin{aligned} \text{Mean: } \frac{7 + 13 + 10 + 12 + 14 + 8 + 9 + 7 + 11 + 6}{10} &= \frac{97}{10} \\ &= 9.7 \end{aligned}$$

- For the median, arrange the numbers in order, beginning with the least number. The median is the middle number. Since there are 10 numbers, the median is the mean of the two middle numbers. For 10 numbers in order, the first middle number is $\frac{10}{2} = 5$, or the 5th number. The next middle number is the 6th number.

6, 7, 7, 8, 9, 10, 11, 12, 13, 14

$$\text{Median: } \frac{9 + 10}{2} = \frac{19}{2}, \text{ or } 9.5$$

- The mode is the number that occurs most often. The mode is 7.

✓ Check

1. Calculate the mean, median, and mode for the numbers in each set.

a) 3, 9, 5, 8, 2, 0, 9, 5	b) 25, 24, 55, 30, 44, 21, 17, 19, 21
c) 14, 18, 16, 12, 11, 16	d) 76, 81, 50, 64, 67, 69, 72, 94, 81, 76

Electronic games are popular among Grade 7 students. Which electronic game do you think Grade 7 students in your class like to play? How could you find out?



Explore

Work in a group.

Which electronic game is most popular in your class?

Conduct a survey to find out.

What survey question will you ask? Record your results.

Reflect & Share

Compare your results with those of another group.

How did the survey question affect the results?

Connect

Mia wanted to find out the favourite singer of her classmates. She conducted a survey. She asked this question:

“Who is your favourite singer: Bryan Adams ____, Susan Aglukark ____, Celine Dion ____, Sam Roberts ____, Shania Twain ____, or Other ____?”

Mia recorded the results in a tally chart.

Mia concluded that Celine Dion was the most popular singer of those named.

However, if all the votes in the “Other” category were for the same person, then that person would be the most popular.

Singer	Number of Students
Bryan Adams	###
Susan Aglukark	###
Celine Dion	### //
Sam Roberts	///
Shania Twain	//
Other	### ## /

The word “data” is plural. So, we say “The data are ...” A single piece of information is called “datum.”

Since Mia collected the data herself, they are called **primary data**.

Data that are found from the library or using the Internet are called **secondary data**.

It is important that a survey is conducted and data are collected in a fair way. Sometimes, the way a question is asked or written might persuade a person to answer a certain way. This type of question is **biased**. A survey question must be unbiased. That is, the question must not lead a person toward a particular answer.

Example

How is each survey question biased?
Rewrite the question so it is unbiased.

- a) “Many students are bored at the end of August.
Should the school year be longer?
Yes _____ No _____”
- b) “Some people get sick after visiting patients in a hospital.
Do you think patients in a hospital should have visitors?
Yes _____ No _____ No Opinion _____”

Solution

- a) The question includes a statement about how some students feel. This may encourage more people to answer “Yes.”
An unbiased survey question is:
“The school year is 10 months long. Should it be longer?
Yes _____ No _____”
- b) The question includes a statement that may encourage people to answer “No.”
An unbiased survey question is:
“Should patients in a hospital have visitors?
Yes _____ No _____ No Opinion _____”

Practice

1. Are primary data or secondary data collected in each situation? How do you know?
 - a) Elly used an encyclopedia to find the area of each continent.
 - b) Jason read the thermometer to find the outside temperature.
 - c) Jane looked in the newspaper to see which NHL team won the game.



Number Strategies

How are these two patterns related?

- 0.75, 1.5, 3, 6, ...
- 96, 192, 384, 768, ...

2. Would you use primary or secondary data in each case? Explain.
 - a) To find the favourite car model in Canada
 - b) To find the favourite juice of Grade 7 students in your school
 - c) To find the favourite song of Grade 7 students in Ontario
 - d) To find the most popular type of transport used by students in your school

3. Biased data are unreliable. Yet, sometimes people use biased data. Why do people use biased data?

4. Think of a survey you could conduct in your school.
 - a) Write a biased survey question.
 - b) Write an unbiased survey question.

5. Comment on each survey question. If it is biased, write an unbiased question.
 - a) “Sugar is bad for your teeth. Should children eat candy?
Yes _____ No _____ No Opinion _____”
 - b) “Children prefer snowboarding to skiing.
Which do you think is more fun?
Snowboarding _____ Skiing _____”

6. **Assessment Focus** Suppose a person intends to open a shoe store in the local mall. The person is unsure of the style or make of shoes to stock. What questions should the person ask to make the best decision? Explain what role a survey might play in the decision.

7.
 - a) Predict the favourite hobby or pastime of your classmates.
 - b) Write a survey question you could ask to find out. Explain how you know your question is unbiased.
 - c) Conduct the survey. Tally the results.
 - d) How did your prediction compare with your results?

Reflect

Why is it important that a survey question is unbiased?



Using Databases to Find Data

Focus Search databases for information.

A **database** is an organized collection of data.

Examples of databases include a telephone book, a dictionary, an encyclopedia, or a library catalogue.

A database is organized into **fields**. Each field contains specific information. In a library database, a book may be stored with information in each of these fields: title, author, publisher, subject, ISBN (international standard book number), or Dewey decimal number.

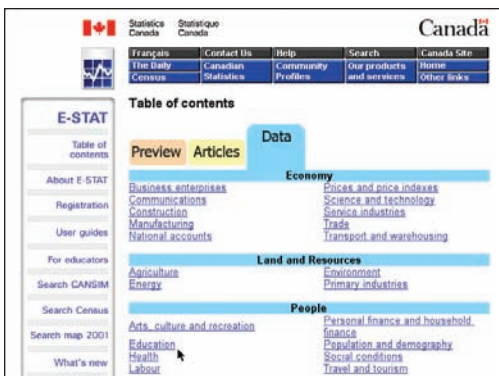
Statistics Canada (Stats Can) is the federal government department that collects, analyses, and stores data about Canada and Canadians. Two of its Internet databases are **CANSIM II** (**Canadian Socio-economic Information Management System**) and **E-STAT**.

Stats Can charges a fee for some of its data on CANSIM II.

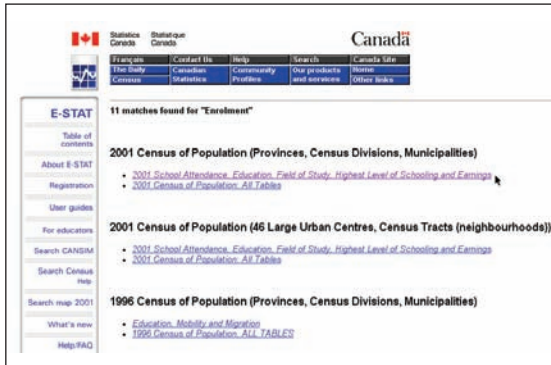
E-STAT is a free database for teachers and students. Your teacher will give you the website addresses for these databases.

To use E-STAT to find data on school attendance for 15- to 24-year-olds, follow these steps:

1. Open the E-STAT Website.
You may be asked for your username and password. Ask your teacher for these.
2. Click the “Data” tab. Click “Education,” as shown above left.
3. Under Census databases, click “Enrolment,” as shown below left.

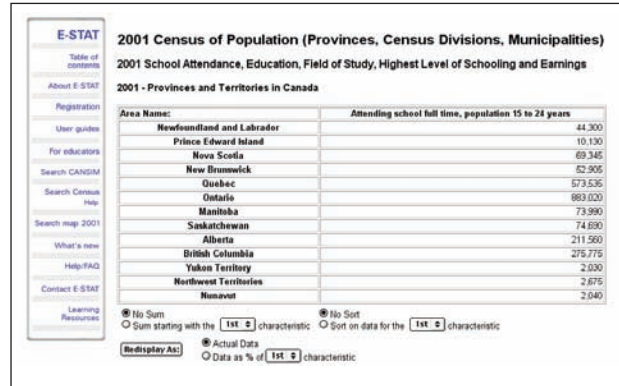
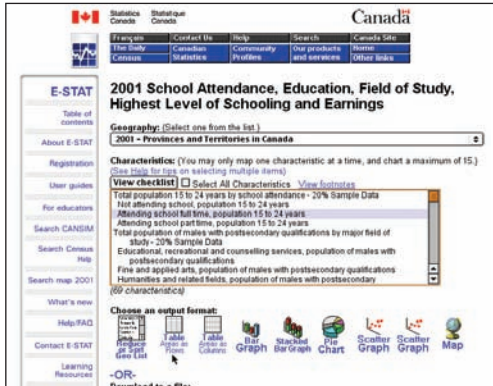


- Under 2001 Census of Population (Provinces, Census Divisions, Municipalities), click “2001 School Attendance, Education, Field of Study, Highest Level of Schooling and Earnings,” as shown below left.



- Click “Attending school, full time, population 15 to 24 years,” as shown above right.

- Choose an output format. For data in a table arranged in rows, click “Table Areas as Rows,” as shown below left. The data are displayed as shown below right.



Check

- Use E-STAT or another database. Research one of the topics below. Print your data. Be sure to state your source.
 - The number of Canadians who had a particular type of occupation at the time of the 1911 Census
 - The top 10 movies of the year
 - The top 10 music CDs of the year
 - A topic of your choice
 Write 3 things you know from looking at the data.

Focus Record data in tables, bar graphs, and pictographs.

Explore

Work on your own.
Use a novel you are currently reading.
Open it to any page.



- Count the number of letters in each of the first 50 words. Record your data in a tally chart.

Number of Letters	Tally of Number of Words
1	
2	
3	
4	

- Graph your data. Justify your choice of graph.
- Which is the most common length of word?
- Who might be interested in these data?

Reflect & Share

Compare your most common length of word with that of a classmate. Should the lengths be the same? Explain.

Connect

Data can be organized in a tally chart or **frequency table**. A frequency table is a tally chart with an extra column.

Andrew recorded the different birds that visited his feeder one morning.

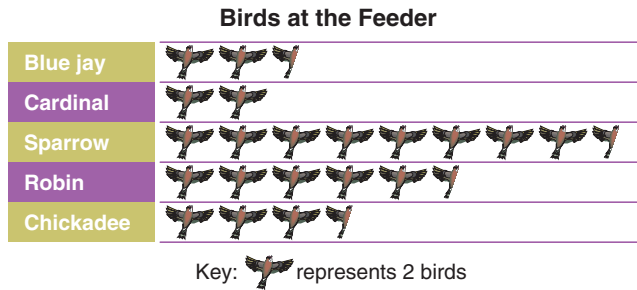


Birds at the Feeder		
Bird	Tally	Frequency
Blue jay	###	5
Cardinal	////	4
Sparrow	### ### ### //	17
Robin	### ### /	11
Chickadee	### //	7

To fill in the *Frequency* column, Andrew counted the tallies for each bird.

He graphed the data using a pictograph.

Andrew chose a key of 1 symbol represents 2 birds.

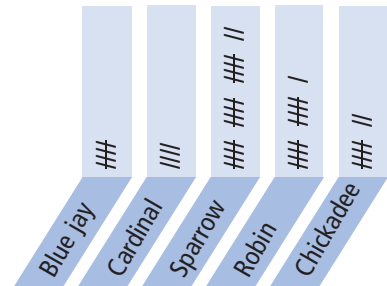
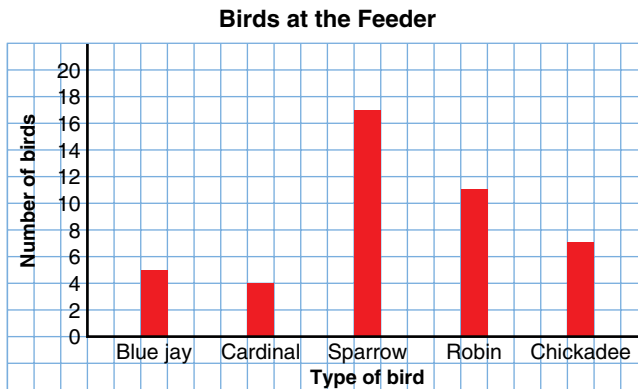


Example

- Construct a bar graph of Andrew's data.
- Compare the graph and tally chart.
How are they alike?

Solution

- Construct a bar graph, below left.
One square represents 2 birds.



- The longest bar on the bar graph represents the same bird as the longest row on the tally chart.
When we rotate the *Tally* column $\frac{1}{4}$ turn counterclockwise, above right, its shape matches that of the bar graph, above left.

Practice

Favourite Canadian Hockey Team		
Hockey Team	Tally	Frequency
Calgary Flames	### III	
Edmonton Oilers	### I	
Montreal Canadiens	###	
Ottawa Senators	###	
Toronto Maple Leafs	### ###	
Vancouver Canucks	### I	

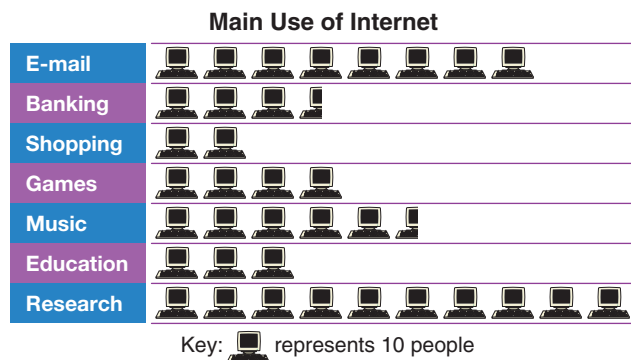
Rolling a Number Cube		
Number	Tally	Frequency
1		
2		
3		


- The table shows the favourite Canadian hockey teams of some Grade 7 students at Hamilton Junior High School.
 - Write the frequency of each team.
 - How many students were surveyed?
 - Which team is the most popular among the sample? The least popular? Give some possible reasons for these results.

- Work with a partner. You will need a number cube labelled 1 to 6.
 - Roll the number cube 50 times. Make a table. Record the frequency of each number.
 - Predict the results if you were to roll the number cube 50 more times. Justify your answer.

- Compare your results with those of another pair of students. If they are different, explain why.
- Graph your data. Justify your choice of graph.

- This pictograph displays the results of a survey.



- What do you think the survey question was? Explain.
- How many people were surveyed?
- How would the pictograph change if  represented 1 person? 50 people?
- Draw a bar graph to display these data.

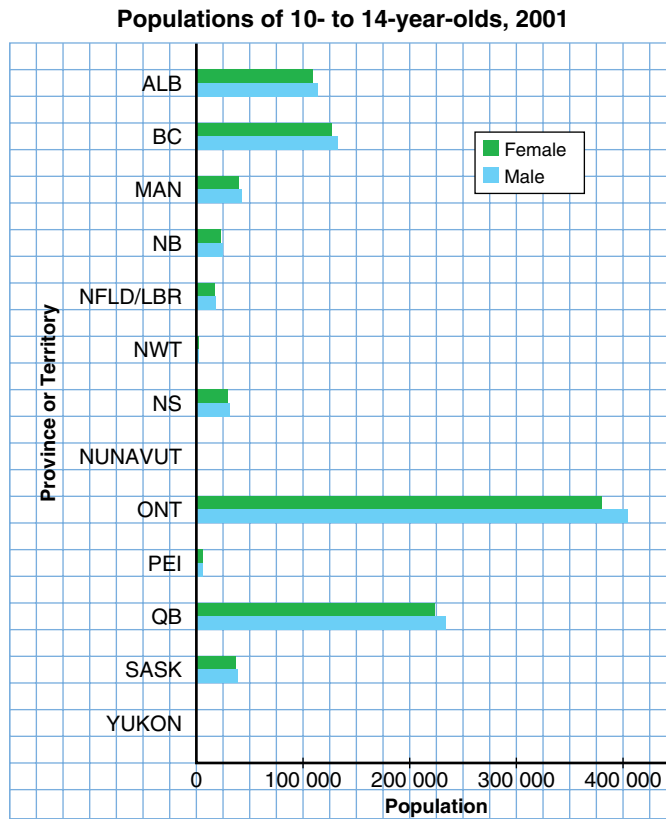
Number Strategies

Add.

- $\frac{1}{2} + \frac{2}{3}$
- $\frac{3}{4} + \frac{4}{5}$
- $\frac{5}{6} + \frac{6}{7}$

- e) Is a bar graph better than a pictograph to display the data? Explain.
- f) Write a question you could answer using the pictograph or bar graph. Answer the question.

4. This is a double-bar graph.



- a) How is this bar graph different from the others in this lesson?
- b) How does the female population compare with the male population?
- c) Which province(s) have approximately the same number of 10- to 14-year-old females as males?
- d) Here are the data for the 3 territories.

	Nunavut	Northwest Territories	Yukon
Females	1550	1725	1090
Males	1685	1785	1225

Why are there no bars on the graph for Nunavut and Yukon?

- e) Could you use a pictograph to display the data in the double-bar graph? Explain.



5. Use an atlas or an almanac.
 - a) Choose 5 cities in Canada.
 - b) Choose a recent year.
Find the population of each city in that year.
 - c) Record the data in a table.
 - d) Graph the data. Justify your choice of graph.
 - e) What do you know from looking at the data?

6. Assessment Focus

- a) Suppose you want to find out how your classmates spend their money. Write a question you could use to survey your classmates.
- b) Conduct the survey. Record the data in a frequency table.
- c) Graph the data. Justify your choice of graph.
- d) What do most of your classmates spend their money on?
- e) Use the graph to write 3 other things you know about how your classmates spend their money.

7. Two classes of Grade 7 students took a spelling test. The number of words each student misspelled is recorded at the left.

Spelling Mistakes

4 7 9 2 1 0 6 5 8 10 7
 3 2 12 8 11 3 4 8 4 5
 8 15 9 6 2 1 0 17 19
 16 3 11 5 10 7 3 7 19
 10 3 5 8 6 13 8 2 4 6
 18 19 5 20 0 1 8 10 3

Number of Mistakes	Tally	Frequency
0 – 2		
3 – 5		

The interval is 3 because the numbers of mistakes are counted in groups of 3.

- a) Copy the frequency table. Continue the pattern of the intervals in the 1st column to 18–20. Complete the 2nd and 3rd columns in the frequency table.
- b) Graph the data.

Reflect

When is a pictograph more appropriate than a bar graph?
 When is a bar graph more appropriate than a pictograph?
 Give examples.

5.3

Stem-and-Leaf Plots

Focus Display data on a stem-and-leaf plot.

The data, and **stem-and-leaf plot**, show science test scores for a Grade 7 class.

How are the two displays related?

What can you see in the stem-and-leaf plot that you cannot see in the chart?

Science Test Scores

64 75 89 99 58 53 69
66 72 81 88 67 75 86
52 97 77 75 57 61 85
94 72 81 65 78 81 93

Science Test Scores

Stem	Leaf
5	2 3 7 8
6	1 4 5 6 7 9
7	2 2 5 5 5 7 8
8	1 1 1 5 6 8 9
9	3 4 7 9

This is a stem-and-leaf plot.

Explore



Work with a partner.

You will need a metre stick or a tape measure.

Measure each other's height in centimetres.

Write it on the board.

Use the data for the whole class.

Draw a stem-and-leaf plot to show the heights, in centimetres, of your classmates.

- Are any students the same height?
- Which is the shortest height? The tallest?
- What is the median height?
- What is the mode height?
- What else do you know from looking at the stem-and-leaf plot?

Reflect & Share

Compare your stem-and-leaf plot with that of another pair of classmates. Do your plots match?

If you answer no, how are they different?

Here are the numbers of books students in one Grade 7 class read in one year.

Each number is the number of books one student read.

We can make a stem-and-leaf plot from these data.

Books Read in One Year

23 19 43 12 16 18 31 17
15 23 27 18 13 16 24 10
16 15 29 25 33 42 20 24
17 38 36 11 26 31 32 19

- The least number of books is 10. The greatest number is 43. Students read between 10 and 43 books. Write the tens digits 1 to 4 in a column. These are the **stems**.

Books Read in One Year

Stem	Leaf
1	0 1 2 3 5 5 6 6 6 7 7 8 8 9 9
2	0 3 3 4 4 5 6 7 9
3	1 1 2 3 6 8
4	2 3

In a stem-and-leaf plot, the leaves are always numbers from 0 to 9.

- Start with the least number, 10. Write 0 as the **leaf** next to the stem, 1. Continue with the next greatest number, 11. Write 1 as the next leaf. Continue in this way. Record all the leaves in order from the least number to the greatest number.
- Write a title for the plot.

Example

Here are the heights, in centimetres, of the members of St. Mark's junior football team.

- What is the range of the heights of the football players?
- Draw a stem-and-leaf plot for the data.
- What is the median height?
- What is the mode height?

Heights of Football Players in Centimetres

147 153 162 171 159 168 145 183 164
187 153 164 148 164 167 187 179
148 190 188 173 155 177 176 189 192

Solution

- a) The least height is 145 cm.
The greatest height is 192 cm.
The range is $192 \text{ cm} - 145 \text{ cm} = 47 \text{ cm}$.

- b) Each number has 3 digits, so the stem will be the hundreds and tens digits.
The leaf will be the ones digit.
The stems are from 14 to 19.
Start with the least number, 145.
Write the leaf, 5, next to the stem, 14.
Continue to write the leaves, from the least number to the greatest number.

Heights of Football Players in Centimetres

Stem	Leaf
14	5 7 8 8
15	3 3 5 9
16	2 4 4 4 7 8
17	1 3 6 7 9
18	3 7 7 8 9
19	0 2

- c) There are 26 numbers.
This is an even number.
The median is the mean of the two middle numbers when the numbers are arranged in order.
For 26 numbers in order, the first middle number is $\frac{26}{2} = 13$, or the 13th number.
The next middle number is the 14th number.

Heights of Football Players in Centimetres

Stem	Leaf
14	5 7 8 8
15	3 3 5 9
16	2 4 4 4 7 8
17	1 3 6 7 9
18	3 7 7 8 9
19	0 2

Count the leaves, beginning at 5.
The 13th and 14th numbers are 167 and 168.
The median is: $\frac{167 + 168}{2} = 167.5$
The median height is 167.5 cm.

- d) The mode is the number that occurs most often.
Leaf 4 occurs three times next to stem 16.
The mode is 164 cm.



The *Example* shows that, when the data are displayed in a stem-and-leaf plot, the range, the median, and the mode can be found from the plot.

When you organize data in a stem-and-leaf plot, the original data are visible. A frequency table only shows how many numbers are in each group, and not what the numbers are.

Practice

Hours Worked by Part-Time Staff
at a Video Store in One Month

Stem	Leaf
9	1 6 9
10	2 5 6 8
11	0 3 4 4 4 7
12	0 1 2 2 5 6 6 8 9
13	2 3 5 6 7 7 7 8 9 9

- What does this stem-and-leaf plot show?
 - How many part-time employees work at the video store?
 - What is the least number of hours worked? The greatest number of hours worked?
 - What is the range of hours worked?
 - What is the median number of hours worked?
 - What is the mode number of hours worked?

- The masses of parcels, in kilograms, are given.
 - Display the data in a stem-and-leaf plot.
 - Find the greatest mass. The least mass.
 - What is the range of masses?
 - What is the median mass?
 - What is the mode mass?

Masses in
Kilograms

28 32 40 36 31
40 48 35 38 34
43 35 41 36 52
37 47 29 42 35
33 39 32 48 37
38 30 35 44 54

- Which type of data cannot be shown in a stem-and-leaf plot? Explain.
- Work with a partner. Use a metre stick to measure each other's stride, to the nearest centimetre. Record the measures on the board. Use the measures for the whole class.
 - Make a stem-and-leaf plot.
 - What did you find out about the strides of your classmates? Write down as much as you can.

- A food manufacturer claims: "We guarantee an average of 50 g of peanuts per bag." In 6 months, Devon found the masses of peanuts, in grams, in 24 bags. Look at the data.
 - Is the food manufacturer's claim true?
 - How could you use a stem-and-leaf plot to justify your answer?

Masses of Peanuts
in Grams

50.1, 49.9, 49.0, 48.9,
50.8, 50.3, 51.3, 49.8,
48.8, 49.0, 50.3, 51.2,
49.4, 49.0, 48.1, 49.6,
49.8, 51.3, 50.5, 50.7,
48.7, 51.0, 49.3, 52.5

Calculator Skills

Find two numbers with a difference of 2.75 and a product of 60.125.

6. Assessment Focus

- a) Collect data on the points scored by a basketball team in its last 15 games. The points could be from games played by your school team or a professional team.
- b) Make a stem-and-leaf plot.
- c) Write 3 things you know from looking at the plot.

Reflect

Explain why it is easier to read data in a stem-and-leaf plot than data in a table.



Meteorologist

A meteorologist is often a specialist. She uses data collection tools suitable for the weather condition being studied. The data collected are pooled nationally and internationally, and studied by a variety of meteorologists and others in related fields. The information and analysis produce severe weather alerts, which can save thousands of lives.



We may not experience surviving a tornado or a hurricane. But there are other weather conditions that are just as destructive.

On January 6, 1998, a severe ice-storm hit Quebec, eastern Ontario, and northeastern U.S. Many people called it the largest ecological disaster in the history of Quebec. On February 6, 1998, Quebec was restored to some normalcy.

When was the last time you heard a “severe weather warning”?

Was the prediction correct?

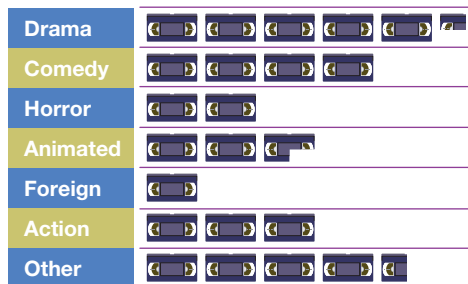
What kinds of data management tools might have been used to predict this event?

Mid-Unit Review

LESSON

- 5.1 1.** A survey was conducted to decide if a new hockey arena should be built. The question was, “We have one hockey arena that is always in use. Do we need a new hockey arena?
Yes _____ No _____”
- Is the question biased? Explain.
 - If your answer to part a is yes, rewrite the question so it is not biased.
- 5.2 2.** The pictograph shows the types of movies rented from a video store in one day.

Movie Rentals in One Day



Key:  represents 4 movies

- Record the data in a frequency table.
 - Construct a bar graph.
 - Write a question you could answer from the bar graph or pictograph.
Answer the question.
 - What else do you know from the graphs?
- 3.** Use an atlas or other database.
- Choose 5 countries other than Canada.
 - Find the area of each country and Canada.
 - Record the data in a table.
 - Graph the data.
 - How does each country’s area compare with Canada’s area?
 - What else do you know from the table or graph?
- 5.3 4.** Here are the history test scores for students in Ms. Epstein’s class.

History Test Scores

56 87 98 34 66 75 50
69 70 83 99 55 83 56
62 90 47 92 75 85 68
98 78 62 51 59 75 81
58 79 80 94 92 63 71

- Draw a stem-and-leaf plot to represent the data.
- What is the range of the scores?
- The pass mark is 50.
How many students did not pass the test?
- Students who scored below 60 had to rewrite the test.
How many students rewrote the test?
- Find the median score.
- Find the mode score.



Using *Fathom* to Investigate Scatter Plots

Focus Identify trends in scatter plots.



This table lists the Academy Award winners for Best Actress from 1973–2002, and the age of each actress in that year.



Academy Award Winners for Best Actress


Actress	Year	Age	Actress	Year	Age
Glenda Jackson	1973	37	Jodie Foster	1988	26
Ellen Burstyn	1974	42	Jessica Tandy	1989	80
Louise Fletcher	1975	41	Kathy Bates	1990	42
Faye Dunaway	1976	35	Jodie Foster	1991	29
Diane Keaton	1977	31	Emma Thompson	1992	33
Jane Fonda	1978	41	Holly Hunter	1993	35
Sally Field	1979	33	Jessica Lange	1994	45
Sissy Spacek	1980	30	Susan Sarandon	1995	44
Katharine Hepburn	1981	74	Frances McDormand	1996	39
Meryl Streep	1982	33	Helen Hunt	1997	34
Shirley MacLaine	1983	49	Gwyneth Paltrow	1998	26
Sally Field	1984	38	Hilary Swank	1999	25
Geraldine Page	1985	61	Julia Roberts	2000	33
Marlee Matlin	1986	21	Halle Berry	2001	33
Cher	1987	41	Nicole Kidman	2002	35

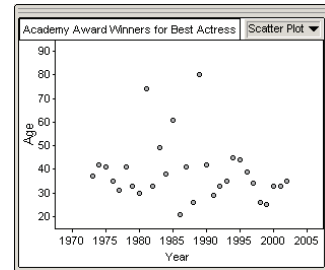
To use *Fathom* to draw a scatter plot for these data, follow these steps:

1. Open *Fathom*. From the File menu, select New.
2. To enter the title:
Click on the New Collection icon , then click on the screen. Double click Collection 1. Type **Academy Award Winners for Best Actress** and click OK, as shown at the right.
3. To enter the data:
Click on the New Case Table icon , then click on the screen.



Click on <new>; type **Year**, then press Enter. A new column appears to the right with the heading <new>. Click on the word <new>, type **Age**, then press Enter. Under the headings *Year* and *Age*, input the data from the table on page 185.

- To graph the data:
Click on the New Graph icon , then click on the screen. Two axes appear.
Click on the column heading, *Year*, and drag it to the horizontal axis.
Click on the column heading, *Age*, and drag it to the vertical axis.
Fathom creates a scatter plot, as shown at the right.



The range of the data is: $80 - 21$, or 59 years.

However, most of the data are located between 31 and 42 years.

The data form a **cluster** between these ages.

This means that, from 1973 to 2002, most winners were between 31 and 42 years old.

There are two large sections without points — between 49 and 61 years, and between 61 and 74 years. These represent gaps in the data. From 1973 to 2002, none of the winners were between 49 and 61 years old, or between 61 and 74 years old.

From the scatter plot, we can see that there is no pattern or **trend** in the data.

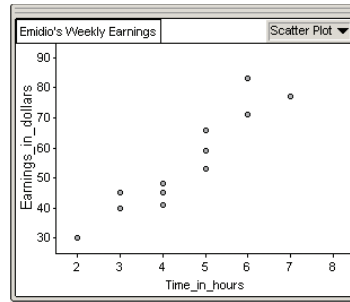
Here is another example of data in a scatter plot:

Emidio works part-time as a waiter in a restaurant. The table and scatter plot on page 187 show the hours he worked each week for 12 weeks, and his earnings, in dollars, for each week.

From the scatter plot, the points show an **upward trend** from left to right. Emidio's earnings increase as time increases. That is, the more hours per week Emidio works, the more he earns.



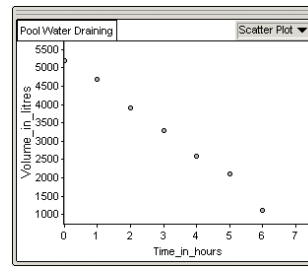
Emidio's Weekly Earnings		
	Time_in_hours	Earnings_in_dollars
1	2	30
2	3	40
3	3	45
4	4	41
5	4	48
6	4	45
7	5	66
8	5	53
9	5	59
10	6	83
11	6	71
12	7	77



Here is a third example of data in a scatter plot:

Water is draining out of a swimming pool. The table and scatter plot show the volume of water, in litres, remaining in the pool at one-hour intervals.

Pool Water Draining		
	Time_in_hours	Volume_in_litres
1	0	5200
2	1	4700
3	2	3900
4	3	3300
5	4	2600
6	5	2100
7	6	1100



From the scatter plot, the points show a **downward trend** from left to right.

The volume of water in the pool decreases as time increases.

That is, the more hours the pool drains, the less water there is in it.

Check

Time	Speed (km/h)
12 noon	0
12:30	70
1:00	85
1:30	100
2:00	100
2:30	100
3:00	0
3:30	0
4:00	100
4:30	65
5:00	0

- Emily drove from Toronto to Cornwall.

She left Toronto at 12 noon and arrived in Cornwall at 5 p.m.

The table at the left shows the speed of the car recorded at different times during her trip.

Use *Fathom* to draw a scatter plot to represent the data.

Describe any trends.

What do you know from looking at the graph?

Reflect

Describe 3 different types of scatter plots.

Provide an example for each type.

Explore

Work with a partner.

Madhu measured the mass of her pet guinea pig every 5 months, until it was 25 months old.

The data are shown at the left.

Age (months)	Mass (g)
5	200
10	350
15	480
20	510
25	520

- One person draws a bar graph. The other person draws a line graph.
- During which period did the guinea pig gain the most mass?
- What happened to the mass of the guinea pig after 15 months? Does this make sense?
- Predict the mass of the guinea pig at 30 months.



Reflect & Share

Discuss with your partner which graph is better for displaying the data. Justify your answer.

Estimate the mass of the guinea pig at 18 months.

Which graph is better to make this estimate? Explain.

Connect



A **line graph** displays data that change over time.

The line graph on page 189 shows how Leah's height changes as she gets older.

From 2 to 13 years, each line segment goes up to the right.

This shows that Leah's height increases.

From 13 to 16 years, the line segments still go up to the right, but they are not as steep.

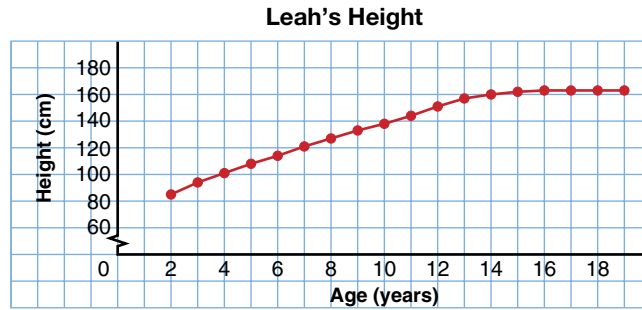
This shows that Leah's height increases, but at a slower rate than before.

From 16 years on, the line segments are horizontal.

This shows that Leah's height has stopped increasing.

She has stopped growing taller.

This symbol ↘ on the vertical axis means that the numbers from 0 to 60 are not shown.



We can use this line graph to find values between data points. At $11\frac{1}{2}$ years, Leah was about 148 cm tall.

Example

- Draw a line graph to display these data.
- Use the graph. Describe any trends in Canada's population.
- Use the graph. During which period did Canada's population increase the most? The least? How can you tell?
- Estimate Canada's population in 2011. Explain how you used the graph to do this. What assumption did you make?

Canada's Population (to the nearest million)	
Years	Number (millions)
1901	5
1911	7
1921	9
1931	10
1941	12
1951	14
1961	18
1971	22
1981	25
1991	28
2001	31

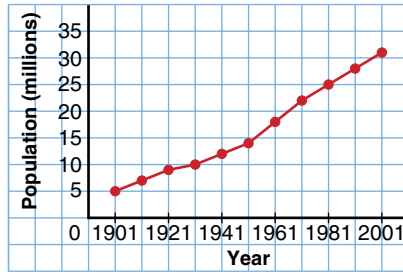
Solution

- Step 1.** Draw axes on grid paper. The horizontal axis represents time, in years. Use 1 square for each 10-year interval, starting in 1901. The vertical axis represents population, in millions. The greatest population to be graphed is 31 million. Make 35 the greatest number on the vertical scale. Use 1 square for every 5 million, starting at 0.

Step 2. Plot a point on the grid for each pair of entries in the table. Use a ruler to join adjacent points.

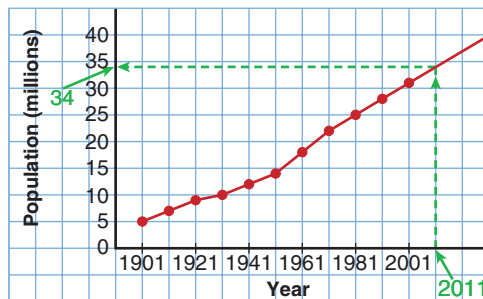
Step 3. Label the axes. Give the graph a title.

Canada's Population



- b) The graph goes up to the right.
This means that Canada's population increased from 1901 to 2001. In general, the line segments from 1951 to 2001 are steeper than the segments from 1901 to 1951.
This means that the population was increasing at a faster rate in the 2nd half of the century.
- c) The period in which the line segment is the steepest represents the greatest increase in population. This happened from 1951 to 1971. From 1921 to 1931, the line segment is the least steep. This is when Canada's population had the least increase.
- d) To predict Canada's population in 2011, extend the last line segment to 2011. From 2011 on the horizontal axis, draw a vertical line to the graph. From the graph, draw a horizontal line to the vertical axis. This line meets the axis at about 34 million. The population of Canada in 2011 will be approximately 34 million.
We assume that Canada's population will continue to grow at the same rate as it did from 1991 to 2001.

Canada's Population



Practice

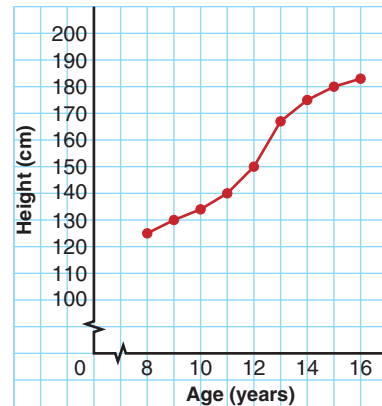
Calculator Skills

Three consecutive 2-digit numbers have a product of 551 286.

What is the sum of the three numbers?

1. a) What does this line graph show?
 b) About how tall was Nathan at each age?
 i) 8 years
 ii) 12 years
 iii) 15 years
 c) During which year did Nathan grow the most?
 The least?
 How does the graph show this?
 d) Predict Nathan's height at 18 years.
 Explain your reasoning.
 e) Predict Nathan's height at 50 years. Explain.

Nathan's Growth



Average Monthly Rainfall (cm)

Month	Vancouver	Ottawa
January	14.0	1.5
February	12.0	1.6
March	9.6	3.2
April	5.8	5.8
May	4.9	7.5
June	4.7	7.7
July	2.6	8.8
August	3.5	9.2
September	5.4	8.3
October	11.7	7.0
November	13.8	6.3
December	16.4	3.3

2. a) What does this table show?
 b) Draw a line graph for each city on the same grid.
 c) Describe the trends in rainfall for the two cities.
 How do the line graphs illustrate these trends?
 d) In which month(s) do the line graphs cross?
 What does this mean?
 e) What is the average annual rainfall for each city?
3. a) Research your region on one of these topics:
 i) the average precipitation for each month
 ii) the maximum temperature for the first day of each month
 iii) the average temperature for each month
 b) Organize the data in a table. Draw a line graph.
 c) Repeat part a for a city or region in a different part of Canada.
 d) Draw a line graph to display these data on the same grid as in part b.
 e) How are the line graphs alike? How are they different?
 f) Write all that you know from looking at the graphs.

Stopping Distance for a Car		
Speed (km/h)	Dry Pavement (m)	Wet Pavement (m)
0	0	0
10	3	6
20	7	11
30	12	17
40	16	26
50	23	38
60	30	50
70	38	64
80	49	78
90	60	97
100	72	120

4. a) What does stopping distance depend on?
 b) On the same grid, draw a line graph for dry pavement and for wet pavement.
 c) Why are line graphs suitable for these data?
 d) Describe the trends in the graphs.
 e) A car travels at 75 km/h on dry pavement. What is its stopping distance?
 f) A car takes 30 m to stop on wet pavement. How fast was it travelling?
 g) Write a question you could answer using the graph but not the table. Explain why you need the graph instead of the table.

5. **Assessment Focus** Nina owns a shoe store. These tables show data about the shoe store.

i)

Yearly Sales	
Year	Sales (\$)
1997	579 000
1998	621 000
1999	598 000
2000	634 000
2001	657 000
2002	642 000
2003	675 000

ii)

Sizes of Shoes Sold in May	
Size	Number of Pairs Sold
6	60
7	239
8	217
9	156
10	61
11	43
12	36



- a) Which data would be best represented with a line graph? Explain.
 b) Draw a line graph for the table you chose in part a.
 c) Describe the trends in the data.
 d) Which type of graph would be suitable for the other table? Explain. Graph the data from the other table.
 e) What do you know from looking at each graph?

Reflect

Why is a line graph the best type of graph to use to make predictions?



Using Spreadsheets to Record and Graph Data

Focus Display data on graphs using spreadsheets.

Spreadsheet software, such as *AppleWorks*, can be used to record, then graph, data.


This table shows the favourite sports of Grade 7 students in Mona's school.

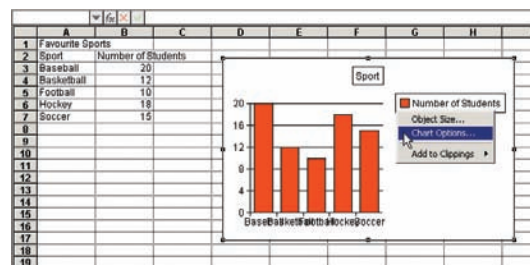
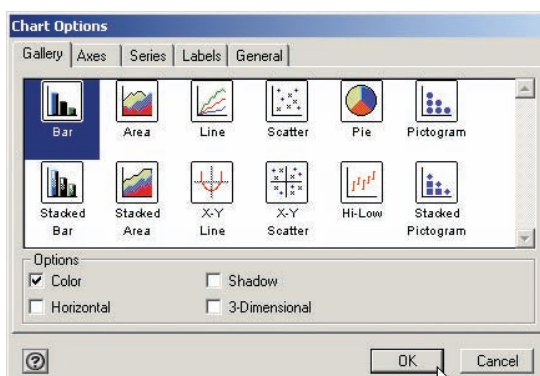
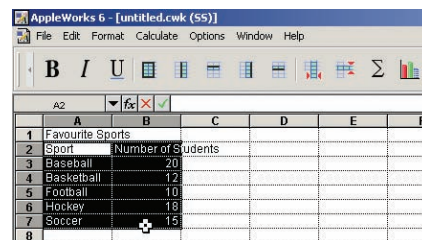
To graph these data using *AppleWorks*, follow these steps:

Open *AppleWorks*. Choose Spreadsheet. Enter the data into rows and columns in the spreadsheet.

Favourite Sports	
Sport	Number of Students
Baseball	20
Soccer	15
Hockey	18
Football	10
Basketball	12

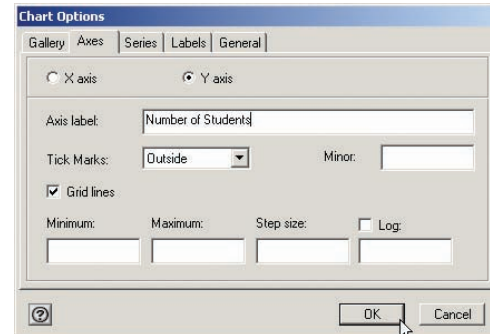
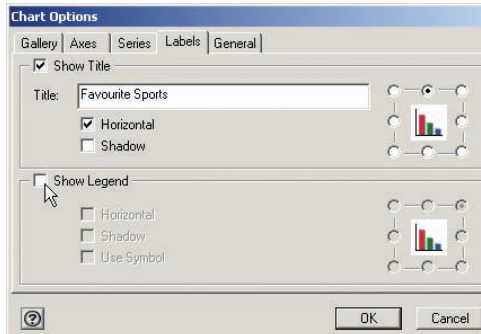
To create a bar graph

1. Highlight the data. Include the column heads, but do not include the table title.
2. Click the graph icon  on the tool bar. A Chart Options dialogue box appears. Choose Bar, then click OK, as shown below left.

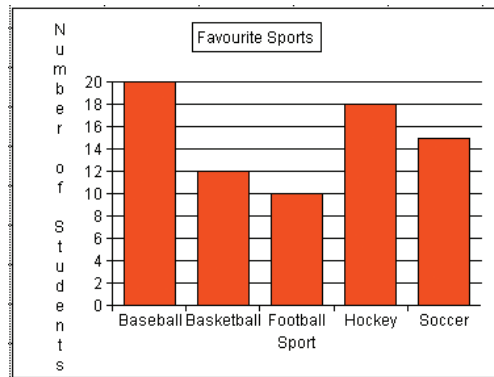


3. The software creates a legend, which is not needed for a bar graph. To remove the legend, right-click the graph. Choose Chart Options, as shown above right. Select the Labels tab. Click the box next to Show Legend to remove the check mark.

- In the Title box, type **Favourite Sports**, as shown below left. To insert labels, click the Axes tab. Select X axis. Type **Sport**. Select Y axis. Type **Number of Students**, as shown below right. Then click OK.



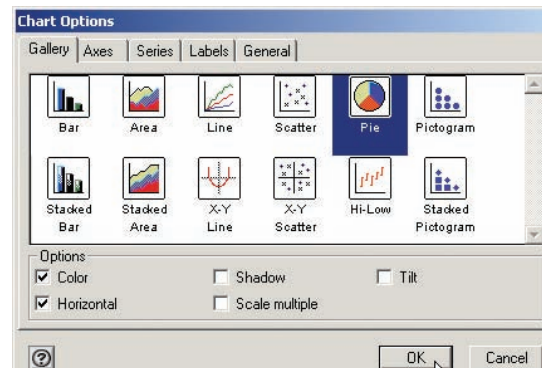
Your graph should look like the one below.




To create a circle graph

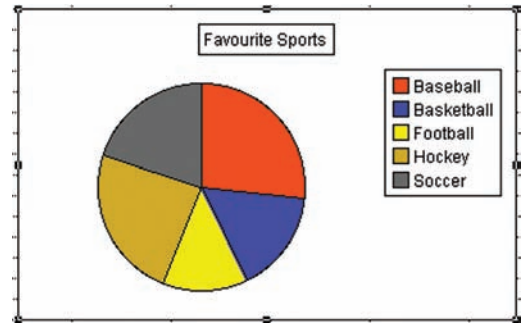
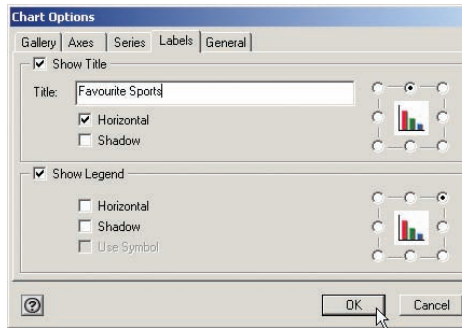
- Use the data on page 193. Highlight the data as shown below left. Do not include the column heads or title.

untitled 2.cwk (SS)			
		A3	Baseball
	A	B	C
1	Favourite Sports		
2	Sport	Number of Students	
3	Baseball	20	
4	Basketball	12	
5	Football	10	
6	Hockey	18	
7	Soccer	15	
8			



A spreadsheet program uses the term “pie” for a circle graph.


- Click the graph icon  on the tool bar. A Chart Options dialogue box appears. Choose Pie, then click OK, as shown bottom right, page 194. The circle graph shows a legend at the right. The legend shows what sport each sector represents.
- To add a title, right-click the graph. Choose Chart Options. Select the Labels tab. In the Title box, type **Favourite Sports**, as shown below left. Then click OK. Your graph should look like the one below right.

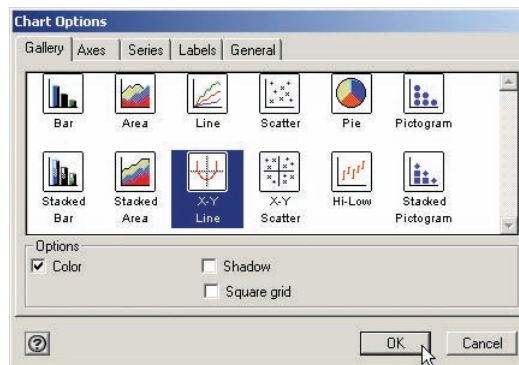


To create a line graph

Average Annual Income of Canadian Women	
Year	Income (\$)
1989	28 219
1990	29 050
1991	29 654
1992	30 903
1993	30 466
1994	30 274
1995	30 959
1996	30 606
1997	30 484
1998	32 553
1999	32 026

These data came from the Statistics Canada website.

- Enter the data into rows and columns in the spreadsheet.
- Highlight the data. Include the column heads, but do not include the table title.
- Click the graph icon  on the tool bar. A Chart Options dialogue box appears. Choose X-Y Line, then click OK, as shown below.



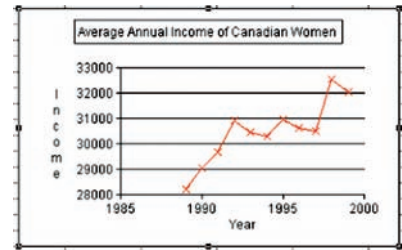
4. The software creates a legend, which is not needed for a line graph. To remove the legend, right-click the graph. Choose Chart Options. Select the Labels tab. Click the box next to Show Legend to remove the check mark. In the Title box, type **Average Annual Income of Canadian Women**. Then click OK.

Your graph should look like the one below.

- What trend does the graph show? Explain.
- How often did the average income increase? Decrease?

How can you tell this from the graph?

- When did the average annual income have the greatest increase? Greatest decrease?
- Write what else you know from the graph.



Check

1. Think about where you met your best friend. The table at the right lists the places where some Canadians met their best friends.
- Use a spreadsheet to draw a bar graph and a circle graph.
 - Which graph represents the data better? Explain.

Place	Number
School	5700
Work	4100
Club or organization	1400
Religious organization	700
Home/neighbourhood	4300
Through family	1200
Through friend	1100
Other	600

Average Value of \$1U.S.	
Year	Value in Canadian Dollars
1997	1.385
1998	1.484
1999	1.486
2000	1.485

2. Use a spreadsheet to draw a line graph for the data in the table at the left.
- What trend does the graph show?
 - Predict the average value, in Canadian dollars, of \$1U.S. in 2002 and in 2003. What assumptions did you make?
 - Research to find the average value, in Canadian dollars, of \$1U.S. in 2002 and 2003. Where could you get this information? How accurate was your prediction?

3. The data below are from the Statistics Canada website.
- Use a spreadsheet.
Create a graph to display the data.
 - Which type of graph best represents the data?
Explain.
 - Which type of graph could not be used to represent the data? Explain.

Math Link

Your World

Newspapers often publish survey results. The headlines may be misleading.

Try to find headlines like these. Cut them out. Explain why they are misleading.

Why would newspapers do this?

Average Hours of Television Viewing per Week, Fall 2001

Province	Adolescents 12–17 years
Newfoundland/Labrador	15.8
Prince Edward Island	12.4
Nova Scotia	14.1
New Brunswick	14.1
Quebec	14.5
Ontario	12.8
Manitoba	12.8
Saskatchewan	12.5
Alberta	13.3
British Columbia	10.9



Focus Understand which measure of central tendency best describes a set of data.

Explore

Work on your own.

Record on the board how many siblings you have.

Use the class data.

Find the mean, the median, and the mode.

Find the range.

The mean, median, and mode are **measures of central tendency**. Each measure is an average.

Reflect & Share

With a classmate, discuss which measure of central tendency best describes the average number of siblings.

Connect



When there is an odd number of data, to find the middle number: Add 1 to the number of data, then divide by 2. This gives the position of the middle number.

For example:

$$\frac{17 + 1}{2} = \frac{18}{2} = 9;$$

the middle number is 9th.

A clothing store sold jeans in these sizes in one day:

28 30 28 26 30 32 28 32 26 28 34 38 36 30 34 32 30

To calculate the mean jeans size sold, add the sizes, then divide by the number of jeans sold.

$$\begin{aligned} \text{Mean} &= \frac{28 + 30 + 28 + 26 + 30 + 32 + 28 + 32 + 26 + 28 + 34 + 38 + 36 + 30 + 34 + 32 + 30}{17} \\ &= \frac{522}{17} \\ &\doteq 30.7 \end{aligned}$$

The mean size is approximately 30.7.

To calculate the median, order the jeans sold from least size to greatest size. The middle number is the median.

There are 17 numbers. The middle number is 9th.

26, 26, 28, 28, 28, 28, 30, 30, 30, 30, 32, 32, 32, 34, 34, 36, 38

The median size is 30.

The mode is the number that occurs most often.

There are two numbers that occur most often.

They are 28 and 30. So, the mode sizes are 28 and 30.

In this situation, the mean, 30.7, is of little use.

The mean does not represent a size.

The median, 30, shows about one-half of the customers bought jeans of size 30 or smaller, and about one-half of the customers bought jeans of size 30 or larger.

The modes, 28 and 30, tell which sizes are purchased more often. The mode is most useful to the storeowner.

He may use the mode to order extra stock of the most popular sizes.

Example



A bookstore has 15 books in its young adult section. There are 5 different prices. This table shows the number of books at each price.

Young Adult Books	
Price (\$)	Number of Books
8.99	3
9.99	5
13.99	5
32.99	1
37.99	1

- Find the mean, median, and mode prices.
- Which measure best represents the average price of a young adult book?
- What is the range of the prices?

Solution

a) Mean price:

- Multiply each price by the total number of books at that price, then add the prices.

$$(8.99 \times 3) + (9.99 \times 5) + (13.99 \times 5) + 32.99 + 37.99 = 217.85$$

- Divide the total price by the total number of books: 15

$$\frac{217.85}{15} \doteq 14.52$$

The mean price per book is approximately \$14.52.

Median price:

There are 15 books.

The table shows the books in order from least price to greatest price.

The median price is the 8th price. The 8th price is \$9.99.

The median price is \$9.99.

Mode price:

There are two mode prices. They are \$9.99 and \$13.99.

- The mean price is not charged for any of the books. Only two books cost more than the mean of \$14.52.

There are two mode prices.

One mode, \$9.99, is the same as the median price.

One-half the books cost less than the median price.

One-half cost more.

So, the median price, \$9.99, best represents the average cost of a young adult book at the store.

- c) For the range, subtract the lowest price from the highest:

$$37.99 - 8.99 = 29.00$$

The range of prices is \$29.00.

Practice

1. Here are Ira's practice times, in seconds, for the 100-m backstroke: 122, 118, 123, 119, 118, 120, 118, 121, 119
- Find the mean, median, and mode of these data.
 - Of the mean, median, and mode, which do you think best describes Ira's race time? Explain.
 - What is the range of these data?

2. Caitlin received these test marks in each subject.

- a) Find the mean, median, and mode for each subject.

- b) Explain what information each measure of central tendency gives.

- c) Which subject is Caitlin best at? Worst at? Explain your reasoning.

Caitlin's Marks							
Math	85	69	92	55	68	75	78
Spelling	72	81	50	69	81	96	92
History	68	74	82	80	76	67	74

Weekly Tips Earned (\$)		
Waiter	Week 1	Week 2
James	1150	600
Kyrra	700	725
Tamara	800	775
Jacob	875	860
George	600	1165

3. The table shows the tips earned by five waiters and waitresses during two weeks in December.

- Calculate the mean, median, and mode tips for each week.
- Calculate the mean, median, and mode tips for the two-week period.
- Compare your answers in parts a and b. Which are the same? Which are different? Explain why.
- Which measure of central tendency best represents the tips earned during the two weeks? Explain.



4. Jamal was training for a 400-m race. His times, in seconds, for the first five races were: 120, 118, 138, 124, 118
- Find the median and mode times.
 - Jamal wants his median time after 6 races to be 121 s. What time must he get in his 6th race? Explain.
5. Find 5 numbers that have a mean of 24 and a median of 25. Justify your answer. How many different sets of 5 numbers can you find? Show that each set has the mean and median stated.
6. A quality control inspector randomly selects boxes of crackers from the production line. She measures their masses. On one day she selects 30 boxes. The inspector records these data:
- 12 boxes: 405 g each
 - 4 boxes: 385 g each
 - 4 boxes: 395 g each
 - 2 boxes: 380 g each
 - 8 boxes: 390 g each
- Which expression can be used to calculate the mean mass? Use it to find the mean mass.
 - $\frac{(405 \times 12 + 395 \times 4 + 390 \times 8 + 385 \times 4 + 380 \times 2)}{30}$
 - $405 \times 12 + 395 \times 4 + 390 \times 8 + 385 \times 4 + 380 \times 2 \div 30$
 - For the shipment of crackers to be acceptable, the mean mass must be at least 395 g. Is this shipment acceptable? Explain.
7. **Assessment Focus**
- Use these data: 28, 30, 30, 31, 32, 33, 34, 35, 37, 38, 39, 41
- Find the mean, median, and mode.
 - What happens to the mean, median, and mode in each case?
 - Each number is increased by 10.
 - Each number is doubled.
 Explain the results.

Number Strategies

Use only the digits 0, 2, 3, and a decimal point. Use each digit only once each time.

Make as many numbers with 2 digits as possible.

Find the sum of the numbers.

Reflect

Use your answers from *Practice*. Describe a situation for each case.

- The mean is the best measure of central tendency.
- The median is the best measure of central tendency.
- The mode is the best measure of central tendency.

Explore

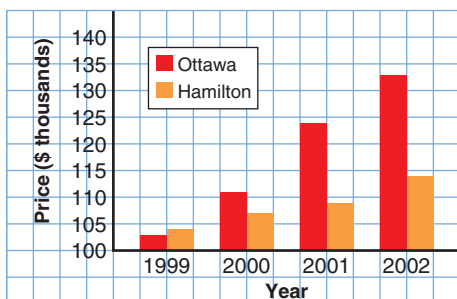
Work on your own.

What do the two graphs below show?

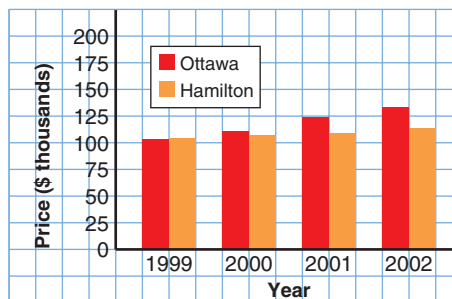
How are the graphs similar? How are they different?

Explain.

Average New House Prices



Average New House Prices



Reflect & Share

Discuss with a classmate:

What impression does each graph give? Explain.

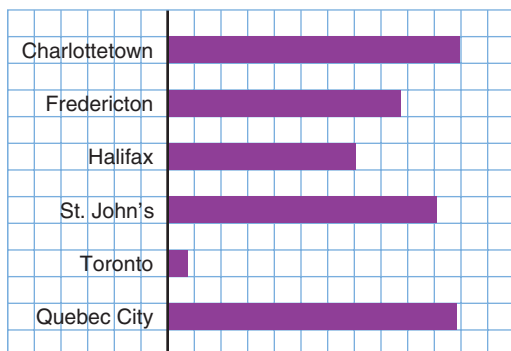
Who may want to use each type of graph?

Connect

Sometimes, graphs are used to distort information and to mislead.

Look at these graphs.

Average Annual Snowfall



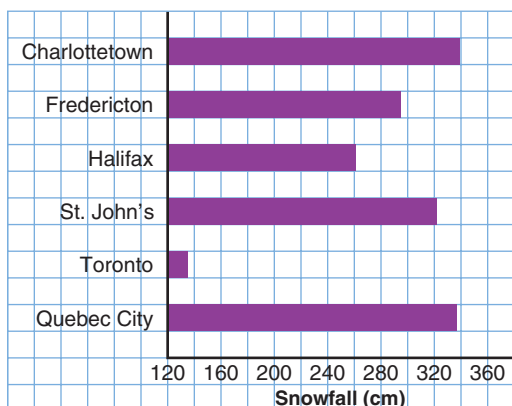
This bar graph is misleading.

It suggests that Quebec City has more than 10 times as much snow as Toronto.

This graph has no measurements of the depth of snow.



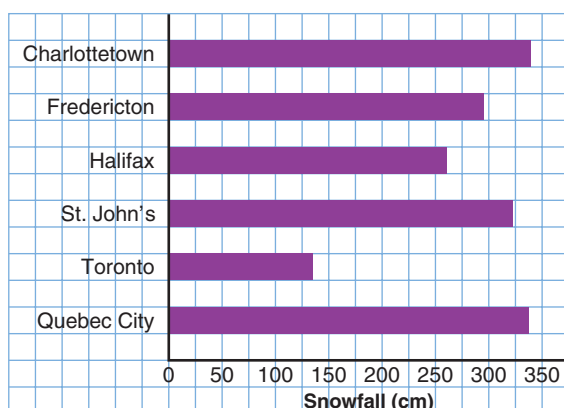
Average Annual Snowfall



Visually, this graph suggests the same information as the first graph. However, the horizontal scale is labelled with the snowfall.

The scale shows that Toronto has about 135 cm of snow and Quebec City has about 335 cm.

Average Annual Snowfall



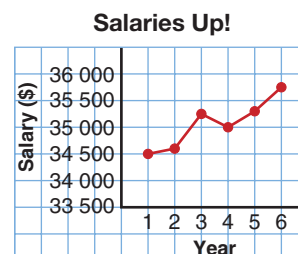
This graph accurately shows the data. The horizontal scale starts at 0.

The lengths of the bars are shown in the correct ratio. Quebec City has between 2 and 3 times as much snow as Toronto.

Example

This line graph is used to suggest that salaries have doubled in 6 years.

- Why is this graph misleading?
- Redraw the graph to show accurately how salaries have changed in 6 years.



Solution

- Use the vertical scale.

The salary in year 1 is about \$34 500.

The salary in year 6 is about \$35 750.

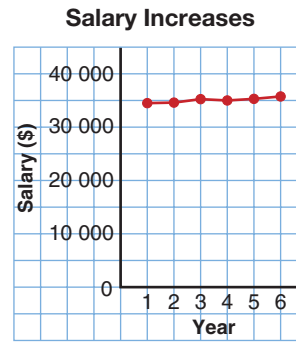
The increase in salary is: $\$35\,750 - \$34\,500 = \$1\,250$

The salaries have increased by only \$1250 in 6 years.

- Make a table from the line graph. Estimate each salary.

Year	Salary (\$)
1	34 500
2	34 600
3	35 250
4	35 000
5	35 300
6	35 750

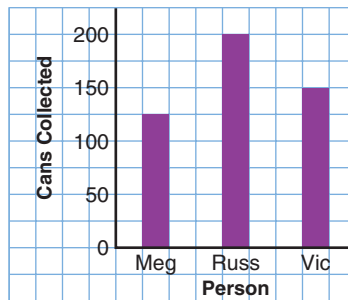
Draw a graph.
Start the vertical scale at \$0.
Use a scale of 1 square to represent \$5000.



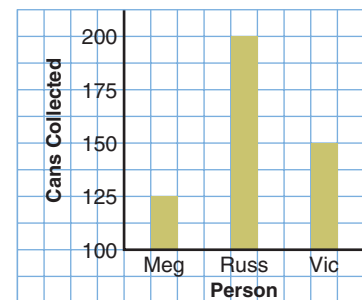
Practice

- Which graph is misleading? Explain why it is misleading.

Food Drive Results



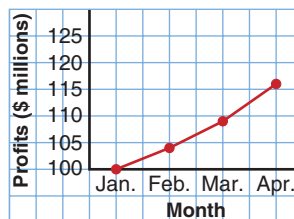
Food Drive Results



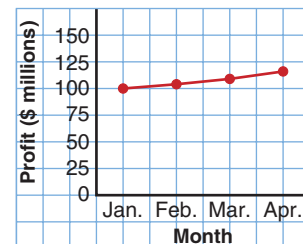
- The two graphs display the Read Books Company's profits for a four-month period.



Read Books Co. Profits



Read Books Co. Profits



- Which graph might the president of the company choose to report profits to the shareholders? Why?
- Which graph might the rival company use to compare profits? Why?
- Predict the company's profit for May. What assumptions do you make?

Mental Math

Estimate each product.

- 3.9×4.1
- 0.5×10.2
- 1.1×11.1
- 20.5×0.9

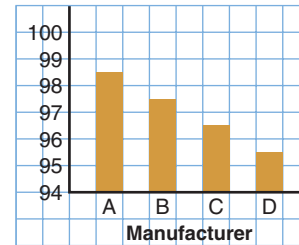
3. Why do some graphs display data in a misleading way? Describe how a graph might be drawn to misrepresent data.

4. A graph similar to this is part of an advertisement for a truck manufacturer.

With the graph,

Manufacturer A says that more than 98 out of 100 of its trucks sold in the last 10 years are still on the road.

Number of Trucks Still on the Road



- What impression does this graph give?
- How many trucks, out of 100, are still on the road for Manufacturer B? C? D?
- Do you think Manufacturer A's trucks are more dependable than the other manufacturers' trucks? Explain.
- Redraw the graph to give an accurate representation of the data.

Board of Directors' Expenses

Quarter	Amount (\$)
1st	85 000
2nd	104 000
3rd	125 000
4th	155 000

5. Draw a graph to display the data at the left in each way:
- The directors want the expenses to look low.
 - The shareholders want to show the expenses are too high.
 - Draw an accurate representation of the data.
- For each graph you draw, explain how it shows what you intended.

6. Assessment Focus

Use newspapers, magazines, or the Internet. Find a graph that creates a false impression.

- Describe how the graph creates a false impression.
- Why might the misleading graph be used?
- How could the graph be changed to present the data more accurately?
- Use your suggestions in part c to draw an accurate graph.

Reflect

Describe two ways in which a graph may be misleading.

Making a Study Sheet

1

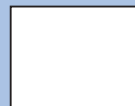
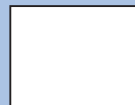
Be sure that you know exactly what will be covered on the test or quiz. Ask your teacher if you are not sure. Highlight these areas in your notebook.



2

List the math vocabulary you will need. Write definitions and provide examples if you need to.

Congruent figures have exactly the same size and shape. Corresponding angles have the same measure. Corresponding sides have the same length.



3

Colour code any formulas you will need.

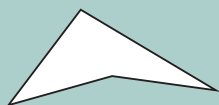
*Area of rectangle = Length \times Width
Area of triangle = $\frac{1}{2} \times$ Base \times Height*

4

Use pictures to help you remember.

Polygon: A closed figure formed by three or more line segments

YES:



NO:



5

Copy out a sample problem. Include all necessary examples and discussion.

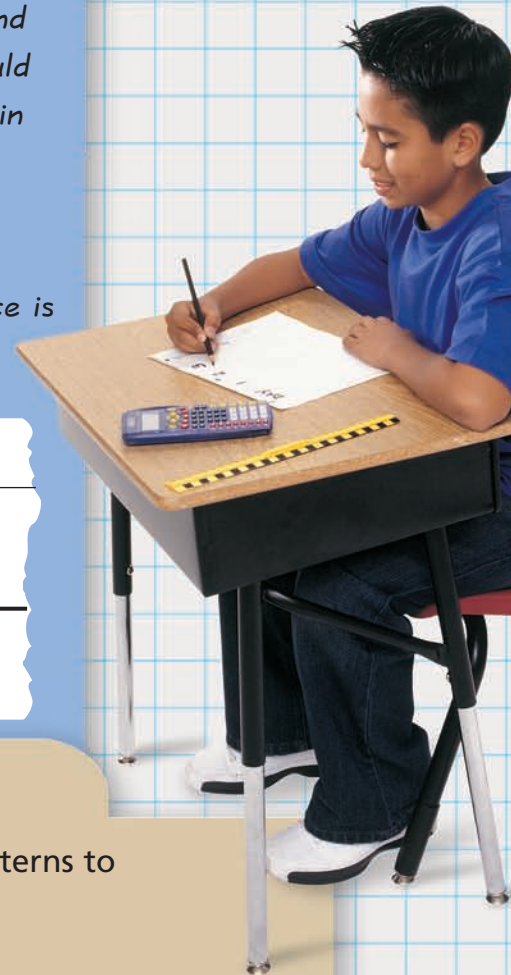
Sample Problem: You have a choice of recess times:

- You may have 30 min a day for the next two weeks,
OR
- You may have 1 min of recess the 1st day, 2 min the 2nd day, 4 min the 3rd day, 8 min the 4th day, and so on, for the next two weeks. Which choice would give you more recess time in the 2 weeks? Explain your answer.

Solution

This problem is about finding out which recess choice is better. The strategy I will use is to make a table.

Day	1	2	3
Choice 1 (min)	30	30	30
Total time (min)	30	60	90
Choice 2 (min)	1	2	4
Total time (min)	1	3	7



6

Use word association and patterns to help you remember.

A hexagon has six sides. (Both have an X.)
 Octagon -- Octopus (Both have 8 sides/arms.)

What Do I Need to Know?

- ✓ **Primary data** are data you collect.
- ✓ **Secondary data** are found from databases on the Internet, or a library, or other sources.
- ✓ In a set of data:

The **mean** is the sum of numbers divided by the number of numbers in the set.

The **median** is the middle number, when there is an odd number of data in the set. When there is an even number of data, the median is the mean of the two middle numbers.

The **mode** is the number that occurs most often. A set of data can have no mode, one mode, or more than one mode.

What Should I Be Able to Do?

For extra practice, go to page 442.

LESSON

- 5.1 1. A recreation group wants to find out the favourite summer activity of teenagers in the town.
- a) Write an unbiased survey question.
 - b) Write a biased survey question. Explain how it is biased.



- 5.2 2. The data in this table are from Statistics Canada.
- 5.5

Average Weekly Earnings in 2001

Job	Earnings (\$)
Forestry	831
Mining	1153
Utilities	1000
Construction	800
Real Estate	612
Education	696
Health Care	584
Transportation	742

- a) What do the data show?
- b) Draw a graph to display the data.
- c) Explain your choice of graph. Could another type of graph have been used? Why?
- d) Which job has the highest weekly earnings?
The lowest weekly earnings?
How is this shown in your graph?
- e) How can the data be used to find the average annual earnings? The average monthly earnings?
How might the graph be used to find these?
- f) Which average: mean, median, or mode, do you think is shown in the table?
Explain your answer.

5.5 3. Jacob collected the data in the table below. The table lists 5 TV shows that air on Sunday evenings. The survey question was “Which of these shows is your favourite?”

Everyone Loves Jordan___, Girl Meets World___, Lost in Time___, Metro PD___, Reality Shock___”

TV Show	Tally	Frequency
Everyone Loves Jordan	### ### ## //	
Girl Meets World	### ###	
Lost in Time	### ////	
Metro PD	////	
Reality Shock	### ### ## ##	

- a) Write the frequency of each response.
- b) How many people did Jacob survey?
- c) Suppose you were a TV producer and had to take one show off the air. Which show would it be? Explain.
- d) Suppose you were an advertiser. Which show would you advertise with? Why?
- e) Display the data using:
 - i) a pictograph
 - ii) a bar graph

5.3 4. A quality control inspector measures the masses of boxes of raisins. He wants to know if the average mass of a box of raisins is 100 g. He randomly chooses boxes from the production department. The masses, in grams, are recorded below.

Masses of Boxes of Raisins in Grams

99.1, 101.7, 99.8, 98.9, 100.8, 100.3, 98.3, 100.0, 97.8, 97.6, 98.5, 101.7, 100.2, 100.2, 99.4, 100.3, 98.8, 102.0, 100.3, 98.0, 99.4, 99.0, 98.1, 101.8, 99.8, 101.3, 100.5, 100.7, 98.7, 100.3, 99.3, 102.5

- a) Draw a stem-and-leaf plot.
- b) What can you tell from the plot that you could not easily see from the data?
- c) Will this shipment be approved? Explain.
- d) What is the median?
- e) What is the mode?

- f) Would the shipment be approved if the mode was used? If the median was used? Explain.

- 5.4** 5. The mean monthly rainfalls for Calgary and Charlottetown are given.

Mean Monthly Rainfall (cm)		
Month	Calgary	Charlottetown
January	1.2	9.8
February	1.0	8.2
March	1.5	7.6
April	2.5	7.5
May	5.3	8.0
June	7.7	7.9
July	7.0	7.4
August	4.9	9.0
September	4.8	9.2
October	1.6	9.9
November	1.2	11.5
December	1.3	10.0

- a) Draw a line graph for each city on the same grid.
- b) Describe each graph. Are there any trends? Explain.
- c) Do the line graphs cross? What does this mean?
- d) Determine the mean annual rainfall for each city. Explain your steps.
- e) Determine the median monthly rainfall for each city.
- f) What else do you know from the table or the graph?

- 5.5** 6. In each case, which is most useful: the mean, median, or mode? Justify your answer.

- a) A storeowner wants to know which sweater sizes he should order. Last week he sold 5 small, 15 medium, 6 large, and 2 X-large sweaters.
- b) Five of Robbie's friends said their weekly allowances are: \$5, \$8, \$10, \$6, and \$5. Robbie wants to convince his parents to increase his allowance.
- c) Tina wants to know if her math mark was in the top half or bottom half of the class.

- 5.5** 7. A small engineering company has an owner and 5 employees.
- 5.6** This table shows their salaries.

Company Salaries	
Position	Annual Salary (\$)
Owner	130 000
Manager	90 000
2 Engineers	50 000
Receptionist	28 000
Secretary	28 000

Which measure of central tendency would you use to describe the average annual salary in each case?

- a) You want to attract a new employee.
- b) You want to suggest the company does not pay its employees well.

Practice Test

1. a) Explain the difference between primary and secondary data.
 b) State if primary data or secondary data are used in each case. Justify your answers.
 - i) Anna searched the Internet to find the top ten movies of the year.
 - ii) Rory phoned his friends to ask if they were coming to his party.

800-m Race Times

3:25, 3:07, 1:55, 3:11
 2:41, 2:47, 3:04, 1:58
 2:35, 3:25, 3:08, 2:53
 2:29, 3:15, 2:55, 2:28
 3:14, 2:47, 3:07, 2:39
 2:39, 2:43, 3:19, 2:54
 3:11, 2:59, 2:42, 2:57

2. Here are the times, in minutes and seconds, of 28 people who competed in an 800-m race.
 - a) Display the data in a stem-and-leaf plot.
 - b) What is the range of times for the race?
 - c) Find the median time.
 - d) Is there a mode time? If so, what is it? If not, explain how you know.
3. Parham received these marks on 7 math tests:
 91, 75, 95, 80, 83, 86, 68
 What mark will he need on his next test in each case?
 Justify each answer.
 - a) The mean of his 8 tests is 84.
 - b) The mode of his 8 tests is 86.
 - c) The median of his 8 tests is 84.

Country of Origin for Visitors to Canada

Country	Number of Visitors
Japan	500 000
France	400 000
Germany	400 000
Australia	175 000
United Kingdom	850 000
Mexico	150 000
Hong Kong	125 000

4. a) Graph the data at the left. Explain your choice of graph.
 b) In the year 2000, approximately 15 000 000 people visited Canada from the U.S. Suppose you want to add these data to your graph in part a. How would your graph change?
 c) Redraw the graph in part a. Include the data from part b.
 d) Compare the two graphs. Which graph gives you more information? Justify your answer.

Your help is needed to organize a school Winter Carnival Day.

Think about:

- the classes or grades that should participate
- which activities students would enjoy
- which snacks and drinks should be offered

You will collect, display, and analyse data.

Part 1

Brainstorm with your classmates. Keep a record of the ideas.

Here are some topics you may want to discuss:

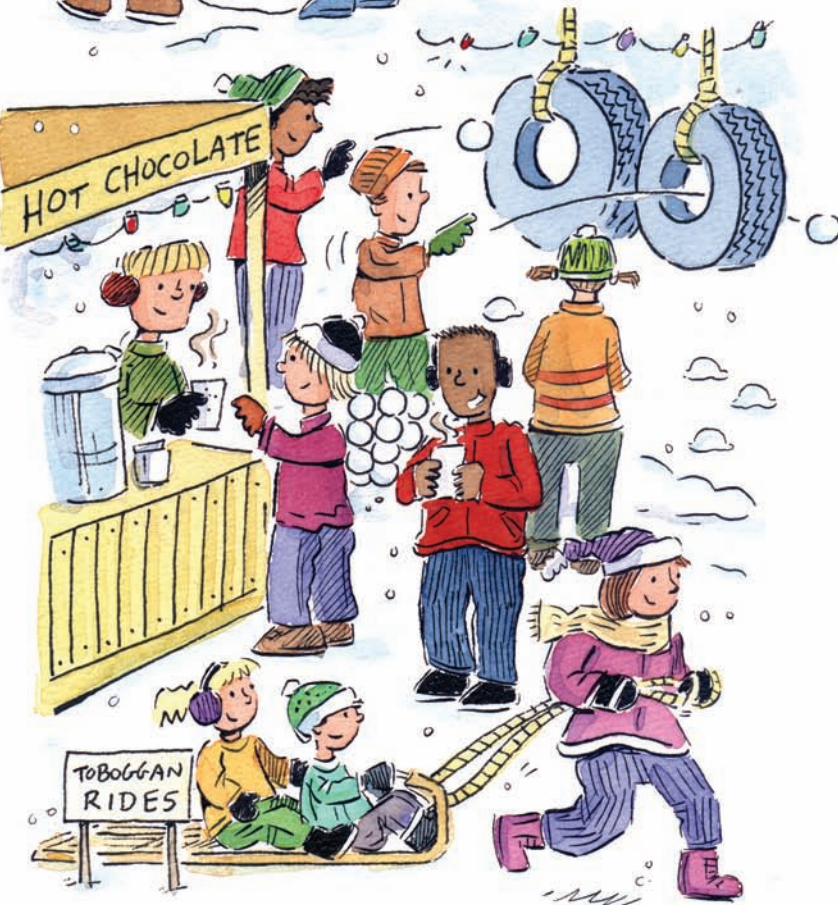
- Who will participate in Winter Carnival Day?
Is it possible for all students in every grade in your school to participate?

Are there special considerations for different age groups?

- What type of indoor and outdoor sports, games, and crafts do you think students in your school would enjoy?
- What types of snacks and drinks should be offered?
How much will this cost?

After brainstorming, break into five groups. Each group will be responsible for collecting data and reporting on one of the following topics:

- Indoor sports
- Outdoor sports
- Games
- Crafts
- Snacks and drinks



Part 2

Your group will collect, display, and analyse data related to your task.

- Write a survey question or questions related to your task. Explain how bias can be avoided when writing the question.
- Conduct the survey.
- Display the collected data in different ways. Justify your displays.

- Analyse the data.

What decisions can be made about Winter Carnival Day from your results?

- Prepare a report of your findings.

Check List

Your work should include:

- ✓ your survey question and data collection plan
- ✓ at least two displays of your data
- ✓ justification for the procedures and displays you chose
- ✓ your analysis and recommendations

Part 3

Present the results of your group work to the rest of the class.



Reflect on the Unit

Describe the different types of graphs you drew.
What can you tell about the data from each type of graph?
Use examples to explain.