Advantages and Disadvantages of Different Graphs

How tall are the students in your class? Is everyone nearly the same height? Or are the heights spread out? What is the most common height for the boys and the girls?

Explore the Math

Materials
- metre stick
- chalk or masking tape
- ruler
- grid paper (optional)
- coloured pencils

interval
- the spread between the smallest and the largest numbers in a range of numbers

What are the best ways to display a large quantity of data?

1. Work in groups of three or four. To the nearest centimetre, measure and record the height of each member of your group.

2. Record the results for the entire class on the board. Include the height and gender of each student.

3. Decide on an interval , and then organize the data into groups. You may wish to use 10 cm as the interval for the height of students in your class. Round the shortest height down to the nearest 10 cm. For example, if the shortest height is 122 cm, start the first interval at 120 cm. Develop a frequency table using the model below.

Interval	Tally	Frequency
120 to 129 cm		
130 to 139 cm		

A frequency table lists items and uses tally marks to record the number of times each item occurs.

4. Display your data using a graph of your choice.

5. a) Compare the information on your graph with that of other groups. How does the type of graph you used affect the amount and the type of information it displays?

  b) List advantages and disadvantages of the type of graph you used.

6. Separate the data into two categories. For example, you might compare boys and girls.

7. Choose one type of graph to display both sets of data.

8. a) Compare the data on the two graphs that you made.

  b) List advantages and disadvantages of the type of graph you used in step 7.

  c) Compare the information on your second graph with that of other groups. Did you reach the same conclusions? Explain.

Reflect on Your Findings

**9.** How might you decide which graph is best for representing a large quantity of data?


## Literacy Link

Types of Graphs

Bar Graph
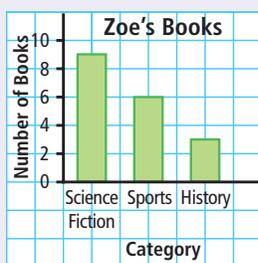
Line Graph

Circle Graph
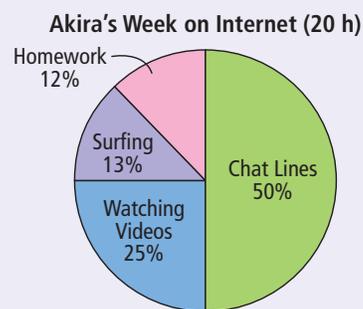
Double Bar Graph
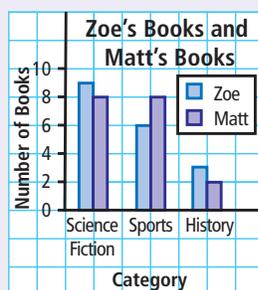
Double Line Graph
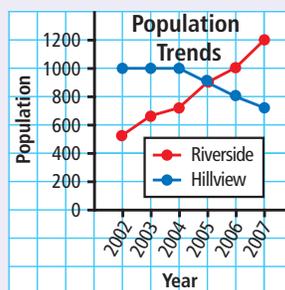
Pictograph
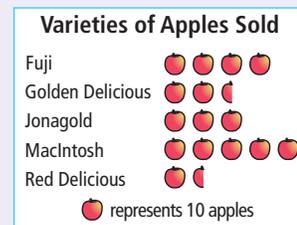
Example 1: Compare Two Graphs

During one weekend, the owners of Pascal's Pizzeria recorded how they received pizza orders and then presented the data using a circle graph and a pictograph.

Weekend Pizza Sales (125 orders)
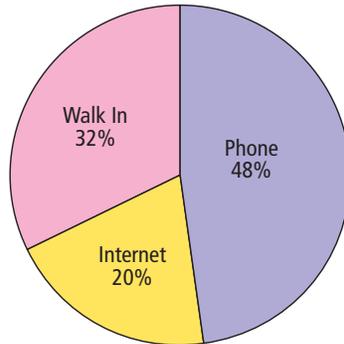
a) How many more pizzas were ordered by phone than on the Internet? Which graph shows this more clearly? Explain.

b) Almost half of the total number of orders came by phone. Which graph shows this more clearly? Explain.

c) Which graph better shows the number of pizzas ordered by Internet? Justify your choice.

d) Would a line graph be a useful way to display the data? Explain why or why not.

e) What other type of graph could be used to display the data?

Solution

a) There were 35 more pizzas ordered by phone than on the Internet.

The pictograph uses symbols to compare the number of pizza orders from the phone, the Internet, and walk ins. The pictograph shows more clearly that there were more than twice as many phone orders as Internet orders.

b) The circle graph shows that 48% of the pizzas were ordered by phone. The circle graph shows this more clearly because almost half of the circle is shaded to represent phone orders.

c) The pictograph shows the number of pizzas ordered by Internet better than the circle graph. The pictograph uses 2.5 pizza symbols to represent the orders from the Internet.

Since each symbol represents 10 pizzas, then $2.5 \times 10 = 25$ pizzas.

You would have to perform extra calculations to determine the number of pizzas ordered by Internet using the information on the circle graph.

For example, the circle graph shows that 20% of the 125 pizzas were ordered on the Internet. You can find the number of pizzas by calculating 20% of the total number of pizzas.

Since $20\% = 0.2$, then $0.2 \times 125 = 25$ pizzas.

d) A line graph would not be useful since the data do not show changes over time. You need to use a graph that compares data in different categories.

e) A bar graph could also have been used to compare data about pizza orders.

Show You Know

The graphs show the number of each variety of apple sold in a fruit stand.

Varieties of Apples Sold

Fuji

Golden Delicious

Jonagold

MacIntosh

Red Delicious

represents 10 apples

Varieties of Apples Sold

Number of Apples vs. Variety

Fuji: 40
Golden Delicious: 25
Jonagold: 30
MacIntosh: 50
Red Delicious: 15
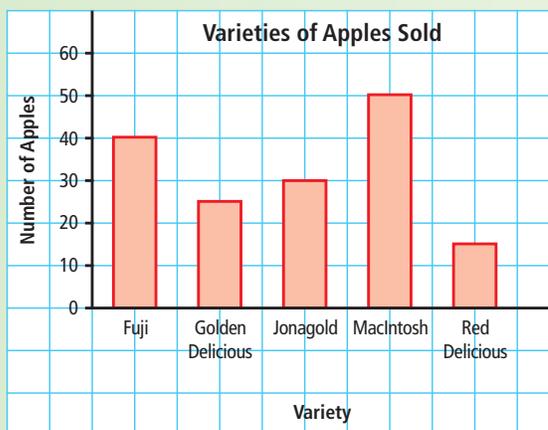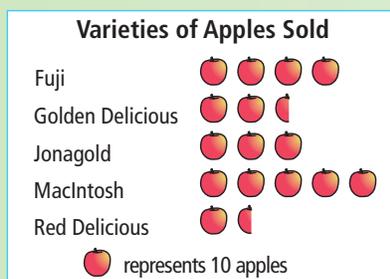
a) In your opinion which graph is easier to read? Justify your choice.

b) Would a line graph be a useful way to display the data? Explain why or why not.

c) What other type of graph could be used to display the data?

Example 2: Representing Data

During the 2005–2006 hockey season, the Edmonton Oilers advanced to the Stanley Cup finals. In regular season play, two of their top three players were Shawn Horcoff (born in Trail, BC) and Jarret Stoll (born in Melville, SK). Here are the statistics for their previous three regular seasons with the Oilers.

Horcoff (Centre)

Season	Games Played	Goals	Assists	Total Points
1	78	12	21	33
2	80	15	25	40
3	79	22	51	73

Stoll (Centre)

Season	Games Played	Goals	Assists	Total Points
1	4	0	1	1
2	68	10	11	21
3	82	22	46	68

a) Use a double bar graph to display the data.

b) Which player shows the most improvement in total points?

c) Total points are used to assess a player's worth. Take a look at the number of games Horcoff and Stoll played. Is this a fair way to assess a player's worth?

d) Would two circle graphs be effective to display the data? Explain.

Solution

a)
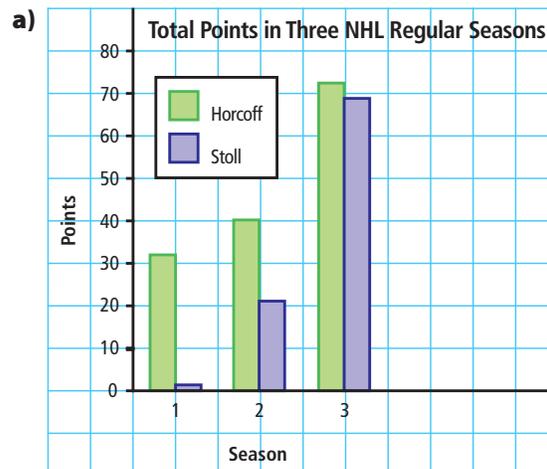
**b)** Stoll shows the most improvement in total points over three seasons.

c) Total points are not a fair way to assess a player's worth. The graph does not take into account the number of games that each centre played during the regular season. The number of games that Stoll played increased over the three seasons, whereas the number of games that Horcoff played stayed approximately the same each season.

d) No, two circle graphs are less effective. Each circle graph shows the percent of points scored in each season compared with the total number of points scored over three seasons. It is difficult to compare the total points of the two players.

Horcoff's Total Points in Three NHL Regular Seasons (146 points)

Season 1 22%
Season 3 49%
Season 2 29%
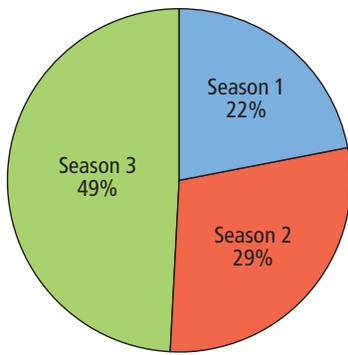
Stoll's Total Points in Three NHL Regular Seasons (90 points)

Season 1 1%
Season 3 76%
Season 2 23%
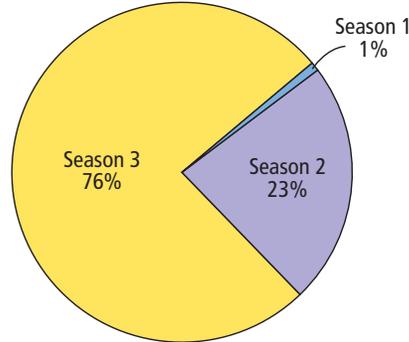
Show You Know

Jenna surveyed students in grade 8 in her school to determine their favourite team sports.

a) Choose one type of graph to display the data.

b) Graph the data.

c) Give one advantage of using your choice of graph.

| Sports	Frequency
Basketball	24
Volleyball	20
Soccer	45
Baseball	25
Hockey	32
Other	4
Total	150

Key Ideas

- Data can be presented using bar graphs, double bar graphs, circle graphs, line graphs, and pictographs.
- Different graphs may provide different information and display certain types of data better.

 - Bar graphs are best for comparing data across categories.

  Gadgets Owned by a Grade 8 Class

  (bar graph: x-axis "Gadgets" with categories Calculator, Cell Phone, Computer, MP3 Player; y-axis "Number of Gadgets" from 0 to 30)
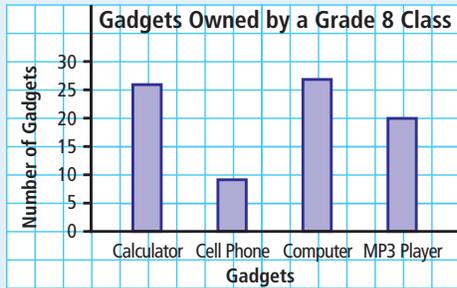
  - Double bar graphs are best for comparing two sets of data across categories.

  What Gadgets Do You Have?

  (double bar graph: x-axis "Gadgets" with categories Calculator, Cell Phone, Computer, MP3 Player; y-axis "Percent of Students" from 0 to 100; legend: Elementary Students, Secondary Students)
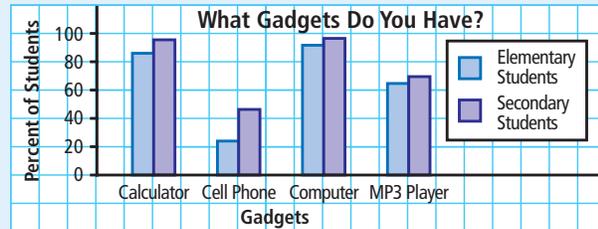
  - Circle graphs are best for comparing categories to the whole using percents. The sum of the percents in a circle graph is 100%.

  Andre's Weekly Activities (25 h)

  (circle graph: Reading 15%, Television 20%, Playing Drums 20%, Playing Sports 25%, Internet/Video Games 20%)
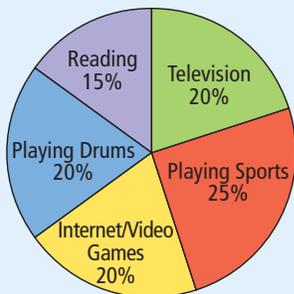
  - Line graphs are best for showing changes in data over time.

  Whitehorse Average Maximum Temperature

  (line graph: x-axis "Month" labeled J F M A M J J A S O N D; y-axis "Temperature (°C)" from -15 to 20)
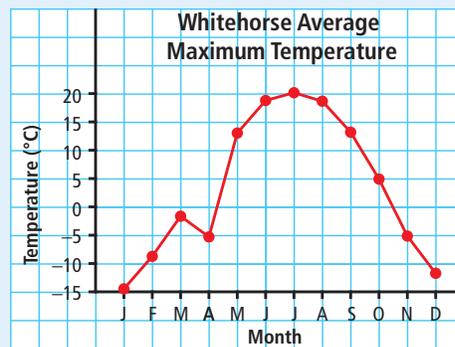
  - Pictographs are best for comparing data that can be easily counted and represented using symbols.

  T-Shirt Sales

Monday	👕 ⅟
Tuesday	👕 👕 ⅟
Wednesday	👕 👕 👕 👕
Thursday	👕 👕 👕 👕 👕 ⅟
Friday	👕 ⅟

  👕 represents 10 T-shirts

Communicate the Ideas

1. Flora wants to use a graph to summarize movie ticket sales for two movies, and make a prediction for future sales. Which graph should she use—the double line graph or the double bar graph? Explain why.
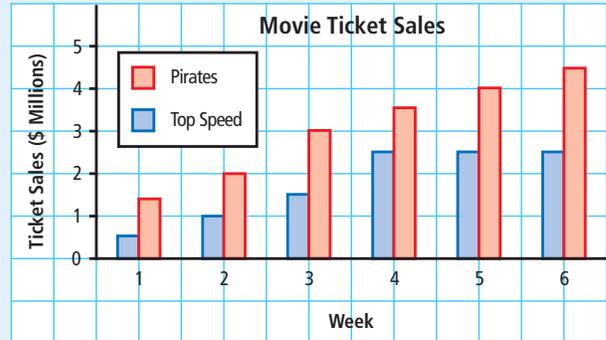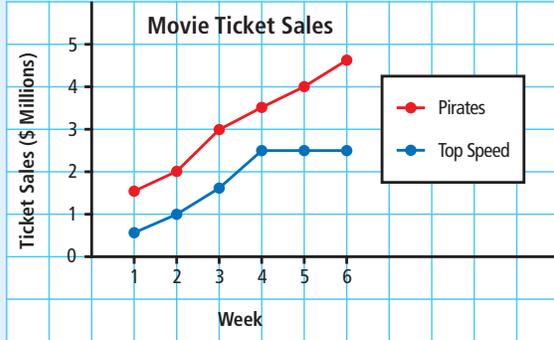
2. Wes surveyed 60 students to determine which type of computer game is the most popular. Wes decided to display the data in a bar graph. Bonnie suggested that a circle graph would be more useful for displaying the data. Who made a better choice? Explain.

Type of Game	Votes
Quest	15
Role-play	20
Simulation	9
Strategy	16
Total	60

3. How are a bar graph and a pictograph similar? How are they different? What type of data is each useful for displaying? Share your answer with a classmate.

Check Your Understanding

Practise

For help with #4 to #6, refer to Example 1 on pages 8–9.

4. Ravi recorded his spending for one month. He displayed the data in a circle graph and a pictograph.

a) How much more does Ravi spend on food than on movies? Which graph shows this more clearly? Explain.

b) Ravi spends half of his money on food and clothing. Which graph shows this more clearly? Explain.

**c)** Describe one advantage and one disadvantage of using each graph.
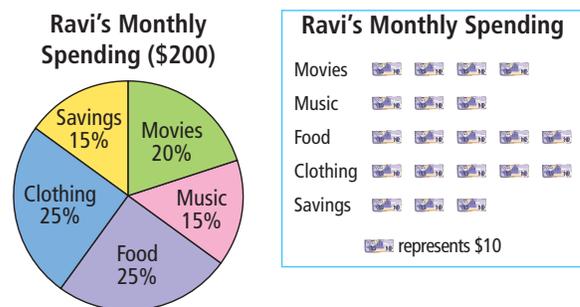
5. The piano that Sara, Ann, and Min use is available for 40 h of practice every week. The graphs show how they divide the practice time.

Piano Practice Per Week (40 h)

Piano Practice Per Week
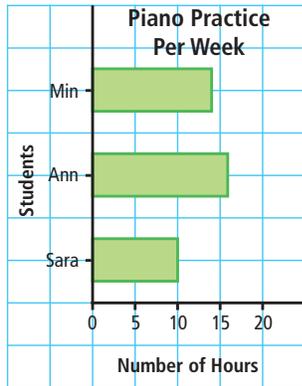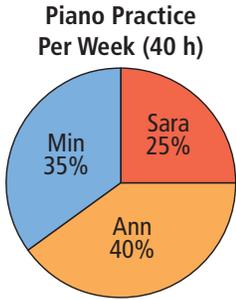
a) What information does each graph provide?

b) Write and answer one question about the data that can be answered from the circle graph.

c) Write and answer one question about the data that can be answered from the bar graph.

6. For a science fair experiment, Mitchell measured the height of a plant every Monday for four weeks. He displayed the data in a line graph and a pictograph.

Week	1	2	3	4
Plant Height (cm)	20	40	60	90
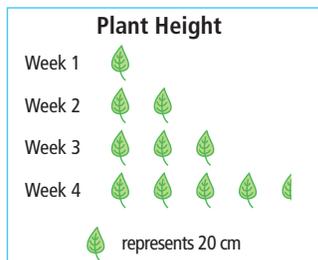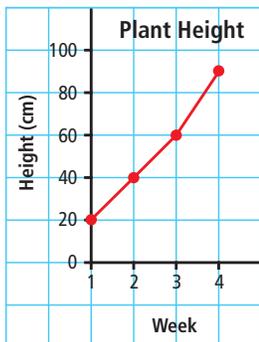
Plant Height

a) What information does each graph provide?

b) Between which two weeks did the plant grow at the same rate?

c) Between which two weeks did the plant change the most in height? Which graph shows this more clearly?

d) Describe one advantage and one disadvantage of using each graph.

7. The table shows the heights of two friends measured over time.

Lewis

Age	Height (cm)
2	40
4	60
6	70
8	100
10	120
12	145
14	165
16	175

Andrea

Age	Height (cm)
2	40
4	60
6	80
8	110
10	130
12	150
14	160
16	160

a) Use a double bar graph and a double line graph to display the data.

b) How are the trends for Andrea and Lewis similar? How are they different?

c) Which graph do you think more clearly shows each student's height trend? Explain your choice.

d) Would two circle graphs be effective for displaying the data? Explain why or why not.

Literacy Link

A *trend* is the general direction that a line graph is going.

8. The table shows the decibel levels of different sounds in the environment.

Sound	Level
Leaves rustling	20 dB
Whisper	30 dB
Heavy traffic	78 dB
Lawn mower	90 dB
Hockey game	104 dB
Thunder clap	120 dB
Stock car races	130 dB
Balloon pop	157 dB

a) Use a bar graph to display the data. What is one advantage of using a bar graph?

b) Could you use a line graph to display the data? Explain.

c) Could you use a circle graph to display the data? Explain.

**d)** Would a pictograph be an effective way to display the data? Explain why or why not.

Apply

9. The graphs show the categories of books that were signed out from a library over a year.

Books Signed Out (3750 books)
- History 10%
- Sports 13%
- Science Fiction 34%
- Teen Romance 20%
- Mystery 23%

Books Signed Out
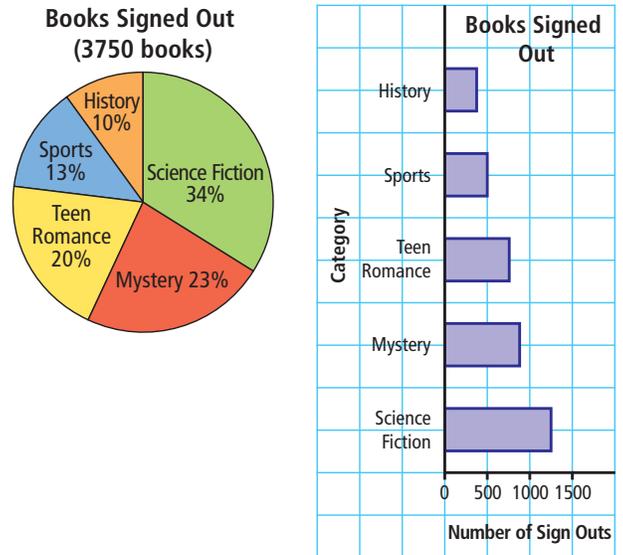
a) Estimate how many times more popular science fiction books are than history books.

b) Which graph helped you answer part a)? Why did you choose this graph?

c) Which category of book has approximately the same number of sign outs as history and sports books together? Show your thinking.

d) Which graph helped you answer part c)? Why did you choose this graph?

e) The library has $12 000 to spend on books based on their popularity. How much money should be spent for each category? Show your work.

f) Which graph did you use to answer part e)? Why did you choose this graph?

10. The pictograph shows the results of the election for the grade 8 representative on the students' council.

Grade 8 Representative

Ari	▤ ▤ ▤ ▤
Bai	▤ ▤ ▤ ▤ ▤ ▤
Niki	▤ ▤ ▤ ▤
Tuong	▤ ▤ ▤ ▤ ▤ ▤

▤ represents 10 votes
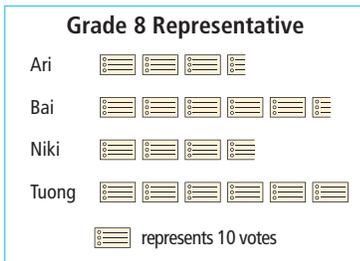
a) Draw a bar graph to show the data in the pictograph.

b) Does the pictograph or the bar graph more clearly show how students voted in this election? Explain your reasoning.

c) Would you recommend using a line graph to show the data? Explain.

d) Identify one advantage and one disadvantage of using a circle graph to show the data.

11. A store manager tracks jewellery sales for one month.

Week	Items Sold
1	14
2	25
3	39
4	65
Total	143

a) Use two different graphs to represent the data.

b) Compare the two graphs. Is one graph more effective in representing the data? Explain your reasoning.

**c)** Should the store continue to sell this jewellery? Explain your thinking.

12. A grade 8 class recorded the following percent scores on a Math test:

78 65 49 72 89 73 68 70 78 85
44 51 75 95 88 63 58 67 90 48
56 77 98 40 63 89 91 82 76 59

a) Organize the data into groups and develop a frequency table.

b) List the different graphs that could be used to display the data.

c) Which graph would most effectively display the test scores? Explain your choice.

13. A radio station was designing a web site for teen listeners. It surveyed 50 students from each of two schools to find out which features most interested students. Each student voted for the two features they most wanted to see on the web site.

School	Entertainment News	Music Downloads	Contests	Message Boards
Queen Elizabeth	40	45	5	10
Hillside	20	35	25	20

a) Choose one type of graph to represent the data. Explain your choice.

b) What two categories are the most important for students from Queen Elizabeth?

14. Janice surveyed ten friends about their favourite colour of Freezie™ to stock in the school store. She used this line graph to show the data.


Favourite Freezie™
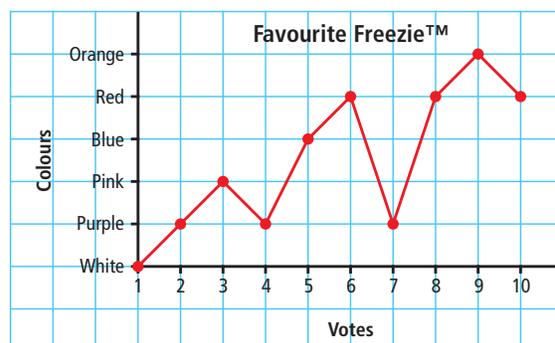
a) How could you improve this graph?

b) Why is using a line graph not a good choice in this case? Explain your reasoning.

15. Search various media, such as magazines, newspapers, and the Internet, for information about music or sports that has been represented in a graph. Print or cut out the graph. Glue or tape it into your notebook.

a) Write and answer two questions about the data in the graph.

b) Represent the data using a different kind of graph.

c) Write and answer two questions about the data that can be answered by your new graph. Your questions should be different from the ones you wrote in part a).

d) Compare the two graphs. Describe an advantage and a disadvantage of using each graph.

16. Here is an incomplete line graph.
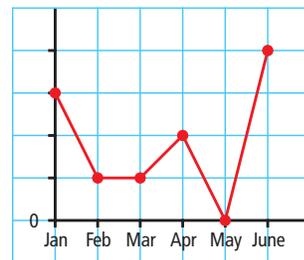
a) Describe a scenario to represent the data on this graph. Then, complete the graph.

b) Draw another graph to show the data.

c) State one disadvantage of using each graph to show the data.

17. Prepare a survey question that would give you data that are appropriate to display in a circle graph.

a) How many different options does your question have? Is your question likely to have a different number of people responding to each option?

b) Explain why the circle graph is preferable to other graphs for displaying this data.

c) Prepare another survey question that would give you data that are appropriate to display in a different graph of your choice.

MATH LINK

Survey the students in your class about their favourite type of music from a list of five or six different types. Consider including the following choice on the survey: None of the above.

a) Record the data in a tally chart and create a frequency table.

b) Draw a graph of your data.

c) Explain an advantage and a disadvantage of using your graph format to display the data.