

# 8.5

## Create Circle Graphs

### Focus on...

After this lesson, you will be able to...

- ❑ construct a circle graph with and without technology



**Number of People Entering During Angela's Shift**

| Age                      | Number of People |
|--------------------------|------------------|
| Children (under 6 years) | 30               |
| Youth (6–18)             | 80               |
| Adults (19–59)           | 55               |
| Seniors (60+)            | 25               |

Angela works at the local movie theatre on weekends. One of Angela's jobs is to record the number of people who enter during her shift. In one shift, she records the data shown in the table.

She wants to make a circle graph that will compare the age groups to each other, and to the total number of people who came in during her shift. How could she make the graph?

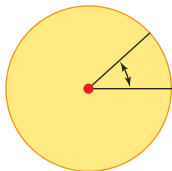
### Explore the Math

#### Materials

- ruler
- compass
- protractor
- coloured pencils

#### central angle

- an angle formed by two radii of a circle
- the vertex of the angle is at the centre of the circle



#### How do you create a circle graph?

1. Construct a circle with a radius of 5 cm. Draw the diameter. With the centre of the circle as the vertex, measure the **central angle** formed by the diameter.
  - a) How many degrees are in the top half of the circle?
  - b) How many degrees are in the bottom half of the circle?
  - c) What is the sum of the central angles of a circle?
2. Construct a circle graph to show how you would sort the students in your class by their number of siblings.
  - a) Survey the class to find out the number of siblings each student has. Record this information in your notebook.
  - b) Draw a circle to represent the whole class.
  - c) Divide the circle into sectors to show how you sorted your classmates. How did you use the result of #1c) to decide on the size of each central angle?

#### Literacy Link

Siblings are brothers and sisters.

## Reflect on Your Findings

- Compare your circle graph with others in the class. How are they similar? How are they different? What might be reasons for any differences?

### Example 1: Draw a Circle Graph Using a Protractor

Shannon surveyed her grade 7 class about the number of days they use the Internet in a typical week. The results are shown in the table.

| Internet Use<br>(Number of Days in a Week) | Number of Students |
|--|--------------------|
| 0  | 3                  |
| 1–3  | 9                  |
| 4 or more                                  | 18                 |

Draw a circle graph to display the data.

#### Solution

Determine the total number of students in the class.

$$3 + 9 + 18 = 30$$

There are 30 students in the class.

Complete the following table.

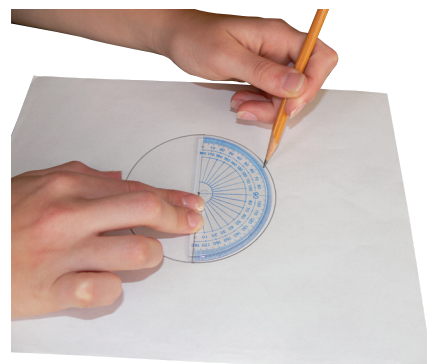
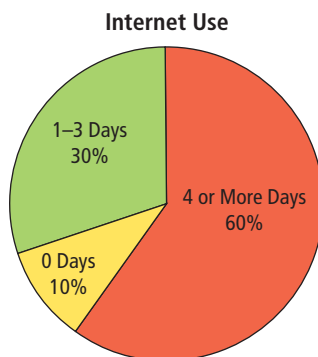
| Internet Use<br>(Number of Days in a Week) | Number of Students | Percent of Total | Decimal Value Equivalent | Central Angle                      |
|--|--------------------|------------------|--------------------------|------------------------------------|
| 0  | 3                  | 10%              | 0.10                     | $0.1 \times 360^\circ = 36^\circ$  |
| 1–3  | 9                  | 30%              | 0.30                     | $0.3 \times 360^\circ = 108^\circ$ |
| 4 or more                                  | 18                 | 60%              | 0.60                     | $0.6 \times 360^\circ = 216^\circ$ |
| <b>Totals</b>                              | 30                 | 100%             | 1.00                     | $360^\circ$                        |

percent of total = (number of students ÷ total number of students) × 100%

There are  $360^\circ$  in a circle.

To create a circle graph:

- Draw a circle.
- Use a protractor to measure and draw each central angle.
- Label each sector with its category and its percent.
- Colour or shade each sector.
- Add a title for the circle graph.



#### Did You Know?

##### Why does a circle have $360^\circ$ ?

The Babylonians saw that the sun took 365 days to complete a circle in the sky. By dividing this circle into 365 parts, the sun would move through one part each day. But 365 does not have many factors and is hard to work with as a fraction. The Babylonians decided that 360 was close enough and a much more convenient number. Discuss with a partner why 360 is more convenient than 365.

## Example 2: Draw a Circle Graph Using Technology

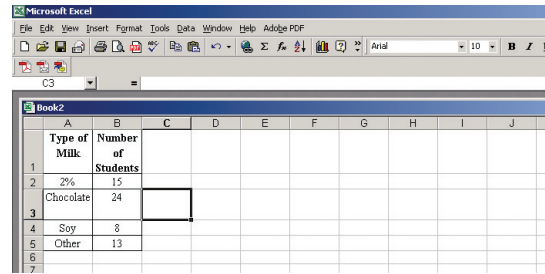
James surveyed all the students in his grade to find their favourite type of milk to drink. His results are shown in the table.

| Type of Milk | Number of Students |
|--------------|--------------------|
| 2%           | 15                 |
| Chocolate    | 24                 |
| Soy          | 8                  |
| Other        | 13                 |

Draw a circle graph to display the data.

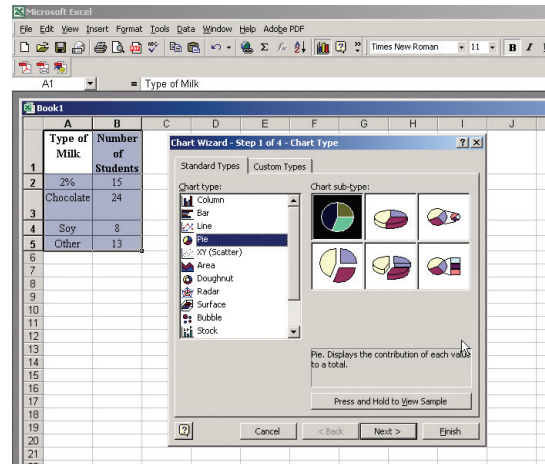
### Solution

Enter the data from the table into two columns of a spreadsheet.



Select the Chart Wizard.

Select Pie Chart.

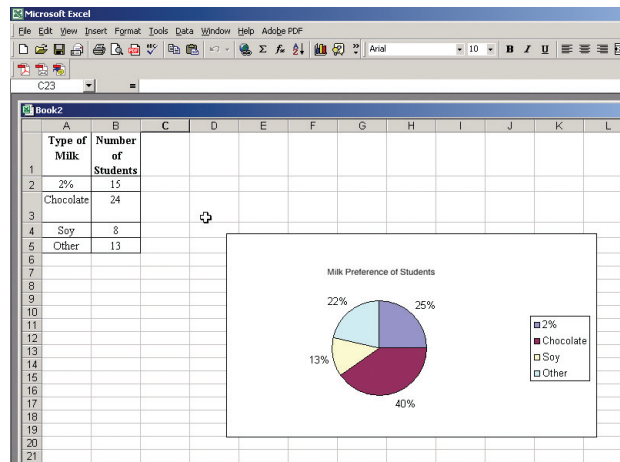


Follow the instructions in the Chart Wizard.

Enter a title for the graph.

Choose to display Category Name and Percentage from the Data Labels page.

Create a pie chart.



**Tech Link**  
Use the spreadsheet software available on your computer to create the circle graph shown here.

## Key Ideas

- The sum of the central angles of a circle is  $360^\circ$ .
- To create a circle graph using a protractor:
  - Express each category as a percent of the total.
  - Use the decimal value equivalent of the percent to calculate the measure of the central angle.  
central angle = decimal value equivalent of percent  $\times 360^\circ$
  - Use a protractor to measure and draw each central angle.
  - Add sector labels and a title to the circle graph.
- To create a circle graph using a spreadsheet:
  - Enter the categories into one column and their corresponding amounts into the next column.
  - Use the **Chart Wizard** to make a pie chart.
  - Enter a title for the graph and choose labels for your sectors.

## Communicate the Ideas

- a) How do you know that the sum of the angles in a circle is  $360^\circ$ ? Explain.
  - b) How is this value used to determine the size of each central angle in a circle graph?
- a) Create a circle graph using data of your choice.
  - b) Write two questions related to your circle graph.
  - c) Give these questions to a classmate or friend. Is your classmate able to interpret your circle graph to answer your questions?
3. Fazila has completed the following table. Are there any errors in the calculations? If yes, identify the errors and correct them.

| Cell Phone Calls Per Day | Number of People | Percent of Total | Decimal Value Equivalent | Central Angle |
|--------------------------|------------------|------------------|--------------------------|---------------|
| 0                        | 3                | 10%              | 0.1                      | $36^\circ$    |
| 1–2                      | 9                | 30%              | 0.3                      | $108^\circ$   |
| 3–5                      | 12               | 36%              | 0.36                     | $130^\circ$   |
| More than 5              | 6                | 20%              | 0.2                      | $72^\circ$    |
| <b>Totals</b>            | 30               | 100%             | 1.00                     | $360^\circ$   |

## Practise

For help with #4 to #6, refer to Example 1 on page 293.

4. Liam sorted and counted his hockey cards and decided to make a circle graph of the types of cards he had.

a) Copy and complete the following table.

| Type          | Number of Cards | Percent of Total | Decimal Value Equivalent | Central Angle |
|---------------|-----------------|------------------|--------------------------|---------------|
| Forward       | 20              |                  |                          |               |
| Defense       | 16              |                  |                          |               |
| Goalie        | 4               |                  |                          |               |
| <b>Totals</b> |                 |                  |                          |               |

b) Draw a circle graph to display the data.

5. All the grade 7s were surveyed to determine their favourite flavour of ice cream.

a) Copy and complete the following table.

| Favourite Ice Cream | Number of Students | Percent of Total | Decimal Value Equivalent | Central Angle |
|---------------------|--------------------|------------------|--------------------------|---------------|
| Chocolate           | 24                 |                  |                          |               |
| Strawberry          | 15                 |                  |                          |               |
| Vanilla             | 12                 |                  |                          |               |
| Other               | 9                  |                  |                          |               |
| <b>Totals</b>       |                    |                  |                          |               |

b) Draw a circle graph to display the data.

6. Jordan surveyed her classmates to determine their favourite school subject. Make a circle graph to display the data.

| Subject | Number of Students |
|---------|--------------------|
| Math    | 9                  |
| Art     | 6                  |
| P.E.    | 9                  |
| Other   | 6                  |

For help with #7 to #9, refer to Example 2 on page 294.

7. Kian recorded the hours he spent on homework during a school week. Use a computer with spreadsheet software to make a circle graph displaying the data.

| Day       | Hours |
|-----------|-------|
| Monday    | 1.75  |
| Tuesday   | 1.25  |
| Wednesday | 2.5   |
| Thursday  | 2.0   |
| Friday    | 0.5   |

8. Angela recorded the following number of people entering the movie theatre during one busy holiday shift. Use a computer with spreadsheet software to create a circle graph to display the data.

| Age                      | Number of People |
|--------------------------|------------------|
| Children (under 6 years) | 60               |
| Youth (6–18)             | 200              |
| Adults (18–59)           | 100              |
| Seniors (60+)            | 40               |

9. The school cafeteria records the number of lunch specials ordered over the week. Use a computer with spreadsheet software to create a circle graph to display the data.

| Lunch Special       | Number Ordered |
|---------------------|----------------|
| Chicken strips      | 350            |
| Fish and chips      | 225            |
| Lasagna             | 175            |
| Pizza               | 451            |
| Macaroni and cheese | 264            |



## Apply

10. The table gives the total population for each of the three Canadian territories in 2001.

**Territory Population in 2001**

| Territory             | Population |
|-----------------------|------------|
| Yukon Territory       | 28 520     |
| Northwest Territories | 37 100     |
| Nunavut               | 26 665     |

- Use a spreadsheet to create a circle graph to display the data.
  - Use the Internet to find the most recent population figures for the territories. Make a circle graph to display the data.
  - Discuss with a partner reasons for the population changes.
11. Select two different types of magazines, for example, sports, fashion, family, news.
- Count the number of full pages of advertising in each magazine.
  - Count the number of full pages of articles.
  - Count the number of pages that contain both articles and advertising.
  - Make a circle graph for each magazine comparing the number of pages of advertising to the number of pages of articles.
  - Which type of magazine has the higher percent of advertising?



## Extend

12. Use the Internet to find the most recent population figures for British Columbia, Alberta, Saskatchewan, and Manitoba. Also, record the population figures from approximately 20 years ago.



- Make two circle graphs:  
Graph A: using the most recent figures  
Graph B: using the older set of data
  - How can you tell from the circle graphs which province showed the largest percent gain in total population, from Graph B to Graph A?
  - Write two questions that could be answered using the circle graphs you drew in part a).
13. Prepare a survey question that would give you data where a circle graph would be helpful.
- How many different options does your question have? Is your question likely to have a different number of people responding to each option?
  - Ask the students in your class your survey question. Record the data in a chart.
  - Create a circle graph to display the data.
  - What conclusion(s) can you make based on your circle graph?