UNIT 7

Data Analysis

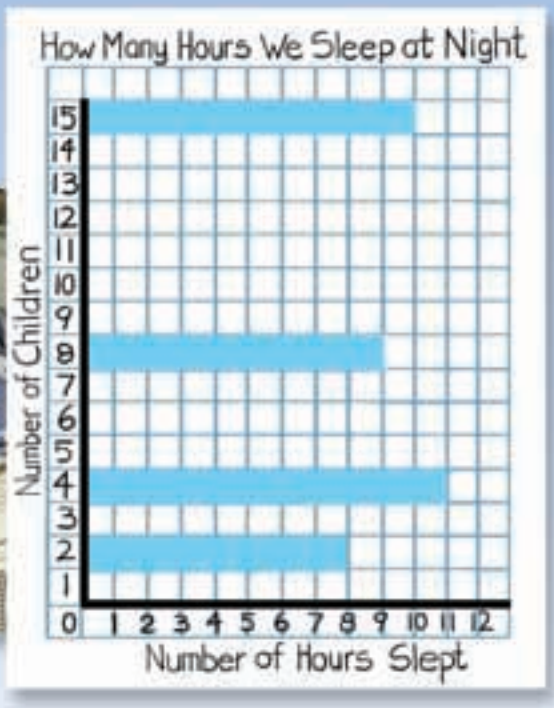
Using Data to Answer Questions

Lunch	Number of Students
Pizza	9
Burger and fries	8
Tuna sandwich	4
Taco	5
Submarine	6

Learning Goals

- interpret graphs
- compare pictographs with different keys
- compare bar graphs with different scales
- draw pictographs and bar graphs
- compare pictographs and bar graphs

Favourite Sports of 100 Children	
Hockey	32
Soccer	27
Lacrosse	9
Baseball	22
Basketball	10



Key Words

- key
- scale
- vertical bar graph
- vertical axis
- horizontal axis
- horizontal bar graph
- trial

These graphs and charts show data about Grade 4 students.
What can you find out from each graph and chart?

LESSON 1

Reading Pictographs and Bar Graphs

Explore

These pictographs show data from a Grade 4 reading group.

The pictograph on the left is from the Unit Launch.
The pictograph on the right shows the same data.

How are the pictographs the same? Different?
Who read the most books in April?
How do you know?

Show *and* Share

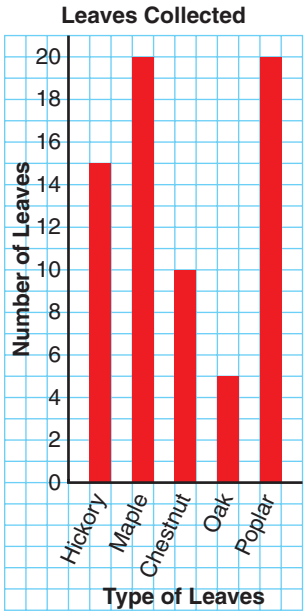
Compare your answers with those of other classmates.
Which pictograph did you use to answer the questions?
Take turns to ask each other questions about the pictographs.

Connect

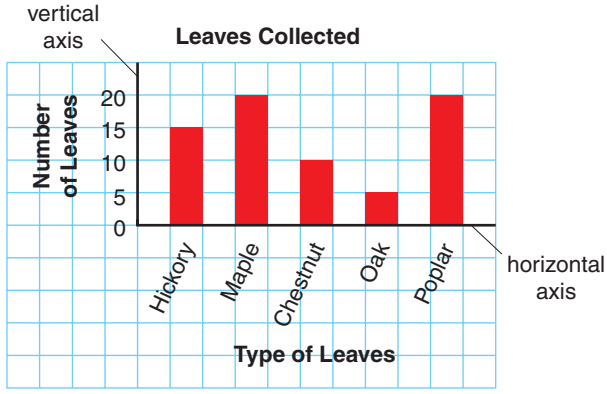
The title of a graph tells you what the graph shows.
The labels tell you what data are displayed.
In a pictograph, symbols are used to show data.

The **key** shows what each symbol represents.
For the pictograph on the right in *Explore*,
the key is  represents 2 books.

In a bar graph, bars are used to show data.
The numbers show the **scale**.
These bar graphs show the same data.



In this graph,
1 square represents 1 leaf.



In this graph,
1 square represents 5 leaves.

The bar graphs have different scales.
The bars are shorter in the graph on the right.
A scale is chosen so the size of the graph is manageable.

These are **vertical bar graphs**.
The bars are drawn upward.
The numbers are on the **vertical axis**.
The types of leaves are on the **horizontal axis**.

Practice

1. This pictograph shows the types of gym shoes Grade 4 students wear at Zeina's school.

a) What is the key?

b) What is the most common type of gym shoe?

c) How many students wear basketball shoes?

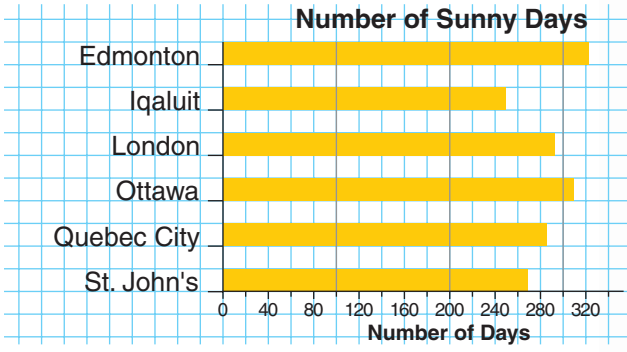
d) Which 2 types of shoes are worn by the same number of students? How do you know?

Types of Gym Shoes

Basketball	3
Trail/Hiking	1
Cross Trainers	4
Court	3
Running	5

represents 3 students

2. This bar graph shows the typical number of sunny days each year for 6 cities.



a) What is the scale?

b) Which cities have more than 300 sunny days?

c) Which cities have between 200 and 300 sunny days?

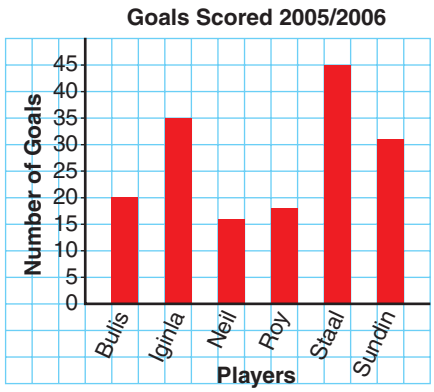
d) Which city has the most sunny days?

e) Suppose the numbers on the axis were not given. Could you still answer part d? Explain.

f) How many sunny days does Iqaluit have? Is your answer exact or approximate? Explain.

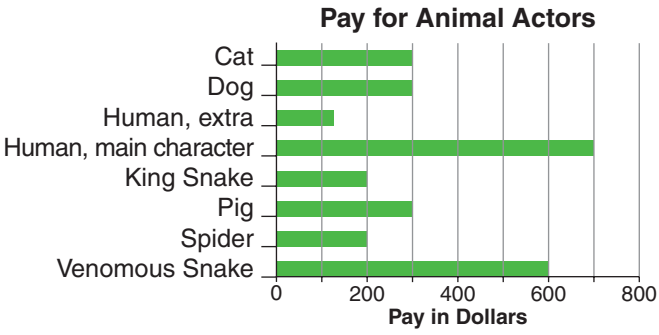
3. The graph in question 2 is a **horizontal bar graph**. How is this graph like the graphs in *Connect?* How is it different?

4. These graphs show the number of goals scored by 6 NHL players in the 2005/2006 season.



a) Who scored the most goals? The fewest goals?
b) Which player scored about one-half the goals of Iginla?
c) Which graph was easier to use, to answer parts a and b? Explain.
d) What is the scale on each graph?
e) Which scale do you think is more appropriate? Explain.

5. a) What does this graph show?



b) Which animal actors receive the same pay?
c) Which actors' pay is one-half that of a venomous snake's?
d) Why do humans appear twice in the graph? What is the difference in their pay?
e) Why do you think some animal actors get paid more than others?

Reflect

How does the key affect the appearance of a pictograph?
How does the scale affect the appearance of a bar graph?

LESSON 2

Drawing Pictographs

Explore

You will need a bag of 20 two-colour counters.

- Empty the counters onto a desk.
- Choose one colour. Make a table.
  Record the number of counters showing this colour.
  This is your first **trial**.
- Return the counters to the bag. Do 4 more trials.
  Count the same colour each time.
  Record the results of each trial.
- Graph your data in a pictograph. Use a key.
  Each symbol should represent more than 1 counter.
- What do you know from looking at the pictograph?

Trial	Number of red counters
1	
2	
3	
4	
5	

Show *and* Share

Did you have fractions of symbols in your pictograph? Explain.
Could you have chosen a key so there would be no fractions? Explain.

Connect

Aliyah asked Grades 4 and 5 students in her school how they travel to school each day.
Here are her results:

Type of transportation to School	Walk	Bus	Bike	Car
Number of Students	30	45	5	25

Aliyah chose  for the symbol because she collected data on the number of students.

To make sure her graph was not too large,

Aliyah chose  to represent 10 students.

Then,  represents 5 students.

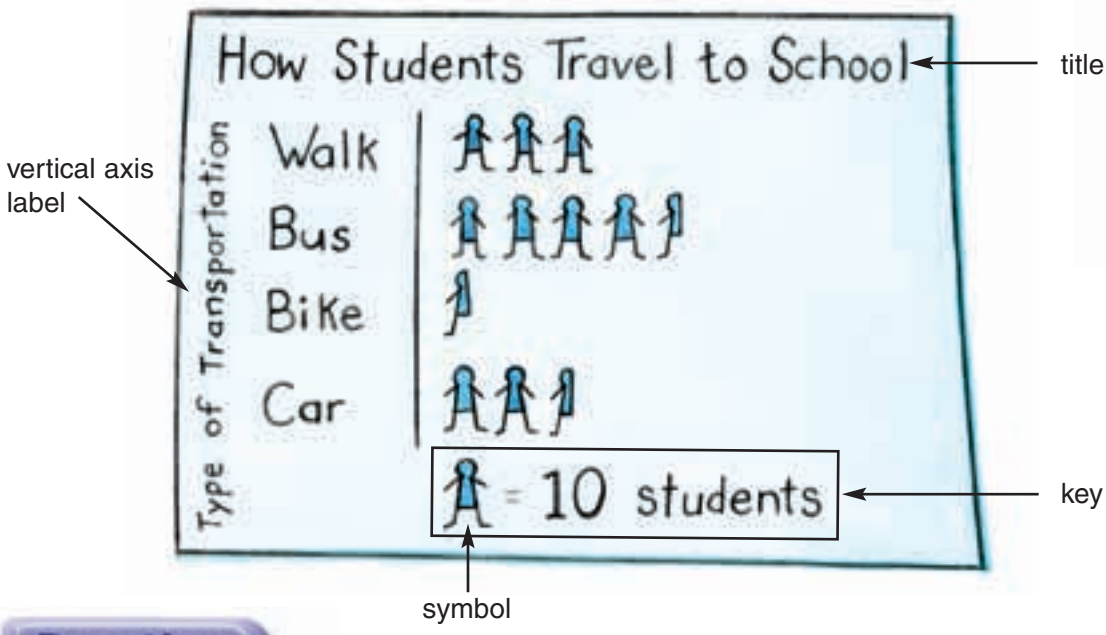
To show 30 students, Aliyah needed 3 symbols: 

To show 45 students, Aliyah needed 4 symbols and $\frac{1}{2}$ a symbol: 

To show 5 students, Aliyah needed $\frac{1}{2}$ a symbol: 

To show 25 students, Aliyah needed 2 symbols and $\frac{1}{2}$ a symbol: 

To draw the pictograph, Aliyah wrote each type of transportation on the vertical axis.
Then, she drew the correct number of symbols beside each type of transportation.
Aliyah completed the pictograph with a key, a label on the axis, and a title.



Practice

1. Each table has data for a pictograph.
Suppose you drew each pictograph. What key would you use? Why?

a)

Favourite Type of Movie	Number of Students
Action	6
Comedy	12
Drama	8
Horror	2
Mystery	4

b)

Favourite Colour	Number of People
Red	15
Yellow	25
Blue	10
Green	25
Orange	40

c)

Favourite Family Activity	Number of Students
Hunting	60
Fishing	50
Dog-sledding	80
Trapping	70
Camping	100

2. **a)** Draw a pictograph to display these data.

Students in the Band

Grade	4	5	6	7	8
Number of Students	9	5	6	11	13

b) How did you choose your key?

c) Write what you know about the band.

3. **a)** Draw a pictograph to display these data.

Time When People Take the Bus in the Morning

Time of Day	6:00	7:00	8:00	9:00	10:00	11:00	12:00
Number of People	4	8	14	2	5	8	10

b) What do you know from the pictograph?

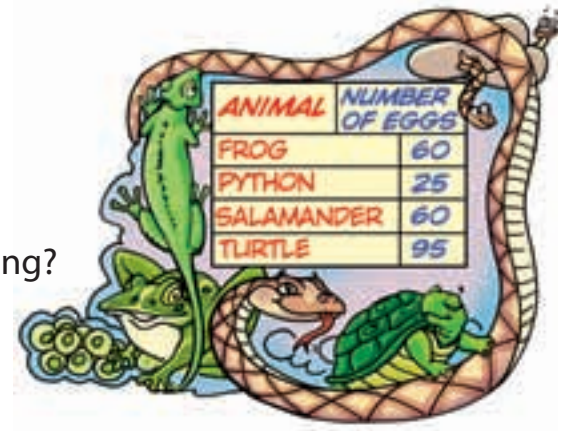
c) Write two questions using the data from the graph.
Exchange questions with a classmate.
Answer your classmate's questions.

4. This table shows the typical number of eggs some animals lay.

a) Draw a pictograph.
How did you choose your key?

b) A seahorse lays about 200 eggs.
How would you include this data on your pictograph?
Would you need to change anything?
Explain the change.

Show your work.



Reflect

When you draw a pictograph, how do you decide what key to use?
Use words, pictures, or numbers to explain.

LESSON 3

Drawing Bar Graphs

Explore

This table shows the typical life spans of some animals.

Animal	Typical Life Span
Asian elephant	40 years
Black rhinoceros	15 years
Killer whale	65 years
Polar bear	20 years

Use grid paper. Draw a bar graph.
Choose a suitable scale.

Show *and* Share

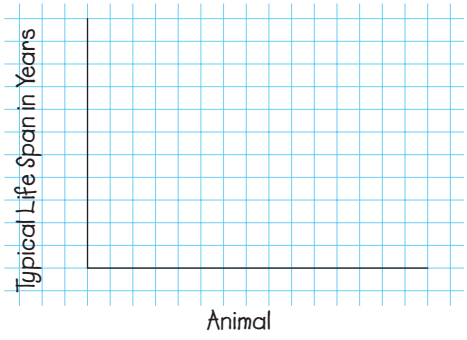
Share your graph with another pair of students.
How are your graphs the same? Different?

The typical life span of a Galapagos tortoise is 100 years.
Suppose you wanted to add the life span of this tortoise to your graph.
Discuss how you might have to change your graph.

Connect

Bar graphs may be drawn vertically or horizontally.
You can graph the data below on grid paper.

Animal	Typical Life Span
Bottle-nosed dolphin	40 years
Brown bear	22 years
Fin whale	85 years
Potbelly seahorse	8 years



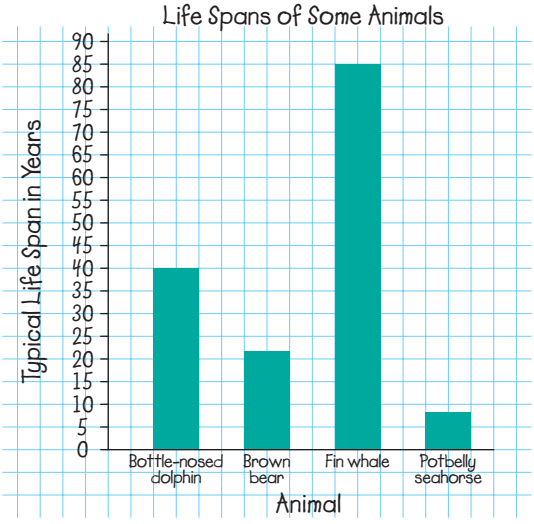
Draw 2 axes. Label the horizontal axis "Animal."
Label the vertical axis "Typical Life Span in Years."

There are 20 squares along one side of the 1-cm grid paper.

➤ Count by 5s for the scale.
The scale is 1 square represents 5 years.

➤ Draw a vertical bar for each animal in the table.
Estimate the lengths of the bars for 22 years and 8 years.
The bar for 22 years ends less than halfway between 20 and 25.
The bar for 8 years ends slightly more than halfway between 5 and 10.

➤ Write a title for the graph.



Practice

1. The number of wins in 2005 is shown for 4 Major League Baseball teams.

a) Draw a bar graph to show the number of wins.
For the scale, count by 5s.

b) Write two things you know from looking at your graph.

Teams	Number of Wins
Blue Jays	80
Mariners	69
Tigers	71
Yankees	95

2. Stefan had a bag of coloured candy.
He counted each colour.

Stefan's Candy

Colour	Tally	Number
Brown	𝍸	5
Red	𝍸 𝍸 ||	12
Yellow	𝍸 𝍸	10
Blue	𝍸 |	6
Orange	𝍸 ||||	9
Green	𝍸 ||	7

a) Draw a bar graph.
Use a scale of 1 square represents 1 candy.
b) Draw a bar graph.
Use a scale of 1 square represents 2 candies.
c) Which scale is better for this graph? Explain.

3. The children in l'école Orléans estimated the time they took to get to school.
a) Draw a bar graph.
Explain why you chose the scale you did.
b) Compare your graph with a classmate's graph.
Do both graphs match? Explain.
c) How many children take the greatest time?
d) Some children take only 5 minutes.
Do they live closest to the school?
Explain your answer.

How Long It Takes to Get to School

Time in Minutes	Number of Children
5	11
10	22
15	38
20	37
25	45
30	10
35	33
40	20
45	12

4. This table shows the heights of some players from the 2006 Canadian women's Olympic hockey team.

a) Draw a bar graph to display these data.

b) Explain why each of these parts of your graph is important: title, bars, labels, scale

c) Why is your scale *not* 1 square represents 1 cm?

Name	Height
Apps	183 cm
Botterill	175 cm
Kellar	170 cm
Ouellette	180 cm
Piper	165 cm
St. Pierre	175 cm
Wickenheiser	178 cm

5. **a)** Draw a bar graph. Explain your choice of scale.

b) Which city had the fewest wet days?

c) Why do you think Victoria had more wet days than Edmonton?

d) Write a question you can answer using the table or the graph. Answer the question.

Show your work.

City	Typical Number of Wet Days Each Year (1961–1990)
Charlottetown	177
Edmonton	123
Fredericton	156
Montreal	162
Ottawa	159
Victoria	153

Math Link

Your World

The driest town in Canada is Osoyoos, B.C. It typically receives less than 20 cm of rainfall each year.

In the Inkaneep native dialect, the name Osoyoos means "where the water narrows."

Reflect

How did you use what you know about reading bar graphs to draw a bar graph?

LESSON 4

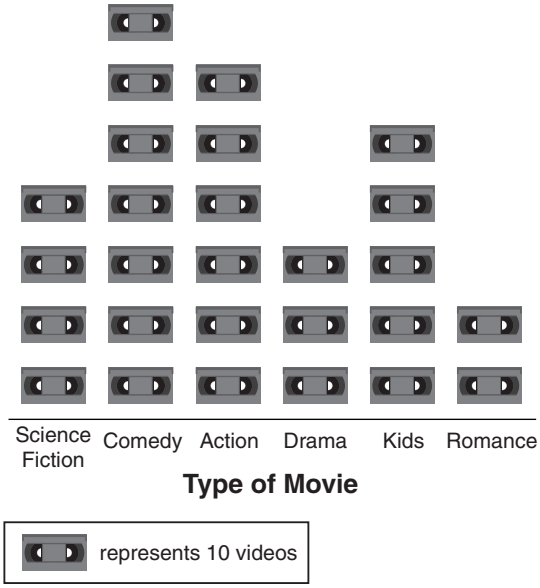
Comparing Pictographs and Bar Graphs

Explore

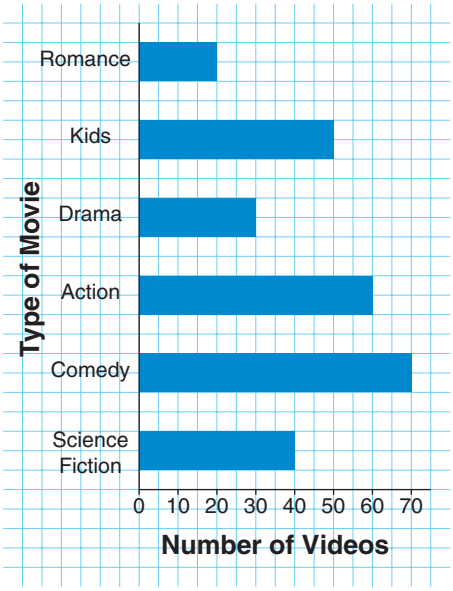
These 2 graphs show the same data.

Videos Rented in One Store on One Day

Pictograph



Bar Graph



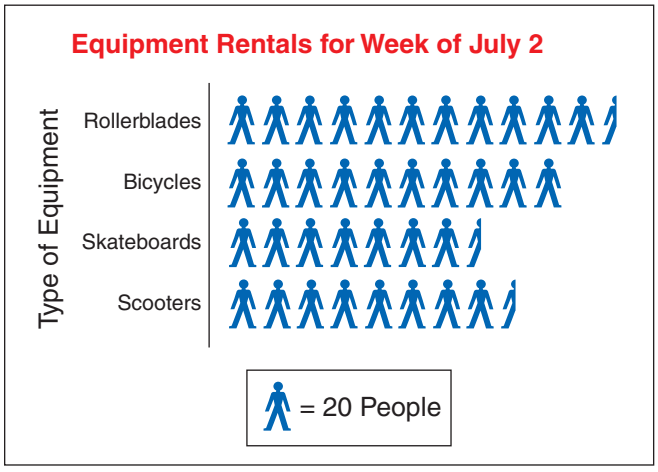
Look at each graph.
List all the things you know from looking at each graph.
How are the graphs the same? Different?

Show *and* Share

Share your list with another pair of classmates.
Which type of movie is most popular? Least popular?
Which graph is easier to read? Why?

Connect

Fun Times Park rents equipment.
This pictograph shows the equipment rentals for one week in July.



This bar graph shows the Saturday activities for one Saturday in July.

Pictographs and bar graphs are similar.
In a pictograph, symbols show the data.
In a bar graph, bars show the data.

From both the pictograph and the bar graph, we can only estimate the number of people.
It is usually easier to estimate the number from a bar graph.
We use the scale to do this.

A pictograph has more impact; it is visually appealing.
In a pictograph, we use the key to help estimate numbers.

Practice

1. This table shows the after-school activities of some students.

Activity	Number of Students
Music lessons	18
Dancing lessons	24
Playing sports	36
Swimming lessons	60
Computer club	42

a) Which activity was chosen by the most students? The fewest?
b) Would you use a bar graph or pictograph to display these data? Explain.
c) Draw the graph you chose in part b.
d) Do you think the data would be the same in your school? Explain.

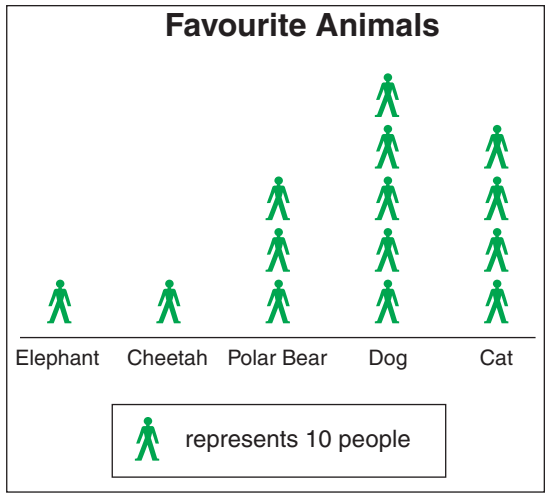
2. Some children were asked to name their favourite animal.

a) How many children like dogs?

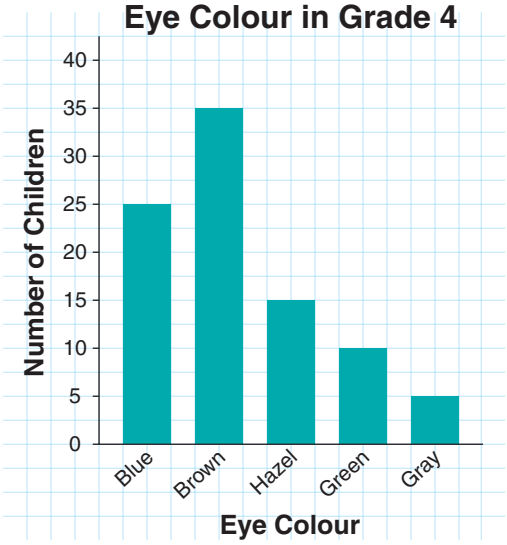
b) List the animals from most popular to least popular.

c) How many children were asked? How do you know?

d) Suppose you had to draw a bar graph to show these data. How could you use the key to help you decide the scale?



3. Children from three Grade 4 classes were asked to tell their eye colour.



a) Which eye colour is most common? Least common?

b) How many more blue eyes are there than hazel?

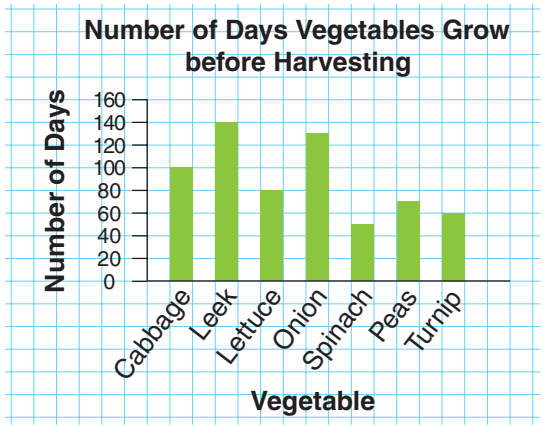
c) How many more brown eyes are there than green?

d) What is the scale?

e) Suppose you had to draw a pictograph to show these data. How could you use the scale to help you decide the key?

f) Make up your own question about this graph. Trade questions with a classmate. Answer the question.

4. **a)** What does the bar graph show?
b) Which vegetable takes the longest time to grow?
c) What else do you know from the graph?
d) Suppose you wanted to display these data as a pictograph. What key would you use? How many symbols would you need for each vegetable?



5. Scott found how many people in Grades 1 to 6 wear glasses. Here are his data.

Grade	Children Who Wear Glasses
1	15
2	5
3	25
4	40
5	30
6	10

a) Draw a pictograph.
b) How did you choose the key?
c) Draw a bar graph.
d) How did you choose the scale?
e) Suppose you wanted the bar graph to fill a page. What scale would you use? Explain.

At Home

Look through newspapers and magazines.
Find a bar graph.
What is its scale?

Reflect

Which do you find easier to read: a pictograph or a bar graph? Explain.

LESSON 5

Strategies Toolkit

Explore

The Grade 4 music class has 26 students.
Each student plays the clarinet, recorder, or trumpet.
There are 12 boys in the class.
Of the 8 students who play the recorder, 5 are girls.
Three boys play the trumpet.
Eight students play the clarinet.
How many girls and boys play each instrument?

Show *and* Share

Describe the strategy you used to solve the problem.

Connect

At a track and field meet, 42 students won medals.
- 18 medals were won in field events.
- 9 gold medals were won in field events.
- 15 silver medals were won in track events.
- 10 bronze medals and 14 gold medals were won.

How many gold, silver, and bronze medals were won in track events? In field events?

Strategies

- **Make a table.**
- **Use a model.**
- **Draw a picture.**
- **Solve a simpler problem.**
- **Work backward.**
- **Guess and test.**
- **Make an organized list.**
- **Use a pattern.**

What do you know?
- Some of the data are given above.
- Use those data to find the unknown data.

Think of a strategy to help you solve the problem.
- You can **make a table**.
- Fill in what you know. Use addition and subtraction to find the missing numbers in the table.

Copy and complete the table.

Medals	Gold	Silver	Bronze	Total
Track		15		
Field	9			18
Total	14		10	42

How many of each type of medal was won?

How do you know your answers are correct?
How could you have solved this problem another way?

Practice

Choose one of the **Strategies**

1. There are rainy days, sunny days, and cloudy days.
   - September and October had the same number of rainy days.
   - There were 6 cloudy days in September.
   - There were 10 rainy days in total for both months.
   - There were 3 more cloudy days in October than in September.

   How many sunny days were there in September? In October?

2. Mr. Chu's class counted animals on its field trip.
   How many of each type of animal were seen in the woods?
   In the stream?
   - 30 animals were counted. There were 16 animals in the woods.
   - 2 omnivores were in the stream, and 4 omnivores were seen in total.
   - In the stream, there were 3 times as many herbivores as omnivores.
   - There were half as many carnivores in the stream as in the woods.

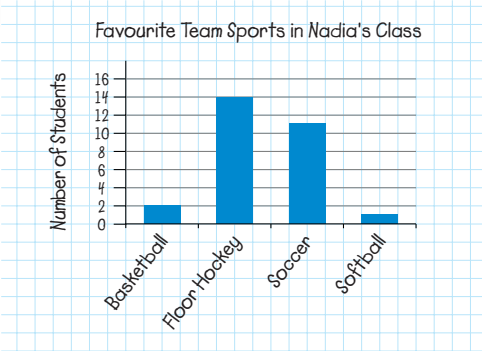
Reflect

How can a table help you solve a problem?
Use words and numbers to explain.

Unit 7 Show What You Know

LESSON 1

1. **a)** What does this bar graph show?
b) What is the scale?
c) Write 3 things you know from the graph.



LESSON 2

2. Madhu found out how many children in her school watched the Canadian hockey team play. The team won a gold medal.

Grade	Children Who Watched the Game
1	25
2	40
3	35
4	55
5	65
6	50

a) Draw a pictograph. Which key did you use? Explain your choice.
b) Choose a different key. Draw another pictograph.
c) Compare the two pictographs. Which is easier to use to answer these questions?
- How many more Grade 4 children watched the game than Grade 2 children?
- How many children watched the game?

LESSON 3

3. The table shows the number of people who like to hold each animal at the zoo.

Animal	Number of People
Banana slug	9
Gila monster	22
Koala	32
Macaw	14
Monkey	16
Rosy boa	6

a) Draw a bar graph. What scale did you use?
b) Draw a different bar graph to display these data. How did you choose your scale this time?

c) How many more people prefer to hold a koala than a monkey?

d) Which animal is most popular? Least popular?

e) Which graph was easier to use to answer the questions in part d? Explain your choice.

f) Write your own question about the bar graphs. Answer the question.

4

4. Look at this pictograph.

Life Spans of Birds in Captivity	
Cockatoo	❤ ❤ ❤ ❤ ❤ ❤ ❤ ◗
Rhea	❤ ❤ ❤ ❤
Vulture	❤ ❤ ❤
Ostrich	❤ ❤ ❤ ❤
Swan	❤ ❤ ❤ ❤ ❤
Bald Eagle	❤ ❤ ❤ ❤ ❤

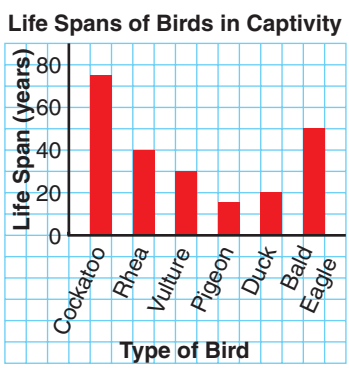
❤ represents 10 years

a) Find two birds whose combined life spans are less than that of a cockatoo.

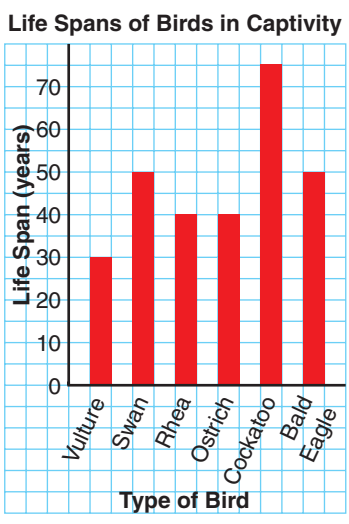
b) A canary's life span is 25 years. How would you show 25 years on this graph?

c) Which bar graph below shows the same data as the pictograph above? How do you know?

Graph A



Graph B



d) Which graph do you think best displays the data? Give reasons for your choice.

UNIT 7

Learning Goals

- ☑ interpret graphs
- ☑ compare pictographs with different keys
- ☑ compare bar graphs with different scales
- ☑ draw pictographs and bar graphs
- ☑ compare pictographs and bar graphs

Unit Problem

Using Data to Answer Questions

Part 1

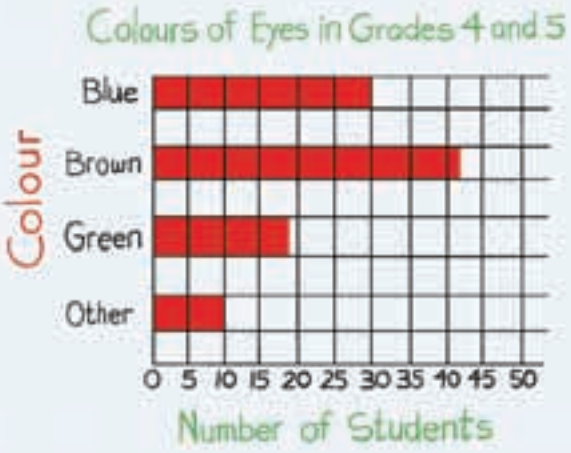
Two students collected these data from students in Grades 4 and 5.

Colours of Eyes in Grades 4 and 5

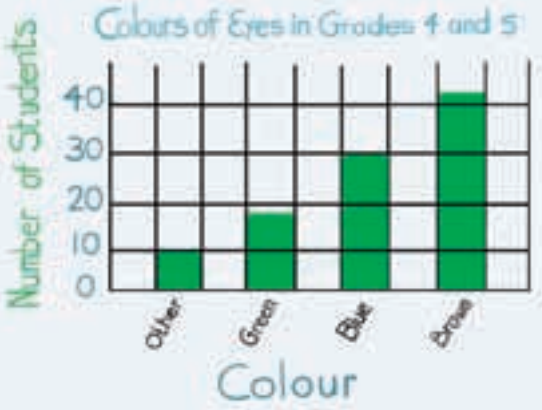
Blue	Brown	Green	Other
30	42	18	10

Each student drew a graph.

Emil's graph



Safia's graph



- How are the graphs the same? Different?
- What is the scale for each graph?
- Why do you think each person chose the scale he or she did?
- Why do you think the scale is *not* 1 square to 1 person?
- Choose a different scale or choose a key.
  Draw your own graph.
  Justify your choice of scale.
- Write 3 things you know from your graph.

Part 2

Look through newspapers and magazines.
Try to find bar graphs and pictographs.
Sketch each graph you find.
Identify its scale or key.

Part 3

Look on the Internet.
Try to find bar graphs and pictographs.
Print each graph you find.
Identify its scale or key.

Check List

Your work should show

- ☑ a clear explanation of the given bar graphs
- ☑ a graph that is easy to understand, with labels and title
- ☑ sketches or printouts of graphs from the media and the Internet
- ☑ clear explanations of the graphs you found

Reflect on Your Learning

Tell what you now know about bar graphs and pictographs that you did not know at the beginning of the unit.

Find two examples where pictographs or bar graphs are used outside the classroom.