UNIT 2

Whole Numbers

Languages We Speak

When settlers from Europe arrived in Canada, they met First Nations people who spoke many different Aboriginal languages. Most settlers spoke French or English. These are now the two official languages of Canada. Canadians speak many other languages at home and at work.

Learning Goals

- represent and describe whole numbers to 1 000 000
- use different strategies to estimate sums and differences
- estimate to solve problems

Key Words

- expanded form
- standard form
- front-end rounding
- compatible numbers
- compensation

This table shows how many people speak some of the Aboriginal languages in Western and Northern Canada.

	B.C.	Yuk.	Alta.	N.W.T.	Sask.	Man.	Nvt.
Cree	1160	15	15 010	155	22 020	18 090	0
Inuktitut	50	20	100	760	50	70	18 605
Ojibway	275	10	625	65	1 370	8 840	0
Dakota/ Sioux	25	0	2 765	0	350	730	0
Blackfoot	35	10	2 630	0	15	25	0
Salish	2570	10	0	0	0	0	0
South Slave	100	20	250	1005	0	0	0
Dogrib	20	0	10	1830	10	0	0
Chipewyan	10	10	225	300	0	20	10

Adapted from Statistics Canada: Population reporting by Aboriginal identity (2001 Census)

- Do you think the numbers in the table are exact or estimates? Explain.
- Why do the numbers have 0 or 5 as the ones digit?
- Which aboriginal language is spoken by the greatest number of people? How do you know?
- In Alberta, do more people speak Dakota/Sioux or Blackfoot? Explain.
- Which language do about 9000 people in Manitoba speak?
- Write a question you could answer using the data in the table.

LESSON 1

Numbers to 100 000

About 30 000 people live in Nunavut.
How does 30 000 compare with the number of people in your community?

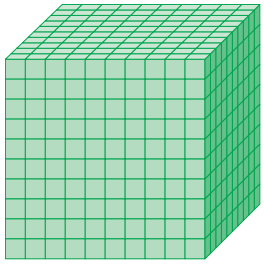
Explore

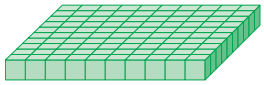
➤ Use Base Ten Blocks to help you answer each question.

- How many ones are in 10? In 100? In 1000?
- How many tens are in 100? In 1000?
- How many hundreds are in 1000?

➤ How could you make a model to show 10 000? How many of each Base Ten Block would you need if you used only:

- the ones cubes?
- the tens rods?
- the hundreds flats?
- the thousands cubes?


1000


100


10

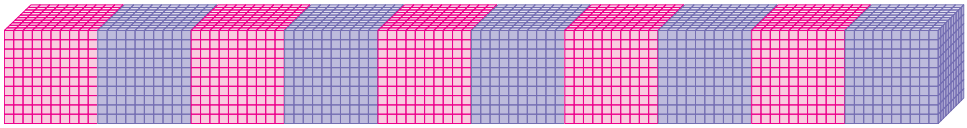

1

Show *and* Share

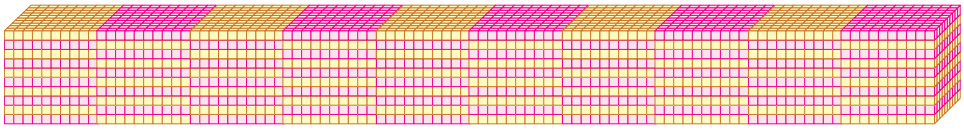
Share your work with another pair of students.
Talk about how the numbers 10, 100, 1000, and 10 000 are related.
Compare your ideas for models of 10 000.
Which model is more efficient?

Connect

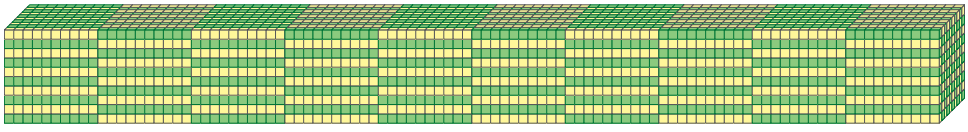
- Ten thousand is 10 times as great as 1 thousand.



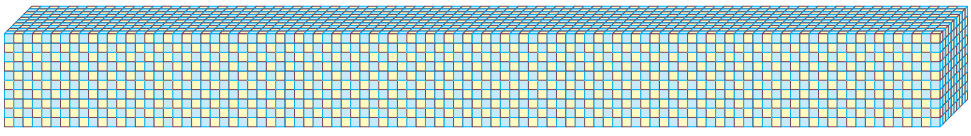
- Ten thousand is 100 times as great as 1 hundred.
  There are 100 hundreds in 10 000.



- Ten thousand is 1000 times as great as 1 ten.
  There are 1000 tens in 10 000.



- Ten thousand is 10 000 times as great as 1 one.
  There are 10 000 ones in 10 000.



- A place-value chart shows the values of the digits in a number.
  This place-value chart shows the number 33 333.
  As you move to the left on this place-value chart, the value of the digit is 10 times as great as the digit before.

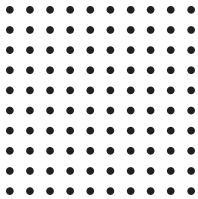
Ten Thousands	Thousands	Hundreds	Tens	Ones
3	3	3	3	3

3 ten thousands = 30 thousands 3 hundreds = 30 tens

Practice

Use Base Ten Blocks if you need them.

1. Your teacher will give you a copy of 100 dots.
What would:
- 1000 dots look like?
- 10 000 dots look like?
- 50 000 dots look like?



2. Would you rather have one hundred $10 bills or ten $1000 bills?
Explain your choice.

3. Suppose you were paid $10 an hour.
a) How many hours would you have to work to earn $500?
b) How many hours would you have to work to earn $5000?

4. Forty thousand coins were minted.
How many boxes are needed to store the coins if each box contains:
a) 100 coins? **b)** 10 coins?
c) 10 000 coins? **d)** 1000 coins?
Use numbers, words, or pictures to explain.

5. **a)** How many tens are in 8000?
b) How many hundreds are in 8000?
c) How many thousands are in 8000?

6. **a)** How many tens are in 20 000?
b) How many hundreds are in 20 000?
c) How many thousands are in 20 000?

7. Use only the digits 1, 3, and 5.
Write a number greater than fifteen thousand.

Math Link

Your World

Statistics Canada publishes data about people and places. These data often involve large numbers.
Use the Internet to find some of these large numbers.

Reflect

When you see a large number, how can you tell how it compares to 10, to 100, and to 1000? Use a large number to explain.

Aim for 100 000

You will need:

- a number cube labelled 1 to 6
- a calculator
- a score sheet

The goal of the game is to reach as close to 100 000 as possible.

Your teacher will give each player copies of a score sheet like this:

Roll	Ten Thousands	Thousands	Hundreds	Tens	Ones
1					
2					

➤ Players take turns to roll the number cube.
Each time the cube is rolled, players decide on the place value of the number and record their decision on their score sheet.
For example, if a 2 is rolled, it can be used to make:
20 000 or 2000 or 200 or 20 or 2

➤ After 7 rolls, players add the numbers on their score sheets to find the total.
The player who is closest to 100 000, without going over, scores 1 point.
Use a calculator to check any sums you need to.

➤ The first player to get 5 points wins.

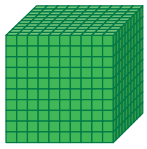
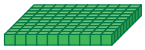
LESSON 2

Exploring One Million

These people are having their heads shaved for charity.
Brown-haired people have about
100 000 hairs on their heads.
About how many people do you
think would have to be shaved
to collect 1 million hairs?

Explore

You can use patterns to learn about 1 million.

Words	One Million	One Hundred Thousand	Ten Thousand	One Thousand	One Hundred	Ten	One
Numbers	1 000 000	100 000	10 000	1000	100	10	1
Base Ten Block	?	?	?				

Look at the chart above.

➤ What do you think:
- the 10 000 block would look like?
- the 100 000 block would look like?
- the 1 000 000 block would look like?

➤ Sketch each block.
How do the lengths, widths, and heights of the blocks compare?
What patterns do you see?

➤ In the chart, what patterns do you see in the numbers?

Show *and* Share

Share the patterns you found with another pair of students.
How do the patterns in the chart compare with the patterns in your sketches of the blocks?

Connect

One million is a very large number.
You can visualize 1 million by imagining a model of a cubic metre.
To fill the cube, you would need
1 million Base Ten unit cubes
or 1000 thousand cubes.

Here are some benchmarks to help you think about the number 1 million.

1 000 000 = 1000 thousands
$1 000 000 = ten thousand $100 bills
1 000 000 min is about 2 years.
1 000 000¢ = $10 000

Practice

Use a calculator when it helps.

1. Have you lived one million hours?
If your answer is no, have you lived one million minutes?
Explain your thinking.

2. Suppose you use a calculator to count to 1 000 000.
How many times will you press the "equals" key if you:
a) count by 1000s?
b) count by 10 000s?
c) count by 100 000s?
Use a calculator to check.

3. How many $10 bills would it take to make $1 million?

4. How long would a line of 1 million centimetre cubes be?
Give your answer using as many different units as you can.

5. How many days would it take you to spend $1 000 000, if each day you spend:

a) $100 000? **b)** $50 000? **c)** $10 000?
d) $1000? **e)** $500? **f)** $100?

6. Suppose you save $100 a month.
How many months would it take until you could trade your savings for 1 million pennies?

7. There are 100 pennies in one roll.
How many pennies are there in

a) 5 rolls? **b)** 10 rolls?
c) 50 rolls? **d)** 100 rolls?
e) 500 rolls? **f)** 1000 rolls?

8. How many rolls of pennies do you need, to have one million pennies?

9. Copy and complete.

a) $999\,999 - 1 = \square$
b) $1\,000\,000 - 100\,000 = \square$
c) $800\,000 + \square = 1\,000\,000$
d) $500\,000 \times \square = 1\,000\,000$
e) $250\,000 \times \square = 1\,000\,000$
f) $1\,000\,000 \div 10 = \square$

10. Measure a straw to the nearest centimetre.
Suppose 1 million straws were laid end-to-end.
How far would they stretch?
How many different ways can you find out?

At Home

Use newspapers and catalogues.
Find items that you could buy to total $1 million.
Interview a senior or elder.
Find out what could have been purchased with $1 million fifty years ago. List the items.

Reflect

What do you know about one million?

LESSON 3

Representing Numbers

Where do you see large numbers used?

Explore

Large numbers like those above can be difficult to visualize.
You can use place value to help get a better feel for large numbers.
Your teacher will give you a copy of this table.

	350 000	910 000	280 000	50 000	200 000
Ten thousands	35				
Thousands					
Hundreds			2800		
Tens				5000	
Ones					

Complete this table.
What patterns do you see in the completed table?

Show *and* Share

Share the patterns you found with another pair of students.
What other ways can you represent large numbers?

Connect

In 2003, there were 656 792 people who attended the Women's World Cup soccer matches.
Here are some different ways to represent that number of people.

- Use a place-value chart to show the number 656 792:

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
6	5	6	7	9	2
↑	↑	↑	↑	↑	↑
600 000	50 000	6000	700	90	2

Every digit has a place value depending on its position.

- Use **expanded form** to write 656 792.
Expanded form shows a number as a sum of the values of all its digits.

$$656\,792 = (6 \times 100\,000) + (5 \times 10\,000) + (6 \times 1000) + (7 \times 100) + (9 \times 10) + (2 \times 1)$$
$$= 600\,000 + 50\,000 + 6000 + 700 + 90 + 2$$

- Use words.
656 792 is six hundred fifty-six thousand seven hundred ninety-two.

We do not use the word "and" when we write or say whole numbers.

- Use **standard form**.
The number 656 792 is written in standard form.
It has space between the thousands digit and the hundreds digit.

When we write numbers with more than 4 digits in standard form, we put a space between groups of 3 digits.

Practice

1. Use a place-value chart to show each number.

a) 273 190 **b)** 40 920 **c)** 738 **d)** 3789

2. Describe the meaning of each digit in this number:
There are 25 630 key chains in the world's largest collection.

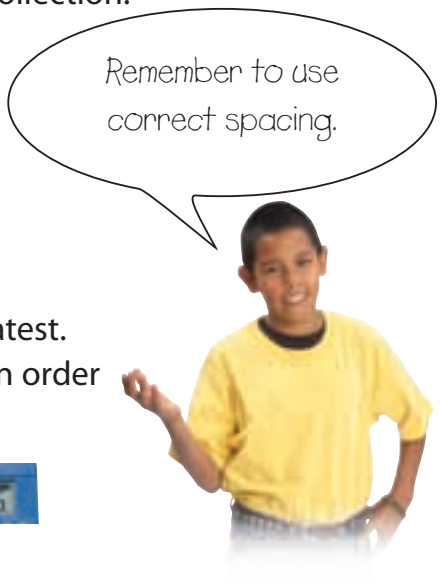
3. Write each number in standard form.

a) 600 000 + 20 000 + 50 + 7

b) nine hundred fifty thousand six

c) sixty-three thousand five hundred twenty-nine

d) 500 000 + 80 000 + 6000 + 400 + 20 + 9



4. The digits in 134 589 are in order from least to greatest.
Write 5 different 6-digit numbers with their digits in order from least to greatest.

5. You will need a calculator.

a) Key in 3 digits.
Record the number in the display,
then write it in expanded form.

b) Do not clear the display.
Key in another digit.
Record the new number,
then write it in expanded form.

c) Repeat part b to record a 5-digit number in expanded form.

d) Repeat part b to record a 6-digit number in expanded form.

e) What happened to the first digit you keyed in?
How did its value change as you keyed in more digits?

6. Copy and complete. Replace each ☐ with $>$, $<$, or $=$.
How did you decide which symbol to use?

a) 35 937 ☐ 35 397 **b)** 272 456 ☐ 227 456

c) 456 123 ☐ 456 123 **d)** 975 346 ☐ 985 346

7. Use the digits 5, 2, 8, 3, 6, 9.

a) What is the greatest number you can make?

b) What is the least number you can make?

c) Write 4 numbers between the numbers you wrote in parts a and b.

d) Order the numbers in parts a, b, and c from least to greatest.

8. Write each number using words, then in expanded form.

a) 34 780 **b)** 40 246 **c)** 100 250 **d)** 329 109

9. Write the numbers in each fact as many ways as you can.

a) The Whistler media room reports that the lifts can carry 59 007 skiers and snowboarders per hour.

b) 597 204 people voted for mayor in the November 2006 elections.

c) The 2004 Census found that there were 186 430 children under the age of 4 in Alberta.

10. Write the value of the red digit in each number.

a) 245 852 **b)** 10 349 **c)** 501 672

d) 1 000 000 **e)** 982 748 **f)** 34 817

11. Use the data in the table.

Province	Area in Square Kilometres
Alberta	661 848
British Columbia	944 735
Manitoba	647 797
Saskatchewan	651 036

a) Which is the largest province?

b) What is its area?

12. Mariette wrote a 6-digit number.
One digit was 0.
The other digits were odd.
No two digits were the same.
The number was the greatest number she could write with these digits.
What number did Mariette write?
How do you know?

13. A student said 84 914 is greater than 311 902 because 8 is greater than 3.
Is the student correct?
How do you know?

14. **Count Down to Zero!**

Game

Each of you needs a calculator.
Each of you keys in a 4-digit number.
Do not show your partner your number.
The goal of the game is to get
your partner's number to 0.
Take turns.
Choose a digit, such as 9.
Say to your partner, "Please give me your 9s."
If your partner has that digit in his number,
he has to tell you the number it represents.
For example, if your partner's number is 9209,
he says," I'll give you nine thousand nine."
You add 9009 to your number.
Your partner subtracts 9009 from his number.
If you choose a digit your partner does not
have in his display, you miss that turn.
Play continues until one of you has
only 0 in the display.

15. What does the zero in each number tell you?

a) 40 817 **b)** 309 563 **c)** 987 034

16. Use the digits from 1 to 9 only once in each question.

a) Make a 6-digit number as close to 100 000 as possible.

b) Make a 6-digit number as close to 500 000 as possible.

c) Which number did you get closer to? How do you know?

17. Here is part of the expanded form of a number:

600 000 + 90 000 + 4000 + . . .

a) What might the number be?

b) How many different numbers are possible?
How do you know?

Reflect

Use numbers, words, or pictures to explain the meaning
of each digit in the number 987 564.

LESSON 4

Estimating Sums

Some problems do not need an exact answer. Sometimes you can estimate a sum.

How do you know if $1000 is enough money to buy the TV and the DVD player?

Do you need to add the prices of the items or can you estimate to find out? Explain your answer.

Explore

This chart shows the seating capacity of each NHL Canadian team's home arena.

Team	Seats
Calgary Flames	20 140
Edmonton Oilers	17 100
Montreal Canadiens	21 273
Ottawa Senators	20 004
Toronto Maple Leafs	18 819
Vancouver Canucks	18 630

- Suppose a game was sold out in Vancouver and in Calgary. About how many people attended these two games?
- The NHL ordered 35 000 pennants to give away for the opening Leafs and Oilers games. The games were sold out. Will there be a pennant for everyone? Explain how you know.

Show *and* Share

Compare your estimates with those of another pair of classmates.
What strategies did you use to estimate?
When is it better to estimate using a greater number than the given number?

Connect

➤ Lori-Ann Muenzer of Edmonton participated in the 2004 Athens Olympic Games. She won Canada's first ever gold medal in cycling.

Lori-Ann was one of 11 090 athletes at the 2004 Athens Olympic Games.
There were 10 651 athletes at the 2000 Sydney Olympic Games.
About how many athletes attended both Olympic Games?

You know that an exact answer is not required because the question asks "about how many."
Estimate: 11 090 + 10 651

- One strategy is to use the front digits to estimate. This strategy is called **front-end rounding**.

  Add the first digits of the numbers:
  11 090 + **1**0 651 is about 10 000 + 10 000 = 20 000

  Then adjust the front-end estimate by looking at the first two digits in each number:
  11 090 + **10** 651 is about
  11 000 + 10 000 = 21 000
  Using the first two digits gets you closer to the exact answer.
  There were about 21 000 athletes at the two games.

Front-end rounding always gives an *underestimate*.

- Another strategy is to use **compatible numbers** to estimate.
  Compatible numbers are pairs of numbers that are easy to work with.
  For example, multiples of 10 are compatible numbers.
  To estimate, replace the actual numbers with numbers that are compatible:
  Write: 11 090 + 10 651
  as: 11 100 + 10 650 = 21 750
  There were about 21 750 athletes at the two games.

Compatible numbers may give an underestimate or an overestimate. It depends on the numbers you use.

In some situations, I want to overestimate. When I shop, I want to know that I have more than enough money!

➤ You can use front-end rounding when you estimate the sum of more than two numbers. You can also use front-end rounding if the numbers have different numbers of digits.

Here are data for five Summer Olympic Games.

Olympic Games	Number of Athletes
Athens, 2004	11 090
Sydney, 2000	10 651
Atlanta, 1996	10 320
Barcelona, 1992	9 956
Seoul, 1988	8 465

When there are 4-digit and 5-digit numbers in a column, we align the digits. So, the 4-digit numbers have a space between digits too.

About how many athletes were at the five games?

Use front-end rounding to find out:
11 090 + **1**0 651 + **1**0 320 + **9**956 + **8**465 is about
10 000 + 10 000 + 10 000 + 9000 + 8000 = 47 000
There were about 47 000 athletes at the five games.

We can adjust the estimate by using **compensation**.

11 090 + 10 651 + 10 320 + 9956 + 8465
↓ ↓ ↓ ↓ ↓
11 000 + 11 000 + 10 000 + 10 000 + 8000 = 50 000
↓ ↓ ↓ ↓ ↓
round down | round up | round down | round up | round up or down

If we round one number down, we round the next number up.

When we estimate then compensate, the estimate is closer to the exact value.
There were about 50 000 athletes at the five games.

Practice

1. Use the numbers in the box.
Find pairs of numbers with each sum.

10	15	20	25
30	35	40	45
50	55	60	65

a) 50 **b)** 60
c) 70 **d)** 80

2. Some compatible numbers have a sum that is a multiple of 10.
Use your answers to question 1 to list pairs of compatible numbers.

3. Use the numbers in the box.

110	230	290	320
460	470	540	650
660	740	820	850

a) Find pairs of numbers with a sum that is a multiple of 100.
b) Why are the numbers compatible in each pair you listed in part a?

4. Estimate each sum. Explain your strategy.
a) 6145 + 3007 **b)** 3654 + 372 **c)** 500 + 2150
d) 1999 + 999 **e)** 4003 + 2968 **f)** 7741 + 685

5. Estimate to find the sums less than 10 000.
a) 3099 + 5824 **b)** 6489 + 3201 **c)** 4673 + 6595
d) 9997 + 8743 **e)** 5063 + 297 **f)** 9539 + 470

6. Estimate: 32 756 + 16 345
a) Do you think the exact answer will be less than or greater than your estimate?
Explain your thinking.
b) How could you use compensation to improve your estimate?

7. The school held a magazine drive.
The junior classes raised $15 875.
The intermediate classes raised $19 256.
a) Did the students beat last year's record of $34 200? Explain.
b) How could you use compatible numbers to estimate?

8. Use these numbers: 5245, 6020, 7985, 6755, 4850
Estimate to find which 2 numbers have the sum closest to:
a) 10 000 **b)** 15 500
Which estimation strategies did you use?

9. Write a story problem where you do not need to find an exact answer to solve the problem.
Explain why estimating the sum is a reasonable strategy.

10. These data show how the population of the Yukon Territory has changed over the past 50 years.

Date	Population
1961	14 600
1971	18 400
1981	23 200
1991	27 800
2001	28 700

Use these data to predict the population of Yukon in 2011.
Explain how you estimated to predict.

11. The table shows the number of tickets sold to 5 live shows at a Concert Hall.

Shows	Monday	Tuesday	Wednesday	Thursday	Friday
Tickets Sold	12 900	14 590	26 565	16 750	24 810

a) About how many tickets were sold for the first two shows?
b) About how many tickets were sold on the two days when the greatest and least numbers of tickets were sold?
c) About how many tickets were sold during the week?
What strategies did you use to solve each problem?

12. At the opening baseball game, 16 254 programs were sold.
At the second game, 15 910 programs were sold.
Predict how many programs should be printed for the third and fourth games.
Explain your thinking.

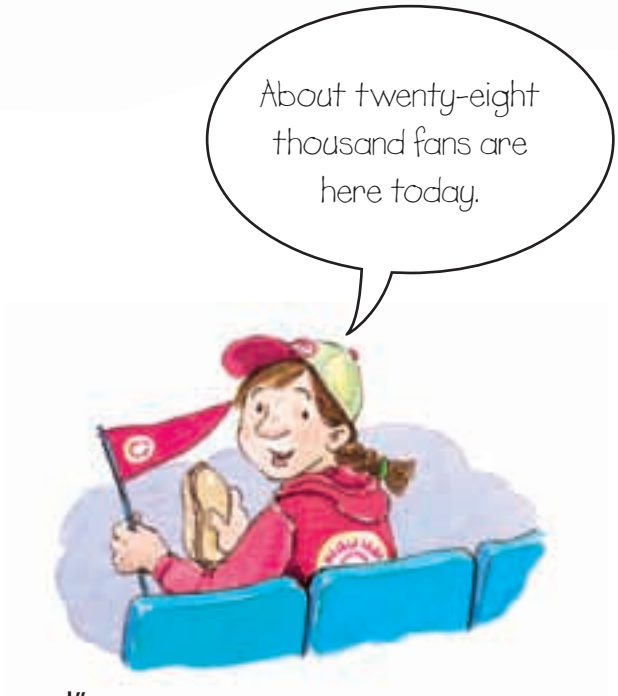
13. Think of a situation where you would estimate to make a prediction.
Explain how you would estimate.

Reflect

How can you tell if your estimate is greater than or less than the exact sum?

LESSON 5

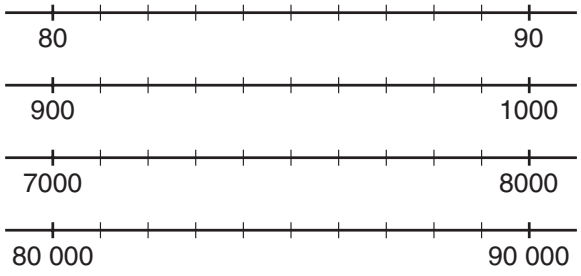
Using Benchmarks to Estimate



Why did Melinda use "about twenty-eight thousand" to describe the attendance?
How did she arrive at that number?

Explore

You will need a copy of these number lines.



➤ Label the first number line with:
- the number that is halfway between the two given numbers
- a number that is closer to the first number than the second number
- a number that is closer to the second number than the first number

➤ Repeat with the other number lines.

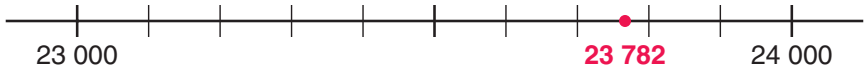
Show *and* Share

Compare the numbers you wrote with those of another pair of classmates.
Talk about how you placed the numbers on the number lines.
Share the strategies you used.

Connect

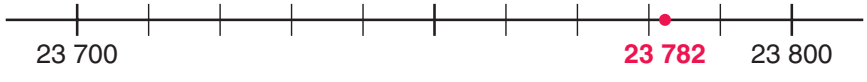
There were 23 782 people at a lacrosse game.
The number 23 782 is exact.
It is a count of the number of people.
To write an estimate for the number of people, you can find the closest benchmark.

On this number line labelled in thousands:



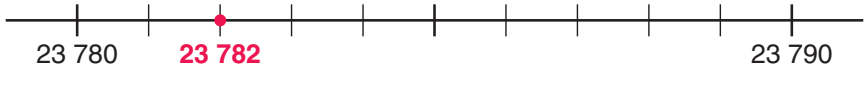
23 782 is between 23 000 and 24 000.
It is closer to 24 000.
An estimate for 23 782 is 24 000.

On this number line labelled in hundreds:



23 782 is between 23 700 and 23 800.
It is closer to 23 800.
A closer estimate for 23 782 is 23 800.

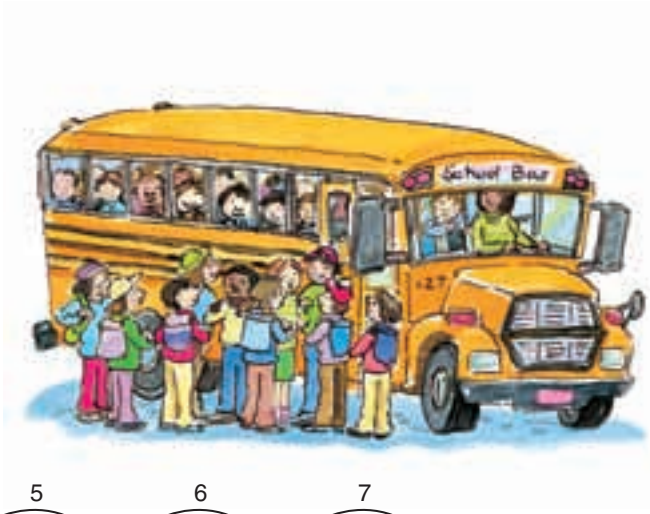
On this number line labelled in tens:



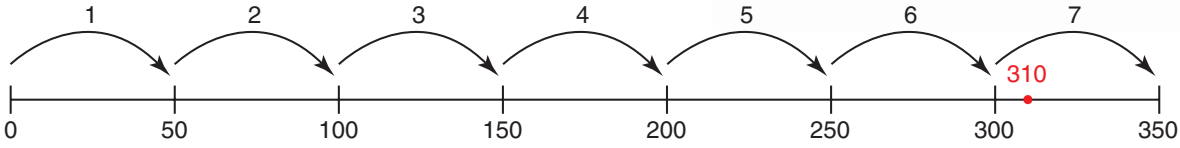
23 782 is between 23 780 and 23 790.
It is closer to 23 780.
An even closer estimate for 23 782 is 23 780.

Sometimes it is important to overestimate.

There are 310 people going to the zoo.
Each school bus holds 50 people.
How many school buses should be ordered?



310 is closest to the benchmark 300.
We would need 6 school buses for 300 children.
But, 10 people would have to stay behind.
It makes sense to overestimate 310 to 350.
Then, we would order 7 school buses.



Practice

Use a number line when it helps.

1. The longest country line dance had 6275 people.
What is the closest benchmark in thousands?

2. Ms. Carr is buying granola bars for her choir.
There are 72 students in the choir.
Granola bars come in boxes of 10.
How many boxes should Ms. Carr buy?
Explain.

3. Estimate to the closest thousand.
How did you get each answer?

a) 2376 **b)** 47 891 **c)** 86 300
d) 4735 **e)** 1999 **f)** 3087

4. Estimate to the closest hundred.

a) 9876 **b)** 41 509 **c)** 53 055
d) 1749 **e)** 5465 **f)** 8230

5. Estimate to the closest ten. How did you get each answer?

a) 2347 **b)** 6708 **c)** 78 973 **d)** 7597

6. Write three numbers for which 300 is an estimate.
How did you choose the numbers?

7. Write three numbers for which 7000 is an estimate.
How do you know that the numbers you chose are correct?

8. Explain how you would write an estimate for 32 627 to the closest thousand and the closest ten thousand.

9. Liam said, "It's about 3:45."
What might the exact time be?
Give reasons for your answer.

10. Write a number that has the same estimate when using benchmarks of thousands and ten thousands.
Explain how you found the number.

11. **a)** Give 2 situations in which exact numbers are important.
b) Give 2 situations in which estimated numbers are more appropriate.

12. The number of people who attended the baseball game was about 42 000 when estimated to the closest thousand.
What was the least possible number of people who attended the game? How do you know?

Reflect

When is it important to overestimate?

LESSON 6

Estimating Differences

Explore

The first day the ski hills were open,
1368 lift tickets were sold.
The second day, 1155 lift tickets were sold.

About how many more tickets were sold the first day?
Estimate to find out.
Record your answer.

Show *and* Share

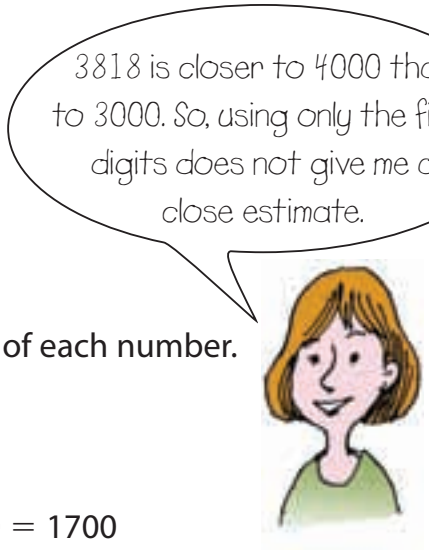
Compare your estimate with that of another pair of students.
How did the strategies you used affect your answers? Explain.

Connect

Here are some students' strategies for estimating a difference.

➤ To estimate: 3818 − 2079,
Alice used front-end rounding.
She subtracted the first digits of the numbers:
3818 − **2**079 is about
3000 − 2000 = 1000

3818 − 2079 is about 1000.



For a closer estimate, Alice looked at the last 3 digits of each number.
818 is about 800.
079 is about 100.
800 − 100 = 700
Alice added 700 to her estimate of 1000: 1000 + 700 = 1700
So, 3818 − 2079 is about 1700.

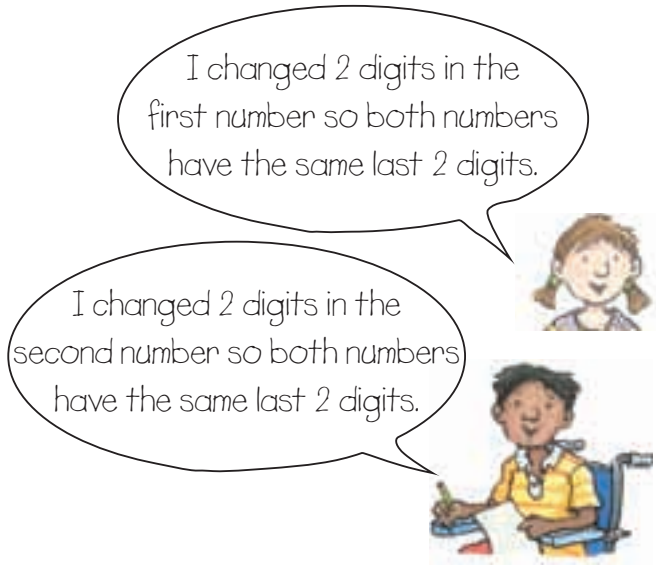
➤ To estimate: 5849 − 3097,
Brian estimated each number to the closest 1000.
5849 is closer to 6000 than to 5000.
3097 is closer to 3000 than to 4000.
6000 − 3000 = 3000
So, 5849 − 3097 is about 3000.

For a closer estimate, Brian estimated each number to the closest 100.
5849 is closer to 5800 than to 5900.
3097 is closer to 3100 than to 3000.
5800 − 3100 = 2700
So, 5849 − 3097 is about 2700.

➤ Both Marie and Sunil used compatible numbers to estimate: 4803 − 310
Marie said that 4803 is close to 4810.
Then, 4810 − 310 = 4500

Sunil said that 310 is close to 303.
Then, 4803 − 303 = 4500

Both students had the same estimate.
4803 − 310 is about 4500.



Practice

1. Use any strategy you wish to estimate each difference.

a) 6723 − 985 **b)** 7415 − 4002 **c)** 6345 − 4328
d) 8640 − 445 **e)** 9876 − 1234 **f)** 8025 − 980

2. Tell if you think each estimate is high or low. How do you know?
Which estimation strategy do you think was used?

a) 2593 − 1548 is about 1000 **b)** 9845 − 6050 is about 3800
c) 7520 − 807 is about 6713 **d)** 6056 − 985 is about 5000

3. Use front-end rounding to estimate each difference.

a) 2593 − 1590 **b)** 9705 − 562 **c)** 8739 − 6326

4. There are 8625 tickets for the concert.
Six thousand eight hundred eighty-five tickets have been sold.
About how many tickets are still for sale?

5. Sandi is in Room 401.

a) Sandi estimates that her class has collected about $1000 more than Room 403.
Is her estimate high or low? Explain.

b) Sandi estimates that Room 404 has collected about $1000 more than Room 403.
How do you think she estimated?
How do you think Sandi should have estimated?

c) What is a good way to estimate the difference between the money collected by Room 402 and Room 403?
Why do you think so?

Magazine Sales	Money Collected
Room 401	$2855
Room 402	$980
Room 403	$1900
Room 404	$2595

6. Two 4-digit numbers have a difference of about 3500.
What might the numbers be? How do you know?

7. *Census at School* is a website where students answer surveys and collect data. The table shows the numbers of students in Canada who answered surveys in the past few years.

Year	2003/04	2004/05	2005/06
Number of Students	7683	22 643	31 960

Predict how many students will answer surveys on the site in 2006/07.
Explain how you estimated to predict.

8. Describe a situation when you would estimate a difference rather than find the exact answer to a subtraction problem.
Explain why an estimate is appropriate.

Math Link

Your World

Jeanne Louise Calment of France was the oldest woman ever. She lived from 1875 to 1997.
About how many years did she live?

Reflect

How do you decide which estimation strategy to use when you subtract? Use words and numbers to explain.

LESSON 7

Using Estimation to Check Answers

A pedometer records
the number of steps you take.

Explore

Emma wore a pedometer for 2 hours.
She recorded the number of steps each hour.
The first hour, Emma took 1347 steps.
The second hour, she took 984 steps.

- In which hour did Emma take more steps?
- How many more steps did Emma actually take?
- Estimate how many more steps Emma took.
- Compare the estimate to the exact number.
  Is the answer reasonable? Explain.

Show *and* Share

Share your work with another pair of students.
Describe and compare the strategies you used to estimate to check the answer.

Lesson Focus | Use estimation to check that answers are reasonable.

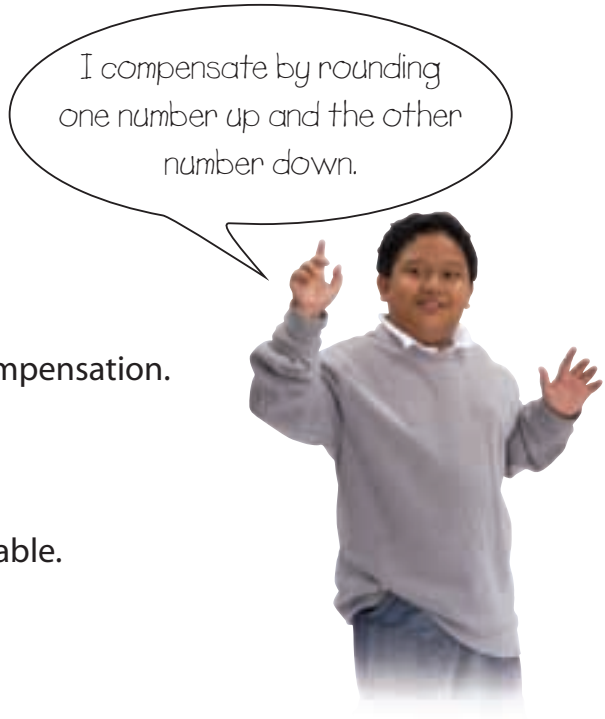
Connect

The students at Glenville Public School are raising money to build wells in Africa.
The Grade 5 class raised $3432. The Grade 6 class raised $2180.

➤ How much did the two classes raise together?

To find out, add: 2180 + 3432
Here are one student's strategies for adding and estimating.
Nate adds from left to right.

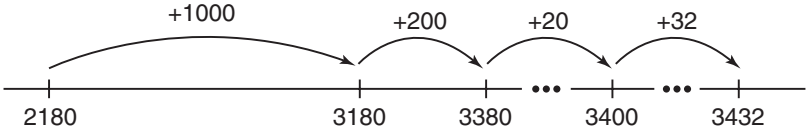
$$\begin{array}{r} 2180 \\ +3432 \\ \hline 5000 \\ 500 \\ 110 \\ +\quad 2 \\ \hline 5612 \end{array}$$



To check this sum is reasonable, Nate uses compensation.
He rounds 2180 *up* to 2200.
He rounds 3432 *down* to 3400.
2200 + 3400 = 5600
Since 5600 is close to 5612, the sum is reasonable.
The two classes together raised $5612.

➤ Which class raised more money?
How much more money did it raise?

Since $3432 is greater than $2180, the Grade 5 class raised more money.
To find out how much more, subtract: 3432 − 2180
Here are one student's strategies for subtracting and estimating.
Abby uses a number line to help her count on to subtract.



Abby counted on: 1000 + 200 + 20 + 32 = 1252
To check her answer is reasonable,
Abby uses an estimate for the number she subtracts.
2180 is closer to 2200 than to 2100.
3432 − 2200 = 1232
Since 1232 is close to 1252, the answer is reasonable.
The Grade 5 class raised $1252 more than the Grade 6 class.

Since 2200 > 2180, the estimate is less than the exact answer.

Practice

1. Add. Estimate to check.

a) 9875 + 5630 **b)** 3098 + 840

c) 5984 + 8408 **d)** 8305 + 988

2. Subtract. Estimate to check.
Is each answer reasonable? How do you know?

a) 7774 − 1796 **b)** 8350 − 2673

c) 6432 − 2798 **d)** 9808 − 1759

3. Estimate to predict which sums are greater than 7000.
Show how you estimated.

a) 4176 + 2457 **b)** 3872 + 5129

c) 5839 + 987 **d)** 6518 + 2828

4. Estimate to predict which differences are greater than 10 000.

a) 73 350 − 65 196 **b)** 28 645 − 12 550 **c)** 35 430 − 29 820

5. Keshav collects stamps.
He has 3845 Canadian stamps and
2690 stamps from other countries.

a) How many stamps does he have altogether?

b) How do you know your answer is reasonable?

6. Great Slave Lake has an area of 28 568 square kilometres.
Great Bear Lake has an area of 31 328 square kilometres.
About how much greater is the area of Great Bear Lake?

7. Taking 10 000 steps a day is a target for healthy living.
Suppose your pedometer counts 8934 steps in one day.
About how many more steps do you need to reach the target number?
Show your work.

8. Carly and Nicole have been saving pennies since they were young.
Carly has collected 45 880 pennies.
Nicole has collected 54 250 pennies.

a) How many more pennies does Nicole have?

b) Both girls have the same goal of collecting 100 000 pennies.
How many more pennies does each of them need?

c) How could you estimate to check your answers are reasonable?
Show your work.

9. Two games were played in the semi-finals of a soccer tournament.
The attendance at one game was 18 595.
The attendance at the other game was 19 240.
a) How many people attended the semi-finals?
b) Check that your answer is reasonable.

10. Members of the school council have raised $10 500.
They plan to buy sports equipment for $3985 and library books for $7545.
a) Use compensation to predict whether the council raised enough money to make the purchases.
b) Check your prediction.

11. A student used a calculator to add: 4370 + 5298
The calculator display showed 48988.
a) Is the answer reasonable? How could the student find out?
b) Which numbers do you think the student keyed in? How do you know?

12. The fund-raising committee has a goal of $25 225.
It raised $14 285 at the benefit concert and $10 975 at the annual spring fair.
Did the committee reach its goal? Explain how you know.

13. Regional Recycling has a target of 24 500 kg of aluminum.
Fairfield delivers 16 650 kg of aluminum.
Westdale delivers 7950 kg of aluminum.
a) Predict whether Regional Recycling met its goal.
b) What strategy did you use to predict?
c) How can you check your prediction?

14. Two 4-digit numbers have a sum of about 9400.
What might the numbers be? How do you know?
Show your thinking.

Reflect

Which is your favourite estimation strategy to check an answer?
Why do you prefer that strategy?

LESSON 8

Strategies Toolkit

Explore

Janay lives in Vancouver.
This year, she visited two cities on two different trips.
Janay flew a total distance of 33 078 km.
Which cities did she visit?

Show *and* Share

Describe the strategy you used to solve this problem.

Connect

The Seven Summits are the highest peaks on the seven continents.

Summit	Continent	Elevation
Kilimanjaro	Africa	5895 m
Vinson Massif	Antarctica	4892 m
Carstensz Pyramid	Australia	4884 m
Everest	Asia	8848 m
Elbrus	Europe	5642 m
Mount McKinley	North America	6194 m
Aconcagua	South America	6962 m

Strategies

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

Terrell has climbed two summits for a total climb of 13 156 m.
Which two summits has he climbed?

What do you know?

- Terrell has climbed two summits.
- The total distance in metres he climbed is 13 156.

Lesson Focus | Interpret a problem and select an appropriate strategy.

Think of a strategy to help you solve the problem.

- You can use **guess and test**.
- Estimate which two heights have a sum of 13 156 m.
- Add the two heights to find out the actual distance in metres.

Use what you know about estimation to choose two mountain heights with a sum close to 13 000 m. Add to check.
If the numbers do not add to 13 156 m, think about your next guesses. Will you choose two different heights or continue to work with one of the heights you already selected?

Check your work.
Is the sum of the two heights 13 156 m?
How could you solve this problem another way?

Practice

Choose one of the **Strategies**

Use the data from *Explore* or *Connect* for these questions.

1. Jay is planning a trip.
   He plans to fly from Vancouver to Cairo with one stop over.
   It is 3511 km by air from London to Cairo.
   It is 9210 km by air from Toronto to Cairo.
   Jay wants to take the shortest route. How should he fly?

2. Kyla has climbed one of the Seven Summits.
   She says after she climbs the next one on her list,
   she will have climbed between 10 000 m and 11 000 m.
   Which of the Seven Summits is Kyla planning to climb next?

Reflect

Choose one *Practice* question. Describe how you solved it.

Unit 2 Show What You Know

LESSON

1

1. On a place-value chart, how is:
- **a)** a 1 in the tens place related to a 1 in the ones place?
- **b)** a 1 in the thousands place related to a 1 in the tens place?
- **c)** a 1 in the ten-thousands place related to a 1 in the tens place?

2

2. Copy and complete.
- **a)** 999 999 + 1 = □
- **b)** 1 000 000 − 10 000 = □
- **c)** 500 000 + □ = 1 000 000
- **d)** 990 000 + □ = 1 000 000

3

3. Write each number from these headlines in words and in expanded form.
- **a)** Police Estimate 350 000 at Canada Day Celebrations
- **b)** 21 273 Attend Each Montreal Hockey Game
- **c)** Power Still Out at 125 500 Homes

4. Write each number in standard form, then in a place-value chart.
- **a)** eighty thousand five hundred twenty-seven
- **b)** 500 000 + 60 000 + 4000 + 300 + 8
- **c)** 200 000 + 5000 + 70 + 9
- **d)** four hundred fifty-six thousand two hundred eighty-five

5. Write the value of each underlined digit.
- **a)** 3<u>4</u>5 123
- **b)** 29 0<u>8</u>7
- **c)** <u>5</u>09 340
- **d)** <u>1</u> 000 000
- **e)** 64<u>5</u> 997
- **f)** 45 <u>9</u>85

6. Write 3 numbers that are greater than 365 000 but less than 367 500.
Write the numbers in order from least to greatest.

4
5

7. Estimate each sum or difference. Explain your strategy.
- **a)** 1258 + 2835
- **b)** 4504 − 945
- **c)** 58 349 + 23 890
- **d)** 45 340 − 29 760
- **e)** 35 608 + 8956
- **f)** 36 785 − 9245

8. The playground committee plans to rebuild the playground.
The materials will cost $28 565.
The labour will cost $15 870.
The committee has raised $45 000.
Does the committee have enough money? Explain how you know.

LESSON

9. Danny and Jake are wearing pedometers for a week.
Danny took 85 678 steps. Jake took 79 876 steps.
a) About how many steps did the students take in total?
b) About how many more steps did Danny take?
Explain your estimation strategies.

5

10. The deepest a submarine has gone is 6526 m below the surface of the ocean.
Use benchmarks to write this distance to the closest:
a) hundred **b)** thousand **c)** ten

7

11. Add or subtract.
How do you know your answers are reasonable?
a) 45 890 + 28 145 **b)** 56 980 − 4695
c) 6985 − 4856 **d)** 14 598 + 73 423

4
6
7

12. The students in Room 25 collected 56 789 pop can tabs.
The students in Room 28 collected 62 450 pop can tabs.
a) Which room collected more tabs? How many more?
b) How many tabs did the 2 rooms collect in total?
c) How many more tabs do the students need to collect to reach their combined goal of 150 000?
d) Estimate to check that the answers are reasonable.

13. This chart shows the number of tickets sold at each ride at the Summer Festival.

Ride	Number of Tickets Sold
Ferris Wheel	45 980
Super Loop	38 675
Top Ten	29 675
Roller Rider	42 781

a) Did the Super Loop or the Top Ten ride sell more tickets? About how many more?
b) Fifty thousand tickets were printed for each ride. At the end of the festival, about how many tickets were left for each ride?

UNIT 2 Learning Goals

- ☑ represent and describe whole numbers to 1 000 000
- ☑ use different strategies to estimate sums and differences
- ☑ estimate to solve problems

Unit Problem

Languages We Speak

This table shows how many people spoke the Aboriginal languages and the top 10 non-official languages in 1971 and in 2001.
In 30 years, there have been many changes in Canada.

Home Language	Number of People, 1971	Number of People, 2001
Aboriginal languages	122 205	181 350
Arabic		209 240
Cantonese		345 730
Chinese	77 890	392 950
German	213 350	220 685
Greek	86 825	
Hungarian	50 670	
Dutch	36 170	
Italian	425 230	371 200
Polish	70 960	163 745
Portuguese	74 760	187 475
Punjabi		280 535
Spanish		258 845
Tagalog		185 420
Ukrainian	144 755	
Yiddish	26 330	

Check List

Your work should show

- ☑ your thinking in words, pictures, or numbers
- ☑ the strategies you used to estimate
- ☑ how you know your answers are reasonable
- ☑ a clear solution to your problem

1. Which languages were in the table in 1971 but not in 2001?

2. Which languages have grown in use from 1971 to 2001?

3. Which languages have declined in use from 1971 to 2001?

4. Tell whether each statement is true or false. Give reasons for your answers.
   a) In 1971, about twice as many people spoke Ukrainian as Chinese.
   b) In 2001, about 2000 more people spoke Tagalog than Polish.
   c) In 2001, about 60 000 more people spoke Aboriginal languages than in 1971.
   d) In 2001, fewer than 350 000 people spoke Italian.
   e) In 2001, more than 479 000 people spoke German or Spanish.

5. Write two other true statements based on the data in the table.

6. **a)** In 2001, about how many people spoke Polish or Portuguese?
   b) About how many more people spoke Polish in 2001 than in 1971?
   c) About how many more people spoke Portuguese in 2001 than in 1971?

7. Write a problem that someone could solve using the table. Solve your problem and explain your solution.

Reflect on Your Learning

You have learned different ways to estimate.
Which way do you find easiest? Why?
Use examples to show the different types of questions for which you estimate.