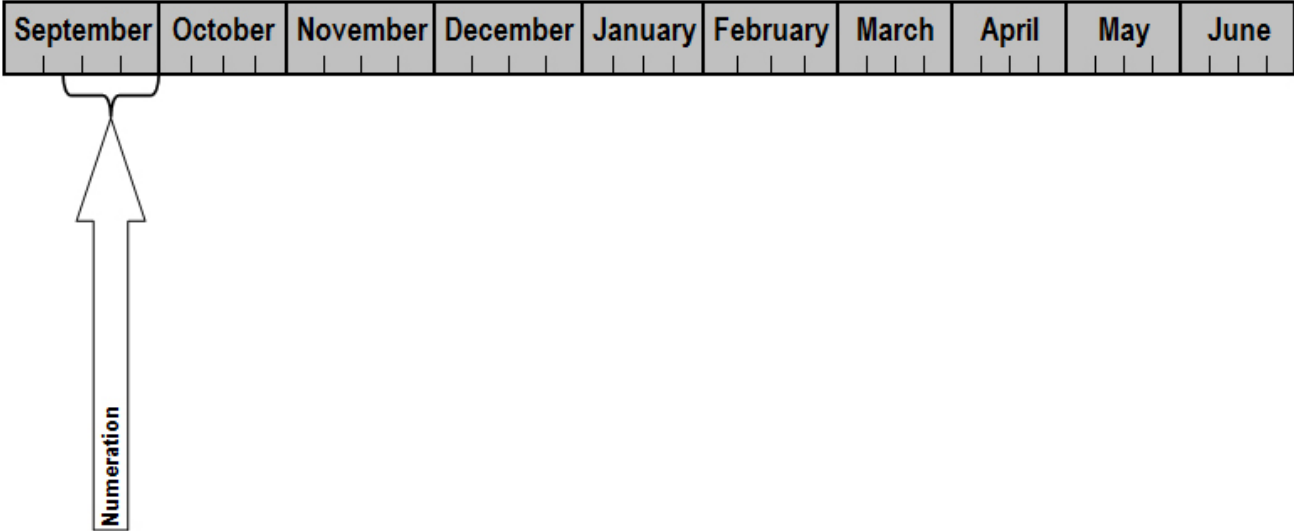


Numeration

Suggested Time: 3 Weeks



Unit Overview

Focus and Context

Students have already had an opportunity to develop a good conceptual understanding of large numbers to one million and of small numbers to one thousandth. In Grade 6, students will continue to develop an understanding of the base-ten number system through continued work with larger numbers as well as with decimals.

Students will explore key concepts of number including:

- whole numbers greater than one million
- decimal numbers less than one thousandth
- solving problems involving whole and decimal numbers
- understanding the context when large or small numbers are used in real life
- using estimation to help determine the reasonableness of an answer
- determining the appropriateness of using technology to solve a given problem and then using it to solve the problem

Math Connects

Students will see large and small numbers in newspapers, on television, in stores and in texts. Understanding these large and small numbers is essential in helping students make sense of larger numbers as well as decimal numbers. Understanding these numbers enables students to make real world connections. This understanding will be beneficial in other subject areas, as well as other strands in the mathematics curriculum. In science, for example, students explore the distances and size of each planet in relation to the earth. In social studies, students look at populations of other countries as well as sizes of land masses. Olympic events, for example, can be used to help students appreciate the necessity of small numbers; a gold medal can be lost due to a difference of one thousandth of a second. As students become more comfortable with large and small numbers, their ability to use these numbers in computation will strengthen.

Process Standards Key

[C]	Communication	[PS]	Problem Solving
[CN]	Connections	[R]	Reasoning
[ME]	Mental Mathematics and Estimation	[T]	Technology
		[V]	Visualization

Curriculum Outcomes

STRAND	OUTCOME	PROCESS STANDARDS
Number	<p>6N1 Demonstrate an understanding of place value, including numbers that are:</p> <ul style="list-style-type: none"> • greater than one million • less than one thousandth. 	[C, CN, R, T]
Number	6N2 Solve problems involving whole numbers and decimal numbers.	[ME, PS, T]

Strand: Number

Outcomes

Students will be expected to

6N1 Demonstrate an understanding of place value, including numbers that are:

- greater than one million
- less than one thousandth.

[C, CN, R, T]

Achievement Indicator:

6N1.1 Explain how the pattern of the place value system, i.e., the repetition of ones, tens and hundreds within each period, makes it possible to read and write numerals for numbers of any magnitude.

Elaborations—Strategies for Learning and Teaching

The beginning of this unit focuses on building a conceptual understanding of numbers greater than one million. Work on numbers that are less than one thousandth will be done later in the unit. Students have already worked with numbers to one million in Grade 5. However, it may be necessary to review numbers to one million to strengthen students' conceptual understanding of large numbers.

It is important that students explore the place value chart to discover the pattern of ones, tens and hundreds to express a period of three digits in the place value system. An example such as 345 345 345 written in words or reading the word name may help students see the pattern more clearly. Students also need to see that, three million forty six thousand five hundred twenty one is written in standard form as 3 046 521, not 3 46 521. Students need to see that they need to have three digits in the thousands period where zero would indicate the absence of hundred thousand in the number. The importance of "0" as a place holder needs to be stressed.

Students should understand that the place value system follows a pattern such that:

- each position represents 10 times as much as the position to its right
- each position represents $\frac{1}{10}$ as much as the position to the left
- place values are grouped in threes for purposes of reading them and the groups are called 'periods'.

Using base ten materials will help students understand that it will take 10 units to create one rod, 10 rods to create one flat and 10 flats to create one large cube.

As students begin working with a place value chart to represent large numbers, concentrate on their understanding of the number as a whole, as well as the value of each digit in the number. To simply place digits in the proper space in the place value chart does not indicate an understanding of the value of that digit. Students need to understand how to transfer the numbers from the place value chart to standard form with correct spacing, as well as in written form and expanded form.

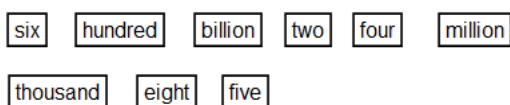
(continued)

 General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Create cards with various number words on each as shown:



Ask students to rearrange the cards creating different number combinations. Next, students are instructed to record the numbers they create, in various ways such as in standard form, expanded form, in a place value chart, and in words. Students can then order these numbers using a number line and explain how they chose the endpoints and benchmarks, as well as how they placed their numbers on the line. Challenge students to create the greatest and the least number using all the cards. (6N1.1)

- Ask students to use the number 619 723 766 to answer the following questions.
 - a) What is the value of the 9?
 - b) What is the value of the 3?
 - c) Choose a digit and show how it is ten times greater than the digit to its immediate right. (6N1.1)

Student-Teacher Dialogue

- Write a number, such as, 32 765 345 on the board. Ask students how many millions are in the number. How many thousands? Ten thousands? Ask them to justify their thinking. (6N1.1)

Journal

- Pose the following problem to students:
Joe said 3 450 000 is greater than 27 450 000 because three is greater than two. Ask students to decide whether or not he is correct and explain using words, numbers and/or pictures. (6N1.1)

Resources/Notes

*Math Focus 6***Lesson 1:** Representing Numbers in the Millions**6N1**

TG pp. 13 – 17

Additional Reading (provided):

Small, Marion (2008) *Making Math Meaningful to Canadian Students K-8*. pp.138 - 157

Van de Walle, John and Lovin, LouAnn (2006) *Teaching Student-Centered Mathematics Grades 3-5*. pp. 47-51

Strand: Number

Outcomes

Students will be expected to

6N1 Continued**Achievement Indicators:**

6N1.1 Continued

6N1.2 Provide examples of where large and small numbers are used; e.g., media, science, medicine, technology.

Elaborations—Strategies for Learning and Teaching

When students begin exploring the value of numbers and are presented with a number such as 7 324 169, they may be asked to indicate what the 7 represents. Students need to see the 7 means 7 000 000. Students should also understand, for example, in the number 345 461, five is in the thousands place, so it represents five thousand, but there are actually 345 thousands in this number.

In groups, give students 6-10 single digit number cards. It may be necessary to give different combinations of cards to different groups so each group will not come up with the same number. For example, group 1 may have the cards with digits 2, 3, 5, 6, 8, 1, 9, 0. Ask each group to come up with the greatest and the least possible number using their number cards. Ask the groups to display their number by writing it on the board and then by saying the number. After each group has presented their number, ask them to order all the numbers from greatest to least and place the numbers on a number line and/or a place value chart. Ask students to present their number lines and/or charts explaining how they were able to place each number. Ask students to choose one number and give an example where the number could be used in a real life situation.

As students begin to work with numbers greater than one million, it can become more challenging to provide meaningful examples to represent these numbers. Various texts, media and technology may provide students real-life examples of large numbers and it can give students a context in which they can understand what these numbers mean. The Guinness Book of World Records, and other subject text such as Social Studies and Science may also provide examples of large number usage.

An activity such as the following could be used to help students develop a good understanding of a million.

- Asking them to estimate how many jelly beans are in a jar.
- Record student responses, asking them to justify their thinking. Discuss any unreasonable responses.
- Ask students to think about how many jelly beans could fit inside their classroom. Is it reasonable to think at least one million could fit? A billion?
- Begin a discussion about these large numbers and ask students where they would possibly see these numbers in their life.

(continued)

General Outcome: Develop Number Sense

Suggested Assessment Strategies

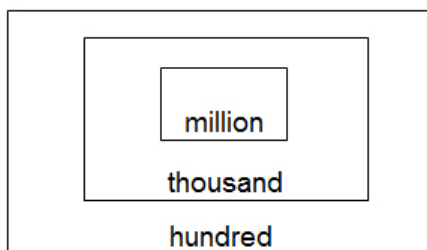
Paper and Pencil

- Tell students that Lori read the number twenty-three million sixty-five thousand one. She recorded it as 23 651. Ask students if she is correct. Ask them to use words, pictures, and/or numbers to explain their answers. (6N1.1)

Performance

- Give students the following problem: We can use base-ten blocks to represent 1, 10, 100 and 1 000 using the unit, rod, flat and cube respectively. Ask: If we were to create new base-ten blocks to represent 10 000, 100 000, 1 000 000 and 10 000 000 what would they look like? (6N1.1)

- Number Curling - Using painters tape, create different sized squares inside the other on the floor. Using different colored beanbags, assign a value for each color. (E.g., red = 5, blue = 2 and green = 6). Ask students to throw/slide several beanbags into the squares. Using the value on each bean bag, ask them to record the number they created using the value in which the bean bags land. For example, a red and a green bean bag in the million square would equal 11 million, a red and blue in the thousand square would total 7 thousand and a green in the hundred square would equal 6 hundred. Students would then take each period and add the numbers together creating the number 11 007 600. They can continue play until they create several numbers. Ask students to compare them with their classmates to decide who had the greatest number. (6N1.1)



- Give students various resources such as newspapers, magazines, etc., and ask them to look for large numbers. They can cut out the article with the large numbers in it and display them in the classroom. Students can look at the articles and compare the numbers – to order them and talk about the contexts in which they are used. (6N1.2)

Resources/Notes

Math Focus 6

Lesson 1 (Cont'd): Representing Numbers in the Millions

6N1

TG pp. 13 – 17

Strand: Number

Outcomes

Students will be expected to

6N1 Continued**Achievement Indicator:**

6N1.2 Continued

6N2 Solve problems involving whole numbers and decimal numbers.

[ME, PS, T]

Elaborations—Strategies for Learning and Teaching

The book *How Much is a Million?* can initiate good discussion. For example, you could ask students if they agree with the suggestion that it would take 23 days to count to one million. If not, try it out. Begin by timing students counting to 100, 200, 300. Use this time to find how long it would take to count to 1 000, then 100 000, then 1 000 000!

In keeping with the theme of the book, ask students if we were to take 1 000 000 unsharpened pencils and lay them down from end to end, how far would they stretch? Would they reach all around Newfoundland? Canada? The world? Students could work in groups then present to the class, discussing their reasoning.

Students will be formally introduced to numbers greater than a million for the first time. Further work on the place value chart can be incorporated here to help students see the connection between a million and a billion. As students extend the place value chart using the patterns they have been exploring, they should see that one billion equals 1 000 millions. Providing students with problem solving experiences involving large numbers may help them gain a better understanding of the value of these numbers.

Problem solving situations should be embedded in a meaningful context as often as possible. Problem solving requires students to build on existing knowledge and develop their own strategies. Encourage students to demonstrate persistence as they work through a challenging problem. It is understandable for them to not know how to go about solving the problem immediately. Solving these challenging problems with minimal assistance will help empower students. Encourage students to communicate their thinking processes about the problem, write out the information they know and what they need to know. Then, using this information to make a plan of how to go about solving the problem will help them be successful with the problem solving process.

In previous years, students have worked with a variety of problem solving strategies. These strategies will prove to be useful to students

(continued)

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Student-Teacher Dialogue

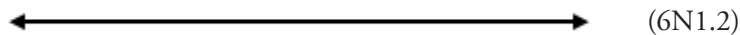
- Ask students: When might 1 000 000 of something be a big amount? When might 1 000 000 of something be a small amount? (6N1.2)
- Using several number lines, incorrectly place one or two numbers on each and ask students to work in small groups to explain why they are in the wrong places. They can share their responses with the group. Ask them to justify their thinking. (6N1.1, 6N12.1, 6N2.2, 6N2.3, 6N2.4, 6N2.5)

Performance

- The chart shows annual salaries for some famous sports stars:

Sport	Annual Salary (\$)
Hockey	\$6 500 000.00
Baseball	twelve million
Basketball	\$18 000 000.00
Golf	one million two hundred thousand
Tennis	\$750 000.00

Ask students to decide which bench marks they wish to use and arrange the salaries in order from least to greatest by sport. Students should be able to explain how they decided on the order.



- Ask students to research the population of the provinces in Canada. In a chart, list them in order from least to greatest and graph the results. Ask students to compare populations of the provinces and write a journal entry on what they have found. (6N1.2)

Resources/Notes

Math Focus 6

Lesson 1 (Cont'd): Representing Numbers in the Millions

6N1

TG pp. 13 – 17

Children’s Literature (provided):

Schwartz, David. M. *How Much is a Million?*

Math Focus 6

Lesson 2: Exploring Billions

6N2

TG pp. 18 – 21

Lesson 2 and Lesson 3 may be combined.

Lesson 3: Solving Problems That Involve Large Numbers

6N2

TG pp. 24 – 27

Curious Math: Pandigital Numbers

TG pp. 28 - 29

Math Game: What’s in a Name?

TG pp. 22-23

Strand: Number

Outcomes

Students will be expected to

6N2 Continued

Elaborations—Strategies for Learning and Teaching

in approaching a wide variety of problems. In order for students to successfully use problem solving strategies, they should be explicitly discussed with students, preferably after a student successfully uses it. There is a value in naming the strategy for students so they can discuss them and use them again. As students work through solving problems and begin to learn new strategies to solve these problems, you may consider posting these strategies in the classroom. A math wall or bulletin board designated to problem solving could be displayed for students. Students can select from the strategy list when they are facing a new problem and when they are not sure how to proceed.

Some possible problem strategies are:

- | | |
|-----------------------------|---------------------------|
| act it out | use a model |
| draw a picture | guess and test |
| look for a pattern | use an open sentence |
| make a chart/table or graph | solve a similar problem |
| consider all possibilities | consider extreme cases |
| make an organized list | work backwards |
| use logical reasoning | change your point of view |

Small, Marian (2008) *Making Math Meaningful to Canadian Students K-8*. Toronto, Canada. Nelson Ed. p. 42

Achievement Indicator:

6N2.1 Identify which operation is necessary to solve a given problem, and solve it.

Provide students with ample problem solving opportunities and situations to practice their already developed strategies to divide, multiple, add and subtract whole numbers. It is through this problem solving that students will become more efficient with these strategies and the concept of performing operations on whole numbers. This will also become a prerequisite to performing operations on decimals.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Paper and Pencil

- Ask students what they would rather have for their allowance: one penny a day which doubles each day or \$1000 a month? Explain their thinking and encourage them to use a table to show their solution. (6N2.1, 6N2.2, 6N2.3)

- The following chart shows the populations of five countries from least to greatest:

Ask students the following:

- (i) The population of Russia is 141 862 011. If the population of Russia is added to the chart, between what two countries would it be listed? Explain how you know.

Country	Population
USA	305 106 000
Indonesia	228 278 928
Pakistan	164 310 000
Japan	127 690 000
Mexico	106 002 500

- (ii) If we combined the population of Mexico and Japan, would it be more or less than the population of the USA?
- (iii) Is there any one country that has about double the population as another? Explain.
- (iv) If all the populations of the listed countries were combined, would we have more than or less than 1 billion people? How do you know? Students show how they arrived at the answer.

(6N2.1, 6N2.2, 6N2.3)

Performance

- Tell students Amy has 500 daytime minutes on her cell phone. She is using on average, 37 minutes a day. Ask students how many days she will have before her minutes are used? Ask them to suggest the number of minutes Amy should use each day to ensure she will not run out of daytime minutes each month. (6N2.1, 6N2.2)
- Tell students John's class sold 104 magazine subscriptions and Jane's class sold 108. The profit on each subscription was \$11.00. One student estimated the total profit was \$230.00. Ask students if this estimate is reasonable. Explain how you know. (6N2.2)

Resources/Notes

Math Focus 6

Lesson 2 (Cont'd): Exploring Billions

6N2

TG pp. 18 – 21

Lesson 2 and Lesson 3 may be combined.

Lesson 3 (Cont'd): Solving Problems That Involve Large Numbers

6N2

TG pp. 24 – 27

Strand: Number

Outcomes

Students will be expected to

6N2 Continued**Achievement Indicators:**

6N2.2 Determine the reasonableness of an answer.

6N2.3 Estimate the solution to, and solve, a given problem.

Elaborations—Strategies for Learning and Teaching

Estimation must be encouraged in all problem solving situations, rather than always asking students to estimate and then calculate. Help students understand that we estimate to ensure we come to a reasonable solution to a problem. Students should always be asked to check the reasonableness of their answers by estimating and employing mental math strategies. ‘Front end estimation’ and ‘using compatible numbers’ are some ways they can do this.

When a student asks whether or not their answer to a question is correct, ask the student if the answer makes sense to them, having them justify their response. Having students determine the reasonableness of an answer and explaining their thinking is a powerful way to assess understanding and learning.

Students need to be given opportunities to see that there will be times when getting an exact answer is not possible. E.g., knowing exactly how many hot dogs to buy for the school population on sports day is difficult. Estimation would be used to come close to a reasonable number. Other real life examples could be explored to emphasize the importance of knowing how to estimate such as knowing how much money would be needed to buy a list of items at the store or how much lumber is needed to build a dog house.

Children’s Literature link – Read *Betcha! Estimation* by Stuart Murphy to help students understand the concept of estimation. Many times students confuse estimation with guessing. Often, students may blurt out answers or “an estimate” without thinking or giving any thought to the number. Students must realize that in order to estimate, students must do something with the numbers (rounding, comparing, using referents/benchmarks, using compatible numbers to do mental math computations, etc.) whereas guessing is a random response without using a strategy.

 General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Provide sample problems such as the following and ask students to solve them. Ask them to share with their classmates how they found their answer:
 - (i) Mr. Ron collects recyclables. He counted 32 full bags of bottles. Mr. Ron knows he has more than 400 recycled bottles. Ask students to come up with some possible amounts of bottles that could be in each bag if there were the same number of bottles in each bag.
 - (ii) Mr. Ben's greenhouse has rows of flowers. There are 72 flowers in each row with 1080 flowers in total. Ask students to find the number of rows in Mr. Ben's greenhouse.

(6N2.1, 6N2.2, 6N2.3)

Portfolio

- Ask students to think about 1 million pennies and answer the following questions:
 - (i) How many loonies would that be worth?
 - (ii) How many \$100 bills would it take to equal the 1 million pennies?
 - (iii) How high would the stack of pennies be if you piled one on top of the other?
 - (iv) What would the mass of 1 million pennies be?
 - (v) Estimate how long it would take to count 1 million pennies.
 - (vi) What could you buy with 1 million pennies?

(6N2.1)

Journal

- Ask students to write about a situation in which estimated numbers were used. (6N2.3)
- Pose the following: Jane has \$500 to buy 8 games. Each game costs \$37. Jane wonders if she has enough money to buy them all. Invite students to help Jane out by explaining how they know if she really does have enough money. How can estimation help to determine the solution to the problem? (6N2.1)

Resources/Notes

*Math Focus 6***Lesson 2 (Cont'd):** Exploring Billions**6N2**

TG pp. 18 – 21

*Lesson 2 and Lesson 3 may be combined.***Lesson 3 (Cont'd):** Solving Problems That Involve Large Numbers**6N2**

TG pp. 24 – 27

Children's Literature (provided):Murphy, Stuart. *Betcha! Estimation*

Strand: Number

Outcomes

Students will be expected to

6N2 Continued**Achievement Indicator:**

6N2.4 Determine whether the use of technology is appropriate to solve a given problem, and explain why.

Elaborations—Strategies for Learning and Teaching

Students need to be aware of when to use technology. There are situations where using a calculator is more appropriate than using Paper and Pencil.

Although it is very important to ask students to master the basic facts and become comfortable using mental math strategies, calculator use can enhance student learning if used appropriately. Sometimes it is beneficial to involve students in solving problems that focus on the problem solving process and not the actual calculations within the problem. Using a calculator can free a student's mind where they are focused on solving the problem and not hung up on the calculations of the numbers.

Solving problems involving large numbers may seem overwhelming to some students. Breaking the problem down into smaller steps, or using smaller numbers will help students understand how to go about solving the problem. It may also be important to emphasize the necessity to estimate the answer to the problem before or after the solution is found.

Calculators can assist students in solving problems involving large numbers. Ask students what kind of jobs would use calculators as part of the work environment? Example – bankers, accountants, stock brokers, etc.

Ask students to determine, using a calculator, how many Grade 6 students would be needed to reach from St. John's to Port aux Basques if they were standing hand to hand.

(It is necessary for students to realize this is a question that requires estimation as each student will have different arm lengths.) Students can get an average arm length for their particular class. Breaking down the problem by determining how many students it would take to reach 10 m, 100 m and then 1 km could help determine the total number of students needed to reach the destination. Students could use the internet to determine many kilometres needed to reach Port aux Basques from St. John's and their calculators can be used to calculate the total number of people needed. It may also then be determined if there are enough people in Newfoundland to reach from St. John's to Port aux Basques and if not, how many more would be needed.

 General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Provide students with index cards folded in half with numbers written on each card. Ask students to work in small groups and distribute the number cards to each group. Give students time to discuss within their group the value of the numbers on the cards. Ask students to place their numbers on a number line made of string. You may also choose to give students blank index cards that could be used to create end points and benchmarks for their groups' set of numbers. Give students time to reflect on their work looking at the placement of the numbers. When students are comfortable and confident of the placement, ask them to explain to the class their placement of the numbers.

Model this task as a whole class activity before going into independent work. (6N1.1, 6N2.2, 6N2.3)

Paper and Pencil

- Ask students to solve the following problem. Mary's class sold tickets for a fundraiser. There were 22 students in Mary's class and each student sold 14 tickets. How many tickets were sold? (6N2.1)

Journal

- Ask the students to make a list of 3-4 situations where they would use a calculator to solve a problem. Ask them to explain why they would use a calculator rather than pencil/paper to get the answer. (6N2.4)

Resources/Notes

Math Focus 6

Lesson 2 (Cont'd): Exploring Billions

6N2

TG pp. 18 – 21

Lesson 2 and Lesson 3 may be combined.

Lesson 3 (Cont'd): Solving Problems That Involve Large Numbers

6N2

TG pp. 24 – 27

Strand: Number

Outcomes

Students will be expected to

6N1 Continued

Achievement Indicator:

6N1.1 Continued

Elaborations—Strategies for Learning and Teaching

As students continue work with large numbers, they sometimes need to rename numbers using decimals. They need to see that a number such as 3 450 000 is about 3.5 million. The focus should be on students’ reasoning and estimating of these numbers. When we are dealing with extremely large numbers it is very difficult to be accurate. If asked to find the population of Canada, students could use a search engine to see that in the 2008 census the population was 33 311 389 people. However, it is impossible to calculate the population of the nation at any given time since it is continuously changing. Therefore, giving this population count is only an estimate. When asked about the population of Canada, a reasonable estimate would be 33.3 million people.

Students are required to rename large numbers using decimals. They need to understand that the number to the left of the decimal names the whole number and the digits to the right of the decimal names the part of the number. For example, in the number 43 431 509 there are 43 whole millions, and 431 thousands. We would write this as 43.4 million.

A place value chart will reinforce students understanding of the values of numbers within periods.

Students could generate large numbers from texts and/or media that are meaningful to them. Using these numbers, ask students to place the numbers in the place value chart and rename the numbers using decimals. Ask them to round the numbers to the nearest tenth and hundredth and show how they decided to rename the numbers.

Million			Thousand			Ones		
H	T	O	H	T	O	H	T	O
	3	3	3	1	1	3	8	9

**Rounded to
Decimal Millions
33.3 million**

For example, if asked to round 33 311 389 to the decimal million, students could write 33.3 million.

 General Outcome: Develop Number Sense

Suggested Assessment Strategies

Portfolio/ Journal

- Tell students that Jim and Tom each rounded numbers to 2.4 million. Ask them if this means they both started with the same exact number? Ask them to explain their thinking using pictures, numbers and words. (6N1.1, 6N2.2)

Performance

- Find news articles that include large numbers written in different forms. Students may use the Internet and search databases such as Statistics Canada.
Ask students to rename the numbers in the article using decimal millions. (6N1.1, 6N1.2)
- Matching game – Prepare two sets of cards. One set of cards will have numbers written in standard form or in words and the other set will have the same number written in decimal form. Ask students to lay all cards face down. The first player turns over two cards. If they match, he/she keeps the cards. If they do not match, the two cards will be turned face down again. Play continues until all of the matches have been found. The player with the most cards at the end of the game wins. (6N1.1, 6N2.2, 6N2.3)
- Ask students to write five numbers between 5 000 000 and 10 000 000 and rename these numbers using decimal millions. They can also place the numbers on a number lines. (6N1.1, 6N2.2, 6N2.3)
- Ask students to research the distance of each planet from the sun. Record these distances in decimal millions. Ask students to create problems that could be solved using this information and get their partner to solve them. E.g., order the planets from least to greatest according to their distance from sun. Rename the numbers and record in a place-value chart. (6N1.1, 6N1.2)

Resources/Notes

*Math Focus 6***Lesson 4: Renaming Numbers****6N1****TG pp. 30 – 33**

Strand: Number

Outcomes

Students will be expected to

6N2 Solve problems involving whole numbers and decimal numbers.

[ME, PS, T]

Achievement Indicator:

6N2.5 Use technology when appropriate to solve a given problem

Elaborations—Strategies for Learning and Teaching

Communicating mathematical understanding and thinking is important in learning new skills and concepts in math. When a student can explain how they know an answer is reasonable, this means a student understands the process and the problem in a way that makes sense to them. As students continue to solve problems, it is necessary to work on their communication skills – showing how they know. Using pictures, numbers and words can help show their understanding and can improve their communication skills.

Consider the following situation:

The Toronto Maple Leafs have 42 regular season games and sell out all their games each season. Their stadium has 18 800 seats.

If we ask students to calculate how many tickets would be sold in a year, they are simply computing two given numbers. A richer way to ask students to engage in problem solving using large numbers would be to ask the following:

Would the Toronto Maple Leafs sell 1 000 000 tickets in a year? If not, how many years would it take to sell 1 000 000 tickets?

Therefore it is necessary to engage students in appropriate questions and tasks that allow such a process. Open ended tasks can allow students an opportunity to effectively communicate their reasoning in multiple ways. These representations strengthen the connections students make among the various strands in the math curriculum.

Working with large numbers may cause some difficulty with computation without the use of technology. It is suggested that students use calculators to work with these large numbers for computational purposes when the focus is not on mental math. Take the opportunity to observe students as they use calculators when computing large numbers. Assess students' understanding as they communicate the reasonableness of the answer they found on the calculator.

General Outcome: Develop Number Sense

Suggested Assessment Strategies*Performance*

- Present the following situation:
Betty sends at least 50 text messages a day to her friends. Each text message has about 140 characters. Ask students how many days it would take Betty to text one and a half million characters. Explain your thinking. (6N1.1, 6N2.1, 6N2.2, 6N2.3, 6N2.4, 6N2.5)
- Ask students to find the 5 most populated countries in the world and record the population. Ask them to estimate the total population of these countries and, using a calculator, determine if the estimate is reasonable. Explain why or why not. (6N2.3, 6N2.4, 6N2.5)

Resources/Notes*Math Focus 6***Lesson 5: Communicating about Large Numbers****6N2**

TG pp. 34 - 37

Strand: Number

Outcomes

Students will be expected to

**6N1 Continued
Achievement Indicator:**

6N1.1 Continued

Elaborations—Strategies for Learning and Teaching

Work at this level should concentrate on having students understand that the place value system extends to the left of the decimal as it does to the right. It is here that it should be emphasized that the majority of real life exposure to decimal numbers is unlikely to extend below the thousandths. However, it is important for students to know that the place value system extends beyond thousandths and that they can use the patterns of the place value chart to assist them in reading and writing these decimal numbers.

Students can often use the same strategies when reading and writing small decimal numbers as those used to read and write large whole numbers.

Show students how to write the numbers that are less than one thousandth in words to get them familiar with saying the words. For example, when talking about two ten thousandths (0.000 2), students could begin writing or saying this as two parts out of ten thousandths, or two in ten thousandths. They could then place this number on the place value chart to show that the 2 is in the ten thousandths place. Therefore we say that the number is 2 ten thousandths.

			1/10	1/100	1/1000	1/10000
Ones			Tenths	Hundredths	Thousandths	Ten Thousandths
H	T	O				
		0.	0	0	0	2

Some students may have trouble reading and writing small numbers. When writing numbers in the place value chart, demonstrate to students how the value of the last digit depends on which period it is placed in.

In example (a) we would read the number as thirteen ten thousandths. In example (b) the last digit is in the hundred thousandths place, therefore we would read or write the number as two and four thousand five hundred sixty seven ten thousandths.

	ones	tenths	hundredths	thousandths	ten thousandths
a)	0	0	0	1	3
b)	2	4	5	6	7

General Outcome: Develop Number Sense

Suggested Assessment Strategies

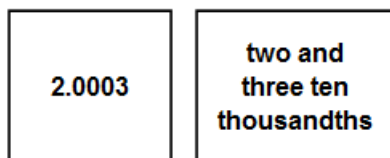
Paper and Pencil

- Ask students to use the following numbers to answer the questions below:
8.0254 2.086 0.83 24.918
 - In which number does 8 represent a value of 8 hundredths?
 - In which number does 2 represent a value of 2 tens?
 - In which number does 0 represent the value of 0 ones? (6N1.1)
- Ask students to write the number 23.0876 in words. (6N1.1)

Performance

- Using a set of 24 decimal ten thousandths problem cards, have 12 cards with decimal ten thousandths written in words and 12 cards with the same numbers written in numbers.

Students can play the game “Go Fish” where players pick 4 cards each. They take turns asking the other if they have the card that matches one in their hand. For example, do you have a card that matches 2 and three hundred thousandths? If the other student has the card with the number 2.0003 on it, they would give the card to the other player.



The game continues until all cards are gone. The player with the most cards at the end of the game wins. (6N1.1, 6N2.2, 6N2.3)

- Ask students to roll a die 5 times. Using the numbers rolled, create a decimal number with a value between 1.000 1 and 9.999 9
(6N1.1, 6N2.2, 6N2.3)
- Using number cards with digits 0-9 on them, ask students to create decimal ten thousandths numbers that are in a desired range. For example, using 5 different number cards create a number that can be found between 1.000 9 and 1.500 1. Ask students to write a journal entry explaining their thinking. (6N1.1, 6N2.2, 6N2.3)

Resources/Notes

*Math Focus 6***Lesson 6: Representing Millionths**
6N1

TG pp. 42-45

*Lesson 6 and Lesson 7 may be combined**Math Focus 6***Lesson 7: Exploring Decimals to Millionths****6N1**

TG pp. 42-45

The focus of lesson 6 and 7 in the resource is on decimals to millionths; however, the outcome states that students will demonstrate an understanding of place value to numbers less than one thousandths. Therefore it is important not to spend a great amount of time on numbers less than ten thousandths.

Strand: Number

Outcomes

Students will be expected to

6N1 Continued**Achievement Indicators:**

6N1.1 Continued

Elaborations—Strategies for Learning and Teaching

As students begin comparing small decimal numbers, connections to how they compare large numbers should be made. However, it must be noted that not all strategies to compare whole numbers will work for decimal numbers. For example, when comparing 3 456 with 345, it is evident to see that 3 456 is greater because there are more digits in the number. When comparing decimals, however, this strategy may not work. Ask students which number is greater - 0. 234 or 0.228 7. Students may think that 0.228 7 is greater because it has more digits. Help students understand that 0.234 is greater because 0.23 is greater than 0.22. It is through this work that student understanding of the place value system will be seen. The place value chart, as well as number lines, can be used in the comparison of decimals. For most students, it will be easier to compare decimals with the same number of decimal places. For decimal numbers that do not have the same number of decimal places, students can be shown that they can place a desired number of zeros at the end of the number without changing the value of the number. It will be necessary here to discuss how one tenth, for example is the same as 10 hundredths, or 100 thousandths or 1 000 ten thousandths. Writing these numbers on a place value chart or under each other to show the relationship would be helpful. E.g.,

0.1
0.10
0.100
0.1000

6N1.2 Continued

Students understanding of decimal numbers involving ten thousandths is an extension of their understanding of the place value system. It can be difficult to provide meaningful examples of numbers that extend beyond the thousandth. Using examples such as ppm (parts per million) in science to explain the amount of a chemical in a solution, may be one way to help students understand where these numbers could be used.

As students continue to work with decimal numbers beyond thousandths they can be shown how these very small numbers are related to larger numbers (millions) using the place value chart.

General Outcome: Develop Number Sense

Suggested Assessment Strategies

Performance

- Provide students with a list of numbers written both in words and in numeral form. Ask them to compare these numbers by placing them in a place value chart.

26.004 3

0.001 3

Seventy ten thousandths

four and fourteen ten thousandths

(6N1.1, 6N2.2, 6N2.3)

Resources/Notes

Math Focus 6

Lesson 8: Using Decimals

6N1

TG pp. 49- 52

Curious Math: Googols and
Googolplexes

TG pp. 53 -54

