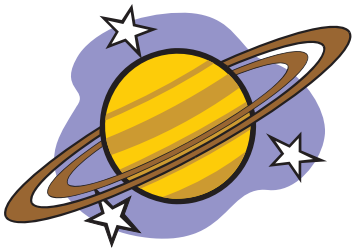
# UNIT 1
# NUMBER CONCEPTS



If you need additional help, there are more resources available at math-help.ca/more.

## 1.1 Place Value

**Numerals Greater than 1 000 000**



Large numbers are used when we talk about distances in the universe, numbers of cells or bacteria, the memory in a computer, or the population of a country. For example, the population of Canada is over 37 000 000 (thirty-seven million) and the distance from the earth to the sun is about 146 000 000 km (one hundred forty-six million). When these large numbers are written with digits, they are called numerals (125 320 000). When we read these numbers using words, they are called number words (one hundred twenty-five million three hundred twenty thousand).

To gain a better understanding of these large numbers, it is important to know what the value of each digit is. We do this with place value, which you have used before with smaller numbers.

Example: The number **2 538 094** is shown next with the place value for each of its digits.

| **2** | **5** | **3** | **8** | **0** | **9** | **4** |
|---|---|---|---|---|---|---|
| ↑ millions | ↑ hundred thousands | ↑ ten thousands | ↑ thousands | ↑ hundreds | ↑ tens | ↑ ones |
| two million | five hundred thirty-eight thousand | | | zero hundreds | Ninety-four | |

The above numeral (number) has 2 millions, 5 hundred thousands, 3 ten thousands, 8 thousands, 0 hundreds, 9 tens, and 4 ones. When we describe the numeral with a number word, we usually combine the millions, the thousands, and the tens and ones. The **number word** is two million five hundred thirty-eight thousand ninety-four.

### Examples with Solutions

1. Which digit is located in each of the following place-values for the numeral **7 029 438**?

| | |
|---|---|
| a. millions | 7, which represents 7 million. |
| b. ten thousands | 2, which represents 20 thousand. |
| c. thousands | 9, which represents 9 thousand. |
| d. hundreds | 4, which represents 4 hundreds. |
| e. tens | 3, which represents 3 tens. |

f. ones — 8, which represents 8 ones.

2. Write number words for the following numerals.

a. 235 608

235 608
There are 235 thousands (2 hundred thousands, 3 ten thousands, and 5 one thousands), 6 hundreds, and 8 ones. The number word is two hundred thirty-five thousand six hundred eight.

b. 3 065 240

3 065 240
There are 3 millions, 65 thousands (6 ten thousands and 5 one thousands), two hundreds, and 4 tens (or forty). The number word is three million sixty-five thousand two hundred forty.

c. 12 560 032

12 560 032
There are 12 millions, 560 thousands, 3 tens and 2 ones (or thirty-two). The number word is twelve million five hundred sixty thousand thirty-two.

3. Write the following number words as numerals.

a. five million thirty thousand eight hundred forty-seven — 5 030 847

b. seventy thousand fifteen — 70 015

c. twelve million two hundred six — 12 000 206

d. three million seven hundred five thousand thirty-four — 3 705 034

When we write numbers with more than 4 digits, we use a space instead of a comma to separate groups of three. This is done because Canada has adopted the metric system and in many other countries a comma is used as a decimal point.

Examples:

1. 27 500 instead of 27,500
2. 5 345 420 instead of 5,345,420
3. 3540 instead of 3,540 (We don't leave a space if there are only 4 digits.)

## Exercises 1.1a

1. What is the value of the digit asked for in each of the following numbers?

   a. 405 632 digit 6

   b. 1 040 670 digit 7

   c. 9 840 035 digit 9

   d. 1 302 670 digit 3

   e. 2 086 075 digit 8

2. Write the numeral for each number word.

   a. three hundred ten thousand thirty

   b. two million five hundred three thousand four hundred twenty-one

   c. seven million seventy thousand seventy

   d. five hundred thousand five

   e. six million six thousand six

   f. forty thousand fifteen

   g. one million twenty thousand three hundred

   h. one hundred thousand one hundred one

3. Write the number word for each numeral.

   a. 2 506 320

   b. 1 035 028

   c. 6 060 060

d. 5 505 055

e. 10 010 001

f. 3 000 033

g. 50 001 001

h. 707 077 007

4. The distance from the earth to the moon is about 384 403 km. Write this numeral as a number word.

5. A byte is a measure of information storage on a computer. A file in a computer takes up 1 250 344 bytes. Write this numeral as a number word.

6. The population of the United States is about three hundred twenty-nine million nine hundred seventy thousand. Write this number word as a numeral.

7. There are about fifty-five million six hundred nineteen thousand people in England. Write this number word as a numeral.

8. A provincial park has about two hundred twenty-three thousand six hundred trees in it. Write this number word as a numeral.

**Extra for Experts**

**Who Am I?**

9. I am a number with 6 digits. My ones digit is 6 and my tens digit is one less. My other four digits are all one less than my tens digit.

10. I have 7 digits. All of my digits are the same and their sum is 14.

11. I have 7 digits. Both my millions digit and my ones digit are equal to 5. Each of the digits in between are two less than five.

12. I have nine digits, each of which is equal. My digits sum to 27.

13. I am greater than one hundred thousand but less than one hundred thousand one hundred. I have a total of six digits and all of them are either zeros or ones. My digits sum to 2. What possible numbers am I?

14. I have 7 digits. My millions digit is 3 and all other digits to the right of it are one more than the digit on its left. What number am I?

15. There are five digits in my number. The first and the last are 1. The second is twice the sum of the first and last, the third is half the second and the fourth is one more than the third. What number am I?

**Numerals less than One Thousandth**

**Small Numbers**

We can think of small numbers as numbers that are little when compared with the numbers we use in everyday life. These small numbers often occur in fields such as chemistry, electronics, and quantum physics.

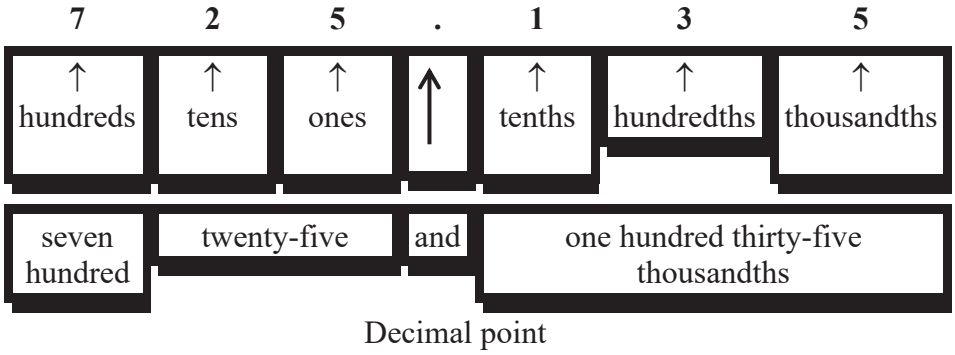
**The Decimal Point**

We can write numbers as large or as small as we want, using our decimal system of numbers. In this system, digits can be placed to the left or to the right of a **decimal point**. Numbers to the left are equal to or greater than one, and numbers to the right are less than one.

**Place Value and the Decimal Point**

To the **right** of the ones column is a decimal point, followed by the columns corresponding to place values of tenths, hundredths, and thousandths.

Example: The number 725.135 is shown with the place value for each of its digits below.




The above **numeral** (number) has 7 hundreds, 2 tens, 5 ones, 1 tenth, 3 hundredths, and 5 thousandths. The **number word** is seven hundred twenty-five **and** one hundred thirty-five thousandths.

**Writing Decimal Numerals and Decimal Number Words**

We usually use the word "**and"** to represent the decimal point.

# ABORIGINAL APPLICATIONS

## THE SALMON

*Artist: T. Isaac*

The Salmon is an extremely important part of the lifestyle and culture of Coastal First Nations people. Its importance as a food source and its impact on the way of life of Aboriginals gives the Salmon a position of special honour and respect.

Through various means of food preservation, such as smoking, canning, and drying, the Salmon provides nourishment throughout the year. The Salmon is an important part of special gatherings and artwork, and serves as a symbol of renewal and prosperity.

**Math Applications**

1. The village fishermen caught a total of 1867 salmon in a food fishing expedition. Round the number of salmon to the nearest…

   a. 1000

   b. 100

   c. 10

2. A large spring salmon can have a weight (mass) of 40 kg. Show 40 as a product of prime factors.

**Answers**

1. a) 2000 b) 1900 c) 1870 2. $2 \times 2 \times 2 \times 5$

# ANSWERS TO EXERCISES AND UNIT TESTS

## UNIT 1

**Exercises 1.1a** (page 4)
**1. a)** 600 **b)** 70 **c)** 9 000 000 **d)** 300 000 **e)** 80 000 **2. a)** 310 030 **b)** 2 503 421 **c)** 7 070 070 **d)** 500 005 **e)** 6 006 006 **f)** 40 015 **g)** 1 020 300 **h)** 100 101
**3. a)** two million five hundred six thousand three hundred twenty **b)** one million thirty-five thousand twenty-eight **c)** six million sixty thousand sixty **d)** five million five hundred five thousand fifty-five **e)** ten million ten thousand one **f)** three million thirty-three **g)** fifty million one thousand one **h)** seven hundred seven million seventy seven thousand seven
**4.** three hundred eighty-four thousand four hundred three **5.** one million two hundred fifty thousand three hundred forty-four
**6.** 300 050 000 **7.** 50 425 000 **8.** 223 600 **9.** 444 456 **10.** 2 222 222 **11.** 5 333 335 **12.** 333 333 333 **13.** 100 010 or 100 001 **14.** 3 456 789 **15.** 14 231

**Exercises 1.1b** (page 9)
**1. a)** 20 **b)** $\frac{4}{10}$ or 0.4 **c)** $\frac{6}{100}$ or 0.06 **d)** $\frac{8}{1000}$ or 0.008 **e)** 3 **2. a)** twenty-five and fifteen thousandths **b)** two hundred fifty and six thousandths **c)** forty-five and one hundred eleven thousandths **d)** two thousand three hundred and five hundred eight thousandths **e)** two hundred fifty and thirteen thousandths **f)** three thousand thirty and three hundredths **g)** one thousand three and three thousandths **h)** seven thousand and seventy-seven thousandths **i)** two hundred five thousand and twenty-nine hundredths **j)** three hundred ten thousand five and six tenths **3. a)** 350.029 **b)** 45.045 **c)** 205.02 **d)** 7500.075 **e)** 100 010.1 **f)** 600 006.06 **g)** 100 101.01
**4. a)** 1.248 **b)** 7.707 **c)** 643.21

**Exercises 1.2** (page 12)
**1. a)** 53 **b)** 53.5 **c)** 53.46 **2. a)** 600 **b)** 610 **c)** 607 **d)** 607.1 **e)** 607.05 **3.** 130 **4.** 1900 **5.** $123.30 **6.** 35.81 **7.** 5, 6, 7, 8 or 9 **8.** 0, 1, 2, 3 or 4 **9.** 5, 6, 7, 8 or 9 **10.** 0, 1, 2, 3 or 4

**Exercises 1.3** (page 16)
**1.** 14 000 000 **2.** $4 049 000 **3.** 89 000 **4.** 960 000 **5.** About 30 720 000 **6.** $726 000 **7.** 440 000 **8.** 1 014 000 bytes

**Exercises 1.4** (page 20)
**1. a)** 5, 71 **b)** 7, 29 **c)** 3, 73 **d)** 11, 31 **e)** 13, 23, 43, 53 **f)** 5 **2. a)** 1, 2, 4, 5, 8, 10, 20, 40; 2, 5 **b)** 1, 5, 11, 55; 5, 11 **c)** 1, 2, 5, 7, 10, 14, 35, 70; 2, 5, 7 **d)** 1, 2, 4, 5, 10, 20, 25, 50, 100; 2, 5 **e)** 1, 3, 5, 15, 25, 75; 3, 5 **3. a)** 3, 6, 9, 12
**b)** 2, 4, 6, 8, 20 **c)** 6, 12, 72 **d)** 8, 16
**4. a)** prime **b)** composite **c)** prime **d)** composite **e)** composite **f)** composite
**5. a)** 49, 56, 63, 70, 77 **b)** 108, 117, 126, 135 **c)** 220, 240, 260 **6.** 2, 3, 5, 7, 11, 13, 17, 19
**7. a)** 1, 5, 25 **b)** 1, 3 **8. a)** 35, 70 **b)** 24, 48, 72, 96 **9.** 1, 2, 4 **10.** 1, 6 **11.** 30, 60, 90
**12.** 2 **13.** 66, 72, 78, 84, 90, 96 Who am I? 210

**Exercises 1.5** (page 25)
**1.** GCF = 4, LCM = 224 **2.** GCF = 4, LCM = 240 **3.** LCM = 60 **4.** GCF = 14 **5.** GCF = 15, LCM = 1050 **6.** GCF = 3, LCM = 420 **7.** 60 minutes **8.** 35 or 105 **9.** 7 **10.** 5 **11.** 10, 20, 40 **12.** 15 and 30
**13. a)** 9:00 am **b)** Bus A will have completed 3 trips. **c)** Bus B will have completed 2 trips.

**Exercises 1.6** (page 29)
**1. a)** proper **b)** improper **c)** proper **d)** improper **e)** improper **f)** proper **g)** improper **h)** proper **i)** improper **j)** proper **k)** improper **l)** improper **m)** improper **n)** proper **2. a)** $\frac{5}{2}$ **b)** $\frac{11}{3}$ **c)** $\frac{41}{8}$ **d)** $\frac{21}{5}$ **e)** $\frac{101}{10}$ **f)** $\frac{101}{5}$ **g)** $\frac{33}{5}$ **h)** $\frac{103}{20}$ **i)** $\frac{1003}{10}$ **j)** $\frac{85}{4}$ **k)** $\frac{63}{4}$ **l)** $\frac{69}{8}$ **m)** $\frac{12}{11}$ **n)** $\frac{601}{20}$ **3. a)** $1\frac{1}{3}$ **b)** $1\frac{2}{3}$ **c)** $1\frac{1}{8}$ **d)** $1\frac{4}{7}$ **e)** $1\frac{2}{7}$ **f)** $4\frac{1}{2}$ **g)** $2\frac{1}{3}$ **h)** $4\frac{1}{3}$ **i)** $2\frac{2}{3}$ **j)** $3\frac{1}{10}$ k) $3\frac{1}{7}$ **l)** $2\frac{2}{13}$ **m)** $5\frac{5}{9}$ **n)** $1\frac{1}{999}$ **4.** $\frac{8}{6}$ or $\frac{9}{7}$ **5.** $\frac{5}{2}$, $\frac{7}{4}$, $\frac{8}{5}$, $\frac{9}{6}$ **6.** $1\frac{1}{2}$ **7.** $3\frac{1}{4}$ **8.** $7\frac{3}{4}$