CHAPTER 1
NUMBER CONCEPTS

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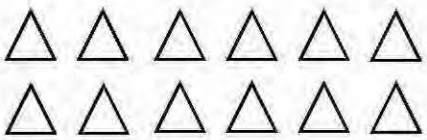
1.1 Representing and Describing Whole Numbers

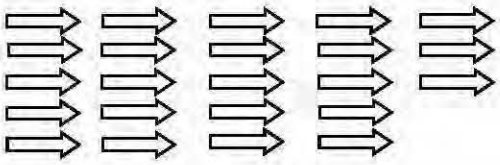
Whole Numbers

Whole numbers can be used to represent (show) how many objects are in a set. There can be no objects in a set, one object, two objects, and so on, up to any number of objects.

Examples: Count the objects below. Use a whole number to represent the number of objects in the set.



The number of triangles shown on the left is **12**.



The number of arrows shown on the left is **23**.

Whole numbers can be thought of as the numbers used for counting plus the number zero.

The set of whole numbers: **0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, …**

Each number can be written in two ways: as a **numeral** and as a **word number**.

Note: We do not include the word "and" with word numbers for whole numbers. The word "and" will be used with decimal numbers.

Examples:

1. 12 is a numeral and twelve is its word number.
2. 145 is a numeral and one hundred forty-five is its word number (**not** one hundred and forty-five).

Numerals are made up of **digits**. For example, the numeral 435 is made up of the digits **4**, **3**, and **5**. Each of these digits represents a certain value. To better understand the value of each digit, we need to understand **place value**, which we will discuss in the next section.

Example: 3417 consists of the **digits** 3, 4, 1, and 7. Each of these digits have different values.

Examples with Solutions

1. Write the numerals for each of the following word numbers.

Eighty-five	85
One hundred twenty-five	125
Four hundred three	403
Five thousand two hundred fifty	5250
Nine thousand twenty	9020
Eight thousand seven	8007

2. Write the word number for each of the following numerals.

655	six hundred fifty-five
1943	one thousand nine hundred forty-three
508	five hundred eight
2030	two thousand thirty
9007	nine thousand seven

3. Write all possible two-digit numerals that can be made from the following two digits.

7, 9	97 – ninety-seven
	79 – seventy-nine

4. Write all possible three-digit numerals that can be made from the following three digits.

4, 3, 1

431 – four hundred thirty-one
413 – four hundred thirteen
341 – three hundred forty-one
314 – three hundred fourteen
143 – one hundred forty-three
134 – one hundred thirty-four

Numerals, Digits, and Values

The **numeral** 427 contains 3 **digits**: 4, 2, and 7. The **value** of each digit depends on its location or **place** in the numeral.

In the numeral 427, the digit 4 has a value of 400 because it is in the hundreds place. The digit 2 has a value of 20 because it is in the tens place. The digit 7 has a value of 7 because it is in the ones place.

Place Value (ones, tens, hundreds, thousands)

When we write numerals from 0 to 9, they involve only the **"ones"** digits.

Examples:

1. 6 is equal to six ones.
2. 2 is equal to two ones.

When we write numerals from 10 to 99, they involve both **"tens"** and **"ones"** digits.

Examples:

1. 20 is equal to 2 tens and 0 ones.
2. 38 is equal to 3 tens and 8 ones.
3. 97 is equal to 9 tens and 7 ones.

When we write numerals between 100 and 999, they involve **hundreds, tens,** and **ones** digits.

Examples:

1. 639 is equal to 6 hundreds, 3 tens, and 9 ones.
2. 485 is equal to 4 hundreds, 8 tens, and 5 ones.

Numerals between 1000 and 9999 include the **"thousands, hundreds, tens,** and **ones"** digits. Below, the number 5628 is shown with the place value for each digit.

5	**6**	**2**	**8**
↑	↑	↑	↑
thousands	hundreds	tens	ones

5628 has 5 thousands, 6 hundreds, 2 tens, and 8 ones.

Writing Numerals Using Proper Spacing

In Canada, we do not use commas with whole numbers. When a numeral has more than 4 digits, we leave a space instead of a comma between every three digits, working from right to left. We do **not** use a comma or leave a space if there are only four digits.

Examples:

1. Write as 11 250 instead of 11,250.
2. Write as 33 066 instead of 33,066.
3. Write as 5268 instead of 5,268.

Expressing a Numeral in Expanded Form

We can show a numeral as a sum of the values of its digits. This is called writing the numeral in expanded form. For example, 328 is equal to 300 + 20 + 8. Keep in mind the place values of the digits.

Examples:

1. $62 = 6 \times 10 + 2 \times 1 = 60 + 2$
2. $549 = 5 \times 100 + 4 \times 10 + 9 \times 1 = 500 + 40 + 9$
3. $7604 = 7 \times 1000 + 6 \times 100 + 0 \times 10 + 4 \times 1 = 7000 + 600 + 4$

Examples with Solutions

1. Write the numeral that has 2 thousands, 5 hundreds, 0 tens, and 7 ones.

   $\underline{2} \times 1000 + \underline{5} \times 100 + \underline{0} \times 10 + \underline{7} \times 1$

   $2000 + 500 + 0 + 7 = 2507$

2. Write the word number for the numeral below.

   6512

   The numeral has 6 thousands, 5 hundreds, 1 ten, and 2 ones.

   The word number is **six thousand five hundred twelve**.

3. Write 4084 in words.

   The numeral has 4 thousands, 0 hundreds, 8 tens, and 4 ones.

   The number is **four thousand eighty-four**.

4. Write three thousand six hundred twenty as a numeral.

   There are 3 thousands, 6 hundreds, and 2 tens.

   The numeral is **3620**.

5. Look at the numeral 6513.

   a. What is the value of the 5?

   The 5 is in the hundreds column, so its value is $5 \times 100 = 500$.

   b. What is the value of the 1?

   The one is in the tens column, so its value is $1 \times 10 = 10$.

   c. What is the value of the 6?

   The 6 is in the thousands column, so its value is $6 \times 1000 = 6000$.

6. Express 759 in expanded form.

There are 7 hundreds, 5 tens, and 9 ones.

$759 = 7 \times 100 + 5 \times 10 + 9 \times 1$
$= 700 + 50 + 9$

7. Write a numeral for a number that has 3 thousands, 3 hundreds, 3 tens, and 3 ones.

3 thousands, 3 hundreds, 3 tens, and 3 ones is equal to $3 \times 1000 + 3 \times 100 + 3 \times 10 + 3 \times 1$

This is equal to $3000 + 300 + 30 + 3 = 3333$.

Exercises 1.1

1. Fill in each blank in the table below.

	thousands	hundreds	tens	ones
a. 9052				
b. 206				
c. 6300				
d. 5106				
e. 310				
f. 42				
g. 7007				

2. Write each of the following numerals in expanded form. The first one is done for you.

   a. 3257 — 3000 + 200 + 50 + 7

   b. 4433

   c. 8056

   d. 8506

   e. 9990

3. Write the numeral for each description below.

   a. 2 thousands, 9 hundreds, 7 tens, and 5 ones

   b. 2 hundreds, 5 tens, and 6 ones

   c. 8 hundreds and 5 ones

   d. 9 thousands, 9 hundreds, 9 tens, and 9 ones

   e. 2 thousands, 7 hundreds, and 3 ones

   f. 6 thousands and 5 tens

   g. 4 thousands, 5 tens and 4 ones

   h. 3 thousands and 3 ones

   i. 27 thousands and 8 ones

   j. 38 hundreds and 20 ones

4. The word numbers below combine some of the place values. Three examples are done for you. Write the correct numeral for each of those that follow.

(i)	five hundred twenty-seven	527
(ii)	twelve hundred sixty-five	1265
(iii)	twenty-six hundred eight	2608

a. eight hundred twelve

b. six hundred twenty-one

c. eighteen hundred seven

d. eleven hundred sixty-eight

e. twenty-five hundred forty-two

f. one thousand two hundred five

g. twenty-nine hundred six

h. nine thousand twenty

i. ten thousand six

5. Write the word number for each numeral listed below.

a. 106

b. 67

c. 235

d. 610

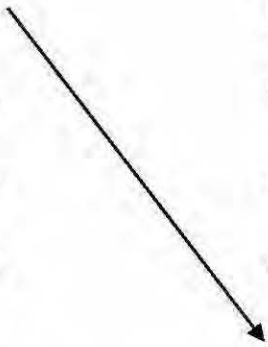
e. 501

f. 1034

g. 1528

h. 5202

6. Match the word number in the left column with the numeral in the right column by drawing an arrow between them. The first one is done for you.



a. six hundred seventy	10 010
b. twenty-three hundred two	2320
c. forty-two thousand sixty-five	11 101
d. ten thousand ten	607
e. twenty-three hundred twenty	670
f. eleven thousand eleven	42 605
g. ten thousand one hundred one	42 065
h. forty-two thousand six hundred five	2302
i. six hundred seven	11 011
j. eleven thousand one hundred one	10 101

7. Use numerals to write each of the following numbers.

a. two hundred greater than twenty-one

b. one thousand greater than five hundred nine

c. two hundred less than one thousand three hundred

d. three hundred less than twenty-five hundred

e. one hundred seventy-two more than seven hundred

f. twelve hundred less than twenty-five hundred

g. seventeen more than fifteen hundred

h. five hundred less than seventeen hundred

8. Use words to write each of the following numbers.

a. 28 more than 500

b. 200 more than 750

c. 300 less than 2575

d. 100 more than 890

e. 1250 more than 1005

f. 210 more than 530

g. 1400 less than 1750

Extra for Experts

WHAT NUMBER AM I?

9. I have 6 thousands, no hundreds, 2 tens, and 3 ones.

10. I have 3 hundreds, twice as many tens as hundreds, and no ones.

11. I have 11 ones and 2 tens.

12. I have 12 tens and 3 ones.

13. I have 13 hundreds, 5 tens and 15 ones.

14. I have twice as many hundreds as tens, twice as many tens as ones, and 2 less than 3 ones.

15. I have 8 thousands, half as many tens as thousands, and one more ones than tens.

16. I have the same number of thousands, hundreds, tens and ones. My number of ones is two more than three.

1.2 Comparing and Ordering Numbers

Comparing Numbers

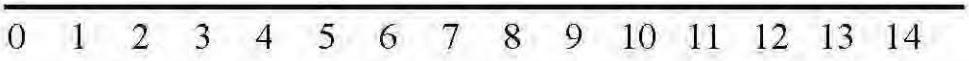
When the size of two numbers are compared to each other, one of the following statements must be true.

1. The two numbers can be **equal to** each other.
2. The first number can be **less than** the second number.
3. The first number can be **greater than** the second number.

We use the following symbols to show each of these comparisons.

Symbols	Examples	
= is equal to	125 is equal to 125.	125 = 125
< is less than	2100 is less than 2200.	2100 < 2200
> is greater than	500 is greater than 100.	500 > 100

We can also use the number line to compare numbers.



Numbers located to the right of a given number are greater than (>) that number.

Examples:

1. 7 > 5
2. 12 > 11
3. 1 > 0

Numbers located to the left of a given number are less than (<) that number.

Examples:

1. 8 < 10
2. 1 < 2
3. 0 < 3

ANSWERS TO EXERCISES AND CHAPTER TESTS

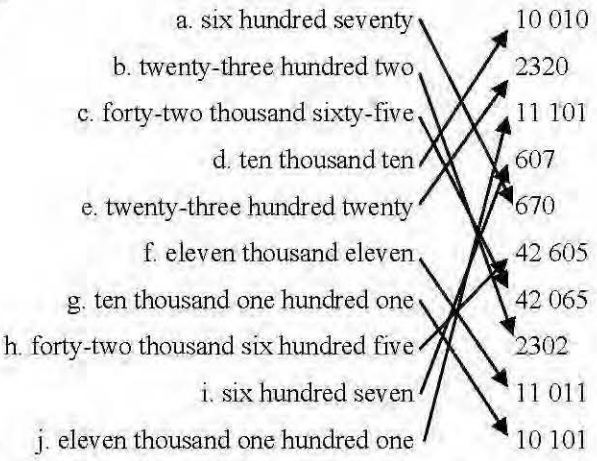
CHAPTER 1

Exercises 1.1 (page 7)

1.

	Thousands	Hundreds	Tens	Ones
a) 9052	9	0	5	2
b) 206	0	2	0	6
c) 6300	6	3	0	0
d) 5106	5	1	0	6
e) 310	0	3	1	0
f) 42	0	0	4	2
g) 7007	7	0	0	7

2. a) 3000 + 200 + 50 + 7
b) 4000 + 400 + 30 + 3 **c)** 8000 + 50 + 6
d) 8000 + 500 + 6 **e)** 9000 + 900 + 90
3. a) 2975 **b)** 256 **c)** 805 **d)** 9999 **e)** 2703
f) 6050 **g)** 4054 **h)** 3003 **i)** 27 008 **j)** 3820
4. a) 812 **b)** 621 **c)** 1807 **d)** 1168 **e)** 2542
f) 1205 **g)** 2906 **h)** 9020 **i)** 10 006
5. a) one hundred six **b)** sixty-seven
c) two hundred thirty-five **d)** six hundred ten
e) five hundred one **f)** one thousand thirty-four
g) one thousand five hundred twenty-eight
h) five thousand two hundred two
6.



7. a) 221 **b)** 1509 **c)** 1100 **d)** 2200 **e)** 872
f) 1300 **g)** 1517 **h)** 1200 **8. a)** five hundred twenty-eight **b)** nine hundred fifty **c)** two thousand two hundred seventy-five **d)** nine hundred ninety **e)** two thousand two hundred fifty-five **f)** seven hundred forty **g)** three hundred fifty **9.** 6023 **10.** 360 **11.** 31
12. 123 **13.** 1365 **14.** 421 **15.** 8045 **16.** 5555

Exercises 1.2 (page 17)
1. a) 540 **b)** 2110 **c)** 4810 **d)** 5110
e) 11 111 **2.** a) 318 **b)** 1028 **c)** 3389
d) 1009 **e)** 21 099 **3. a)** 210, 207, 165, 156
b) 3165, 3155, 3090, 3033
c) 8100, 8099, 947, 895
d) 5010, 5005, 4990, 4988
e) 4532, 4529, 4444, 4399
4. a) 139, 159, 165, 240, 268
b) 1009, 1029, 1034, 1040
c) 4408, 4499, 4500, 4510
d) 890, 908, 7009, 7010
e) 10 009, 10 010, 10 110, 10 111
5. 839, 893, 389, 398, 938, 983
6. 542, 245, 524, 254, 425, 452 **7.** 7, 8, 9
8. 0, 1, 2 **9.** 0, 1, 2, 3 **10.** 0, 1, 2, 3, 4, 5, 6, 7, 8
11. 9999

Exercises 1.3 (page 22)
1. a) 8, 9 **b)** 0, 1, 2, 3, 4 **c)** 7 **d)** 0 **e)** 5
f) 4, 5, 6, 7, 8, 9 **g)** 0, 1, 2, 3 **h)** 0 **2.** 6, 7
3. 22, 24, 26, 28 **4.** 10, 20 **5.** 12, 24 **6.** 21, 63

Extra Practice – Chapter 1 (page 23)
1. a) 202 **b)** 3333 **c)** 3300 **d)** 3330 **e)** 3030
f) 3003 **2. a)** two thousand four hundred ten
b) two thousand ten **c)** two thousand four
d) nine thousand one hundred five
3. 2, 4, 42, 24 **4.** 758 587 857 785 578 875
5. a) 400 + 50 + 6 **b)** 9000 + 800 + 2
c) 7000 + 60 + 7 **6.** 963 **7.** 2222 **8.** 5555
9. a) 1210 **b)** 5011 **c)** 8114 **10. a)** 3302
b) 7389 **c)** 10 101 **11.** 898, 899, 908, 910
12. 2110, 2101, 2011 **13.** 8, 9
14. 0, 1, 2, 3, 4, 5, 6, 7, 8 **15. a)** 15, 16, 17
b) 18, 19 **c)** 15, 18 **16. a)** 5, 10, 15 **b)** 12, 18
17. a) 200 + 30 + 4 **b)** 400 + 2
c) 2000 + 900 + 30 + 9 **18. a)** 423 **b)** 965
c) 5270

Chapter 1 Test (page 27)
1. a) 45 **b)** 57 **c)** 2210 **2. a)** 400 **b)** 5000
c) 80 **3. a)** 2612 **b)** 3047 **c)** 205 **d)** 30 200
4. a) thirty-four thousand fifteen
b) sixty thousand seven **5. a)** 3420 **b)** 4000
c) 2800 **6.** 2020 **7.** 2200 **8.** 7777