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Mathematics

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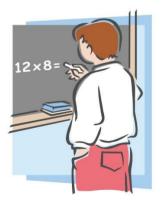
Table of Contents

÷   ✗   ÷

UNIT 1

NUMBER CONCEPTS AND OPERATIONS

1.1   Representing and Describing Whole Numbers to 1 000 000

1.2   Rounding and Estimation

1.3   Mental Mathematics

1.4   Multiplying 2-Digit Numbers

1.5   Dividing 2-Digit Numbers by 1-Digit Numbers

1.1   Representing and Describing Whole Numbers

Word Numbers and Numerals

▪ When we express an amount or quantity using words, we call it a **word number** (e.g. twenty five, one hundred thirty two, etc.). However, when we use symbols to represent a quantity, we call it a **numeral** (e.g. 25, 132, etc.).

e.g. ***Two thousand one hundred fifty three   OR   2153***

↑   ↑

WORD NUMBER   **NUMERAL**

Writing Word Numbers

▪ When we write a word number to represent a whole number numeral, we <u>don't</u> use the word *"and." (This word is reserved for decimals.)*

e.g. (i) 138 is written as *one hundred thirty eight* **NOT** one hundred <u>*and*</u> thirty eight.

(ii) 4530 is written as *four thousand five hundred thirty* **NOT** four thousand five hundred <u>*and*</u> thirty.

Numerals and Digits

▪ Numerals are made up of **digits**. For example, the numeral 356 is made up of the digits **3**, **5**, and **6**. Each one of these digits represents a certain value. To better understand the value of each digit, we need to understand **place value**. This topic is discussed in the next section.

e.g. *5368 consists of the following digits, each with different values: **5, 3, 6, and 8***.

▪ The **value** of each digit depends on its location or **place** in the numeral. For example, in the numeral 235, the digit 2 has a value of 200 (it is in the hundreds place), the digit 3 has a value of 30 (it is in the tens place), and the digit 5 has a value of 5 (it is in the ones place).

Using Proper Spacing Instead of Commas in Numerals

▪ Canada has adopted international rules for the metric system and as a result we do not use commas with whole numbers (in some countries commas stand for decimals). As a result, when a numeral has more than 4 digits, we leave a <u>space</u> instead of a comma between every three digits, working from right to left. In addition, we do **not** use a comma or leave a space if there are only four digits.

Examples

(i) Use 35 172 instead of 35,172.	*(Leave a space three digits to the right.)*
(ii) Use 534 873 instead of 534,873.	*(Leave a space three digits to the right.)*
(iii) Use 4215 instead of 4,215.	*(Since there are only 4 digits, do not leave a space.)*

Examples with Solutions

1. Write a numeral for each of the following word numbers.

	Answer
a. two hundred fifty three	*a. 253*
b. one hundred twenty	*b. 120*
c. three thousand four hundred seventy	*c. 3470*
d. six thousand fifty seven	*d. 6057*
e. five thousand six hundred two	*e. 5602*
f. fifty thousand three hundred six	*f. 50 306*

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

	Answer
a. 509	*a. five hundred nine*
b. 3238	*b. three thousand two hundred thirty eight*
c. 4044	*c. four thousand forty four*
d. 6305	*d. six thousand three hundred five*
e. 8230	*e. eight thousand two hundred thirty*
f. 41 206	*f. forty one thousand two hundred six*

3. Write as many different numerals as possible from the following digits.

	Solution
7, 3	▪ *Possible numerals with one digit are 3 and 7*
	▪ *Possible numerals with two digits are 37 and 73*
	▪ *All possible numerals are: 3, 7, 37, 73*

4. Use proper spacing and the deletion of commas to rewrite each numeral shown incorrectly on the left.

Incorrectly Written Numeral	Correct Version
a. 4,678	a. *4678 (remove comma, no space)*
b. 7 349	b. *7349 (remove space)*
c. 10,348	c. *10 348 (remove comma, insert space)*
d. 72,431	d. *72 431 (remove comma, insert space)*
e. 145,689	e. *145 689 (remove comma, insert space)*

Place Value

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

    e.g. 1. 9 is equal to nine ones.
    2. 2 is equal to two ones.

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

    e.g. 1. 16 is equal to 1 ten and 6 ones.
    2. 68 is equal to 6 tens and 8 ones.

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

    e.g. 1. 962 is equal to 9 hundreds, 6 tens, and 2 ones.

- Numerals between 1000 and 99 999 can include the **"ten thousands, thousands, hundreds, tens,** and **ones" digits**. The number 23 417 is shown next with the place value for each digit next.

2	3	4	1	7
↑	↑	↑	↑	↑
ten thousands	thou-sands	hun-dreds	tens	ones

So 23 417 has 2 ten thousands, 3 thousands, 4 hundreds, 1 ten and 7 ones
    (*twenty three thousand   four hundred   seventeen*)
        ↑   ↑
Combine the thousands.   Combine the tens and ones.

Examples with Solutions

1. What is the value of the underlined digit in each of the following numerals?

	Answer
a. 4<u>5</u>3	a. *The digit 5 is in the tens place, so it is equal to 5 x 10 = 50.*
b. 68<u>2</u>	b. *The digit 2 is in the ones place, so it is equal to 2 x 1 = 2.*
c. <u>5</u>09	c. *The digit 5 is in the hundreds place, so it is equal to 5 x 100 = 500.*
d. 2<u>3</u>45	d. *The digit 3 is in the hundreds place, so it is equal to 3 x 100 = 300.*
e. <u>5</u>230	e. *The digit 5 is in the thousands place, so it is equal to 5 x 1000 = 5000.*
f. 5<u>4</u> 895	f. *The digit 4 is in the thousands place, so it is equal to 4 x 1000 = 4000.*
g. <u>2</u>4 305	g. *The digit 2 is in the ten thousands place, so it is equal to 2 x 10 000 = 20 000.*

2. Write each numeral described below.

a. I have 5 tens, 4 hundreds, and 3 ones.	a. *453*
b. I have 2 thousands, 3 hundreds and 7 ones.	b. *2307*
c. I have 9 hundreds, 7 thousands, and 8 ones.	c. *7908*
d. I have 6 ten thousands and 2 hundreds.	d. *60 200*
e. I have 3 ten thousands, 1 thousand, and 5 tens.	e. *31 050*
f. I have 6 thousands and 3 ones.	f. *6003*
g. I have 3 hundreds and 7 thousands.	g. *7300*

3. Write each numeral as a number word.	_Solution_
a. 25 040	a. _twenty five thousand forty_
b. 620 305	b. _six hundred twenty thousand three hundred five_
c. 702 027	c. _seven hundred two thousand twenty seven_
d. 800 808	d. _eight hundred thousand eight hundred eight_
4. Write each number word as a numeral.	
a. three hundred twenty five thousand two hundred nine	a. _325 209_
b. one hundred twenty five thousand six hundred forty eight	b. _125 648_
c. two hundred thousand three hundred ten	c. _200 310_
c. six hundred thousand thirty five	d. _600 035_

Expressing a Numeral using Expanded Notation

- We can show a numeral as a sum of the values of its digits (called writing the numeral in **expanded notation**). For example, 526 is equal to 500 + 20 + 6 (keeping in mind the place values of the digits).

e.g. (i) $34 = 3 \times 10 + 4 \times 1 = 30 + 4$
    (ii) $793 = 7 \times 100 + 9 \times 10 + 3 \times 1 = 700 + 90 + 3$
    (iii) $8408 = 8 \times 1000 + 4 \times 100 + 0 \times 10 + 8 \times 1 = 8000 + 400 + 8$

Examples with Solutions

1. Write each numeral in expanded notation.	
a. 5642	a. _5642 = 5 x 1000+ 6 x 100+4 x 10+2 x 1_
b. 4059	b. _4059 = 4 x 1000+5 x 10 + 9 x 1_
c. 24 040	c. _24 040 = 2 x 10 000+4 x 1000 +4 x 10_

2. Write the numeral that has 5 thousands, 2 hundreds, 3 tens, and 0 ones.	▪ *$\underline{5}$ x 1000 + $\underline{2}$ x 100 + $\underline{3}$ x 10 + $\underline{0}$ x 1* *= 5000 + 200 + 30 + 0 = 5230*
3. Write the word number for the numeral below. **7215**	▪ *The numeral has 7 thousands, 2 hundreds, 1 ten, and 5 ones.* ▪ *The word number is **seven thousand two hundred fifteen**.*
4. Write 30 574 in words.	▪ *The numeral has 3 ten thousands, 5 hundreds, 7 tens, and 4 ones.* ▪ *The word number is **thirty thousand five hundred seventy four**.*
5. Write three hundred thousand five hundred twenty as a numeral.	▪ *There are 3 hundred thousands, 5 hundreds, and 2 tens.* ▪ *The numeral is **300 520**.*

6. In the numeral 70 218,
   a.   What is the value of the 2?
 	
   b.   What is the value of the 1?
 	
   c. What is the value of the 7?
	a. The 2 is in the hundreds column, so its value is 2 x 100 = 200.
	b. The one is in the tens column, so its value is 1 x 10 = 10.
	c. The 7 is in the ten thousands column, so its value is 7 x 10 000 = 70 000.

Exercises 1.1

1. Write a numeral for each of the following word numbers.

a. one hundred seventy	b. five hundred nine
c. four hundred twenty four	d. six thousand fifteen
e. two thousand thirty six	f. twenty two thousand ten
g. thirty thousand two hundred one	h. two hundred thousand six hundred

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

    a. 345

    b. 304

    c. 1250

    d. 2253

    e. 32 753

    f. 70 150

    g. 125 344

    h. 333 303

3. Write as many different numerals as possible from the following digits.

    a. 5, 2

    b. 1, 7

4. Rewrite each numeral using proper spacing and deleting commas.

    a. 4,790

    b. 7,666

    c. 5,555

    d. 12,456

    e. 30,148

    f. 22,088

    g. 470,031

    h. 330,022

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5. Fill in each blank with the correct digit in the table below.

	ten thousands	thousands	hundreds	tens	ones
a. 405					
b. 2210					
c. 6070					
d. 5055					
e. 20 245					
f. 31 042					
g. 78 103					

6. Write each numeral using expanded notation.

   a. 4522   b. 3022

   c. 40 250   d. 12 090

   e. 38 080   f. 120 790

7. Write each numeral described below.

   a. I have 3 thousands, 2 tens, and 7 ones.   b. I have 6 hundreds and 9 ones.

   c. I have 2 ten thousands, 3 hundreds, 5 tens, and 2 ones.   d. I have 8 thousands, 3 tens, and 5 ones.

8. What is the value of the digit underlined in each numeral?

   a. 5<u>6</u>71   b. 60<u>9</u>2

   c. 6<u>3</u> 697   d. <u>5</u>4 207

9. Draw an arrow to match the numeral in the left hand column with the number word in the right. The first one is done for you.

a. 125 430   nine hundred eight thousand eight

b. 750 209   one hundred twenty five thousand four hundred thirty

c. 300 025   four hundred ten thousand ten

d. 908 008   seven hundred fifty thousand two hundred nine

e. 410 010   three hundred thousand twenty five

f. 125 043   three hundred thousand two hundred fifty

g. 300 250   one hundred twenty five thousand forty-three

Extra for Experts   **WHAT NUMBER AM I?**

10. I have 3 thousands, 2 hundreds, 0 tens, and 2 ones.

_Answer _____

11. I have 2 hundreds, three times as many tens as hundreds, and half as many ones as hundreds.

_Answer _____

12. I have 15 ones and 9 tens.

_Answer _____

13. I have 30 tens and 2 ones.

Answer _____

14. I have 14 hundreds, 6 tens,
    and 18 ones.

Answer _____

15. I have twice as many thousands as
    tens, twice as many tens as ones,
    and 2 less than 4 ones.

Answer _____

16. I have 6 thousands, half as many
    hundreds as thousands, and the
    same number of tens and ones as
    hundreds.

Answer _____

17. I have the same number of
    thousands, hundreds, tens, and
    ones. The sum of my digits is 28.

Answer _____

18. List all of the 3-digit numerals that can be made from the digits 3, 6, and 9.

19. List all of the numerals containing one, two, or three digits than can be made
    from the digits 5, 2, and 3.

1.2   Using Estimation

Estimating Values

- **Estimation** is used often in day-to-day activities to determine approximate values. Several examples of where estimation is used are listed next.

    - Your height or that of your classmates
    - How much is needed to pay for groceries in your shopping cart
    - How much gas is needed for your car to travel between two towns
    - How much fertilizer is needed for the lawn

- Other uses of estimation include:

    - Making predictions
    - Checking whether an answer is reasonable (This is particularly useful when you use a calculator.)

Rounding Numbers

- To get closer to the exact answer when we use estimation, sometimes we **round** a number either up or down first.

Rules for Rounding

- Use the following steps to round numbers.

    (*i*). *Go to the column immediately <u>to the right</u> of the digit corresponding to the place value asked for.*

    (ii). *Round <u>up</u> if that digit is 5 or greater (5 to 9) or leave it the same if it is less than 5 (0 to 4).*

    (iii). *Replace digits to the right of the place value asked for with zero.*

Rounding Examples

Round 7382 to   *Estimated Answer*

a. the nearest ten	▪ Go to the <u>ones</u> column. ▪ It is 2 so leave the 10s digit and replace those to the right with 0. *(Note: 7382 is closer to 7380 than to 7390.)*	*7380*
b. the nearest 100	▪ Go to the <u>tens</u> column. ▪ It is 8 so round the hundreds column up to 4 and replace those to the right with 0. *(Note: 7382 is closer to 7400 than to 7300.)*	*7400*
c. the nearest 1000	▪ Go to the hundreds column. ▪ It is 3 so leave the thousands column and replace those to the right with 0. *(Note: 7382 is closer to 7000 than to 8000.)*	*7000*

Estimating Operations between Two Numbers

▪ When estimation is used to find the sum, difference, product, or quotient between two numbers, use the following steps.

   (i). Round one number down to a convenient number.

   (ii). Round the other one up to a convenient number.

   (iii). Perform the operation between the numbers.

Examples with Solutions

1. Round the number 4764 as follows:	
a. to the nearest hundred	▪ *Go to the tens column.* ▪ *There are 6 tens, so round the hundreds digit up.* ▪ *Replace digits to the right of the hundreds with 0.* ▪ *The number becomes 4800.*
b. to the nearest 1000	▪ *Go to the hundreds column.* ▪ *There are 7 hundreds so round the thousands column up.* ▪ *Replace digits to the right of the thousands with 0.* ▪ *The number becomes 5000.*
c. to the nearest 10	▪ *Go to the ones column.* ▪ *There are 4 ones so leave the tens column the same.* ▪ *Replace digits to the right of the tens with 0.* ▪ *The number becomes 4760.*

2. <u>Estimate</u> the following product by
 	
   (i) rounding the numbers first, and
 	
   (ii) finding the resulting product.
 	
      289 x 11
	▪ *Round 289 up to 300 and round 11 down to 10.*
	
	▪ *The estimated product is 300 x 10 = 3000.*

Exercises 1.2

1. Round each number as follows.

   a. 63 to the nearest 10   *Answer* _____

   b. 86 to the nearest 10   *Answer* _____

   c. 161 to the nearest 100   *Answer* _____

d. 12 249 to the nearest 100   *Answer* _____

e. 18 708 to the nearest 1000   *Answer* _____

f.   2535 to the nearest 10   *Answer* _____

g. 71 900 to the nearest 1000   *Answer* _____

h.   1658 to the nearest 10   *Answer* _____

i.   90 909 to the nearest 100   *Answer* _____

j.   191 919 to the nearest 10   *Answer* _____

k.   64 601 to the nearest 1000   *Answer* _____

2. If you were going to <u>estimate</u> the product of each pair of numbers, what number would you round each factor to and then what would be your estimate?

a. 28 x 43   *Rounded numbers* ____ *x* ____

                                            Estimate _____

b. 109 x 295   *Rounded numbers* ____ *x* ____

                                            Estimate _____

c. 48 x 103   *Rounded numbers* ____ *x* ____

                                            Estimate _____

d. 322 x 285   *Rounded numbers* ____ *x* ____

                                            Estimate _____

e. 1024 x 95   *Rounded numbers* ____ *x* ____

                                            Estimate _____

3. Round each separate number to the nearest 100 first and then estimate the sum.

281
322
593

Rounded numbers ____ + ____ + _____

Estimate of the sum _____

4. On a recent vacation trip, the Wong family traveled 512 km on the first day, 620 km on the second day, 490 km on the third day, and 572 km on the fourth day. Round each distance to the nearest 100 and then estimate the total distance traveled.

Answer _____

5. Mr. Coulson's class had a raffle. Soeng sold 42 tickets, Pedro 58, Bob 71, and Hannah 114. Round each sale to the nearest 10 and then estimate the total number of tickets they sold.

Answer _____

6. Myra, Ron, Jack, and Sumi collect hockey cards. Myra has 312, Ron has 472, Jack has 225, and Sumi has 530. Round each to the nearest 100 and estimate how many cards they had altogether.

Answer _____

7. In Nand's school, there were 74 students in Kindergarten, 69 in Grade 1, 42 in Grade 2, 73 in Grade 3, 94 in Grade 4, 89 in Grade 5, 88 in Grade 6, and 64 in Grade 7. Round the number in each grade to the nearest 10 and then estimate how many students there were in the school.

Answer _____

Extra for Experts

8. If 15 680 had been rounded up to the nearest 10, what were all of the possible numerals that it could have originally been?

Answer _____

9. If 28 500 had been rounded down to the nearest hundred, what were all of the possible digits that could have been in the tens column?

Answer _____

10. Estimate how many days there are in 21 months. Explain how you did this.

Answer:

11.   List all possible numbers which meet the following conditions:

a.   These 2-digit numbers, when
     rounded to the nearest 10, are
     equal to 40

                                                              Answer _____

b.   These numbers, between 8545
     and 8555, when rounded to the
     nearest 100, are equal to 8600

                                                              Answer _____

12. Re-arrange the following number cards in the following ways.

| 8 | 2 | 4 | 9 |

a.   to make the largest possible
     number

                                                              Answer _____

b.   to make the smallest possible
     number

                                                              Answer _____

ANSWERS TO

EXERCISES AND

UNIT TESTS

UNIT 1 – ANSWERS
Page 7: Exercises 1.1

1a) 170	b) 509	c) 424	d) 6015	e) 2036
f) 22 010	g) 30 201	h) 200 600	2a) three hundred forty five	b) three hundred four

2c) one thousand two hundred fifty	d) two thousand two hundred fifty three	e) thirty two thousand seven hundred fifty three	f) seventy thousand one hundred fifty	g) one hundred twenty five thousand three hundred forty four

2h) three hundred thirty three thousand three hundred three　　3a) 2, 5, 25, 52　　b) 1, 7, 17, 71　　4a) 4790　　b) 7666

4c) 5555	d) 12 456	e) 30 148	f) 22 088	g) 470 031
4h) 330 022	5a) 0 0 4 0 5	b) 0 2 2 1 0	c) 0 6 0 7 0	d) 0 5 0 5 5
5e) 2 0 2 4 5	f) 3 1 0 4 2	g) 7 8 1 0 3	6a) 4x 1000 + 5 x 100 + 2 x 10 + 2 x 1	

6 b) 3 x 1000 + 2 x 10 + 2 x 1　　c) 4 x 10 000 + 2 x 200 + 5 x 10　　d) 1 x 10 0000 + 2 x 1000 + 9 x 10

6 e) 3 x 10 000 + 8 x 1000 + 8 x 10　　f) 1 x 100 000 + 2 x 10 000 + 7 x 100 + 9 x 10

7a) 3027	8a) 600	9.		10. 3202
b) 609	b) 90			11. 261
c) 20 352	c) 3000			12. 105
d) 8035	d) 50 000			13. 302
				14. 1478
				15. 8042

9.
a. 125 430 → nine hundred eight thousand eight
b. 750 209 → one hundred twenty five thousand four hundred thirty
c. 300 025 → four hundred ten thousand ten
d. 908 008 → seven hundred fifty thousand two hundred nine
e. 410 010 → three hundred thousand twenty five
f. 125 043 → three hundred thousand two hundred fifty
g. 300 250 → one hundred twenty five thousand forty-three

16. 6333　　18. 369, 396, 639, 693, 936, 963　　19. 2, 3, 5, 23, 32, 25, 52, 35, 53
17. 7777　　　　　　　　　　　　　　　　　　　　　523, 532, 253, 235, 352, 325

Page 14: Exercises 1.2

1a) 60	b) 90	c) 200

1d) 12 200	e) 19 000	f) 2540	g) 72 000	h) 1660

1i) 90 900　　j) 191 920　　k) 65 000　　2a) 30 x 40; 1200　　b) 100 x 300; 30 000

2c) 50 x 100; 5000　　d) 300 x 300; 90 000　　e) 1000 x 100; 100 000　　3. 300 + 300 + 600; 1200

4. 500 + 600 + 500 + 600; 2200 km	5. 40 + 60 + 70 + 110; 280 tickets	6. 300 + 500 + 200 + 500; 1500 cards

7. 70 + 70 + 40 + 70 + 90 + 90 + 90 + 60; 580 students　　8. 15 675, 15 676, 15 677, 15 678, 15 679　　9. 1, 2, 3, 4

10. Round 21 months down to 20 and round the number of days in each month to 30. 30 x 20 = 600	11a) 35, 36, 37, 38, 39, 40, 41, 42, 43, 44	b) 8550, 8551, 8552, 8553, 8554, 8555	12a) 9842 b) 2489