Addition and Subtraction of Whole Numbers: Rounding Whole Numbers*

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Abstract

This module is from Fundamentals of Mathematics by Denny Burzynski and Wade Ellis, Jr. This module discusses how to round whole numbers. By the end of the module students should be able to understand that rounding is a method of approximation and round a whole number to a specified position.

1 Section Overview

- Rounding as an Approximation
- The Method of Rounding Numbers

2 Rounding as an Approximation

A primary use of whole numbers is to keep count of how many objects there are in a collection. Sometimes we're only interested in the approximate number of objects in the collection rather than the precise number. For example, there are *approximately* 20 symbols in the collection below.

The *precise* number of symbols in the above collection is 18.

Rounding

We often approximate the number of objects in a collection by mentally seeing the collection as occurring in groups of tens, hundreds, thousands, etc. This process of approximation is called **rounding**. Rounding is very useful in estimation. We will study estimation in Chapter 8.

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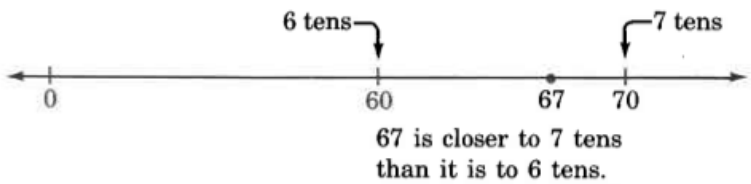
When we think of a collection as occurring in groups of tens, we say we're *rounding to the nearest ten.* When we think of a collection as occurring in groups of hundreds, we say we're *rounding to the nearest hundred.* This idea of rounding continues through thousands, ten thousands, hundred thousands, millions, etc.

The process of rounding whole numbers is illustrated in the following examples.

Example 1

Round 67 to the nearest ten.

On the number line, 67 is more than halfway from 60 to 70. The digit immediately to the right of the tens digit, the round-off digit, is the indicator for this.

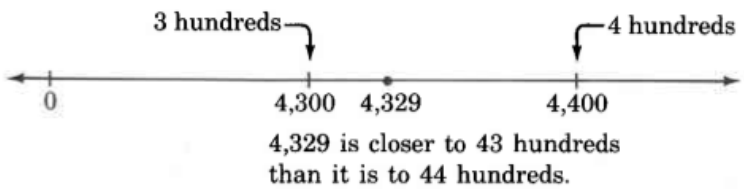


Thus, 67, rounded to the nearest ten, is 70.

Example 2

Round 4,329 to the nearest hundred.

On the number line, 4,329 is less than halfway from 4,300 to 4,400. The digit to the immediate right of the hundreds digit, the round-off digit, is the indicator.

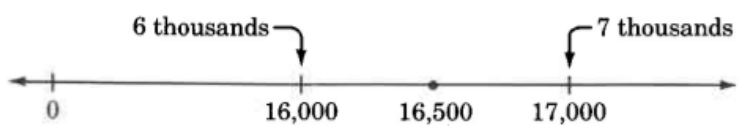


Thus, 4,329, rounded to the nearest hundred is 4,300.

Example 3

Round 16,500 to the nearest thousand.

On the number line, 16,500 is exactly halfway from 16,000 to 17,000.



By convention, when the number to be rounded is *exactly halfway* between two numbers, it is rounded to the *higher* number.

Thus, 16,500, rounded to the nearest thousand, is 17,000.

Example 4

A person whose salary is $41,450 per year might tell a friend that she makes $41,000 per year. She has rounded 41,450 to the nearest thousand. The number 41,450 is closer to 41,000 than it is to 42,000.

3 The Method of Rounding Whole Numbers

From the observations made in the preceding examples, we can use the following method to **round a whole number** to a particular position.

1. Mark the position of the round-off digit.
2. Note the digit to the immediate right of the round-off digit.
   a. If it is less than 5, replace it and all the digits to its right with zeros. Leave the round-off digit unchanged.
   b. If it is 5 or larger, replace it and all the digits to its right with zeros. Increase the round-off digit by 1.

3.1 Sample Set A

Use the method of rounding whole numbers to solve the following problems.

Example 5
Round 3,426 to the nearest ten.

1. We are rounding to the tens position. Mark the digit in the tens position

   3,426
   ↑
   tens position

2. Observe the digit immediately to the right of the tens position. It is 6. Since 6 is greater than 5, we *round up* by replacing 6 with 0 and adding 1 to the digit in the tens position (the round-off position): $2 + 1 = 3$.
   3,430

Thus, 3,426 rounded to the nearest ten is 3,430.

Example 6
Round 9,614,018,007 to the nearest ten million.

1. We are rounding to the nearest ten million.

   9,614,018,007
   ↑
   ten millions position

2. Observe the digit immediately to the right of the ten millions position. It is 4. Since 4 is less than 5, we *round down* by replacing 4 and all the digits to its right with zeros.
   9,610,000,000

Thus, 9,614,018,007 rounded to the nearest ten million is 9,610,000,000.

Example 7
Round 148,422 to the nearest million.

1. Since we are rounding to the nearest million, we'll have to *imagine* a digit in the millions position. We'll write 148,422 as 0,148,422.

   0,148,422
   ↑
   millions position

2. The digit immediately to the right is 1. Since 1 is less than 5, we'll *round down* by replacing it and all the digits to its right with zeros.
   0,000,000
   This number is 0.

Thus, 148,422 rounded to the nearest million is 0.

Example 8
Round 397,000 to the nearest ten thousand.

1. We are rounding to the nearest ten thousand.
   397,000
   ↑
   ten thousand position
2. The digit immediately to the right of the ten thousand position is 7. Since 7 is greater than 5, we round up by replacing 7 and all the digits to its right with zeros and adding 1 to the digit in the ten thousands position. But $9 + 1 = 10$ and we must carry the 1 to the next (the hundred thousands) position.
   400,000

Thus, 397,000 rounded to the nearest ten thousand is 400,000.

3.2 Practice Set A

Use the method of rounding whole numbers to solve each problem.

Exercise 1 ***(Solution on p. 11.)***
Round 3387 to the nearest hundred.

Exercise 2 ***(Solution on p. 11.)***
Round 26,515 to the nearest thousand.

Exercise 3 ***(Solution on p. 11.)***
Round 30,852,900 to the nearest million.

Exercise 4 ***(Solution on p. 11.)***
Round 39 to the nearest hundred.

Exercise 5 ***(Solution on p. 11.)***
Round 59,600 to the nearest thousand.

4 Exercises

For the following problems, complete the table by rounding each number to the indicated positions.

Exercise 6 ***(Solution on p. 11.)***
1,642

hundred	thousand	ten thousand	million

Table 1

Exercise 7
5,221

hundred	thousand	ten thousand	million

Table 2

Exercise 8 ***(Solution on p. 11.)***
91,803

Hundred	thousand	ten thousand	million

Table 3

Exercise 9
106,007

hundred	thousand	ten thousand	million

Table 4

Exercise 10 ***(Solution on p. 11.)***
208

hundred	thousand	ten thousand	million

Table 5

Exercise 11
199

hundred	thousand	ten thousand	million

Table 6

Exercise 12 ***(Solution on p. 11.)***
863

hundred	thousand	ten thousand	million

Table 7

Exercise 13
794

hundred	thousand	ten thousand	million

Table 8

Exercise 14 ***(Solution on p. 11.)***
925

hundred	thousand	ten thousand	million

Table 9

Exercise 15
909

hundred	thousand	ten thousand	million

Table 10

Exercise 16 ***(Solution on p. 12.)***
981

hundred	thousand	ten thousand	million

Table 11

Exercise 17
965

hundred	thousand	ten thousand	million

Table 12

Exercise 18 *(Solution on p. 12.)*
551,061,285

hundred	thousand	ten thousand	million

Table 13

Exercise 19
23,047,991,521

hundred	thousand	ten thousand	million

Table 14

Exercise 20 *(Solution on p. 12.)*
106,999,413,206

Hundred	thousand	ten thousand	million

Table 15

Exercise 21
5,000,000

hundred	thousand	ten thousand	million

Table 16

Exercise 22 *(Solution on p. 12.)*
8,006,001

hundred	thousand	ten thousand	million

Table 17

Exercise 23
94,312

hundred	thousand	ten thousand	million

Table 18

Exercise 24 *(Solution on p. 12.)*
33,486

hundred	thousand	ten thousand	million

Table 19

Exercise 25
560,669

hundred	thousand	ten thousand	million

Table 20

Exercise 26 *(Solution on p. 12.)*
388,551

hundred	thousand	ten thousand	million

Table 21

Exercise 27
4,752

hundred	thousand	ten thousand	million

Table 22

Exercise 28 *(Solution on p. 13.)*
8,209

hundred	thousand	ten thousand	million

Table 23

Exercise 29
In 1950, there were 5,796 cases of diphtheria reported in the United States. Round to the nearest hundred.

Exercise 30 ***(Solution on p. 13.)***
In 1979, 19,309,000 people in the United States received federal food stamps. Round to the nearest ten thousand.

Exercise 31
In 1980, there were 1,105,000 people between 30 and 34 years old enrolled in school. Round to the nearest million.

Exercise 32 ***(Solution on p. 13.)***
In 1980, there were 29,100,000 reports of aggravated assaults in the United States. Round to the nearest million.

For the following problems, round the numbers to the position you think is most reasonable for the situation.

Exercise 33
In 1980, for a city of one million or more, the average annual salary of police and firefighters was $16,096.

Exercise 34 ***(Solution on p. 13.)***
The average percentage of possible sunshine in San Francisco, California, in June is 73%.

Exercise 35
In 1980, in the state of Connecticut, $3,777,000,000 in defense contract payroll was awarded.

Exercise 36 ***(Solution on p. 13.)***
In 1980, the federal government paid $5,463,000,000 to Viet Nam veterans and dependants.

Exercise 37
In 1980, there were 3,377,000 salespeople employed in the United States.

Exercise 38 ***(Solution on p. 13.)***
In 1948, in New Hampshire, 231,000 popular votes were cast for the president.

Exercise 39
In 1970, the world production of cigarettes was 2,688,000,000,000.

Exercise 40 ***(Solution on p. 13.)***
In 1979, the total number of motor vehicle registrations in Florida was 5,395,000.

Exercise 41
In 1980, there were 1,302,000 registered nurses the United States.

4.1 Exercises for Review

Exercise 42 ***(Solution on p. 13.)***
(here[1]) There is a term that describes the visual displaying of a number. What is the term?

Exercise 43
(here[2]) What is the value of 5 in 26,518,206?

Exercise 44 ***(Solution on p. 13.)***
(here[3]) Write 42,109 as you would read it.

[1] "Addition and Subtraction of Whole Numbers: Whole Numbers" <http://cnx.org/content/m34795/latest/>
[2] "Addition and Subtraction of Whole Numbers: Whole Numbers" <http://cnx.org/content/m34795/latest/>
[3] "Addition and Subtraction of Whole Numbers: Reading and Writing Whole Numbers" <http://cnx.org/content/m34778/latest/>

Exercise 45

(here[4]) Write "six hundred twelve" using digits.

Exercise 46 ***(Solution on p. 13.)***

(here[5]) Write "four billion eight" using digits.

[4] "Addition and Subtraction of Whole Numbers: Reading and Writing Whole Numbers" <http://cnx.org/content/m34778/latest/>

[5] "Addition and Subtraction of Whole Numbers: Reading and Writing Whole Numbers" <http://cnx.org/content/m34778/latest/>

Solutions to Exercises in this Module

Solution to Exercise (p. 4)
3400
Solution to Exercise (p. 4)
27,000
Solution to Exercise (p. 4)
31,000,000
Solution to Exercise (p. 4)
0
Solution to Exercise (p. 4)
60,000
Solution to Exercise (p. 4)

hundred	thousand	ten thousand	million
1,600	2000	0	0

Table 24

Solution to Exercise (p. 5)

Hundred	thousand	ten thousand	million
91,800	92,000	90,000	0

Table 25

Solution to Exercise (p. 5)

hundred	thousand	ten thousand	million
200	0	0	0

Table 26

Solution to Exercise (p. 5)

hundred	thousand	ten thousand	million
900	1,000	0	0

Table 27

Solution to Exercise (p. 6)

hundred	thousand	ten thousand	million
900	1,000	0	0

Table 28

Solution to Exercise (p. 6)

hundred	thousand	ten thousand	million
1,000	1,000	0	0

Table 29

Solution to Exercise (p. 7)

hundred	thousand	ten thousand	million
551,061,300	551,061,000	551,060,000	551,000,000

Table 30

Solution to Exercise (p. 7)

hundred	thousand	ten thousand	million
106,999,413,200	106,999,413,000	106,999,410,000	106,999,000,000

Table 31

Solution to Exercise (p. 7)

Hundred	Thousand	ten thousand	Million
8,006,000	8,006,000	8,010,000	8,000,000

Table 32

Solution to Exercise (p. 8)

hundred	thousand	ten thousand	million
33,500	33,000	30,000	0

Table 33

Solution to Exercise (p. 8)

hundred	thousand	ten thousand	million
388,600	389,000	390,000	0

Table 34

Solution to Exercise (p. 8)

hundred	thousand	ten thousand	million
8,200	8,000	10,000	0

Table 35

Solution to Exercise (p. 9)
19,310,000
Solution to Exercise (p. 9)
29,000,000
Solution to Exercise (p. 9)
70% or 75%
Solution to Exercise (p. 9)
$5,500,000,000
Solution to Exercise (p. 9)
230,000
Solution to Exercise (p. 9)
5,400,000
Solution to Exercise (p. 9)
graphing
Solution to Exercise (p. 9)
Forty-two thousand, one hundred nine
Solution to Exercise (p. 10)
4,000,000,008