

## Section 1.2 Rounding Whole Numbers

### Objectives

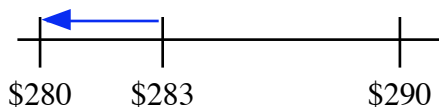
In this section, you will learn to:

- Round whole numbers

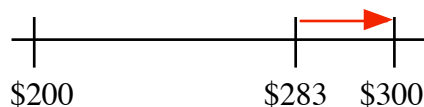
### INTRODUCTION

Sometimes, when working with a large number, it is easier to think of the number in *rounded* terms. For example, if the price of a lawn mower is \$283, we could round it to the nearest \$10 value and think of it as \$280; or we could round it to the nearest \$100 value and think of it as \$300. These rounded numbers, \$280 and \$300, are called *approximations*, or *estimates*.

In rounding \$283 to the nearest \$10,  
we round *down* to \$280.



In rounding \$283 to the nearest \$100,  
we round *up* to \$300.



When rounding to the nearest ten we use the digit in the ones place to determine whether we should round the number up or down. This ones place digit is called the **rounding digit**. When rounding to the nearest hundred, the rounding digit is in the tens place.

- When the rounding digit is either 0, 1, 2, 3 or 4, we round *down*.
- When the rounding digit is either 5, 6, 7, 8 or 9, we round *up*.

Because \$5 is the very middle number between two \$10 values, such as \$280 and \$290, it might seem that we can round up or down. For the sake of consistency, we always round *up* when the rounding digit is 5. The main reason for this is that there are five digits (0, 1, 2, 3 and 4) that cause a number to be rounded down, so there should also be five digits that cause a number to be rounded up (5, 6, 7, 8 and 9).

### RULES FOR ROUNDING WHOLE NUMBERS

On the next page are the rules for rounding. We use two examples—one that rounds up and one that rounds down—to show the application of the various steps.

## Rules for Rounding:

1. Identify the place digit that is to be rounded.

a) “Round 28,714 to the nearest thousand” means that the 8, in the thousands place, is the place digit.

↓  
28, 7 14

b) “Round 28,714 to the nearest hundred” means that the 7, in the hundreds place, is the place digit.

↓  
28, 7 14

2. Identify the number to its *immediate right*, called the rounding digit.

a) Rounding 28,714 to the nearest thousand means the rounding digit is the 7.

↓  
28, 7 14

b) Rounding 28,714 to the nearest hundred means the rounding digit is the 1.

↓  
28, 7 1 4

3. i) If the rounding digit is 5 or higher, round *up* (add 1 to the place digit).

ii) If the rounding digit is 4 or lower, round *down* (add 0 to the place digit).

4. All digits to the right of the place digit are written as zeros. Rewrite the number showing the appropriate approximation.

a) In rounding 28,714 to the nearest thousand, the rounding digit, 7, is more than 5, so we must add 1 to the place digit 8, making a 9 in the thousands place, and all of the digits following it are zeros:

↓  
28, 7 14  
+ 1  
↓  
29, 0 00

b) In rounding 28,714 to the nearest hundred, the rounding digit, 1, is less than 5, so we must add 0 to the place digit, meaning the hundreds place will remain a 7, and all of the digits following it are zeros:

↓  
28, 7 1 4  
+ 0  
↓  
28, 7 00

So, 28,714 can be approximated as 29,000 when rounded to the nearest *thousand*

and can be approximated as 28,700 when rounded to the nearest *hundred*.

Notice that the digits to the *left* of the place digit remain unchanged. This is true for most rounding. As you will see in a little bit, when the place digit is 9, rounding up will change more than just the place digit.



**Example 2:** For each of the following, round the number to the indicated place.

- a) 97 *ten*                      b) 928 *hundred*                      c) 4,951 *hundred*  
d) 29,950 *hundred*                      d) 9,850 *thousand*

**Procedure:** For each of these the place digit is 9. Think about them carefully.

**Answer:** a) 100      b) 900      c) 5,000      d) 30,000      e) 10,000

**YTI #2**

For each of the following, round the number to the indicated place. Use Example 2 as a guide.

- a) 598 *ten*                      b) 962 *hundred*                      c) 3,927 *hundred*  
d) 694,905 *ten-thousand*                      e) 395,031 *hundred-thousand*

**APPLICATIONS**

Sometimes it's helpful when working with large numbers to round them first. What follows are some statistical data involving large numbers. Your job is to round them and write a sentence that shows the approximation.

**Example 3:** The U.S. census estimates that in the year 2015, the population of the state of Illinois will be 12,808,000. Round this number to the nearest million, and write a sentence indicating the approximation.

*Source: www.census.gov*

**Procedure:** First round the number to the nearest million. It rounds to 13,000,000. Then write a sentence for the approximation. Use the word "approximately" in the sentence, and write the number in words.

**Answer:** In 2015, the population of Illinois will be approximately thirteen million.

**YTI #3**

The average distance from the earth to the moon is 239,062 miles. Round this number to the nearest **ten thousand**, and write a sentence indicating the approximation. *Source: www.ares.jsc.nasa.gov*

Sentence: \_\_\_\_\_

**YTI #4**

The average distance from the earth to the sun is 149,597,871 kilometers. Round this number to the nearest **million**, and write a sentence indicating the approximation. *Source: www.neo.jpl.nasa.gov*

Sentence: \_\_\_\_\_

**You Try It Answers: Section 1.2**

**YTI #1:** a) 530      b) 4,600      c) 5,000      d) 80,000      e) 1,900,000

**YTI #2:** a) 600      b) 1,000      c) 3,900      d) 690,000      e) 400,000

**YTI #3:** The average distance from the earth to the moon is approximately two hundred forty thousand miles.

**YTI #4:** The average distance from the earth to the sun is approximately one hundred fifty million kilometers.

## Focus Exercises: Section 1.2

*Round each of these numbers to the nearest ten.*

- |                 |                 |               |               |
|-----------------|-----------------|---------------|---------------|
| <b>1.</b> 67    | <b>2.</b> 92    | <b>3.</b> 683 | <b>4.</b> 345 |
| <b>5.</b> 1,941 | <b>6.</b> 2,318 | <b>7.</b> 199 | <b>8.</b> 795 |

*Round each of these numbers to the nearest hundred.*

- |                   |                   |                  |                  |
|-------------------|-------------------|------------------|------------------|
| <b>9.</b> 638     | <b>10.</b> 2,049  | <b>11.</b> 1,708 | <b>12.</b> 2,350 |
| <b>13.</b> 14,386 | <b>14.</b> 22,708 | <b>15.</b> 6,951 | <b>16.</b> 9,962 |

*Round each of these numbers to the nearest thousand.*

- |                    |                    |                    |                    |
|--------------------|--------------------|--------------------|--------------------|
| <b>17.</b> 2,906   | <b>18.</b> 8,061   | <b>19.</b> 36,407  | <b>20.</b> 49,513  |
| <b>21.</b> 159,370 | <b>22.</b> 509,423 | <b>23.</b> 289,516 | <b>24.</b> 699,850 |

*Round each of these numbers to the nearest ten thousand.*

- |                    |                    |                    |                      |
|--------------------|--------------------|--------------------|----------------------|
| <b>25.</b> 25,408  | <b>26.</b> 47,583  | <b>27.</b> 99,361  | <b>28.</b> 192,805   |
| <b>29.</b> 150,764 | <b>30.</b> 324,612 | <b>31.</b> 898,053 | <b>32.</b> 3,996,416 |

*Round each of these numbers to the nearest hundred thousand.*

- |                    |                    |                      |                      |
|--------------------|--------------------|----------------------|----------------------|
| <b>33.</b> 624,058 | <b>34.</b> 709,655 | <b>35.</b> 952,407   | <b>36.</b> 990,521   |
| <b>37.</b> 784,672 | <b>38.</b> 850,043 | <b>39.</b> 4,966,381 | <b>40.</b> 9,980,376 |

*Round each of these numbers to the nearest million.*

- |                      |                       |                       |                        |
|----------------------|-----------------------|-----------------------|------------------------|
| <b>41.</b> 3,580,416 | <b>42.</b> 5,929,300  | <b>43.</b> 4,277,095  | <b>44.</b> 9,308,416   |
| <b>45.</b> 9,301,448 | <b>46.</b> 46,283,000 | <b>47.</b> 29,508,416 | <b>48.</b> 199,540,926 |

*Rewrite the underlined phrase with the requested approximation.*

49. In 2005, the Rialto Unified School District's budget revenues were \$192,863,877. Round this number to the nearest million. *Source: www.rialto.k12.ca.us*
50. In 2005, the population of Florida was 17,789,864. Round this number to the nearest hundred thousand. *Source: factfinder.census.gov*
51. In 2002, gas consumption statistics for all international flights showed that the total number of gallons of gas consumed was 4,990,797,640. Round this number to the nearest hundred million. *Source: www.bts.gov*
52. It is estimated that the world's rain forests are being destroyed at a rate of 77,893,900 acres per year. Round this number to the nearest million. *Source: www.rain-tree.com*
53. In the 2001 - 2002 school year, 6,248,610 students were enrolled in grades K - 12 in California. Round this number to the nearest hundred thousand. *Source: nces.ed.gov*
54. Statistics compiled by the Center for Disease Control through December, 2004 indicate the total number of reported AIDS cases was 944,305. Round this number to the nearest ten thousand. *Source: www.cdc.gov*