Whole Numbers

Key Terms

addition	division sign (÷)	quotient
borrowing	divisor	remainder
carrying	equals sign (=)	rounding
decimal number system	minus sign (−)	square
denominate number	multiplication	subtraction
difference	multiplication sign (×)	sum
digits	place value	whole number
dividend	plus sign (+)	
division	product	

Basic Principles of Whole Numbers

Objectives

After studying this unit, you will be able to:

- Identify the place value of whole numbers.
- Round whole numbers to a given place value.
- Recognize denominate numbers.

Carpenters and other workers in the building construction trades must develop a mastery of mathematics principles, operations, and formulas. Every aspect of the construction industry requires an understanding and accurate use of mathematical concepts. As a carpenter, you will need to be skilled in tasks such as reading a tape measure, estimating materials, and calculating rafter line length, just to name a few. Calculators can be an efficient tool when performing math operations, but they are not always available, or practical, on a construction site. Because of this, it is essential that carpenters learn basic math principles and develop the ability to solve operations without the use of a calculator.

Place Values

The **decimal number system**, also known as the Arabic number system, uses 10 as its base unit. This system consists of 10 different digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. **Digits** are symbols that are used to create everyday numbers.

Numerical values are expressed by placing a combination of digits together to create a whole number. A **whole number** is a numeral that stands alone as a unit and can contain multiple digits. Whole numbers do not include a fraction or a decimal. In the decimal number system, the value of the digit is determined by its location in the whole number. This value is called the **place value**. The following chart shows the place value of each digit within the number 5,694.

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Add the values of each digit to determine the value of the whole number.

The digit 5 is in the thousands column	$5 \times 1,000 =$	$5,000$
The digit 6 is in the hundreds column	$6 \times 100 =$	600
The digit 9 is in the tens column	$9 \times 10 =$	90
The digit 4 is in the ones column	$4 \times 1 =$	$+\,4$
	$=$	$5,694$

Math Tip

To make numbers easier to read, a comma is inserted after every third digit counting from the right.

Example 1-1

What are the place values of the digits in the number 5,298,347?

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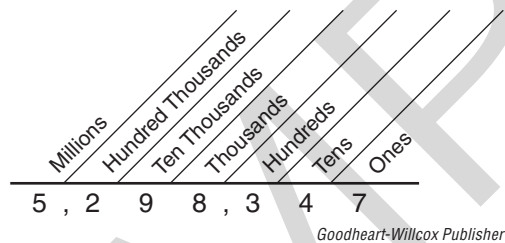
Example 1-2

Sometimes a zero is one of the digits within a whole number. Regardless of where it is located in the number, its place value remains zero.

What is the place value of the zero in the whole number 2,084?

The zero is in the hundreds column, so then $0 \times 100 = 0$.

The whole number would be read as two thousand eighty-four.

Rounding Whole Numbers

There are times when whole numbers do not need to be exact. When calculating material estimates for a project or cost estimates for a quote, numbers can be rounded to a specific place value. **Rounding** numbers is the process of increasing or decreasing the value of the number to a specific place value. When calculating the area of the roof in the following image, the 1,382 sq ft roof would be rounded to 1,400 sq ft for estimating or purchasing the material. Because shingles are sold by the square (100 sq ft), the area of the roof is rounded up to the next full square.

Calculate–1,382 sq ft
Buy–1,400 sq ft

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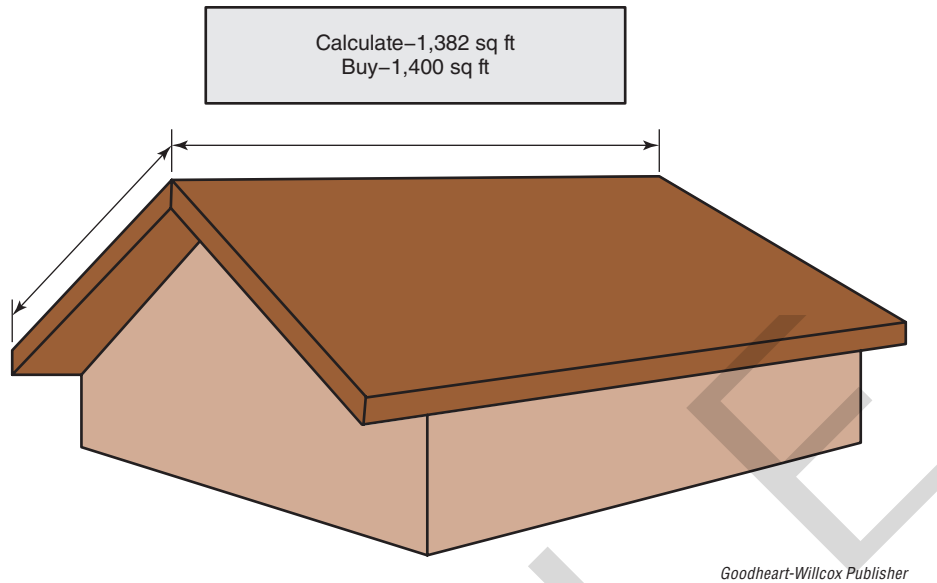
When calculating material estimates for a project, numbers are generally rounded up to account for how materials are sold or for waste factor. Other times, numbers can be rounded up or down to a specific place value depending on the situation.

Steps for Rounding to a Nearest Place Value

1. Identify the place value to which the number is being rounded.
2. Identify the digit to the right of that place value.
3. If the digit to the right is 5 or greater, increase the place value number up by one (round up). If the digit to the right is 4 or less, do not change the place value number.
4. Change the remaining digits to the right to zeros.

Example 1-3

Round the number 34,673 to the thousands place value.

The number in the thousands place value is 4.

$$34,673$$

The digit to the right of the 4 is 6.

$$34,673$$

Since 6 is greater than 5, the 4 is rounded up by one, making it 5. The remaining numbers to the right are changed to zero.

$$35,000$$

Example 1-4

Round the number 16,841 to the hundreds place value.

The number in the hundreds place value is 8.

16,**8**41

The digit to the right of the 8 is 4.

16,8**4**1

Since the 4 is less than 5, the 8 is not changed but the remaining numbers to the right are changed to zero.

16,8**00**

Denominate Numbers

When working in construction, numbers will often be associated with a unit of measurement. Numbers consisting of a numeric value and a unit of measure are referred to as **denominate numbers**. Carpenters work with denominate numbers in every phase of the construction process from site prep to framing to final finish. For example, 32′ and 64′ are denominate numbers because they include a value (32 and 64) and a unit of measure (feet). Other examples include:

- 15 lb
- 64 sq ft
- 3 hours, 14 minutes, 45 seconds
- 2 tons, 600 pounds

Carpentry Notes

Paint Estimation

During the finishing stages of construction, carpenters take room measurements and purchase the appropriate quantity of paint for the walls and ceilings. This is one occasion when carpenters take exact calculations, and then round the number up. Rounding up will help cover any extra paint needed for touch-ups or mistakes. If 1 gallon of paint will cover an area of 400 sq ft, how many gallons of paint are needed for a 764 sq ft room?

To round up 764 sq ft to the nearest hundreds, look at the number to the right of the hundreds place value. As 6 is greater than 5, then round up the hundreds place value to 8, which gives you 800 sq ft. Since 1 gallon of paint will cover an area of 400 sq ft, 2 gallons of paint are needed for this project.

Work Space/Notes

Unit 1 Review

Name _____ **Date** _____ **Class** _____

Use the number 4,784,523 to answer the following questions.

1. Which digit is in the hundreds place?

   _____

2. Which digit is in the ten thousands place?

   _____

3. Which digit is in the tens place?

   _____

4. Which digit is in the hundred thousands place?

   _____

5. Which digit is in the thousands place?

   _____

Use the number 4,721,593 to answer the following questions.

6. In which place value is the 3?

   _____

7. In which place value is the 7?

   _____

8. In which place value is the 4?

   _____

9. In which place value is the 9?

   _____

10. In which place value is the 1?

    _____

Round the following whole numbers to the indicated place value.

11. Round 172,839 to the ten thousands place value.

    _____

12. Round 74,613 to the thousands place value.

    _____

13. Round 93,827 to the tens place value.

    _____

14. Round 17,464,594 to the millions place value.

      _____

15. Round 8,462 to the hundreds place value.

      _____

16. Round 729,381 to the hundred thousands place value.

      _____

17. Round 943 to the hundreds place value.

      _____

18. Round 91,735 to the tens place value.

      _____

19. Round 31,723,468 to the ten thousands place value.

      _____

20. Round 6,527,914 to the thousands place value.

      _____

Identify the denominate numbers in the following problems.

*See Appendix A

Wall Frame

21. A carpenter cuts 64 boards to a length of 93″ for wall *studs**.

      _____

*See Appendix A

Foundation and Floor Frame

22. The floor plan called for 8 *floor joists** to be installed 16″ on center.

      _____

23. The dimensions on the floor plan are 16′ by 14′ for the 2 bedrooms.

      _____

24. The estimated time for 4 workers to shingle the roof was 6 hours, 30 minutes.

      _____

25. The 7-acre property building site will have 3 buildings on the north end.

      _____