# 1

# Math Basics

The understanding of numbers and how to correctly complete basic math operations with all forms of numbers is the foundation of culinary math. Food costing, recipe size conversion, recipe development, and cost control begin with the basic math concepts covered in this chapter. Errors in basic math calculations can become costly and time-consuming. It is necessary for your success to master these skills before tackling the math of the kitchen.

The primary goal of this chapter is to review basic math, including whole numbers, fractions, and decimals. After completing the basic review, the chapter covers percent and then word problems and their solutions. This chapter is designed to be a resource that may be used as a reference for the subsequent chapters.

## OBJECTIVES

- Identify the place value of a whole number.
- Identify the types of fractions.
- Convert a whole number to a fraction.
- Convert an improper fraction to a mixed number.
- Convert a mixed number to an improper fraction.
- Solve fraction problems.
- Identify the first four place values to the right of the decimal point.
- Solve decimal problems.
- Convert fractions to decimals and decimals to fractions.
- Convert a percent to a decimal or fraction and a decimal or fraction to a percent.
- Round given numbers based on the situation.
- Solve word problems for the part, whole, or percent.

## WHOLE NUMBERS

*Whole numbers* are the counting numbers and 0. They are 0, 1, 2, 3, 4, 5, and so on. The following chart identifies the place value of whole numbers.

**WHOLE NUMBERS**

| Trillions | | | | Billions | | | | Millions | | | | Thousands | | | | Units | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| hundreds | tens | ones | , | hundreds | tens | ones | , | hundreds | tens | ones | , | hundreds | tens | ones | , | hundreds | tens | ones |
| _ | _ | _ | | _ | _ | _ | | _ | _ | _ | | _ | _ | _ | | _ | _ | _ |

It is important to be familiar with place value when dealing with whole number operations.

## FRACTIONS

*Fractions* are numeric symbols of the relationship between the part and the whole. They are composed of a numerator (the top number in a fraction) and a denominator (the bottom number in a fraction). Fractions are frequently used in the kitchen. Measuring cups, measuring spoons, and the volumes and weights of products ordered may be expressed in fractional quantities. Most ingredients in the recipes or formulas found in a kitchen or in a cookbook express quantities in fractional form. The fractions used in the kitchen are, for the most part, the more common fractions: $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$. A culinary recipe or formula would most likely never use a fraction such as $\frac{349}{940}$ cup of flour. However, when making calculations to increase or decrease a recipe's yield, you will be confronted with fractions that have to be converted to a measure that is more realistic in the kitchen.

A fraction may be thought of as all of the following:

- A part of a whole number: 3 out of 5 slices of pie could be presented as $\frac{3}{5}$. In this example, 3 is the part and 5 is the whole.
- An expression of a relationship between two numbers:

  $\underline{3}$ The *numerator*, or top number
  7 The *denominator*, or bottom number
- A division problem: The fraction $\frac{3}{7}$ can also be written as the division problem $3 \div 7$.

## TYPES OF FRACTIONS

A *proper (common) fraction* is a fraction in which the numerator is less than the denominator. For example:

$$\frac{1}{2} \quad \text{and} \quad \frac{3}{4}$$

An *improper fraction* is a fraction with a numerator that is greater than or equal to the denominator, such as:

$$\frac{28}{7}, \frac{140}{70}, \quad \text{and} \quad \frac{28}{28}$$

A *mixed number* is a number that contains both a whole number and a fraction, such as:

$$4\frac{3}{8}$$

A *lowest-term* fraction is the result of reducing a fraction so that the numerator and the denominator have no other common factors beside 1. For example:

$$\frac{14}{28} = \frac{14 \div 14}{28 \div 14} = \frac{1}{2}$$

The fraction $^{14}/_{28}$ is a proper fraction, but it is not in lowest terms. Both 14 and 28 share the following factors: 2, 7, and 14. If you divide both 14 and 28 by the largest factor, 14, the result is $^{1}/_{2}$, which is equivalent to $^{14}/_{28}$.

The result of reducing a fraction so that the numerator and the denominator no longer have any common factors is a fraction expressed in its lowest terms, or lowest-term fraction.

## CONVERTING WHOLE NUMBERS TO FRACTIONS

To convert a whole number to a fraction, place the whole number over 1.

**EXAMPLE 1.1:** $5 \rightarrow \frac{5}{1}$

## CONVERTING IMPROPER FRACTIONS TO MIXED NUMBERS

To convert an improper fraction to a mixed number, divide the numerator by the denominator. The quotient will be the whole number, and the remainder (if any) will be placed over the denominator of the original improper fraction to form the fractional part of the mixed number.

**REMEMBER**
When dividing, the numerator is the number being divided.

Numerator ÷ Denominator

or

$\text{Denominator}\overline{)\text{Numerator}}$

**EXAMPLE 1.2:**

Convert $^{23}\!/_{5}$ to a mixed number.

$$\begin{array}{l} \qquad\qquad\;\; 4 \\ \dfrac{23}{5} = 5\overline{)\,23} = 4\dfrac{3}{5} \\ \qquad\quad \underline{-20} \\ \qquad\qquad\;\; 3 \end{array}$$

**EXAMPLE 1.3:**

Convert $^{239}\!/_{43}$ to a mixed number.

$$\begin{array}{l} \qquad\qquad\quad\; 5 \\ \dfrac{239}{43} = 43\overline{)\,239} = 5\dfrac{24}{43} \\ \qquad\qquad \underline{-215} \\ \qquad\qquad\quad 24 \end{array}$$

## CONVERTING MIXED NUMBERS TO IMPROPER FRACTIONS

### STEPS TO CONVERTING MIXED NUMBERS TO IMPROPER FRACTIONS

**STEP 1.** Multiply the whole number by the denominator.

**STEP 2.** Add the result to the numerator.

**STEP 3.** Place the resulting number over the original denominator.

**EXAMPLE 1.4:**

Convert $4\frac{2}{3}$ to an improper fraction.

**STEP 1.** Multiply 4 and 3. $4\frac{2}{3}$ $4 \times 3 = 12$

**STEP 2.** Add 2 to the result. $4\frac{2}{3}$ $12 + 2 = 14$

**STEP 3.** Use 14 from step 2 as the numerator and 3 as the denominator.

$$\frac{14}{3} = 4\frac{2}{3}$$

Note that the denominator is the same in both the improper fraction and the mixed number.

## SOLVING PROBLEMS WITH FRACTIONS

### ADDITION OF FRACTIONS

Fractions that are added to one another must have the same denominator, called the *common denominator*.

**EXAMPLE 1.5:**

$$\frac{1}{7}+\frac{2}{7}=\frac{3}{7}$$

7 is the common denominator.

**EXAMPLE 1.6:**

$$\text{Solve } \frac{1}{8}+\frac{5}{16}$$

To solve this example, you must find a common denominator.

**There are two ways to do this:**

1. **MULTIPLY THE TWO DENOMINATORS TOGETHER:** To find the common denominator for $\frac{1}{8}$ and $\frac{5}{16}$, multiply the first denominator, 8, by the second denominator, 16: $(8 \times 16) = 128$. The numerator of each fraction must be multiplied by the same number as the denominator was multiplied by, so that the value of the fraction remains the same. In this example, multiply the 1 by 16 and multiply the 5 by 8. Thus:

$$\frac{1}{8}=\frac{1\times16}{8\times16}=\frac{16}{128}$$

$$\frac{5}{16}=\frac{5\times8}{16\times8}=\frac{40}{128}$$

$$\frac{16}{128}+\frac{40}{128}=\frac{56}{128}$$

This answer is not in lowest terms. In order to reduce it to lowest terms, divide the numerator and the denominator by the greatest common factor. In this example, divide 56 and 128 by 8. The answer in lowest terms is $\frac{7}{16}$.

2. **DETERMINE IF ONE DENOMINATOR IS THE FACTOR OF THE OTHER:** Especially in recipes, it is not unusual for the denominator of one fraction to be evenly divisible by the denominator in the other fraction. In the following example, 16 can be divided

by 8, so 8 can be used as the common denominator. This method can save time but will work only when one of the denominators is a factor of the other:

$$\frac{1}{8}+\frac{5}{16}=\frac{(1\times 2)}{(8\times 2)}+\frac{5}{16}=\frac{2}{16}+\frac{5}{16}=\frac{7}{16}$$

You will notice in this approach that it is not necessary to reduce the answer. It is already in lowest terms.

## SUBTRACTION OF FRACTIONS

Fractions that are subtracted from one another must also have a common denominator. The same methods used for converting denominators to common denominators when adding fractions can be used when subtracting fractions.

**EXAMPLE 1.7:**

$$\frac{3}{8}-\frac{1}{8}=\frac{2}{8}=\frac{1}{4}$$

**EXAMPLE 1.8:**

$$\frac{7}{8}-\frac{5}{9}=\frac{7\times 9}{8\times 9}-\frac{5\times 8}{9\times 8}=\frac{63}{72}-\frac{40}{72}=\frac{23}{72}$$

## MULTIPLICATION OF FRACTIONS

The process of multiplying fractions simply requires that the numerators be multiplied together and the denominators be multiplied together; the results of the multiplied numerators are placed over the results of the multiplied denominators.

*Any mixed numbers must first be converted to improper fractions before multiplying them.*

$$\frac{\text{Numerator}\times\text{Numerator}}{\text{Denominator}\times\text{Denominator}}=\frac{\text{NN}}{\text{DD}}$$

**EXAMPLE 1.9:**

$$\frac{4}{7}\times\frac{3}{5}=\frac{12}{35}$$

**EXAMPLE 1.10:**

$$1\frac{1}{2}\times\frac{1}{5}\times\frac{1}{7}=\frac{3}{2}\times\frac{1}{5}\times\frac{1}{7}=\frac{3}{70}$$

### DIVISION OF FRACTIONS

To divide fractions, first convert any mixed numbers to improper fractions. Next, invert the second fraction (the divisor) by placing the denominator on top of the numerator. Finally, change the division sign to a multiplication sign and complete the equation as a multiplication problem.

**REMEMBER**
A common denominator is not required when multiplying or dividing fractions.

**EXAMPLE 1.11:**

$$\frac{3}{4}\div1\frac{2}{3}=\frac{3}{4}\div\frac{5}{3}=\frac{3}{4}\times\frac{3}{5}=\frac{9}{20}$$

**EXAMPLE 1.12:**

$$\frac{7}{1}\div\frac{3}{4}=\frac{7}{1}\times\frac{4}{3}=\frac{28}{3}=9\frac{1}{3}$$

## DECIMALS

Decimals are another common style of number that is often found in the food-service industry:

- Metric quantities are expressed in decimal form.
- Money is expressed in decimal form.
- Digital scales express weight in decimal form.
- Most calculators use decimal forms of numbers.

A *decimal number* is a number that uses a decimal point and place value to show values less than 1. Like the fraction, a decimal is the representation of a part of the whole. Decimals are expressed in powers of 10. A period (.), called a *decimal point*, is used to indicate the decimal form of the number.

### PLACE VALUES

The first four place values to the right of the decimal point are as follows:

| DECIMAL PLACES | | | | | |
|---|---|---|---|---|---|
| 0 | . | tenths | hundredths | thousandths | ten-thousandths |

**EXAMPLE 1.13:**

Convert the following fractions to decimal:

$$\frac{1}{10} = 0.1$$

$$\frac{9}{100} = 0.09$$

$$\frac{89}{1{,}000} = 0.089$$

$$\frac{321}{10{,}000} = 0.0321$$

A *repeating* or *recurring decimal* is the result of converting a fraction to a decimal that repeats. If you convert $\frac{1}{3}$ to a decimal, the result is 0.333333… (a repeating decimal in which the 3 goes on infinitely). To record a repeating decimal, you can put a bar over the first set of repeating digits.

## SOLVING PROBLEMS WITH DECIMALS

### ADDITION AND SUBTRACTION OF DECIMALS

The decimal points and place values must be aligned when adding and subtracting decimal values. For instance, if you are adding 0.14 and 0.5, it is important to remember that you can only add numbers of the same place value. So, you must add the 1 to the 5, since they are both in the tenths place. The answer to this problem is 0.64, not 0.19.

**EXAMPLE 1.14:**

Solve the following decimal problems:

$$3.14+18.4+340.1+200.147 = \begin{array}{r} 3.14 \\ 18.4 \\ 340.1 \\ +200.147 \\ \hline 561.787 \end{array}$$

$$9.736-6.5 = \begin{array}{r} 9.736 \\ -6.5 \\ \hline 3.236 \end{array}$$

## MULTIPLICATION OF DECIMALS

When you are multiplying decimals, first, multiply as though they were whole numbers. Then mark off from right to left the same number of decimal places as found in both the multiplier and the multiplicand (number multiplied) and place the point in your answer (the product).

$$\begin{array}{r} \text{Multiplicand} \\ \times\ \text{Multiplier} \\ \hline \text{Product} \end{array}$$

If, for example, you are multiplying 40.8 by 3.02, you would first do the multiplication as if there were no decimal points 408 × 302 and then count how many *decimal places*, or numbers to the right of the decimal point, there are. In this case, one number (8) is to the right of the decimal point in 40.8, and two numbers (02) are to the right in 3.02. This makes a total of three decimal places, so in the product we would insert the decimal point so that there are three numbers to the right of the decimal point.

**EXAMPLE 1.15:**

$$\begin{array}{rl} 40.8\times 3.02 = 40.8 & = 1 \text{ decimal place} \\ \times 3.02 & = 2 \text{ decimal places} \\ \hline 816 & \\ +122400 & \\ \hline 123.216 & = 3 \text{ decimal places} \end{array}$$

## DIVISION OF DECIMALS

As with multiplication, you are first going to divide decimals as you divide whole numbers:

$$\begin{array}{r} \text{Quotient} \\ \text{Divisor}\overline{\smash{)}\text{Dividend}} \end{array}$$

There are five steps in dividing decimals:

**STEP 1.** Set up the division problem as you would if you were dividing whole numbers.

**STEP 2.** Move the decimal point of the divisor to the right (if it is not already a whole number) so that you have a whole number. This will eliminate a decimal in the divisor.

**STEP 3.** Move the decimal point in the dividend the same number of places to the right. If you need to move the decimal more places than there are digits, add zeros to accommodate this move.

**STEP 4.** Place another decimal point right above the decimal's new position in the dividend. This places the decimal point in your answer (quotient).

**STEP 5.** Divide as though you are dividing whole numbers, disregarding the decimal points. Be careful to keep the digits in the same place values lined up as you divide. For the purposes of this text, dividing to the ten-thousandths place is sufficient.

**EXAMPLE 1.16:**

Solve the following:

$$\begin{array}{r} 3.7 \\ 8.325 \div 2.25 = 225\overline{)\,832.5} \\ -675 \\ \hline 1575 \\ -1575 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 8 \\ 12 \div 1.5 = 15\overline{)\,120} \end{array}$$

## CONVERTING FRACTIONS TO DECIMALS AND DECIMALS TO FRACTIONS

### CONVERTING FRACTIONS TO DECIMALS

To convert a fraction to its equivalent decimal number, carry out the division to the ten-thousandths place and truncate. *Truncate* means to cut off a number at a given decimal place without regard to rounding (e.g., 12.34567 truncated to the hundredths place would be 12.34).

**EXAMPLE 1.17:**

Convert ½ to decimal form.

$$2\overline{)1.0}^{\,0.5}$$

### CONVERTING DECIMALS TO FRACTIONS

To convert a decimal number to a fraction:

**STEP 1.** Read the number as a decimal using place value.

**STEP 2.** Write the number as a fraction.

**STEP 3.** Reduce to lowest terms.

**EXAMPLE 1.18:**

Convert 0.0075 to a fraction.

**STEP 1.** Seventy-five ten-thousandths

**STEP 2.** $\frac{75}{10{,}000}$

**STEP 3.** $\frac{75}{10{,}000} = \frac{3}{400}$

## PERCENT

A *percentage* is a ratio of a number to 100. A *ratio* is a comparison of two numbers, or the quotient of two numbers. A ratio can be expressed as a fraction, a division problem, or an expression, such as ⅗, 3 ÷ 5, or 3 to 5. The term *percent* means "part of one hundred"; the symbol for percent is %. Thus, 7 percent means 7 parts out of every 100. Like fractions and decimals, percent is an expression of the relationship between part and whole. If 34 percent of the customers in a restaurant favor nutritious entrées, a part (34) of a whole number of customers (100) is being expressed. With percent, the whole is *always* 100. In this example, all of the customers that enter the restaurant represent 100 percent.

The use of percentage to express a rate is common practice in the food-service industry. For example, food and beverage costs, labor costs, operating costs, fixed costs, and profits are usually stated as a percent to establish standards of control. Additionally, in a kitchen or bakeshop, percent is used to find yield percent and bakers' percent, which will be covered in later chapters.

To indicate that a number is a percent, the number must be accompanied by the word *percent* or a percent sign (%).

## CONVERTING DECIMAL TO PERCENT

To convert a decimal to a percent, multiply the number by 100 and add a percent sign.

**EXAMPLE 1.19:**

$$0.25 = 0.25 \times 100 = 25\%$$

A shortcut would be to simply move the decimal point two places to the right and add a percent sign.

## CONVERTING PERCENT TO DECIMAL

To convert a percent to its decimal form, divide by 100 and drop the percent sign.

**EXAMPLE 1.20:**

$$30\% = \frac{30}{100} = 0.30$$

A shortcut would be simply to move the decimal point two places to the left and drop the percent sign.

If there is a fraction in the percent, first change that fraction to a decimal.

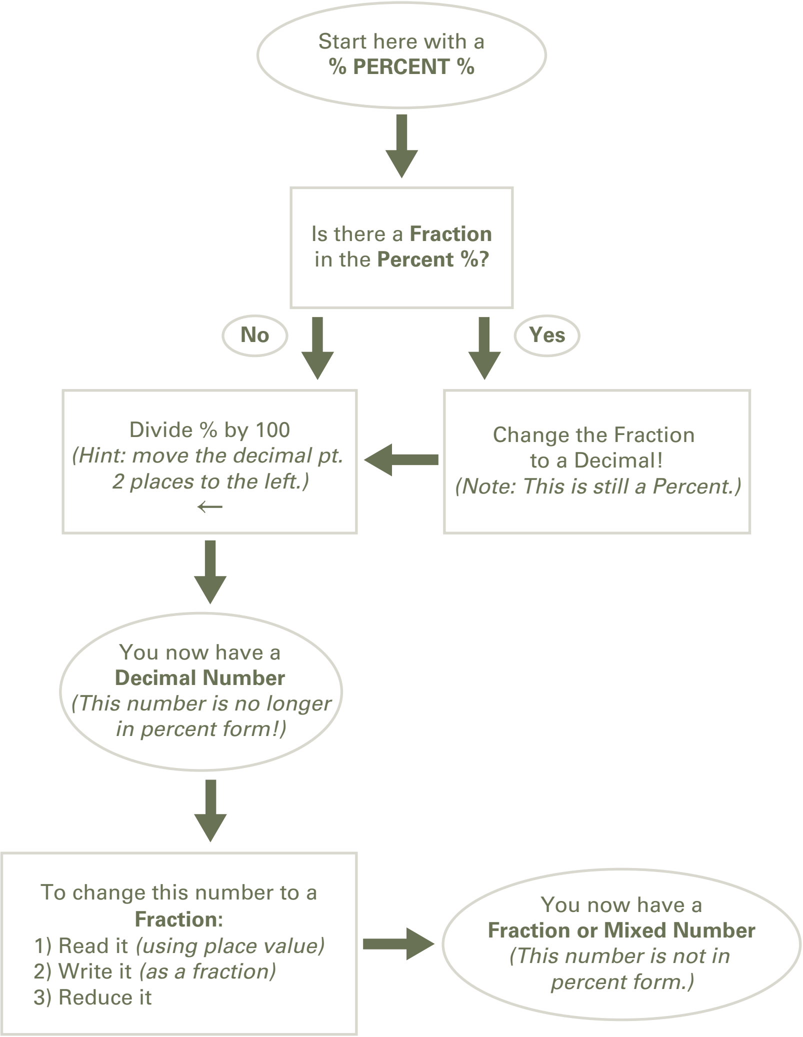
**EXAMPLE 1.21:**

Convert this percent to a decimal: $37\frac{1}{4}\%$

$$37\frac{1}{4}\% = 37.25\%$$

$37.25\%$ converts to 0.3725

PERCENT TO DECIMAL AND PERCENT TO FRACTION FLOWCHART



## PERCENTS IN THE KITCHEN

In the kitchen it is often necessary for the chef to work with percentages. Chefs may use percentages to calculate and apply a yield percent or food cost percent. In these cases, it is helpful to remember the following formulas.

$$\textbf{PERCENT} = \frac{\text{Part}}{\text{Whole}}$$

$$\textbf{PART} = \text{Whole} \times \text{Percent}$$

$$\textbf{WHOLE} = \frac{\text{Part}}{\text{Percent}}$$

**REMEMBER**
Any time you use percentages on a mathematical operation—on a calculator, with a pencil and paper, or in your head—you must first convert the percent to its decimal form.

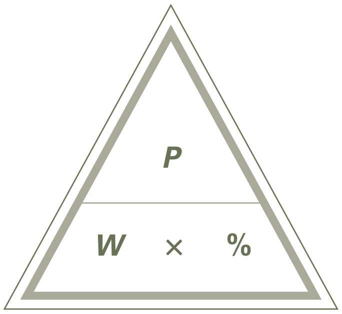
Hints for using formulas involving percentages:

- The number or word that follows the word *of* is usually the whole number and the word *is* usually is connected to the part. What is 20 percent of 70? In this example, *of 70* implies that 70 is the whole; 20 is the percent. The *what is* implies that the part is the unknown and what you are solving for.
- The percentage will always be identified with either the symbol % or the word *percent*.
- The part will usually be less than the whole.
- Before trying to solve the problem, identify the part, whole, and percent and which you need to solve for.

## THE PERCENT TRIANGLE

The following triangle is a tool used to find part, whole, or percent. Rather than memorizing the three separate formulas provided in the preceding section, many students find the following triangle helpful and easy to remember.

### STEPS FOR USING THE PERCENT TRIANGLE



The Percent Triangle

**STEP 1.** Determine what you are looking for—part, whole, or percent.

**STEP 2.** *To find the part*
Cover the *P* for part.
*W* and % are side by side. This directs you to multiply the whole by the percent. (Remember first to change the percent to a decimal by dividing by 100.)

*To find the whole*
Cover the *W* for whole.
*P* is over %. This directs you to divide the part by the percent. (Remember first to change the percent to a decimal by dividing by 100.)

*To find the percent*
Cover the % for percent.
*P* is over *W*. This directs you to divide the part by the whole and multiply the answer by 100 to convert it to the percent.

## ROUNDING

Rounding is an important basic math skill. In the world of mathematics, rounding is predominantly a numeric concept (5 or more rounds up and 4 or less rounds down). Many basic math textbooks contain exercises that have the students practice rounding to a specific place value. In the applied math needed in the food-service industry, however, it is far more important to consider the situation before rounding. When dealing with money, for example, it is important to round to the cent or the hundredths place. Determining to round up or down is clearly dependent on the situation. Whether you choose to round up or down can affect the outcome dramatically. In the food-service industry, the number you rounded may be multiplied by a very large number. If you have rounded incorrectly, the answer could result in a large loss of income, several people going hungry at a party you are catering, or not having enough of a particular ingredient. Rounding will be covered more specifically in the chapters to follow.

## SOLVING WORD PROBLEMS

Word problems are good practice for applied math because they use real-life situations. Following is a list of steps designed to break down the process of solving word problems into manageable pieces.

### STEPS TO SOLVING WORD PROBLEMS

**STEP 1.** Determine what is being solved for.

**STEP 2.** Decide what must be done to get the answer.

**STEP 3.** Perform the necessary calculations.

**STEP 4.** Find out if the question has been answered by the calculations.

**STEP 5.** Decide whether the answer is reasonable.

In culinary math, step 5 takes on a whole new meaning because it is related to real situations dealing with food. For instance, a problem could ask how many apple pies should be made for dinner if 40 percent of your customers usually order a slice of apple pie. Each pie is cut into 8 slices, and you are expecting 240 customers this evening. After you complete the calculations, your answer indicates that you need 240 pies. At this point, you should ask yourself if this answer makes sense given the other information you have. If you are expecting 240 customers, this would mean that the number you arrived at allows for one pie per person; clearly something is wrong with the calculations. When this occurs, you should go over your work to find where the error was made. Your ability to find errors will indicate a clear understanding of the concept and facilitate your learning. If you pay close attention to making sure your answer makes sense, it is clear to see that the correct answer is 12 pies.

**EXAMPLE 1.22:**

Donna, the restaurant manager, is planning a dinner that her restaurant is catering. She knows that they will be serving 300 guests. Donna predicts that 40% of the guests will order the beef entrée. How many orders of the beef entrée should Donna have the kitchen prepare?

**STEP 1.** Determine what is being solved for.

*In this problem, you are being asked to find the number of beef entrées to prepare.*

**STEP 2.** Decide what must be done to get the answer.

*You know the total number of guests, which represents the whole, and you know the percentage of guests that will be ordering beef. Therefore, you must be looking for the part. Using the triangle, if you cover up the P for part, the formula that you should use is Whole × Percent (in decimal form).*

**STEP 3.** Perform the necessary calculations.

*300 × 0.4 = 120 beef entrées*

**STEP 4.** Find out if the question has been answered by the calculation.

*The question asked for how many beef entrées you should prepare. The calculations show that 120 beef entrées is 40% of 300. The problem is solved.*

**STEP 5.** Decide whether the answer is reasonable.

*The answer of 120 beef entrées is reasonable because if we estimate 50%, or half, of the guests, it would be 150 entrées. We were looking for only 40%, so 120 beef entrées is reasonable.*

### EXAMPLE 1.23:

You purchased a used convection oven for $410. As a result of paying in cash, you got a 15% discount from the asking price. What was the original price?

**STEP 1.** Determine what is being solved for.

*In this problem, you are being asked to find the original price of the convection oven.*

**STEP 2.** Decide what must be done to get the answer.

*You are given the price you paid* ***after*** *a 15% discount. The asking price is the whole. So, using the percent triangle we determine, by covering up the whole, that the formula is Part ÷ Percent (in decimal form). However, we cannot say that $410 represents 15% of the asking price. We need a part and a percent that are related. If the discount is 15% of the asking price, then the $410 must represent 85% of the asking price. Now you have a related part and percent.*

**STEP 3.** Perform the necessary calculations.

*$410 ÷ 0.85 = $482.3529, or $482.35*

**STEP 4.** Find out if the question has been answered by the calculation.

*The question asked for the asking price of the convection oven. We determined that $410 is 85% of $482.35—the asking price.*

**STEP 5.** Decide whether the answer is reasonable.

*The answer of $482.35 is greater than $410 by a reasonable amount.*

## CHAPTER REVIEW

Basic math is the foundation for all of the math covered in this text. Understanding the concepts covered is the key to your success in culinary math. As you complete the work in this chapter, make sure that you have a good handle on these concepts. You should refer back to this chapter as you progress through the book, if needed.

## CHAPTER PRACTICE

Answers to odd-numbered questions may be found on page 218.

Calculate the following. Reduce your answer to lowest terms.

**1.** $\frac{1}{2}+\frac{1}{8}=$

**2.** $\frac{1}{6}+\frac{1}{5}=$

**3.** $6\frac{1}{6}+\frac{1}{4}=$

**4.** $\frac{2}{3}+\frac{3}{4}=$

**5.** $10+\frac{1}{9}+\frac{2}{3}=$

**6.** $\frac{2}{10}-\frac{1}{6}=$

**7.** $\frac{1}{2}-\frac{1}{8}=$

**8.** $7\frac{3}{8}-\frac{2}{24}=$

**9.** $\frac{5}{6}\times\frac{2}{3}=$

**10.** $15\times\frac{4}{5}=$

**11.** $1\frac{3}{4}\times 4\frac{3}{8}=$

**12.** $\frac{1}{2}\div\frac{1}{4}=$

**13.** $\frac{1}{4}\div\frac{7}{8}=$

**14.** $1\frac{1}{2}\div 6=$

**15.** $1\frac{3}{8}\div 6\frac{7}{10}=$

Complete the following chart by deciding if the answer is reasonable.

| Question | Answer | Unreasonable Because | Answer Should Be Approximately |
|---|---|---|---|
| **16.** What is your salary per month for your full-time job? | $32.41 | | |
| **17.** You have 3 pints of strawberries. Each cake requires 1½ pints. How many cakes can you make? | 6 cakes | | |
| **18.** You have 20 pounds of dough. Each loaf requires ¾ pound of dough. How many loaves can you make? | 2 loaves | | |
| **19.** How much do you pay in rent each month? | $32.41 | | |
| **20.** How many customers did you serve last night? | 3.02 | | |
| **21.** What is the check average in your restaurant? | $0.29 | | |
| **22.** How many total hours did the dishwasher work this week? | 168 hours | | |

Convert the following fractions into their decimal equivalent.

**EXAMPLE:** $\frac{1}{2} = 0.5$

**23.** $\frac{3}{2} =$

**24.** $\frac{3}{8} =$

**25.** $\frac{9}{18} =$

**26.** $\frac{5}{16} =$

**27.** $\frac{2}{5} =$

**28.** $\frac{7}{8} =$

**29.** $\frac{6}{24} =$

**30.** $\frac{3}{48} =$

**31.** $\frac{26}{5} =$

**32.** $\frac{66}{10} =$

**33.** $\frac{440}{100} =$

**34.** $\frac{4{,}400}{1{,}000} =$

Solve the following. If your answer has more than four decimal places, drop all digits past four places (truncate). Do not round the answer.

**35.** $3.6024 + 18.32 + 51.05 + 2.5 =$

**36.** $0.0365 + 0.001 + 0.999 =$

**37.** $9.765 - 4.0631 =$

**38.** $1.26345 - 0.99 =$

**39.** $78 \div 0.0347 =$

**40.** How many times can 95 be divided by 4.75?

**41.** $3.25 \div 12 =$

**42.** $032 \times 1.1 =$

**43.** $0.065 \times 2.001 =$

**44.** $42 \times 2\frac{1}{2}\% =$

Find the decimal equivalent for the following:

**45.** 150%

**46.** 9.99%

**47.** $\frac{1}{4}\%$

**48.** 100%

**49.** 0.5%

**50.** 25%

Change these numbers to percentages.

**51.** 0.0125

**52.** 9.99

**53.** 0.00001

**54.** $\frac{2}{5}$

**55.** $1\frac{1}{8}$

Complete the following table. If your answer has more than four decimal places, drop all digits past four places (truncate). Do not round or reduce the answer.

| Decimal | Fraction | Percent |
|---|---|---|
| **56.** | $\frac{5}{6}$ | |
| **57.** 0.009 | | |
| **58.** | | $7\frac{3}{4}\%$ |
| **59.** 1.23 | | |
| **60.** | | 0.45% |
| **61.** | $\frac{7}{8}$ | |

For the following table, the given situations present a number that is a result of mathematical calculations. However, these numbers do not necessarily make sense in a kitchen. Determine if the situation requires the number to be rounded up or down, and give an explanation.

| The Situation | Circle the Correct Rounded Answer | Explanation |
|---|---|---|
| **62.** A case of zucchini will serve 76.8 people. How many people can you serve? | 76 or 77 servings | |
| **63.** A magnum of wine will fill 12.675 glasses with 4 ounces of wine. How many glasses will you be able to sell from this bottle? | 12 or 13 servings | |

| The Situation | Circle the Correct Rounded Answer | Explanation |
|---|---|---|
| **64.** You need 6.4 pounds of onions for a recipe. How many pounds should you purchase? | 6 or 7 pounds | |
| **65.** You have calculated a selling price of $12.2704 for the special of the day. How much should you charge for this special? | $12.27 or $12.28 | |
| **66.** 68.65% of a mango is usable. What percent can you use? | 68% or 69% | |
| **67.** 13.374 pies will be necessary to serve the guests at a party you are catering. How many pies should you bake? | 13 or 14 pies | |
| **68.** 1½ teaspoons of cumin costs $0.0439. How much does the cumin cost? | $0.04 or $0.05 | |
| **69.** 5¼ watermelons are needed to make fruit salad. How many watermelons should you order for this fruit salad? | 5 or 6 watermelons | |

Solve each of the following word problems. Show your work. For percent answers, round to the nearest tenth percent. Any partial pennies, round up.

**70.** A restaurant purchases 80 pounds of sweet potatoes. Twenty-five percent of the potatoes are peels. How many pounds of sweet potatoes are peels?

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**71.** If you order 300 lobster tails and you use 32 percent, how many do you have left?

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**72.** You made 400 rolls, which is 40 percent of what you have to make. What is the total number of rolls you have to make?

**73.** You have 60 percent of a bottle of raspberry syrup remaining. If 10 fluid ounces were used, how many fluid ounces did the bottle originally hold?

**74.** Out of 250 cakes, you use 34 percent for a party. How many cakes are left over?

**75.** What percent discount would you have gotten if the actual price of an item was $16.95 and you paid $15.96?

**76.** Annual recycling costs are $7,000. Annual sales amount to $1,185,857. What percent of sales does recycling cost represent?

**77.** Last night you served 30 guests Shrimp Scampi. This represents 15% of all of the entrées you served. How many entrées did you serve?

**78.** If a caterer receives an order for 2,800 canapés at $0.06 each and he requires 30 percent down how much will the client owe after the deposit is paid?

**79.** You paid $508 for a new piece of equipment after a 9 percent discount. What was the original price? Round your answer to the nearest cent.

**80.** By 10:00 A.M. only 3 cups remain in a coffee urn. Eighty-five percent of the coffee has been consumed. How many cups of coffee does the urn hold?

**81.** You are serving 3 different entrées at a party you are catering. If 100 guests are having Beef Wellington, 175 guests are having Pasta Primavera, and 45 percent of the guests are having Coq Au Vin. How many guests are expected at this party?

**82**. A case of apples you received has 12 rotten apples in it. If this represents 25 percent of the entire case, how many apples were in the case?

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**83**. Mr. Willis purchased $150.00 worth of spices and herbs. Because this was such a large order, the supplier charged Mr. Willis only $132.00. What percent discount did Mr. Willis receive?

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**84**. Talia usually charges $0.95 per piece for mini appetizers. For a large party she charges her customers $780 for one thousand mini appetizers. What percent discount was Talia offering?

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**85**. You are catering a dinner party for 25 guests. Each guest will be served a ramekin of chocolate mousse. If only 18 guests show up, what percent of the mousse will be left over?

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**86**. There are 47 people working in your café. Twenty-nine employees are part time. What percent of your employees are full time? Round your answer to the nearest tenth of a percent.

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