

# Culinary Math Curriculum



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# Authors



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This curriculum and accompanying products will help participants refresh their knowledge of math basics and learn more about math as it relates to the culinary arts.

## Curriculum Structure

The *Culinary Math Curriculum* is composed of the following lessons. Approximate lesson times are included. Times will vary depending on implementation and participant skill level.

| Lesson | Title                                                     | Approximate Time   |
|--------|-----------------------------------------------------------|--------------------|
| One    | Math Review: Fractions, Decimals, Ratios, and Percentages | 60 minutes         |
| Two    | Math Review: Measurement Systems                          | 60 minutes         |
| Three  | Math Review: Conversions                                  | 60 minutes         |
| Four   | Culinary Math: Calculating Food Costs                     | 90 minutes         |
| Five   | Culinary Math: Kitchen Measuring Tools                    | 90 minutes         |
| Six    | Culinary Math: Converting Standardized Recipes            | 90 minutes         |
|        | <b>Total</b>                                              | <b>7 1/2 hours</b> |

## Lesson Structure

Each lesson begins with a Lesson Overview, Lesson Objectives, and a Lesson at a Glance table listing the lesson activities, materials required, suggested preparation steps, and approximate class time.

### Lesson Sections

The actual lesson follows the overview, which will contain some of the sections described below. Most lessons are designed to be completed within an hour.

#### ***FOCUS***

Every lesson begins with a FOCUS activity intended to capture participants' attention. This may be in the form of a small or large class discussion, a game, a review of previous lesson information, or a demonstration. During this activity, participants are introduced to the topic of the lesson.

#### ***LEARN***

The LEARN activity in each lesson varies in its presentation mode. It may be a slide presentation, group activity, or demonstration.

#### ***REVIEW***

The majority of lessons end with a REVIEW activity intended to briefly review the lesson's key messages or main points.

# Lesson One – Math Review: Fractions, Decimals, Ratios, and Percentages

## Lesson Overview

*In lesson one, participants will learn to calculate using fractions, decimals, ratios, and percentages. After the lesson, participants will take part in activities based on what they have learned.*

## Lesson Objectives

After completing this lesson, participants will be able to:

- Add, subtract, multiply, and divide fractions
- Add, subtract, multiply, and divide decimals
- Round decimals
- Convert fractions, decimals, ratios, and percentages
- Calculate using the ratio-proportion method

## Lesson at a Glance

| Activity | Materials                                                                                                                                                                                                                                                                                 | Preparation                                                                                                                                                                                                                                                                                                                                                                      | Approximate class time                       |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| FOCUS    | <ul style="list-style-type: none"><li>• <i>Culinary Math Student Workbook</i></li><li>• <i>Math Review: Fractions, Decimals, Ratios, and Percentages Pre-Quiz – Answer Key</i></li></ul>                                                                                                  | <ul style="list-style-type: none"><li>• Access <i>Math Review: Fractions, Decimals, Ratios, and Percentages Pre-Quiz</i> in the student workbook</li></ul>                                                                                                                                                                                                                       | 10 minutes                                   |
| LEARN    | <ul style="list-style-type: none"><li>• <i>Math Review: Fractions, Decimals, Ratios, and Percentages</i> slide presentation</li><li>• <i>Culinary Math Student Workbook</i> (optional)</li><li>• <i>Math Review: Fractions, Decimals, Ratios, and Percentages</i> online lesson</li></ul> | <ul style="list-style-type: none"><li>• Prepare <i>Math Review: Fractions, Decimals, Ratios, and Percentages</i> slide presentation for viewing</li><li>• Access <i>Math Review: Fractions, Decimals, Ratios, and Percentages</i> pages in student workbook (optional)</li><li>• Access <i>Math Review: Fractions, Decimals, Ratios, and Percentages</i> online lesson</li></ul> | 30 minutes                                   |
| REVIEW   | <ul style="list-style-type: none"><li>• <i>Culinary Math Student Workbook</i></li><li>• <i>Math Review: Fractions, Decimals, Ratios, and Percentages – Answer Key</i></li></ul>                                                                                                           | <ul style="list-style-type: none"><li>• Access <i>Math Review: Fractions, Decimals, Ratios, and Percentages</i> pages in the student workbook</li></ul>                                                                                                                                                                                                                          | 20 minutes (can be completed during lecture) |

# Lesson One – Math Review: Fractions, Decimals, Ratios, and Percentages

## FOCUS: Fractions, Decimals, Ratios, and Percentages Pre-Quiz

10 minutes

### Purpose:

To assess participants' current knowledge of fractions, decimals, ratios, and percentages.

### Materials:

- *Culinary Math Student Workbook*
- *Math Review: Fractions, Decimals, Ratios, and Percentages Pre-Quiz – Answer Key*

### Facilitation Steps:

1. Instruct participants to complete the *Math Review: Fractions, Decimals, Ratios, and Percentages Pre-Quiz*, located in the student workbook, prior to or at the start of class.
2. Have the *Math Review: Fractions, Decimals, Ratios, and Percentages Pre-Quiz – Answer Key* available for instructor reference.
3. Have participants pair up and compare answers.

# Fractions, Decimals, Ratios, and Percentages Pre-Quiz – Answer Key

Read each question and calculate the correct answer.

- 1) Which is larger:  $\frac{8}{11}$  or  $\frac{5}{9}$  ?

$$\frac{8 \text{ (x 9)}}{11 \text{ (x 9)}} = \frac{72}{99}$$

$$\frac{5 \text{ (x 11)}}{9 \text{ (x 11)}} = \frac{55}{99}$$

$$\frac{72}{99} \text{ is larger than } \frac{55}{99}$$

$$\frac{8}{11} \text{ is larger than } \frac{5}{9} = \mathbf{A}$$

- 2) Add:  $\frac{8}{9} + \frac{5}{7} =$

$$\frac{8 \text{ (x 7)}}{9 \text{ (x 7)}} + \frac{5 \text{ (x 9)}}{7 \text{ (x 9)}} = \frac{56}{63} + \frac{45}{63} = \frac{101}{63} = \mathbf{1 \frac{38}{63} = D}$$

- 3) Subtract:  $\frac{7}{9} - \frac{3}{10} =$

$$\frac{7 \text{ (x 10)}}{9 \text{ (x 10)}} - \frac{3 \text{ (x 9)}}{10 \text{ (x 9)}} = \frac{70}{90} - \frac{27}{90} = \frac{43}{90} = \mathbf{C}$$

- 4) Multiply:  $3\frac{4}{7} \times \frac{8}{13} =$

$$3\frac{4}{7} = \frac{(7 \times 3) + 4}{7} = \frac{25}{7}$$

$$\frac{25}{7} \times \frac{8}{13} = \frac{25 \times 8}{7 \times 13} = \frac{200}{91} = \mathbf{2 \frac{18}{91} = B}$$

- 5) Divide:  $\frac{1}{6} \div \frac{4}{5} =$

$$\frac{1}{6} \div \frac{4}{5} = \frac{1}{6} \times \frac{5}{4} = \frac{5}{24} = \mathbf{C}$$



6) Round 0.318 to the nearest hundredth.

**0.32 – round up because 8 is greater than 5 = B**

7) Subtract:  $0.96 - 0.4 =$

$$\begin{array}{r} 0.96 \\ - 0.40 \\ \hline \end{array}$$

**0.56 = A**

8) Multiply:  $5.19 \times 2.3 =$

$$\begin{array}{r} 5.19 \quad \text{two decimals} \\ \times 2.3 \quad \text{one decimal} \\ \hline 1557 \\ + 10380 \\ \hline \end{array}$$

**11.937 three decimals = D**

9) Convert  $\frac{5}{9}$  to a percentage.

$$5 \div 9 = 0.556$$

$$0.556 \times 100 = \mathbf{55.6\% = C}$$

10) Solve for  $x$ :  $\frac{3}{4} = \frac{25}{x}$

$$25 \times 4 = 100 \quad 3 \times X = 3x$$

$$\frac{3x}{3} = \frac{100}{3} = \mathbf{33.3 = B}$$

# Lesson One – Math Review: Fractions, Decimals, Ratios, and Percentages Slide Presentation

## LEARN: Fractions, Decimals, Ratios, and Percentages Slide Presentation

30 minutes

### Purpose:

Participants will learn how to calculate using fractions, decimals, ratios, and percentages.

### Materials:

- *Math Review: Fractions, Decimals, Ratios, and Percentages* slide presentation
- *Culinary Math Student Workbook* (optional)
- *Math Review: Fractions, Decimals, Ratios, and Percentages* online lesson

### Facilitation Steps:

1. Share the following information with participants as you show the slide presentation.

Optional: You may complete practice problems in the student workbook as part of the lecture.

Note to instructor: In lieu of the slide presentation, you may assign the *Math Review: Fractions, Decimals, Ratios, and Percentages* online lesson. It covers all the same content but allows participants to learn at a self-paced speed.

**Slide 1:** Introduction slide.

### Slide 2: Objectives

At the end of this lecture, you should be able to:

- Add, subtract, multiply, and divide fractions
- Add, subtract, multiply, and divide decimals
- Round decimals
- Convert fractions, decimals, ratios, and percentages
- Calculate using ratio-proportion method

**Slide 3:** Fractions title slide.

### Slide 4: What is a Fraction?

A fraction represents a part of a whole or division of one number by another. The top number is the numerator (part of the whole), and the bottom number is the denominator (whole).

### Slide 5: Estimating Size

Let's compare fractions by size. It's important to know if one fraction is less than, greater than, or equal to another. A whole is the same number in the numerator as the denominator. For example,  $1/1 = 1$  whole.

When the denominators are both the same, the fraction with the larger numerator has the greater value. For example,  $1/8$  is smaller than  $3/8$ .

When the numerators are the same, the fraction with the smaller denominator has the greater value. For example,  $\frac{1}{2}$  is greater than  $\frac{1}{8}$ .

#### Slide 6: Practice Questions

Let's practice with size.

Which is smaller:  $\frac{1}{4}$  or  $\frac{1}{2}$ ?  *$\frac{1}{4}$  is smaller.*  
*When the numerators are the same, the fraction with the smaller denominator has the greater value.*

Which is larger:  $\frac{1}{4}$  or  $\frac{3}{4}$ ?  *$\frac{3}{4}$  is larger.* *When the denominators are both the same, the fraction with the larger numerator has the greater value.*

#### Slide 7: Common Denominators

When the numerators and the denominators are different, you will need to find the common denominator of the two fractions.

1. To find a common denominator, multiply the numerator and denominator of the first fraction by the denominator of the second fraction.
2. Next, multiply the numerator and denominator of the second fraction by the denominator of the first fraction.

#### Slide 8: Practice Question

Now try this practice problem on your own.  
Remember to find the common denominator!

#### Slide 9: Practice Answer

Find a common denominator:  
Multiply the numerator and denominator of the first fraction by 4 (the denominator of the second fraction).

Multiply the numerator and denominator of the second fraction by 5 (the denominator of the first fraction).

Compare the numerators. Because 16 is greater than 15, it means that  $\frac{4}{5}$  is greater than  $\frac{3}{4}$ . The chef had more pie remaining.

$$\text{Pie: } \frac{4(x4)}{5(x4)} = \frac{16}{20}$$

$$\text{Cake: } \frac{3(x5)}{4(x5)} = \frac{15}{20}$$

*The Chef had more Pie left over because  $\frac{16}{20}$  is more than  $\frac{15}{20}$  which means that  $\frac{4}{5}$  is more than  $\frac{3}{4}$ .*

#### Slide 10: Reducing Fractions

Sometimes large fractions can be simplified. This is called reducing a fraction to lowest terms.

Find the largest number that will divide evenly into both the numerator and the denominator. For example, to reduce  $\frac{15}{25}$  to lowest terms, divide the largest number (5) that goes evenly into both the numerator and the denominator.

Optional video: Reducing Fractions

<https://www.youtube.com/watch?v=IIHP0niNflA>

#### Slide 11: Mixed Numbers

Sometimes fractions are written with whole numbers. To create an improper fraction (where the numerator is larger than the denominator), multiply the denominator by the whole number and add the numerator; then place that number over the existing denominator. To create a mixed number, divide the numerator by the denominator.

### **Slide 12: Adding Fractions**

If common denominators exist, add the numerators but keep the common denominator. Reduce to lowest terms.

To add fractions without common denominators, determine a common denominator. You may have to multiply one or both denominators. Add the numerators but keep the common denominator. Reduce to lowest terms or create a proper fraction.

### **Slide 13: Subtracting Fractions**

If common denominators exist, subtract the numerators but keep the common denominator. Reduce to lowest terms.

To subtract fractions without common denominators, determine a common denominator. You may have to multiply one or both denominators. Subtract the numerators but keep the common denominator. Reduce to lowest terms or create a proper fraction.

Optional video: Add and Subtract Fractions  
<https://www.youtube.com/watch?v=nnO3-SGdGhc>

### **Slide 14: Multiplying Fractions**

In multiplication, you must convert any mixed numbers to improper fractions, if needed. Multiply the numerators and multiply the denominators. Reduce to lowest terms if necessary.

### **Slide 15: Dividing Fractions**

In division, you also must convert any mixed numbers to improper fractions, if needed. Invert the divisor by placing the denominator over the numerator. Cancel terms if needed.

Multiply the inverted divisor by the dividend. Reduce if necessary.

Optional video: Multiply and Divide Fractions  
<https://www.youtube.com/watch?v=MVqV8qQ0BF8>

### **Slide 16: Decimals title slide.**

### **Slide 17: Fractions and Decimals**

Decimals are another way of displaying fractions and are used to display values less than one. The metric system is a decimal-based system.

As you can see here, numbers left of the decimal point are whole numbers. To the right, they are the fractional parts.

### **Slide 18: Rounding Decimals**

If rounding to a whole number, the end value will be whole. If rounding to tenths, the end value is in tenths. If rounding to hundredths, the end value is in hundredths.

Look at the number one decimal place to the right of the desired end value. For example, if rounding to the tenths, look at the hundredths value.

Round up if the number to the right of the end value is 5 or higher. Delete all numbers to the right of the end value. For example, 1.75 rounded to the nearest tenth becomes 1.8.

If the number to the right of the end value is 4 or less, leave the number in your end value unchanged. Delete all numbers to the right of the end value. For example, 1.233 rounded to the nearest hundredth becomes 1.23.

Optional video: Rounding Decimals

<https://www.youtube.com/watch?v=AH6JMQ2Z9ho>

### **Slide 19: Adding Decimals**

To add decimals, align the decimals so the decimal point is the same. Add zeros at the end to make all the decimals the same length. Then add.

### **Slide 20: Subtracting Decimals**

Subtraction is like addition. Align the decimals so the decimal point is the same. Add zeros at the end to make all the decimals the same length. Then subtract.

Optional video: Adding and Subtracting Decimals

<https://www.youtube.com/watch?v=NPDI4BVYn0E>

### **Slide 21: Multiplying Decimals**

In multiplication, you do not need to align the decimals. Multiply the numbers together. This symbol (\*) is a placeholder, but you may use zero as well.

Count the total number of decimal places of the numbers and move the decimal point by that many spaces to the left.

### **Slide 22: Dividing Decimals**

In division, first create whole numbers by multiplying the decimal by 10, 100, or 1,000, or by moving the decimal to the right until a whole number is created.

Do the same to the other number. For example, if you moved the decimal one place to the right,

then move the decimal one place to the right on the other number. Then divide.

Optional video: Multiplying and Dividing Decimals

<https://www.youtube.com/watch?v=Nz2iuCUgHRc>

### **Slide 23: Ratios and Percentages title slide.**

### **Slide 24: What is a Ratio?**

A ratio indicates how much of one number is contained in another. It is a comparison between two items.

Example: There are 3 apples, 8 bananas, and 1 orange in a bowl. The ratio of apples to bananas is 3:8. The ratio of oranges to total number of fruits is 1:12. It can also be written  $\frac{3}{8}$  or  $\frac{1}{12}$  like a fraction.

### **Slide 25: What is a Percentage?**

A percentage is a fraction or ratio expressed as part of 100.

Example: Amanda has 100 apples. Steve takes 25 apples. The ratio of apples taken compared to amount remaining is 25:100. The percentage is 25%.

### **Slide 26: Converting Ratio to a Percentage**

Ratios can be converted in percentages. First, divide the first number by the second number then multiply by 100. Add the % symbol.

### **Slide 27: Converting Fractions to Percentage**

To convert fractions to percentages, divide the numerator by the denominator, multiply by 100, and then add the percent (%) symbol.

Optional video: Review of Basic Percentages  
<https://www.youtube.com/watch?v=Z229RysttR8>

**Slide 28:** Using Ratio Proportion Method title slide.

**Slide 29:** Cross Multiplying

Cross multiplication is used to calculate if two fractions are the same value. Multiply the numerator of the first fraction by the denominator of the second.

Multiply the numerator of the second fraction by the denominator of the first. If the results are the same, the fractions are equal.

Optional video: Equivalent Fractions and Cross Products  
<https://www.youtube.com/watch?v=S0znSQL1BOA>

**Slide 30:** Solve for  $x$  with Fractions

To find the value of  $x$  in a proportion, set up the equation for cross multiplication. Cross multiply. To get  $x$  alone, divide each side by the number next to the  $x$  to solve.

**Slide 31:** Calculating Percentages

To change a fraction into a percentage, use the formula  $P/W = x/100$ . Partial quantity is represented as  $P$  over the whole quantity represented as  $W$ .

The second fraction will be  $x$  over 100 since the whole quantity is 100 in a percentage. Solve by finding  $x$ .

**Slide 32:** Closing slide.

# Lesson One – Math Review: Fractions, Decimals, Ratios, and Percentages

## REVIEW: Fractions, Decimals, Ratios, and Percentages

20 minutes

### Purpose:

Participants will practice math questions using fractions, decimals, ratios, and percentages.

### Materials:

- *Culinary Math Student Workbook*
- *Math Review: Fractions, Decimals, Ratios, and Percentages – Answer Key*

### Facilitation Steps (this may have been completed as part of lecture):

1. Have participants complete the practice questions in the *Math Review: Fractions, Decimals, Ratios, and Percentages* section of the student workbook.
2. Answer any questions participants may have about the calculations.
3. Have participants self-check or peer-check their answers as you share them from the *Math Review: Fractions, Decimals, Ratios, and Percentages – Answer Key*.

# Fractions, Decimals, Ratios, and Percentages - Answer Key

## Fractions

### Estimating Size

- When the denominators are both the same, the fraction with the larger numerator has the greater value
  - For example,  $\frac{1}{8}$  is smaller than  $\frac{3}{8}$
- When the numerators are the same, the fraction with the smaller denominator has the greater value
  - For example,  $\frac{1}{2}$  is greater than  $\frac{1}{8}$
- If the numerators and denominators are different, you will need to find the common denominator of the two fractions
  - To find a common denominator, multiply the numerator and denominator of the first fraction by the denominator of the second fraction
  - Next, multiply the numerator and denominator of the second fraction by the denominator of the first fraction

$$\frac{7 \text{ (x 6)}}{10 \text{ (x 6)}} = \frac{42}{60}$$

$$\frac{5 \text{ (x 10)}}{6 \text{ (x 10)}} = \frac{50}{60}$$

$$\frac{50}{60} \text{ is larger than } \frac{42}{60}$$

$$\frac{5}{6} \text{ is larger than } \frac{7}{10}$$

### Practice Questions

- 1) Which is larger:  $\frac{5}{7}$  or  $\frac{6}{7}$ ?

**$\frac{6}{7}$** , because the numerator is larger.

- 2) The chef had  $\frac{4}{5}$  of the pie left and  $\frac{3}{4}$  of the cake remaining after the brunch was over. Did the chef have more pie or cake left?

$$\frac{4 \text{ (x 4)}}{5 \text{ (x 4)}} = \frac{16}{20}$$

$$\frac{3 \text{ (x 5)}}{4 \text{ (x 5)}} = \frac{15}{20}$$

$$\frac{16}{20} \text{ is larger than } \frac{15}{20}$$

**$\frac{4}{5}$  is larger than  $\frac{3}{4}$**



### Reducing Fractions

- To reduce to lowest terms, find the largest number that will divide evenly into both the numerator and the denominator

$$\frac{15 (\div 5)}{25 (\div 5)} = \frac{3}{5}$$

### Mixed Numbers

- To create an improper fraction, multiply the denominator by the whole number and add the numerator, then place that number over the existing denominator
- To create a mixed number, divide the numerator by the denominator

$$3 \frac{4}{5} = \frac{(5 \times 3) + 4}{5} = \frac{19}{5}$$

$$\frac{19}{5} = 19 \div 5 = 3 \frac{4}{5}$$

### Adding Fractions

- If there are common denominators, add the numerators but keep the denominator
- If the denominators are not the same, find the common denominator and add the numerators
- Reduce to lowest terms

$$\frac{7}{12} + \frac{3}{12} = \frac{10}{12} = \frac{5}{6}$$

$$\frac{9}{10} + \frac{4}{5} = ? \quad \frac{4 (\times 2)}{5 (\times 2)} = \frac{8}{10} \quad \frac{9}{10} + \frac{8}{10} = \frac{17}{10} = 1 \frac{7}{10}$$

### Subtracting Fractions

- If there are common denominators, subtract the numerators but keep the denominator
- If the denominators are not the same, find the common denominator and subtract the numerators
- Reduce to lowest terms

$$\frac{5}{7} - \frac{2}{7} = \frac{3}{7}$$

$$\frac{4}{5} - \frac{2}{3} = ? \quad \frac{4 (\times 3)}{5 (\times 3)} = \frac{12}{15} \quad \frac{2 (\times 5)}{3 (\times 5)} = \frac{10}{15}$$

$$\frac{12}{15} - \frac{10}{15} = \frac{2}{15}$$

### Practice Questions

- 3) Reduce  $\frac{3}{12}$  to lowest terms.

$$\frac{3 (\div 3)}{12 (\div 3)} = \frac{1}{4}$$

- 4) Reduce  $\frac{18}{45}$  to lowest terms.

$$\frac{18 (\div 9)}{45 (\div 9)} = \frac{2}{5}$$

- 5) What is the improper fraction for  $5 \frac{3}{8}$ ?

$$5 \frac{3}{8} = \frac{(8 \times 5) + 3}{8} = \frac{43}{8}$$

- 6) What is the mixed number of  $\frac{36}{8}$ ?

$$\frac{36}{8} = 36 \div 8 = 4 \frac{1}{2}$$

- 7)  $\frac{9}{15} + \frac{3}{15} = \frac{12}{15} = \frac{4}{5}$

- 8)  $\frac{1}{9} + \frac{2}{7} = \frac{1 (\times 7)}{9 (\times 7)} + \frac{2 (\times 9)}{7 (\times 9)} = \frac{7}{63}$

$$+ \frac{18}{63} = \frac{25}{63}$$

- 9)  $\frac{4}{5} - \frac{2}{5} = \frac{2}{5}$

- 10)  $\frac{12}{15} - \frac{2}{9} = \frac{12 (\times 3)}{15 (\times 3)} - \frac{2 (\times 5)}{9 (\times 5)}$

$$\frac{36}{45} - \frac{10}{45} = \frac{26}{45}$$

### Multiplying Fractions

- Convert any mixed numbers to improper fractions, if needed
- Multiply the numerators and multiply the denominators
- Reduce to lowest terms

$$2\frac{6}{7} \times \frac{5}{8} = ?$$

$$2\frac{6}{7} = \frac{(7 \times 2) + 6}{7} = \frac{20}{7}$$

$$\frac{20}{7} \times \frac{5}{8} = \frac{20 \times 5}{7 \times 8} = \frac{100}{56}$$

$$\frac{105}{56} = 1\frac{11}{14}$$

### Dividing Fractions

- Convert any mixed numbers to improper fractions, if needed
- Place the denominator over the numerator of the second fraction
- Cancel, if needed
- Multiply across
- Reduce to lowest terms

$$\frac{3}{5} \div \frac{7}{10} = ?$$

$$\frac{3}{5} \div \frac{7}{10} = \frac{3}{5} \times \frac{10}{7} = \frac{3}{\cancel{5}1} \times \frac{\cancel{10}2}{7} = \frac{3}{1} \times \frac{2}{7} = \frac{3 \times 2}{1 \times 7} = \frac{6}{7}$$

### Practice Questions

$$11) \frac{9}{10} \times 4\frac{4}{9} =$$

$$4\frac{4}{9} = \frac{(9 \times 4) + 4}{9} = \frac{40}{9}$$

$$\frac{40}{9} \times \frac{9}{10} = \frac{40 \times 9}{9 \times 10} =$$

$$\frac{360}{90} = 4$$

$$12) 9\frac{1}{2} \times \frac{3}{4} =$$

$$9\frac{1}{2} = \frac{(2 \times 9) + 1}{2} = \frac{19}{2}$$

$$\frac{19}{2} \times \frac{3}{4} = \frac{19 \times 3}{2 \times 4} =$$

$$\frac{57}{8} = 7\frac{1}{8}$$

$$13) 2\frac{1}{8} \div \frac{2}{7} =$$

$$2\frac{1}{8} = \frac{(8 \times 2) + 1}{8} = \frac{17}{8}$$

$$\frac{17}{8} \times \frac{7}{2} = \frac{119}{16} = 7\frac{7}{16}$$

$$14) \frac{19}{12} \div \frac{1}{3} =$$

$$\frac{19}{12} \times \frac{3}{1} = \frac{57}{12} = 4\frac{3}{4}$$

# Decimals

## Rounding

- Determine end value
- Look at the number to the right of the end value
  - Round up if 5 or higher
  - If 4 or less, number stays the same

## Adding Decimals

- Align the decimals
- Add zeros to make them the same length
- Add

Add 0.91, 0.4, and 1.65

$$\begin{array}{r} 0.91 \\ 0.40 \\ + 1.65 \\ \hline 2.96 \end{array}$$

## Subtracting Decimals

- Align the decimals
- Add zeros to make them the same length
- Subtract

Subtract 1.5 from 2.35

$$\begin{array}{r} 2.35 \\ - 1.50 \\ \hline 0.85 \end{array}$$

## Practice Questions

- 1) Round 0.258 to the hundredths.

**0.26**

- 2) Round 1.9 to the nearest whole number.

**2**

- 3)  $8.2 + 0.07 + 11 =$

$$8.20 + 0.07 + 11.00 = \mathbf{19.27}$$

- 4)  $0.25 + 1.2 + 3.86 =$

$$0.25 + 1.20 + 3.86 = \mathbf{5.31}$$

- 5)  $6.75 - 0.5 =$

$$6.75 - 0.50 = \mathbf{6.25}$$

- 6)  $0.41 - 0.2 =$

$$0.41 - 0.20 = \mathbf{0.21}$$

### Multiplying Decimals

- Multiply the numbers together
- This symbol (\*) is a placeholder; you may use zero as well
- Count the number of decimal places
- Move the decimal point

Multiply 2.8 by 0.13

$$\begin{array}{r} 2.8 \quad \text{one decimal} \\ \times 0.13 \quad \text{two decimals} \\ \hline 0.364 \quad \text{three decimals} \end{array}$$

### Dividing Decimals

- Create whole numbers by multiplying decimal by 10
- Do the same thing to both numbers and divide

$$10 \div 0.5$$

Convert 0.5 to a whole number by moving the decimal one place to the right, then do the same with 10

$$100 \div 5 = 20$$

therefore

$$10 \div 0.5 = 20$$

### Practice Questions

7)  $3.5 \times 0.27 =$

3.5    one decimal

$\times 0.27$     two decimals

**0.945**    three decimals

8)  $6.12 \times 1.5 =$

6.12    two decimals

$\times 1.5$     one decimal

9.180    three decimals

**= 9.18**

9)  $6 \div 0.25 =$

$$6 \times 100 = 600$$

$$0.25 \times 100 = 25$$

$$600 \div 25 = \mathbf{24}$$

10)  $9 \div 0.333 =$

$$9 \times 1000 = 9000$$

$$0.333 \times 1000 = 333$$

$$9000 \div 333 = \mathbf{27.027}$$

## Ratios, Proportions, and Percentages

### Converting Ratio to a Percentage

- Divide the first number by the second number
- Multiply by 100
- Add the % symbol

Convert 5:6 to a percent

$$5 \div 6 = 0.83333$$

$$0.8333 \times 100 = 83.33\%$$

### Converting Fraction to a Percentage

- Divide the numerator by the denominator
- Multiply by 100
- Add the % symbol

Convert  $\frac{3}{5}$  to a percent

$$3 \div 5 = 0.6$$

$$0.6 \times 100 = 60\%$$

### Practice Questions

- 1) Convert 7:10 to a percent.

$$7 \div 10 = 0.7$$

$$0.7 \times 100 = 70\%$$

- 2) Convert  $\frac{6}{7}$  to a percent.

$$6 \div 7 = 0.857$$

$$0.857 \times 100 = 85.7\%$$

### Cross Multiplying

- Multiply the numerator of the first fraction by the denominator of the second
- Multiply the numerator of the second fraction by the denominator of the first

$$\text{Does } \frac{3}{4} = \frac{12}{16} ?$$

$$3 \times 16 = 48$$

$$12 \times 4 = 48$$

Yes, they are equal.

### Solve for X with Fractions

- To solve for “x”, cross multiply
- Divide each side to get X alone

$$\frac{2}{6} = \frac{9}{x} ?$$

$$\frac{2}{6} \times \frac{9}{x}$$

$$9 \times 6 = 54$$

$$2 \times X = 2x$$

$$\frac{2x}{2} = \frac{54}{2} = 27$$

### Practice Questions

3) Does  $\frac{2}{9} = \frac{16}{27}$  ?

$$2 \times 27 = 54$$

$$16 \times 9 = 144$$

**No, they are not equal.**

4)  $\frac{8}{9} = \frac{10}{x}$


$$\frac{8}{9} = \frac{10}{x} ?$$

$$\frac{8}{9} \quad \frac{10}{x}$$

$$9 \times 10 = 90$$

$$8 \times X = 8x$$

$$\frac{8x}{8} = \frac{90}{8} =$$

**11.25 OR  $11\frac{1}{4}$**

### Calculating Percentages

- Partial quantity =  $P$  over whole quantity =  $W$
- The second fraction will be “ $x$ ” over 100 since the whole quantity is 100 in a percentage

- Solve for “ $x$ ”

$$\frac{1}{8} = \frac{x}{100}$$

$$1 \times 100 = 100$$

$$8 \times X = 8x$$

$$\frac{8x}{8} = \frac{100}{8} = 12.5\%$$

### Practice Questions

$$5) \frac{9}{13} = \frac{x}{100}$$

Express  $x$  as a percentage.

$$9 \times 100 = 900$$

$$13 \times X = 13x$$

$$\frac{13x}{13} = \frac{900}{13} = \mathbf{69.2\%}$$

# Lesson Two – Math Review: Measurement Systems

## Lesson Overview

*In lesson two, participants will learn about common measurement systems. After the lesson, participants will take part in activities based on what they have learned.*

## Lesson Objectives

After completing this lesson, participants will be able to:

- Calculate between measurements in the metric system
- Convert apothecary and household measurements
- Calculate time using standard and military time

## Lesson at a Glance

| Activity | Materials                                                                                                                                                                                                                               | Preparation                                                                                                                               | Approximate class time                       |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| FOCUS    | <ul style="list-style-type: none"><li>• <i>Culinary Math Student Workbook</i></li><li>• <i>Math Review: Measurement Systems Pre-Quiz – Answer Key</i></li></ul>                                                                         | <ul style="list-style-type: none"><li>• Access <i>Math Review: Measurement Systems Pre-Quiz</i> section in the student workbook</li></ul> | 10 minutes                                   |
| LEARN    | <ul style="list-style-type: none"><li>• <i>Math Review: Measurement Systems</i> slide presentation</li><li>• <i>Culinary Math Student Workbook</i> (optional)</li><li>• <i>Math Review: Measurement Systems</i> online lesson</li></ul> | <ul style="list-style-type: none"><li>• Prepare <i>Math Review: Measurement Systems</i> slide presentation for viewing</li></ul>          | 30 minutes                                   |
| REVIEW   | <ul style="list-style-type: none"><li>• <i>Culinary Math Student Workbook</i></li><li>• <i>Math Review: Measurement Systems – Answer Key</i></li></ul>                                                                                  | <ul style="list-style-type: none"><li>• Access <i>Math Review: Measurement Systems</i> section in the student workbook</li></ul>          | 20 minutes (can be completed during lecture) |



## Lesson Two – Math Review: Measurement Systems

### FOCUS: Measurement Systems Pre-Quiz

10 minutes

#### Purpose:

To assess participants' current knowledge of measurement systems.

#### Materials:

- *Culinary Math Student Workbook*
- *Math Review: Measurement Systems Pre-Quiz – Answer Key*

#### Facilitation Steps:

1. Instruct participants to complete the *Math Review: Measurement Systems Pre-Quiz*, located in the student workbook, prior to or at the start of the class.
2. Have the *Math Review: Measurement Systems – Answer Key* available for instructor reference.
3. Have participants pair up and compare answers.

# Metric, Apothecary, Household, and Time Pre-Quiz – Answer Key

Read each question and calculate the correct answer.

- 1) Convert 267 micrograms to milligrams.

$$\frac{1 \text{ mg}}{1000 \text{ mcg}} = \frac{x \text{ mg}}{267 \text{ mcg}}$$

OR Move decimal to left 3 spaces.

$$1 \times 267 = 267$$

$$1000 \times X = 1000X$$

$$\frac{1000x}{1000} = \frac{267}{1000} = \mathbf{0.267 \text{ mg} = A}$$

- 2) Convert 58.9 grams to kilograms.

$$\frac{1000 \text{ g}}{1 \text{ kg}} = \frac{58.9 \text{ g}}{x \text{ kg}}$$

OR Move decimal to left 3 spaces.

$$1 \times 58.9 = 58.9$$

$$1000 \times X = 1000X$$

$$\frac{1000x}{1000} = \frac{58.9}{1000} = \mathbf{0.0589 \text{ kg} = C}$$

- 3) Convert 4.3 centimeters to millimeters.

$$\frac{1 \text{ cm}}{10 \text{ mm}} = \frac{4.3 \text{ cm}}{x \text{ mm}}$$

OR Move decimal to the right 1 space.

$$10 \times 4.3 = 43$$

$$1 \times X = 1X$$

$$\frac{1x}{1} = \frac{43}{1} = \mathbf{43 \text{ mm} = B}$$

4) Convert 120 milligrams to grains.

$$\frac{1 \text{ gr}}{60 \text{ mg}} = \frac{x \text{ gr}}{120 \text{ mg}}$$

$$1 \times 120 = 120$$

$$60 \times X = 60X$$

$$\frac{60x}{60} = \frac{120}{60} = \mathbf{2 \text{ gr or gr ii} = C}$$

5) How many teaspoons are in 3 tablespoons?

$$\frac{3 \text{ t}}{1 \text{ T}} = \frac{x \text{ t}}{3 \text{ T}}$$

$$3 \times 3 = 9$$

$$1 \times X = 1X$$

$$\frac{1x}{1} = \frac{9}{1} = \mathbf{9 \text{ teaspoons} = B}$$

6) Convert 2 quarts to gallons.

$$\frac{4 \text{ qts}}{1 \text{ gal}} = \frac{2 \text{ qts}}{x \text{ gal}}$$

$$2 \times 1 = 2$$

$$4 \times X = 4X$$

$$\frac{4x}{4} = \frac{2}{4} = \mathbf{0.5 \text{ gallons} = B}$$

7) Convert 8 pounds to ounces.

$$\frac{1 \text{ lb}}{16 \text{ oz}} = \frac{8 \text{ lbs.}}{x \text{ oz}}$$

$$8 \times 16 = 128$$

$$1 \times X = 1X$$

$$\frac{1x}{1} = \frac{128}{1} = \mathbf{128 \text{ ounces} = A}$$

8) How many feet is 72 inches?

$$\frac{1 \text{ ft}}{12 \text{ in}} = \frac{x \text{ ft}}{72 \text{ in}}$$

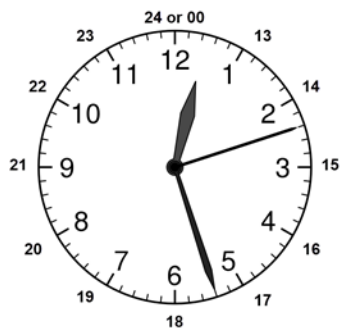
$$72 \times 1 = 72$$

$$12 \times X = 12X$$

$$\frac{12x}{12} = \frac{72}{12} = \mathbf{6 \text{ feet} = C}$$

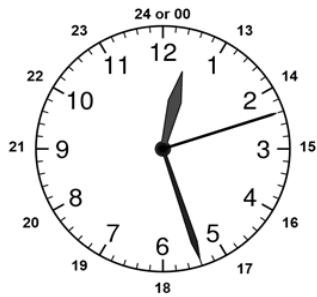
9) Convert 1530 to traditional time.

$$1530 = \mathbf{3:30 \text{ p.m.} = D}$$



10) Convert 11:59 p.m. to military time.

11:59 p.m. = **2359 = B**



## Lesson Two – Math Review: Measurement Systems

# LEARN: Measurement Systems Slide Presentation

30 minutes

### Purpose:

Participants will learn how to calculate using measurement systems.

### Materials:

- *Math Review: Measurement Systems* slide presentation
- *Culinary Math Student Workbook* (optional)
- *Math Review: Measurement Systems* online lesson

### Facilitation Steps:

1. Share the following information with participants as you show the slide presentation.

Optional: Participants may complete practice problems in the student workbook as part of lecture.

Note to instructor: In lieu of the slide presentation, you may assign the *Math Review: Measurement Systems Online Lesson*. It covers all the same content but allows participants to learn at a self-paced speed.

**Slide 1:** Introduction slide.

**Slide 2:** Objectives

At the end of this lesson, you will be able to:

- Calculate between measurements in the metric system

- Convert apothecary and household measurements
- Calculate time using standard and military time

**Slide 3:** Metric System title slide.

**Slide 4:** What is the Metric System?

The metric system uses powers of 10 and the amounts are written as whole numbers or decimals, not fractions.

Metric measures are determined by their prefixes, as seen in the image here. When moving from a bigger unit to a smaller unit, multiplication is used, and the decimal point moves to the right. When moving from a smaller to bigger unit, division is used, and the decimal moves to the left.

The metric system includes three base units of measurement: liter (volume), gram (weight), and meter (length).

**Slide 5:** Metric Conversion

To convert using the ratio-proportion method, set up the equation using known equivalencies, keeping the unit of measurement in the numerators and denominators the same. Cross-multiply and divide. Always label your answer with the correct units.

### **Slide 6: Moving Decimals**

Another option is to move the decimal point according to the level of metric. To convert a bigger unit to a smaller one, move the decimal to the right. To convert smaller units to bigger, move the decimal to the left.

For example, let's convert 1 L to mL. It is going from a bigger quantity to a smaller one, so the decimal will move to the right. Notice on the picture that "Milli-" is 3 levels down, so move the decimal to the right 3 spots. 1 L equals 0.001 mL. Always remember the preceding zero, and to label your answer.

### **Slide 7: Practice**

*Have participants solve the conversions using any method.*

### **Slide 8: Practice Answers**

*Discuss the answers and methods used.*

### **Slide 9: Apothecary System title slide.**

### **Slide 10: Apothecary System**

The apothecary system of measurement was used in the United States until 1971, when it was replaced by the metric system.

One grain (gr) equals the weight of one grain of wheat. It is written using Roman numerals as seen here. Dram (dr) is another measurement in the apothecary system.

### **Slide 11: Household System title slide.**

### **Slide 12: Household System**

The household system is based off the apothecary system and is used in cooking, as in

cups and spoons. Most people who have used a recipe at home or in a commercial kitchen are familiar with the household system of measurement.

Household measurements of weight (mass) are based on the avoirdupois system, which, like the apothecary system, is antiquated. The avoirdupois system is only used to measure weight, and the basic unit is the ounce (oz).

The household system is used to measure volume, weight, and length. Household measurements of volume include the teaspoon (abbreviated tsp), tablespoon (abbreviated T), fluid ounce (fl oz), cup (c), pint (pt), quart (qt), and gallon (gal). You can use the ratio-proportion method to convert between measurements. Equivalencies should be memorized.

Optional video: Apothecary and Household System

<https://www.youtube.com/watch?v=afsN39JyFZA>

### **Slide 13: Volume**

Volume units include teaspoon (tsp), tablespoon (T), fluid ounce (fl oz, commonly known as ounce or oz), cup (c), pint (pt), quart (qt), and gallon (gal).

When converting, remember that 3 teaspoons = 1 tablespoon, 2 tablespoons = 1 fluid ounce, and 4 quarts = 1 gallon = 128 fluid ounces. As you can see in the box, fluid ounces can also be converted to cups, pints, and quarts.

### **Slide 14: Weight**

Household measurements for weight include ounces (oz), pounds (lbs.), and tons. One pound = 16 ounces. 2,000 pounds = 1 ton.

### Slide 15: Length

Household measurements for length include inch (in), foot (ft), yard (yd), and mile (mi). 12 inches = 1 foot, 3 feet = 1 yard, and 5,280 feet = 1,760 yards = 1 mile.

### Slide 16: Conversion Example

This is an example of how the ratio-proportion method is used to solve conversion.

**Slide 17:** Military (International) Time title slide.

### Slide 18: Traditional Versus Military Time

Traditional time is based on 12-hour increments. It begins at 12:00 a.m. (midnight) and the next 12 hours begin at 12:00 p.m. (noon).

Military time is one long increment of 24 hours. It begins at 0001 and ends at 2400. Both 0000 and 2400 represent midnight and no a.m. or p.m. is used when writing the time. Military time is also known as international time.

### Slide 19: Convert Traditional to Military

To convert traditional time to military time:

- From 12 a.m. to 12:59 a.m., replace 12 with 00, delete colon and “a.m.”
  - 12:45 a.m. = 0045
- Up to 9:59 a.m., place a 0 in front of the time, delete colon and “a.m.”
  - 8:30 a.m. = 0830
- From 10:00 a.m. to 12:59 p.m., delete colon and “a.m.” or “p.m.”
  - 11:15 a.m. = 1115

- After 12:59 p.m., delete colon and “p.m.”. Add 12 hours to the traditional time
  - 4:23 p.m. = 1623

### Slide 20: Convert Military to Traditional

To convert military time to traditional time:

- Before 1000, remove first zero, add colon and “a.m.”
  - 0705 = 7:05 a.m.
- From 1000 to 1159, add colon and “a.m.”
  - 1037 = 10:37 a.m.
- From 1200 to 1259, add colon and “p.m.”
  - 1251 = 12:51 p.m.
- After 1259 p.m., subtract 1200, add colon and “p.m.”
  - 1624 = 4:24 p.m.

### Slide 21: Let's Practice

*Ask participants to read the clock in traditional time and military time (a.m. and p.m.).*

### Slide 22: Let's Practice Answers

Answers:

Traditional = 12:27 a.m. or 12:27 p.m.

Military = 1227 or 0027

A common time conversion error made by students is to convert times between 12:01 a.m. and 12:59 a.m. to 2401 to 2459. The correct way is 0001 to 0059.

### Slide 23: Closing slide.



## Lesson Two – Math Review: Measurement Systems

### REVIEW: Measurement Systems

20 minutes

#### Purpose:

Participants will practice math questions using measurement systems.

#### Materials:

- *Culinary Math Student Workbook*
- *Math Review: Measurement Systems – Answer Key*

#### Facilitation Steps (these may have been completed as part of lecture):

1. Have participants complete the practice questions in the *Math Review: Measurement Systems* section of the student workbook.
2. Answer any questions that participants may have on the calculations.
3. Have participants self-check or peer-check their answers as you share them from the *Math Review: Measurement Systems – Answer Key*.

# Metric, Apothecary, Household, and Time – Answer Key

## Metric System

### Metric Conversion

- To convert quantities, use the ratio-proportion method
- Use known equivalencies
- Keep the unit of measurement in the numerators and denominators the same
- Cross-multiply and divide
- Label answer with units

Convert 250 milligrams to grams

$$\frac{1g}{1000mg} = \frac{xg}{250mg}$$

$$\frac{1g}{1000mg} \swarrow \searrow \frac{xg}{250mg}$$

$$1 \times 250 = 250$$

$$1000 \times X = 1000X$$

$$\frac{1000x}{1000} = \frac{250}{1000} = 0.25 g$$

### Practice Questions

- 1) Convert 3000 milliliters to liters.

Move decimal 3 spots to the

left = **3 L**

- 2) Convert 450 kilograms to milligrams.

Move decimal 6 spots to the

right = **450, 000, 000 mg**

- 3) Convert 6.25 meters to millimeters.

Move decimal 3 spots to the

right = **6,250 mm**

## Apothecary

### Converting

- 1 grain (gr) = weight of one grain of wheat
  - 2 grains are written gr ii
  - 1 grain (or gr i) = 60 milligrams
- 1 dram (dr) = 60 grains

### Practice Questions

- 1) Convert 4 grains to milligrams.

$$\frac{1 \text{ gr}}{60 \text{ mg}} = \frac{4 \text{ gr}}{x \text{ mg}}$$

$$4 \times 60 = 240$$

$$1 \times X = 1X$$

$$\frac{1x}{1} = \frac{240}{1} = \mathbf{240 \text{ mg}}$$

- 2) Convert 3 drams to milligrams.

$$\frac{1 \text{ dr}}{60 \text{ gr}} = \frac{3 \text{ dr}}{x \text{ gr}} =$$

$$3 \times 60 = 180$$

$$1 \times X = 1X$$

$$\frac{1x}{1} = \frac{180}{1} = 180 \text{ gr}$$

$$\frac{1 \text{ gr}}{60 \text{ mg}} = \frac{180 \text{ gr}}{x \text{ mg}} =$$

$$180 \times 60 = 10,800$$

$$1 \times X = 1X$$

$$\frac{1x}{1} = \frac{10800}{1} = \mathbf{10,800 \text{ mg}}$$

# Household

## Volume

- Includes teaspoon (tsp), tablespoon (T), fluid ounce (fl oz), commonly referred to as ounce (oz), cup (c), pint (pt), quart (qt), and gallon (gal)
- 3 teaspoons = 1 tablespoon
- 2 tablespoons = 1 fluid ounce
- 4 quarts = 1 gallon = 128 fluid ounces

## Weight

- Includes ounces (oz), pounds (lbs.), and tons
- 1 lb. = 16 oz
- 2,000 lbs. = 1 ton

## Length

- Includes inch (in), foot (ft), yard (yd), and mile (mi)
- 12 inches = 1 foot
- 5,280 feet = 1,760 yards = 1 mile

## Practice Questions

- 1) How many tablespoons are there in 12 fluid ounces?

$$\frac{1 \text{ fl oz}}{2 \text{ T}} = \frac{12 \text{ fl oz}}{x \text{ T}}$$

$$2 \times 12 = 24$$

$$1 \times X = 1X$$

$$\frac{1x}{1} = \frac{24}{1} = \mathbf{24 \text{ T}}$$

- 2) How many ounces are in 4.5 pounds?

$$\frac{16 \text{ oz}}{1 \text{ lb}} = \frac{x \text{ oz}}{4.5 \text{ lbs.}}$$

$$16 \times 4.5 = 72$$

$$1 \times X = 1X$$

$$\frac{1x}{1} = \frac{72}{1} = \mathbf{72 \text{ oz}}$$

- 3) A girl is 5 foot 2 inches.  
How tall is she in inches?

$$\frac{12 \text{ in}}{1 \text{ ft}} = \frac{x \text{ in}}{5 \text{ ft}}$$

$$12 \times 5 = 60$$

$$1 \times X = 1X$$

$$\frac{1x}{1} = \frac{60}{1} = 60 + 2 =$$

**62 inches**

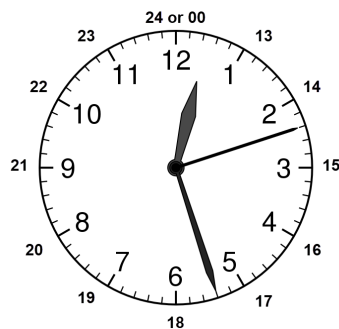
## **Military/International Time**

### **Traditional time (12 hours)**

- Begins at 12:00 a.m. (midnight) and second 12 hours begins at 12:00 p.m. (noon)

### **Military time (24 hours)**

- Begins at 0001 and ends at 2400
- Both 0000 and 2400 represent midnight
- No a.m. or p.m. is used
- No colons are used



### **Practice Questions**

- 1) Convert 6:15 p.m. to military time.

**1815**

- 2) Convert 1945 to traditional time.

**7:45 p.m.**

# Lesson Three – Math Review: Conversions

## Lesson Overview

*In lesson three, participants will learn to convert between measurement systems. After the lesson, participants will take part in activities based on what they have learned.*

## Lesson Objectives

After completing this lesson, participants will be able to:

- Convert between U.S. customary and metric length measurements
- Convert between household and metric volume measurements
- Convert between household and metric weight measurements
- Convert between U.S. customary and metric temperature measurements

## Lesson at a Glance

| Activity | Materials                                                                                                                                                                                                                                           | Preparation                                                                                                                                                                                                             | Approximate class time                       |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| FOCUS    | <ul style="list-style-type: none"><li>• <i>Culinary Math Student Workbook</i></li><li>• <i>Math Review: Conversions Pre-Quiz – Answer Key</i></li></ul>                                                                                             | <ul style="list-style-type: none"><li>• Access <i>Math Review: Conversions Pre-Quiz</i> section in the student workbook</li></ul>                                                                                       | 10 minutes                                   |
| LEARN    | <ul style="list-style-type: none"><li>• <i>Math Review: Conversions</i> slide presentation</li><li>• <i>Culinary Math Student Workbook</i> (optional)</li><li>• <i>Math Review: Conversions</i> online lesson</li></ul>                             | <ul style="list-style-type: none"><li>• Prepare <i>Math Review: Conversions</i> slide presentation for viewing</li></ul>                                                                                                | 30 minutes                                   |
| REVIEW   | <ul style="list-style-type: none"><li>• <i>Culinary Math Student Workbook</i></li><li>• <i>Math Review: Conversions – Answer Key</i></li><li>• <i>Math Review Summative Quiz</i></li><li>• <i>Math Review Summative Quiz – Answer Key</i></li></ul> | <ul style="list-style-type: none"><li>• Access <i>Math Review: Conversions</i> section in the student workbook</li><li>• Print off and distribute the <i>Math Review Summative Quiz</i> (one per participant)</li></ul> | 20 minutes (can be completed during lecture) |

## Lesson Three – Math Review: Conversions

### FOCUS: Math Review: Conversions Pre-Quiz

10 minutes

#### Purpose:

To assess participants' current knowledge of converting between measurement systems.

#### Materials:

- *Culinary Math Student Workbook*
- *Math Review: Conversions Pre-Quiz – Answer Key*

#### Facilitation Steps:

1. Instruct participants to complete the *Math Review: Conversions Pre-Quiz*, located in the student workbook, prior to or at the start of the class.
2. Have the *Math Review: Conversions Pre-Quiz – Answer Key* available for instructor reference.
3. Have participants pair up and compare answers.

# Conversions Pre-Quiz – Answer Key

Read each question and calculate the correct answer.

- 1) Convert 10 centimeters to inches.

$$10 / 2.54 = \mathbf{3.937 \text{ inches} = A}$$

- 2) Convert 3 feet to yards.

$$3 \text{ feet} = \mathbf{1 \text{ yard} = B}$$

- 3) Convert 4 meters to feet.

$$\frac{1 \text{ ft}}{0.3048 \text{ m}} = \frac{x \text{ ft}}{4 \text{ m}}$$

$$1 \times 4 = 4$$

$$0.3048 \times X = 0.3048x$$

$$\frac{0.3048x}{0.3048 \times} = \frac{4}{0.3048} = \mathbf{13.12 \text{ feet} = D}$$

- 4) Convert 15 milliliters to teaspoons.

$$1 \text{ teaspoon} = 5 \text{ mL}$$

$$15 / 5 = \mathbf{3 \text{ teaspoons} = C}$$

- 5) Convert 3 tablespoons to milliliters.

$$1 \text{ tablespoon} = 15 \text{ mL}$$

$$3 \times 15 = \mathbf{45 \text{ milliliters} = A}$$

- 6) Convert 0.5 liters to fluid ounces.

$$32 \text{ fluid ounces} = 1 \text{ L}$$

$$0.5 \times 32 = \mathbf{16 \text{ fluid ounces} = C}$$

- 7) Convert 2 kilograms to pounds.

$$2.2 \text{ pounds} = 1 \text{ kilogram}$$

$$2.2 \times 2 = \mathbf{4.4 \text{ pounds} = B}$$

- 8) Convert 0.5 pounds to grams.

$$1 \text{ pound} = 454 \text{ grams}$$

$$454 \times 0.5 = \mathbf{227 \text{ grams} = D}$$

- 9) Convert 102°F to °C.

$$(^{\circ}\text{F} - 32) \times 0.5556 = ^{\circ}\text{C}$$

$$(102 - 32) \times 0.5556 = \mathbf{38.9^{\circ}\text{C} = C}$$

- 10) Convert 39.2°C to °F.

$$(^{\circ}\text{C} \times 1.8) + 32 = ^{\circ}\text{F}$$

$$(39.2 \times 1.8) + 32 = \mathbf{102.6^{\circ}\text{F} = D}$$



## Lesson Three – Math Review: Conversions

### LEARN: Conversions Slide Presentation

30 minutes

#### Purpose:

Participants will learn how to convert between measurement systems.

#### Materials:

- *Math Review: Conversions* slide presentation
- *Culinary Math Student Workbook* (optional)
- *Math Review: Conversions* online lesson

#### Facilitation Steps:

1. Share the following information with participants as you show the slide presentation.

Optional: You may complete practice problems in the student workbook as part of the lecture.

Note to instructor: In lieu of the slide presentation, you may assign the *Math Review: Conversions* online lesson. It covers all the same content but allows participants to learn at a self-paced speed

**Slide 1:** Introduction slide.

**Slide 2:** Objectives

At the end of this lesson, you will be able to:

- Convert between U.S. customary and metric length measurements
- Convert between household and metric volume measurements

- Convert between household and metric weight measurements
- Convert between U.S. customary and metric temperature measurements

**Slide 3:** Length title slide.

**Slide 4:** U.S. Customary to Metric – Length

The units of feet and inches are called “United States customary units.” It historically comes from the British imperial system that existed before they went to metric.

The United States is one of only a few countries that have not fully adopted the metric system. Here are the conversions, but it should be noted that you may find these rounded.

Optional video: Metric System Explained Simply

[https://www.youtube.com/watch?v=1TICcW\\_mugs](https://www.youtube.com/watch?v=1TICcW_mugs)

**Slide 5:** Let’s Practice

Have participants select the formula and calculate.

**Slide 6:** Let’s Practice Solution

Review answer with participants.

**Slide 7:** Volume title slide.

**Slide 8:** Household to Metric – Volume

Household to metric conversions are often seen in liquid measurement.

**Slide 9:** Let's Practice

Have participants select the formula and calculate.

**Slide 10:** Let's Practice Solution

Review answer with participants.

**Slide 11:** Weight title slide.

**Slide 12:** Household to Metric – Weight

When cooking from a recipe, ensuring that you have the right amount of each ingredient is one of the most important aspects of getting the recipe right and having the dish taste great.

Most recipes will specify the amount of each ingredient as a weight with European recipes generally being in kilograms and grams. American recipes generally use pounds and ounces.

**Slide 13:** Let's Practice

Have participants select the formula and calculate.

**Slide 14:** Let's Practice Solution

Review answer with participants.

**Slide 15:** Temperature title slide.

**Slide 16:** U.S Customary to Metric – Temperature

The Fahrenheit scale is based on 32° for the freezing point of water and 212° for the boiling point of water. The Celsius scale, also called centigrade, is based on 0° for the freezing point of water and 100° for the boiling point of water. Like the potential for errors with weight-based dosing, errors regarding temperature are also common.

**Slide 17:** Let's Practice

Have participants select the formula and calculate.

**Slide 18:** Let's Practice Solution

Review answer with participants.

**Slide 19:** Closing slide.

## Lesson Three – Math Review: Conversions

### REVIEW: Conversions

**20 minutes**

**Purpose:**

Participants will practice converting between measurement systems.

**Materials:**

- *Culinary Math Student Workbook*
- *Math Review: Conversions – Answer Key*
- *Math Review: Summative Quiz*
- *Math Review Summative Quiz – Answer Key*

**Facilitation Steps (this may have been completed as part of the lecture):**

1. Have participants complete the practice questions in the *Math Review: Conversions* section in the student workbook.
2. Answer any questions participants may have on the calculations.
3. Have participants self-check or peer-check their answers as you share them from the *Math Review: Conversions – Answer Key*.
4. At the conclusion of the lesson, allow time for students to complete the *Math Review: Summative Quiz*. If desired, this could be completed in a subsequent class or as an open-book quiz. The answer key is provided for ease of grading.

# Conversions – Answer Key

## Length

### U.S. Customary to Metric

- United States customary units are inches and feet
- 1 inch = 2.54 centimeters
- 1 foot = 0.3048 meters = 30.48 centimeters
- 3 feet = 1 yard

Convert 2.5 inches to centimeters.

$$\frac{1 \text{ inch}}{2.54 \text{ cm}} = \frac{2.5 \text{ inches}}{x \text{ cm}}$$

$$2.5 \times 2.54 = 6.35$$

$$1 \times X = 1 \times$$

$$\frac{1 \times}{1} = \frac{6.35}{1} = 6.35 \text{ cm}$$

### Practice Questions

- 1) Convert 3 meters to feet.

$$\frac{0.3048 \text{ m}}{1 \text{ ft}} = \frac{3 \text{ m}}{x \text{ ft}}$$

$$3 \times 1 = 3$$

$$0.3048 \times X = 0.3048 \times$$

$$\frac{0.3048 \times}{0.3048} = \frac{3}{0.3048} = \mathbf{9.8 \text{ ft}}$$

- 2) Convert 7 inches to centimeters.

$$\frac{1 \text{ in}}{2.54 \text{ cm}} = \frac{7 \text{ in}}{x \text{ cm}}$$

$$7 \times 2.54 = 17.78$$

$$1 \times X = 1 \times$$

$$\frac{1 \times}{1} = \frac{17.78}{1} = \mathbf{17.78 \text{ ft}}$$

3) Convert 4 feet into yards.

$$\frac{3 \text{ ft}}{1 \text{ yd}} = \frac{4 \text{ ft}}{x \text{ yds}}$$

$$4 \times 1 = 4$$

$$3x \ X = 3x$$

$$\frac{3x}{3} = \frac{4}{3} = 1.33 \text{ yds}$$

## Volume

### Household to Metric

- 1 teaspoon = 5 milliliters
- 1 tablespoon = 15 milliliters
- 1 fluid ounce = 30 milliliters
- 32 fluid ounces = 1 liter

Convert 3 tablespoons to milliliters,

$$\frac{1 \text{ T}}{15 \text{ mL}} = \frac{3 \text{ T}}{x \text{ mL}}$$

$$15 \times 3 = 45$$

$$1 \times X = 1 \times$$

$$\frac{1x}{1} = \frac{45}{1} = 45 \text{ mL}$$

### Practice Questions

- 1) Convert 60 milliliters to tablespoons.

$$\frac{1 \text{ T}}{15 \text{ mL}} = \frac{x \text{ T}}{60 \text{ mL}}$$

$$60 \times 1 = 60$$

$$15 \times X = 15x$$

$$\frac{15x}{15} = \frac{60}{15} = \mathbf{4 \text{ T}}$$

- 2) Convert 2.5 liters to fluid ounces.

$$\frac{1 \text{ L}}{32 \text{ fl oz}} = \frac{2.5 \text{ L}}{x \text{ fl oz}}$$

$$2.5 \times 32 = 80$$

$$1 \times X = 1x$$

$$\frac{1x}{1} = \frac{80}{1} = \mathbf{80 \text{ fl. oz}}$$

# Weight

## Household to Metric

- 1 pound = 454 grams
- 2.2 pounds = 1 kilogram

Convert 150 pounds to kilograms:  $\frac{2.2 \text{ lbs.}}{1 \text{ kg}} = \frac{150 \text{ lbs.}}{x \text{ kg}}$

$$1 \times 150 = 150$$

$$2.2 \times X = 2.2x$$

$$\frac{2.2 x}{2.2} = \frac{150}{2.2} = 68.2 \text{ kg}$$

## Practice Questions

- 1) Convert 200 grams to pounds.

$$\frac{1 \text{ lb.}}{454 \text{ g}} = \frac{x \text{ lbs.}}{200 \text{ g}}$$

$$1 \times 200 = 200$$

$$454 \times X = 454x$$

$$\frac{454x}{454} = \frac{200}{454} = \mathbf{0.44 \text{ lbs.}}$$

- 2) Convert 225 pounds to kilograms.

$$\frac{2.2 \text{ lbs.}}{1 \text{ kg}} = \frac{225 \text{ lbs.}}{x \text{ kg}}$$

$$1 \times 225 = 225$$

$$2.2 \times X = 2.2x$$

$$\frac{2.2 x}{2.2} = \frac{225}{2.2} = \mathbf{102.3 \text{ kg}}$$

# Temperature

## U.S. Customary to Metric

- The Fahrenheit scale is based on 32° for the freezing point of water and 212° for the boiling point of water
- The Celsius scale, also called centigrade, is based on 0° for the freezing point of water and 100° for the boiling point of water

### Celsius to Fahrenheit

$$(^{\circ}\text{C} \times 1.8) + 32 = ^{\circ}\text{F}$$

Note:  $\frac{9}{5}$  can be used instead of 1.8.

### Fahrenheit to Celsius

$$(^{\circ}\text{F} - 32) \times 0.5556 = ^{\circ}\text{C}$$

Note:  $\frac{5}{9}$  can be used instead of 0.5556.

## Practice Questions

- 1) Convert 99.1°F to °C.

$$(99.1 - 32) \times 0.5556 =$$

**37.3°C**

- 2) Convert 38.6°C to °F.

$$(38.6 \times 1.8) + 32 =$$

**101.5°F**



Name: \_\_\_\_\_ Class: \_\_\_\_\_

# Math Review Summative Quiz

Read each question and calculate the correct answer.

- 1) Mr. Thomas ate  $\frac{7}{8}$  of his meal and Mrs. Thomas ate  $\frac{9}{11}$  of her meal. Who ate more of the meal?
  - a) Mr. Thomas
  - b) Mrs. Thomas
  - c) Neither, they ate the same amount
- 2) Mr. Lambert drank  $\frac{4}{5}$  of his water pitcher in the morning and  $\frac{1}{6}$  of his water pitcher in the afternoon. How much of the water did he drink in total?
  - a)  $\frac{29}{30}$
  - b)  $\frac{15}{18}$
  - c)  $\frac{5}{11}$
  - d)  $1\frac{3}{63}$
- 3) Subtract:  $\frac{3}{4} - \frac{4}{7} =$ 
  - a)  $1\frac{9}{28}$
  - b)  $\frac{5}{28}$
  - c)  $\frac{3}{7}$
  - d)  $1\frac{5}{16}$
  - e)  $\frac{4}{90}$
- 4) Multiply:  $\frac{1}{5} \times \frac{6}{16} =$ 
  - a)  $\frac{23}{40}$
  - b)  $\frac{-7}{40}$
  - c)  $\frac{3}{40}$
  - d)  $\frac{8}{15}$
- 5) Divide:  $\frac{1}{2} \div \frac{2}{3} =$ 
  - a)  $\frac{1}{3}$
  - b)  $\frac{-1}{6}$
  - c)  $1\frac{1}{16}$
  - d)  $\frac{3}{4}$
- 6) Round 0.259 to the tenths.
  - a) 0.3
  - b) 0.26
  - c) 0.2
  - d) 0.25
- 7) Subtract:  $0.583 - 0.21 =$ 
  - a) 0.562
  - b) 0.373
  - c) 0.793
  - d) 0.41
- 8) Multiply:  $4.36 \times 1.25 =$ 
  - a) 3.49
  - b) 5.61
  - c) 5.45
  - d) 4.5
- 9) Convert  $\frac{9}{12}$  to a percent.
  - a) 7.5%
  - b) 75%
  - c) 0.75%
  - d) 1.3%
- 10) Solve for x:  $\frac{5}{6} = \frac{25}{x}$ 
  - a) 30
  - b) 1.2
  - c) 21
  - d) 120

- 11) Convert 365 micrograms to milligrams.  
a) 0.365  
b) 365,000  
c) 3.65  
d) 3650
- 12) Convert 26.7 grams to kilograms.  
a) 267,000  
b) 0.267  
c) 0.0267  
d) 2.67
- 13) Convert 1.25 centimeters to millimeters.  
a) 0.0125  
b) 12.5  
c) 1250  
d) 12,500
- 14) Convert 20 milligrams to grains.  
a) 0.3  
b) 0.02  
c) 3  
d) 0.5
- 15) How many teaspoons are in 2 tablespoons?  
a) 12  
b) 9  
c) 6  
d) 0.5
- 16) Convert 10 quarts to gallons.  
a) 0.25  
b) 0.5  
c) 1.5  
d) 2.5
- 17) Convert 3 pounds to ounces.  
a) 48  
b) 64  
c) 32  
d) 24
- 18) How many feet is 108 inches?  
a) 7.5  
b) 8  
c) 8.5  
d) 9
- 19) A chef on a military based was to report to work at 1945. In traditional time, when did the chef's shift start?  
a) 7:45 a.m.  
b) 9:45 a.m.  
c) 7:45 p.m.  
d) 9:45 p.m.
- 20) A reservation was made at a restaurant for 12:05 a.m. In military time, when is the reservation?  
a) 1205  
b) 2305  
c) 0005  
d) 0105
- 21) Convert 4 inches to centimeters.  
a) 10.2  
b) 8.6  
c) 20.1  
d) 5.4
- 22) Convert 3 yards to feet.  
a) 0.5  
b) 1  
c) 6.5  
d) 9
- 23) Convert 2 meters to feet.  
a) 12.5  
b) 6.6  
c) 24.4  
d) 13.1
- 24) Convert 10 milliliters to teaspoons.  
a) 1  
b) 2  
c) 3  
d) 4
- 25) Convert 2 tablespoons to milliliters.  
a) 10  
b) 15  
c) 30  
d) 45

26) Convert 3 liters to fluid ounces.

- a) 32
- b) 36
- c) 48
- d) 101

27) A pumpkin weighs 8.8 kilograms. How much does the pumpkin weigh in pounds?

- a) 4
- b) 6.6
- c) 19.4
- d) 22

28) Convert 3 pounds to grams.

- a) 151.3
- b) 454
- c) 908
- d) 1361

29) A person's temperature is 98.6°F. What would the temperature be in °C?

- a) 37
- b) 37.8
- c) 38
- d) 39.3

30) A person's temperature is 36.8°C. What would the temperature be in °F?

- a) 99.1
- b) 98.2
- c) 100.8
- d) 101

# Math Review Summative Quiz –

## Answer Key

Read each question and calculate the correct answer.

- 1) Mr. Thomas ate  $\frac{7}{8}$  of his meal and Mrs. Thomas ate  $\frac{9}{11}$  of her meal. Who ate more of the meal?  
**a) Mr. Thomas**  
 b) Mrs. Thomas  
 c) Neither, they ate the same amount.
- 2) Mr. Lambert drank  $\frac{4}{5}$  of his water pitcher in the morning and  $\frac{1}{6}$  of his water pitcher in the afternoon. How much of the water did he drink in total?  
**a)  $\frac{29}{30}$**   
 b)  $\frac{15}{18}$   
 c)  $\frac{5}{11}$   
 d)  $1\frac{3}{63}$
- 3) Subtract:  $\frac{3}{4} - \frac{4}{7} =$   
 a)  $1\frac{9}{28}$   
**b)  $\frac{5}{28}$**   
 c)  $\frac{3}{7}$   
 d)  $1\frac{5}{16}$   
 e)  $\frac{4}{90}$
- 4) Multiply:  $\frac{1}{5} \times \frac{6}{16} =$   
 a)  $\frac{23}{40}$   
 b)  $\frac{-7}{40}$   
**c)  $\frac{3}{40}$**   
 d)  $\frac{8}{15}$
- 5) Divide:  $\frac{1}{2} \div \frac{2}{3} =$   
 a)  $\frac{1}{3}$   
 b)  $\frac{-1}{6}$   
 c)  $1\frac{1}{16}$   
**d)  $\frac{3}{4}$**
- 6) Round 0.259 to the tenths.  
**a) 0.3**  
 b) 0.26  
 c) 0.2  
 d) 0.25
- 7) Subtract:  $0.583 - 0.21 =$   
 a) 0.562  
**b) 0.373**  
 c) 0.793  
 d) 0.41
- 8) Multiply:  $4.36 \times 1.25 =$   
 a) 3.49  
 b) 5.61  
**c) 5.45**  
 d) 4.5
- 9) Convert  $\frac{9}{12}$  to a percent.  
 a) 7.5%  
**b) 75%**  
 c) 0.75%  
 d) 1.3%
- 10) Solve for x:  $\frac{5}{6} = \frac{25}{x}$   
**a) 30**  
 b) 1.2  
 c) 21  
 d) 120

- 11) Convert 365 micrograms to milligrams.  
**a) 0.365**  
b) 365,000  
c) 3.65  
d) 3650
- 12) Convert 26.7 grams to kilograms.  
a) 267,000  
b) 0.267  
**c) 0.0267**  
d) 2.67
- 13) Convert 1.25 centimeters to millimeters.  
a) 0.0125  
**b) 12.5**  
c) 1250  
d) 12,500
- 14) Convert 20 milligrams to grains.  
**a) 0.3**  
b) 0.02  
c) 3  
d) 0.5
- 15) How many teaspoons are in 2 tablespoons?  
a) 12  
b) 9  
**c) 6**  
d) 0.5
- 16) Convert 10 quarts to gallons.  
a) 0.25  
b) 0.5  
c) 1.5  
**d) 2.5**
- 17) Convert 3 pounds to ounces.  
**a) 48**  
b) 64  
c) 32  
d) 24
- 18) How many feet is 108 inches?  
a) 7.5  
b) 8  
c) 8.5  
**d) 9**
- 19) A chef on a military based was to report to work at 1945. In traditional time, when did the chef's shift start?  
a) 7:45 a.m.  
b) 9:45 a.m.  
**c) 7:45 p.m.**  
d) 9:45 p.m.
- 20) A reservation was made at a restaurant for 12:05 a.m. In military time, when is the reservation?  
a) 1205  
b) 2305  
**c) 0005**  
d) 0105
- 21) Convert 4 inches to centimeters.  
**a) 10.2**  
b) 8.6  
c) 20.1  
d) 5.4
- 22) Convert 3 yards to feet.  
a) 0.5  
b) 1  
c) 6.5  
**d) 9**
- 23) Convert 2 meters to feet.  
a) 12.5  
**b) 6.6**  
c) 24.4  
d) 13.1
- 24) Convert 10 milliliters to teaspoons.  
a) 1  
**b) 2**  
c) 3  
d) 4
- 25) Convert 2 tablespoons to milliliters.  
a) 10  
b) 15  
**c) 30**  
d) 45

26) Convert 3 liters to fluid ounces.

- a) 32
- b) 36
- c) 48
- d) 101**

27) A pumpkin weighs 8.8 kilograms. How much does the pumpkin weigh in pounds?

- a) 4
- b) 6.6
- c) 19.4**
- d) 22

28) Convert 3 pounds to grams.

- a) 151.3
- b) 454
- c) 908
- d) 1361**

29) A person's temperature is 98.6°F. What would the temperature be in °C?

- a) 37**
- b) 37.8
- c) 38
- d) 39.3

30) A person's temperature is 36.8°C. What would the temperature be in °F?

- a) 99.1
- b) 98.2**
- c) 100.8
- d) 101

# Appendix A – Conversion Abbreviations

|                    |              |
|--------------------|--------------|
| <b>micrograms</b>  | <b>mcg</b>   |
| <b>milligram</b>   | <b>mg</b>    |
| <b>gram</b>        | <b>g</b>     |
| <b>kilogram</b>    | <b>kg</b>    |
| <b>pound</b>       | <b>lb</b>    |
| <b>ounce</b>       | <b>oz</b>    |
| <b>grain</b>       | <b>gr</b>    |
| <b>dram</b>        | <b>dr</b>    |
| <b>teaspoon</b>    | <b>tsp</b>   |
| <b>tablespoon</b>  | <b>T</b>     |
| <b>milliliters</b> | <b>mL</b>    |
| <b>liter</b>       | <b>L</b>     |
| <b>fluid ounce</b> | <b>fl oz</b> |
| <b>cup</b>         | <b>c</b>     |
| <b>pint</b>        | <b>pt</b>    |
| <b>quart</b>       | <b>qt</b>    |
| <b>gallon</b>      | <b>gal</b>   |
| <b>inch</b>        | <b>in</b>    |
| <b>foot</b>        | <b>ft</b>    |
| <b>yard</b>        | <b>yd</b>    |
| <b>millimeters</b> | <b>mm</b>    |
| <b>centimeters</b> | <b>cm</b>    |
| <b>meters</b>      | <b>m</b>     |

# Appendix B – Conversions

|                      |                         |                          |                        |                         |
|----------------------|-------------------------|--------------------------|------------------------|-------------------------|
| <b>1 milligram</b>   | <b>1,000 micrograms</b> |                          |                        |                         |
| <b>1 gram</b>        | <b>1,000 milligrams</b> | <b>15-16 grains</b>      |                        |                         |
| <b>1 pound</b>       | <b>454 grams</b>        | <b>16 ounces</b>         |                        |                         |
| <b>1 ton</b>         | <b>2,000 pounds</b>     |                          |                        |                         |
| <b>1 kilogram</b>    | <b>1,000 grams</b>      | <b>2.2 pounds</b>        |                        |                         |
| <b>1 grain</b>       | <b>60 milligrams</b>    |                          |                        |                         |
| <b>1 dram</b>        | <b>60 grains</b>        |                          |                        |                         |
| <b>1 teaspoon</b>    | <b>5 milliliters</b>    |                          |                        |                         |
| <b>1 tablespoon</b>  | <b>3 teaspoons</b>      | <b>15 milliliters</b>    |                        |                         |
| <b>1 fluid ounce</b> | <b>2 tablespoons</b>    | <b>30 milliliters</b>    |                        |                         |
| <b>1 cup</b>         | <b>½ pint</b>           | <b>8 fluid ounces</b>    |                        |                         |
| <b>1 pint</b>        | <b>2 cups</b>           | <b>16 fluid ounces</b>   | <b>480 milliliters</b> |                         |
| <b>1 quart</b>       | <b>2 pints</b>          | <b>4 cups</b>            | <b>32 ounces</b>       | <b>1 liter</b>          |
| <b>1 gallon</b>      | <b>4 quarts</b>         | <b>8 pints</b>           | <b>16 cups</b>         | <b>128 fluid ounces</b> |
| <b>1 inch</b>        | <b>2.54 centimeters</b> |                          |                        |                         |
| <b>1 foot</b>        | <b>12 inches</b>        | <b>30.48 centimeters</b> | <b>0.348 meters</b>    |                         |
| <b>1 yard</b>        | <b>3 feet</b>           |                          |                        |                         |
| <b>1 meter</b>       | <b>100 centimeters</b>  | <b>1000 millimeters</b>  |                        |                         |
| <b>1 mile</b>        | <b>5,280 feet</b>       | <b>1,760 yards</b>       |                        |                         |

## Temperature Conversion:

|           |                           |  |  |  |
|-----------|---------------------------|--|--|--|
| <b>°C</b> | <b>(°F - 32) x 0.5556</b> |  |  |  |
| <b>°F</b> | <b>(°C x 1.8) + 32</b>    |  |  |  |



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## Lesson Four – Culinary Math: Calculating Food Costs

### Lesson Overview

*Participants will learn how to calculate food costs to determine the cost of recipes as well as menu prices for a restaurant or food service establishment. After the lesson, participants will apply what they have learned using hands-on activities to solve authentic problems encountered in the industry.*

### Lesson Objectives

After completing this lesson, participants will be able to:

- Calculate the unit costs of food items
- Understand as purchased and edible portion in determining costs
- Calculate Baker's Batch Costing
- Calculate raw food cost of recipes and the cost per serving
- Calculate menu prices using the food cost percentage method

### Lesson at a Glance

| Activity | Materials                                                                                                                                                                                                                                                                                                                                     | Preparation                                                                                                                                                                                                                                                                          | Approximate class time |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| FOCUS    | <ul style="list-style-type: none"> <li>• <i>Culinary Math Student Workbook</i></li> <li>• <i>Culinary Math: Calculating Food Costs Pre-Quiz – Answer Key</i></li> </ul>                                                                                                                                                                       | <ul style="list-style-type: none"> <li>• Access <i>Culinary Math: Calculating Food Costs Pre-Quiz</i> section in the student workbook</li> </ul>                                                                                                                                     | 10 minutes             |
| LEARN    | <ul style="list-style-type: none"> <li>• <i>Culinary Math: Calculating Food Costs</i> slide presentation</li> <li>• <i>Culinary Math Student Workbook</i></li> <li>• <i>Culinary Math: Calculating Food Costs</i> online lesson</li> <li>• Food scale(s)</li> <li>• Food item(s)</li> <li>• Calculator(s)</li> <li>• Pen and paper</li> </ul> | <ul style="list-style-type: none"> <li>• Become familiar with specialized vocabulary</li> <li>• Prepare <i>Culinary Math: Calculating Food Costs</i> slide presentation for viewing</li> <li>• Gather the food scale(s), food item(s), calculator(s), and pens and papers</li> </ul> | 60 minutes             |
| REVIEW   | <ul style="list-style-type: none"> <li>• <i>Culinary Math Student Workbook</i></li> <li>• <i>Culinary Math: Calculating Food Costs – Answer Key</i></li> </ul>                                                                                                                                                                                | <ul style="list-style-type: none"> <li>• Access <i>Culinary Math: Calculating Food Costs</i> pages in the student workbook</li> </ul>                                                                                                                                                | 20 minutes             |

## Lesson Four – Culinary Math: Calculating Food Costs

### FOCUS: Calculating Food Costs Pre-Quiz

**10 minutes**

**Purpose:**

To assess participants' current knowledge of food costing calculations.

**Materials:**

- *Culinary Math Student Workbook*
- *Culinary Math: Calculating Food Costs Pre-Quiz – Answer Key*

**Facilitation Steps:**

1. Instruct participants to complete the *Culinary Math: Calculating Food Costs Pre-Quiz*, located in the student workbook, prior to or at the start of class.
2. Have the *Culinary Math: Calculating Food Costs Pre-Quiz – Answer Key* available for instructor reference.
3. Have participants pair up and compare answers. Review the answers with participants with the aim of identifying strengths and weaknesses. This should be done with the purpose of guiding future instruction. What concepts do you need to spend more time on? What concepts do participants already have a firm understanding of?

# Calculating Food Costs

## Pre-Quiz – Answer Key

Read each question and calculate the correct answer. Solve using any method.

1. What is the as purchase cost of food?
  - a) It's not that important; chefs just cook
  - b) The amount of money spent on the raw ingredients**
  - c) The food that the guest pays for
  - d) The cost of employee meals
2. What is the edible portion cost?
  - a) The cost of the amount of the ingredient that is actually going into the recipe**
  - b) The food the guest eats
  - c) The food the guest leaves on their plate
  - d) The part of the ingredient that is the nicest to eat
3. What is the unit cost formula?
  - a) As-purchased cost - Edible portion cost
  - b) As purchased unit - Units purchased
  - c) As-purchased cost \* Units purchased
  - d) As-purchased cost / Units purchased**
4. You buy 12 lbs. of tomatoes to make a marinara sauce. You paid \$15.84. What is the unit cost of the tomatoes?
  - a) \$19.08
  - b) \$1.32**
  - c) \$3.84
  - d) \$27.84
5. What is the formula to calculate the cost per serving?
  - a) Cost of recipe \* Recipe yield
  - b) Cost of recipe + Recipe yield
  - c) Cost of recipe - Recipe yield
  - d) Cost of recipe / Recipe yield**
6. The food cost for a gumbo recipe is \$88.76. The recipe yields 28 servings. What is the food cost per serving?
  - a) \$60.76
  - b) \$116.76
  - c) \$3.17**
  - d) \$2,485.28

7. What is the food cost percentage formula?

- a)  $\$ \text{ Food cost } * \text{ Menu price}$
- b)  $\$ \text{ Food cost } / \text{ Menu price}$**
- c)  $\$ \text{ Food cost } + \text{ Menu price}$
- d)  $\$ \text{ Food cost } - \text{ Menu price}$

8. What is the menu price formula?

- a)  $\$ \text{ Food cost } / \text{ Food cost } \%$**
- b)  $\$ \text{ Food cost } * \text{ Food cost } \%$
- c)  $\$ \text{ Food cost } + \text{ Food cost } \%$
- d)  $\$ \text{ Food cost } - \text{ Food cost } \%$

9. The food cost for a menu item is \$3.50. The chef wants a 34% food cost. What should the menu price be?

- a) \$10.29**
- b) \$1.19
- c) \$37.50
- d) \$3.16

10. A menu item is priced at \$12 and has a 32% food cost. What is the food cost in dollars for the menu item?

- a) \$35.29
- b) \$11.68
- c) \$3.84**
- d) \$12.32

## Lesson Four – Culinary Math: Calculating Food Costs

# LEARN: Calculating Food Costs Slide Presentation

60 minutes

### Purpose:

Participants will learn how to calculate food cost for restaurants and other food service establishments.

### Materials:

- *Culinary Math: Calculating food Costs* slide presentation
- *Culinary Math Student Workbook*
- *Culinary Math: Calculating Food Costs* online lesson
- Food scale(s)
- Food item(s)
- Calculator(s)
- Pen and paper

### Facilitation Steps:

1. Share the following information with participants as you show the slide presentation.

Note to instructor: In lieu of the slide presentation, you may assign *Culinary Math: Calculating Food Costs* online lesson. It covers all the same content but allows participants to learn at a self-paced speed.

**Slide 1:** Introduction slide.

**Slide 2:** Objectives

At the end of this lecture, you should be able to:

- Calculate the unit costs of food items
- Understand as purchased and edible

portion in determining costs

- Understand Baker's Batch Costing
- Calculate raw food cost of recipes and the cost per serving
- Calculate menu prices using the food cost percentage method

**Slide 3:** Calculating Food Cost title slide

Have participants access the *Food Cost Vocabulary Graphic Organizer* in the student workbook. Participants should complete the columns as the information is shared in the slide presentation.

**Slide 4:** Food Cost

Discussion Question: Why do chefs need to understand Food Cost?

Potential answers: To run a profitable business, make purchasing decisions, or make decisions about pricing menu.

Explain Why: To climb the kitchen ladder of success, it is important to learn not only how to cook but how to think like a chef. Food cost is always at the forefront of a chef's mind. It can make or break a commercial establishment. If you watch shows like *Hell's Kitchen* or *Iron Chef*, you will see expensive ingredients thrown around like it's free. But life in a commercial kitchen is not like this and it's not like cooking at home. Participants need to start thinking like a chef and not like a home cook.

**Slide 5:** Edible Portion Cost Versus As-Purchased Cost

As-purchased cost is the amount of money spent on the ingredients. It's also known as raw food cost.

Edible portion cost is the amount of the ingredient that is actually going into the recipe.

When calculating the recipe cost, the unit for AP and EP need to be the same. If they aren't, you will need to convert one of them.

Every ingredient has a yield. That is the amount of the ingredient that actually goes to a recipe. When ingredients must be trimmed, boned, skinned, cored, or peeled before they can be used in a recipe, some of the ingredients are lost. The adjustment that accounts for the loss is called yield percentage.

\*The examples in this lesson assume 100% yield. Various yields can be used in future lessons for advanced participants.

#### **Slide 6: Unit Cost Formula**

Have the participants practice checking their answers.

1. Divide the cost of the ingredient by the number of units.
2. Then, multiply that by the amount in the recipe.

#### **Slide 7: Unit Cost Example**

Have participants work on the example question.

1. Divide the cost of the ingredient by the number of units = \$0.165 per oz
2. Then, multiply that by the amount in the recipe = \$0.99 is the food cost for the cheese

#### **Slide 8: Cost of the Recipe Versus Cost Per Serving**

The cost of the recipe is how much it costs to make the whole recipe.

The cost per serving is how much it costs you to make one serving of that recipe. Recipes usually yield multiple servings.

Step 1: Calculate the EP cost for each ingredient.

EP cost for each ingredient = (as-purchased cost / units purchased) \* amount in recipe

Hint: As-purchased units and edible portion units need to be the same. If they're not, you need to convert one of them

Step 2: Add up all the EP costs for all the ingredients. That's your cost for the whole recipe.

Step 3: Divide the recipe cost by the number of servings the recipe yields. That's your per serving cost. You'll use that later to calculate menu prices.

#### **Slide 9: Cost of Recipe Versus Cost Per Serving Example**

Have participants work on the example question.

1. Add up all the edible portions = \$6.67
2. Then divide by the recipe yield = \$6.67 / 12 = \$0.56 is the food cost to fill one taco

(Hint: This example assumes all the ingredients have a 100% yield.)

#### **Slide 10: The Q Factor**

The Q Factor is the cost of items directly associated with selling the food that the guest thinks are free. For example, to-go boxes and napkins. To calculate accurate food cost, you should include the cost of these items and include them in your menu pricing.

#### **Slide 11: Steps to Calculate Food Cost**

This summarizes the steps you need to take to cost out a recipe. Now that you understand the concepts, let's review the steps and prepare to work on the example in the following slides.

#### **Slide 12: Food Cost Example**

Have participants calculate the unit cost and the edible portion cost for each ingredient.

Unit cost = AP cost / AP unit

EP cost = Unit cost \* amount in recipe

Recipe cost = Sum all EP cost

Food cost per serving = Divide recipe cost by recipe yield

### **Slide 13: Food Cost Example Answers**

Review the answers with the participants and reteach as needed.

Unit cost = AP cost / AP unit

EP cost = Unit cost \* amount in recipe

Recipe cost = Sum all EP cost = it costs \$1.03 to make this recipe

Food cost per serving = Recipe cost / recipe yield = \$0.09 (cost per serving)

### **Slide 14: Baker's Batch Costing Title Slide**

### **Slide 15: Baker's Batch Example**

In using baker's percentage, each ingredient in a formula is expressed as a percentage of the flour weight, and the flour weight is always expressed as 100%.

Have the participants add up the total weight of the recipe.

Simple addition tells us that we are making 169.5 pounds of dough. We now consider the cost per pound of our ingredients.

Have the participants total up the total cost of each ingredient.

Note that although we are considering the water to be free, it is still included in the dough weight. On the next slide, we calculate the entire batch cost.

Have the participants divide the batch cost by the batch weight.

### **Slide 16: Baker's Batch Cost Example Answers**

We now know that it costs us \$19.02 in ingredients to make 169.5 pounds of dough.

To determine the cost of one pound of dough, we divide the batch cost by the dough weight.

$\$19.02 / 169.5 = \$0.11$  per pound of dough

Compare answers and reteach as needed.

### **Slide 17: Menu Pricing Title Slide**

Now that you know how to calculate food cost, you will use that number to calculate menu prices.

### **Slide 18: Menu Pricing Discussion Question**

Possible answers include labor costs (often the highest expense), rent, insurance, and utilities.

### **Slide 19: Cost Versus Price**

Cost is how much a restaurant or bakery pays for ingredients, usually from a wholesale food distributor. Price is what a restaurant or bakery charges its guests on the menu. These prices are marked up to cover food costs, labor cost, and other costs associated with running a business.

### **Slide 20: Profit Versus Revenue**

Profit is money left over after all the expenses are paid. Revenue is money made from sales before any expenses are paid.

### **Slide 21: Food Cost Percentage Formula**

Food cost percentage is the percentage of revenue that covers the cost of food.

Food cost / Menu price = Food cost % as a decimal. Most commercial establishments like to keep their food cost percentage around 34% - 37%.

### **Slide 22: Menu Price Formula**

Food Cost \$ / Food cost % as a decimal = Menu price



**Hint:** Turn the % into a decimal first.

**Slide 23:** Contribution Margin

The contribution margin is the money left over to pay all the other expenses and maybe a profit.

Menu price - Food cost = Contribution margin

Think back to all the other expenses a restaurant must cover other than food.

**Slide 24:** Menu Pricing for Profit

Remember that profit is the money left over after all the expenses are paid.

**Slide 25:** Food Cost % Method Example

Have participants calculate the menu price for the burger and the contribution margin.

Formula is: Total cost per serving / Food cost % as a decimal = Menu price

$$1.50 / .3 = \$5$$

What is the contribution margin? Menu price - Food cost = 5 - 1.50 = 3.50

**Slide 26:** Food Cost Isn't Everything

Discussion Question: What other factors affect menu prices?

Have participants use the pictures to make guesses about other things to consider when assigning menu prices.

**Slide 27:** Factors Affecting Menu Prices

Can you think of real-world examples, such as restaurants in your neighborhood, for each of these factors?

**Slide 28:** How to Determine Menu Price Points

If time allows, watch this short YouTube video that reinforces key concepts.

<https://www.youtube.com/watch?v=QpYX4GfSiHA>

**Slide 29:** Closing slide.

2. Have participants use the information they have learned in an application activity: As Purchase Cost Versus Edible Portion

Purpose: Participants will participate in a hands-on activity that demonstrates the difference between the as-purchased cost of ingredients and the edible portion cost. Participants will apply the unit cost formula.

3. Gather the needed materials:

- Food scale(s)
- Food item(s) with a high non-usable portion
  - Ex: Cabbage 79%, carrots with tops 60%, potatoes 85%
- Kitchen knife, cutting board for trimming
- Pen and paper

4. Have participants access the *As Purchase Cost Versus Edible Portion Cost* page in the student workbook.

Instructor Note: You can do this either as a demonstration or divide participants into teams depending on the resources you have available.

5. Explain Why: Participants think that if they pay \$2 for a 1-lb. head of cabbage, the food cost is \$2 per lb. Demonstrate the difference by weighing the whole cabbage and having the students calculate what it costs per ounce.

Then, remove the outer leaves, trim out the stem, and re-weigh it. Have the participants recalculate the costs per ounce. If you have the resources, repeat this several times with

different food items that have a very high non-usable portion.

6. Activity steps:

1. Have participants weigh the raw food item and record the weight on notebook paper or a graphic organizer.
2. Have participants calculate the as-purchased cost per unit using the following formula:

$$\frac{\text{Cost of the ingredient}}{\text{\# of units}} = \text{Cost per unit}$$

3.  $\$2.00 / 16 \text{ ounces} = .125 \text{ per ounce}$

4. Have the participants remove the outer leaves and trim out the stem.

5. Re-weigh it and record the weight.

6. Recalculate the edible portion cost per unit.

Hint: Yield on cabbage is 79%, meaning you will lose about 21% of the ingredient after trimming. 79% of 16 is 12.64.

7.  $\$2.00 / 12.64 = .158 \text{ per ounce}$

7. Explain Why: The cost per unit is going up because of the loss in trimming. In a commercial kitchen, this can make a big difference in profitability of a menu item.

## Lesson Four – Culinary Math: Calculating Food Costs

### REVIEW: Calculating Food Costs

20 minutes

**Purpose:**

Participants will practice calculating food costs through different activities.

**Materials:**

- *Culinary Math Student Workbook*
- *Culinary Math: Calculating Food Costs*  
– Answer Key

**Facilitation Steps:**

1. Have the participants complete the practice questions in the *Culinary Math: Calculating Food Costs* section in the student workbook.
2. Answer any questions participants may have on the calculations.
3. Have participants self-check or peer-check their answers as you share them from the *Culinary Math: Calculating Food Costs* – Answer Key.

# Calculating Food Costs – Answer Key

## Unit Cost Formula

### Pro Tip:

Applying the cost-per-unit formula is integral to a successful operation. If you do not calculate these formulas, you will not be able to properly estimate the cost of menu items in your kitchen. Ultimately, you will not be able to arrive at a selling price that will offer you a reasonable profit.

### Directions

1. Divide the cost of the ingredient by the number of units.
2. Multiply that by the amount in the recipe.

Formulas:

As-purchased cost

\_\_\_\_\_ = Cost per unit

# of units

Cost per unit \* Amount in the recipe = Edible portion cost.

### Practice Questions

1. A chef purchased 24 oz of long grain rice for \$2.49. What is their cost per unit?

$$\frac{\$ 2.49}{24 \text{ oz}} = .10375 \text{ per unit (round to .10)}$$

**\$0.10 per oz**

2. The cost of a case of canned Italian plum tomatoes is \$18.78. There are 6 cans in the case. What is the cost per unit?

$$\frac{\$18.78}{6} = \$3.13 \text{ per can}$$

# Calculating Food Costs – Answer Key

## Edible Portion Cost

### Pro Tip:

When a fruit or vegetable is bought already cleaned, the price will include the cost from trim loss, extra packaging, labor, etc. This makes the cost of a cleaned product greater than the cost of an uncleaned product, even though there are costs attached to fabricating the fruit or vegetable in-house.

### Directions

1. Identify the given as-purchased cost (APC) information.
2. Decide which unit of measurement to use and perform the calculations necessary to convert the as-purchased cost (APC) to this unit.
3. Find the yield percentage.
4. Substitute the as-purchased cost and the yield percentage into the edible portion cost formula and calculate.

Formulas:

Cost Per Unit

As-purchased cost / Number of units

Edible Portion Cost

As-purchased cost per unit / Yield % (in decimal form)

### Practice Question

You are making pesto sauce for a chicken dish on your menu. You purchase basil in bunches. Each bunch weighs 2 ½ ounces and costs \$0.79 per bunch. Basil has a 56% yield. What is the edible portion cost of the basil?

As-purchased cost Per Unit: \$0.32 per oz

Edible Portion Cost: **\$0.57 per oz**

### Did You Know?

Many products have a 100% yield, such as flour, sugar, dried spices, wines, spirits, syrups, and processed foods. The edible portion cost may still be computed for these products, but you would divide by 1 (the decimal form of 100%). As a result, the edible portion cost and the as-purchased costs are the same.

## Lesson Five – Culinary Math: Kitchen Measuring Tools

### Lesson Overview

*Participants will learn how to identify units of measure as well as how to use the measuring and weighing tools common in a commercial kitchen. They will be able to convert measurements in a recipe to scale the yield up or down. After the lesson, participants will apply what they have learned using hands-on activities to solve authentic problems encountered in the industry.*

### Lesson Objectives

After completing this lesson, participants will be able to:

- Identify the standard units and tools for measuring and weighing
- Convert measurements in a recipe to change the yield

### Lesson at a Glance

| Activity | Materials                                                                                                                                                                                                                                                                                                                                                                                                             | Preparation                                                                                                                                                                                                                                                                            | Approximate class time |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| FOCUS    | <ul style="list-style-type: none"> <li>• Paper and pen or pencil</li> <li>• <i>Culinary Math Student Workbook</i></li> <li>• <i>Culinary Math: Kitchen Measuring Tools Pre-Quiz – Answer Key</i></li> </ul>                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Access the <i>Culinary Math: Kitchen Measuring Tools Pre-Quiz</i> section in the student workbook</li> </ul>                                                                                                                                  | 10 minutes             |
| LEARN    | <ul style="list-style-type: none"> <li>• <i>Culinary Math: Kitchen Measuring Tools</i> slide presentation</li> <li>• <i>Culinary Math Student Workbook</i></li> <li>• <i>Culinary Math: Kitchen Measuring Tools</i> online lesson</li> <li>• <i>Application Activity: Kitchen Measuring Tools – Answer Key</i></li> <li>• Food scale(s)</li> <li>• Liquid measuring cup(s)</li> <li>• Dry measuring cup(s)</li> </ul> | <ul style="list-style-type: none"> <li>• Become familiar with specialized vocabulary</li> <li>• Prepare <i>Culinary Math: Kitchen Measuring Tools</i> slide presentation for viewing</li> <li>• Gather the food scale(s), liquid measuring cup(s), and dry measuring cup(s)</li> </ul> | 60 minutes             |
| REVIEW   | <ul style="list-style-type: none"> <li>• <i>Culinary Math Student Workbook</i></li> <li>• <i>Culinary Math: Converting Recipe Yield – Answer Key</i></li> </ul>                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>• Access the <i>Culinary Math: Kitchen Measuring Tools</i> section in the student workbook</li> </ul>                                                                                                                                           | 20 minutes             |

## Lesson Five – Culinary Math: Kitchen Measuring Tools

### FOCUS: Kitchen Measuring Tools Pre-Quiz

10 minutes

#### Purpose:

To assess participants' current knowledge of measurement and weight units in a kitchen.

#### Materials:

- *Culinary Math: Kitchen Measuring Tools*
- *Culinary Math: Kitchen Measuring Tools Pre-Quiz – Answer Key*

#### Facilitation Steps:

1. Instruct participants to complete the *Culinary Math: Kitchen Measuring Tools Pre-Quiz*, located in the student workbook, prior to or at the start of class.
2. Have the *Culinary Math: Kitchen Measuring Tools Pre-Quiz – Answer Key* available for instructor reference.
3. Have participants pair up and compare answers. Review the answers with participants with the aim of identifying strengths and weaknesses. This should be done with the purpose of guiding future instruction. What concepts do you need to spend more time on? What concepts do the participants already have a firm understanding of?

# Kitchen Measuring Tools

## Pre-Quiz – Answer Key

Read each question and calculate the correct answer. Solve using any method.

1. Which of the following is NOT a type of volume measurement?
  - a) Cup
  - b) Fluid ounce
  - c) Liter
  - d) Pound**
2. Which of the following should NOT be done when using measuring cups or spoons?
  - a) Hold the spoon steady when measuring
  - b) View liquid measuring cups from above when measuring**
  - c) Pour ingredients into cups slowly
  - d) Level the top of measuring spoons
3. Use your knowledge of changing batch yields to solve the following problem. You are working with a recipe that yields only 12 servings originally. Which recipe conversion factor is correct if you need to make 24 servings?
  - a) 2**
  - b) .5
  - c) 5
  - d) 3
4. The number and size of servings a recipe will make describes which of the following terms?
  - a) Yield**
  - b) Cooking time
  - c) Preparation instructions
  - d) Nutritional information
5. How many teaspoons are in a tablespoon?
  - a) 16
  - b) 3**
  - c) 4
  - d) 2
6. You have a recipe that needs to be cut in half. The recipe calls for 3 cups of all-purpose flour. How much flour will you need for the recipe?
  - a. 6
  - b) 1
  - c) 1 ½ cups**
  - d) 12



## Culinary Math Curriculum

7. You have a recipe that you need to double. The recipe calls for a  $\frac{1}{4}$  lb. of sugar. How much sugar will you need?
- a) 1 lb
  - b)  $\frac{1}{2}$  lb**
  - c)  $\frac{1}{8}$  lb
  - d) 4 lb
8. How many ounces are in a pound?
- a) 16 oz**
  - b) 8 oz
  - c) 4 oz
  - d) 1 oz
9. You are making a dough recipe that yields 48 oz. It asked you to divide the dough into 4 bowls. How many oz of dough will each bowl have?
- a) 12 oz**
  - b) 3 oz
  - c) 6 oz
  - d) 8 oz
10. Which of the following is NOT a consequence of poor measurement in food production and cooking?
- a. Poor customer satisfaction
  - b. Inconsistent product
  - c. Increased food costs
  - d. Increased precision**

## Lesson Five – Culinary Math: Kitchen Measuring Tools

# LEARN: Kitchen Measuring Tools Slide Presentation

60 minutes

### Purpose:

Participants will learn how to identify kitchen measuring tools, units of measuring and weighing, and be able to convert measurements in a recipe for restaurants and other food service establishments.

### Materials:

- *Culinary Math: Kitchen Measuring Tools* slide presentation
- *Culinary Math Student Workbook*
- *Culinary Math: Converting Units of Measure Instructor Resource*
- *Application Activity: Kitchen Measuring Tools* – Answer Key
- *Culinary Math: Kitchen Measuring Tools* online lesson
- Food scale(s)
- Liquid measuring cup(s)
- Dry measuring cup(s)

### Facilitation Steps:

1. Share the following information with participants as you show the slide presentation.

Note to instructor: In lieu of the slide presentation, you may assign the *Culinary Math: Kitchen Measuring Tools* online lesson. It covers all the same content but allows participants to learn at a self-paced speed.

**Slide 1:** Introduction slide.

### Slide 2: Objectives

At the end of this lesson, you will be able to:

- Identify the standard units and tools for measuring and weighing
- Convert measurements in a recipe to change the yield

### Slide 3: Kitchen Measuring Tools Title Slide

Have participants access the *Kitchen Measuring Vocabulary Graphic Organizer* in the workbook. Participants should complete the columns as the information is shared in the slide presentation.

### Slide 4: Discussion Questions

Discussion Question: Why do chefs need to understand kitchen measuring tools?

Explain Why: Poor measuring techniques increases food costs, makes an inconsistent product, and causes customer dissatisfaction.

### Slide 5: Measuring Systems

U.S. system uses cups, tablespoons, fluid ounces to measure volume, but ounces and pounds to measure weight.

### Slide 6: Measuring Systems

The metric system uses grams, kilograms, and milligrams to measure weight. To measure volume, it uses liters and milliliters.

## Culinary Math Curriculum

### **Slide 7: Weight Versus Volume**

Answer: Dry ingredients that are more than a few tablespoons are usually shown by weight, not by volume. When a measurement for a dry ingredient is in ounces, it's a weight measurement. If you don't have a scale, you need to convert the weight into volume. Ex: 16 oz of flour = 3  $\frac{3}{4}$  cups.

### **Slide 8: Tools for Measuring Volume**

Volume: The measurement of the space occupied by a solid, liquid, or gas.

Use measuring cups and spoons to measure liquids and small amounts of dry ingredients.

### **Slide 9: Tools for Measuring Weight**

Weight: The weight of an ingredient is the measurement of its mass, or heaviness.

Scales can measure with greater accuracy and weigh any ingredient, liquid or dry.

Bakeshops typically prefer weight measures.

### **Slide 10: Count**

Good for measuring standardized ingredients which are processed, graded, and packaged according to established standards. Ex: eggs, shrimp, butter.

### **Slide 11: Measuring Techniques**

For dry volume, overfill the measuring cup or spoon and scrape off the excess.

Remember that some recipes call for packing ingredients like brown sugar.

### **Slide 12: Measuring Techniques**

For Liquid volume be sure to set the measuring cup on a flat surface and read with your eye level of the mark, then fill to the mark.

### **Slide 13: Measuring Techniques**

Choose a scale that suits the size of the food. Some are better for ounces, others for pounds.

If the scale can't be reset, note the tare, and subtract it after weighing the food.

### **Slide 14: Ounces: Dry Versus Liquid**

For example: 1 cup of all-purpose flour weighs 4.5 ounces, not 8 ounces. On the other hand, 1 cup of chocolate chips weighs a little over 6 ounces.

### **Slide 15: Ounces: Dry Versus Liquid**

If a recipe calls for an ounce amount of a dry ingredient, the bet option is to weigh that ingredient with a scale.

### **Slide 16: Cups: Dry Versus Liquid**

Dry measuring cups are designed to measure dry ingredients while liquid measuring cups are designed to measure liquids.

### **Slide 17: Converting Measurements in Recipes To Change the Yield title slide**

### **Slide 18: Volume Conversion Chart**

These are some of the most used volume measurements in home recipes. A more comprehensive conversion chart may be helpful.

Volume and weight conversions are an important resource to have in the kitchen.

## Culinary Math Curriculum

When halving or doubling a recipe, making the correct conversions can make or break your results.

Explain the relationship between teaspoons and tablespoons using visual aids.

### **Slide 19: Weight Conversion**

These are some of the most used volume measurements in home recipes. A more comprehensive conversion chart may be helpful.

Explain the relationship between ounces and pounds. Use visual aids if possible.

### **Slide 20: Quantities by Weight Versus Quantities by Volume**

Most recipes in the United States measure ingredients by volume. In other parts of the world, it's more common for ingredients to be listed by metric weight.

For this reason, it's a good idea for anyone who does a lot of cooking to own a good metric kitchen scale to make use of any recipe they might come across.

Explain the relationship between units that measure volume and units that measure weight. Discuss the relationship between the U.S. system and the metric system.

### **Slide 21: Converting Recipe Yield**

Scaling recipes up and down will be discussed in more detail in a future lesson. For this lesson, we will focus on converting the units of measure and working with fractions to change the amount of each ingredient in a recipe to change the yield of the recipe.

### **Slide 22: Converting Recipe Yield**

Review each unit of measurement and quantity. Prepare participants to double the recipe on the next slide. Give participants time to calculate the new amount needed for each ingredient at their own pace.

### **Slide 23: Converting Recipe Yield**

You may need to review how to add fractions or convert fractions to decimals depending on how you choose to solve the problem. Review answers with participants and reteach them as needed.

### **Slide 24: Closing slide.**

1. Have participants use the information from the presentation in an application activity. Students will participate in a hands-on activity that demonstrates the difference between measuring liquids versus dry ingredients and volume versus weight.
2. Gather the needed materials:
  - Food scale(s)
  - Liquid measuring cup(s)
  - Dry measuring cup(s)
  - Pen and paper
  - Student workbook

Instructor's Note: You can do this either as a demonstration and/or divide participants into teams depending on the resources you have available. Have participants access the student workbook pages for this activity to complete as they follow the steps.

3. Explain why there's a difference between weight ounces and volume ounces. Weight ounces are used for measuring dry ingredients (16 ounces is equivalent to 1 pound). Volume ounces are used for

measuring liquid ingredients (8 ounces equals a pound).

## 4. Activity Steps:

### Method 1

1. Fill a liquid measuring cup with water to the 1 cup mark.
2. Place the cup on a flat surface and position yourself at eye level with the water before attempting to read the water level.
3. Zero out the scale to eliminate the tare weight.
4. Weigh the water on scale and record the weight in the table in ounces and grams.

### Method 2

1. Fill a 1-cup dry measuring cup with flour.
2. Overfill the cup and level it with a butter knife or other straight edge.
3. Zero out the scale to eliminate the tare weight.
4. Weigh the flour on the scale and record weight in the table in ounces and grams.

Table for Evaluation of 1 cup liquid weight and 1 cup dry weight

| Method     | Ounces | Grams |
|------------|--------|-------|
| 1          | 8      | 228   |
| 2          | 4 ½    | 128   |
| Difference | 3 ½    | 100   |

## Question

Was there a difference in measurement between the two methods? Why?

Answer: There was a significant difference. There is a difference between weight ounces and volume ounces. There is also a difference between liquid measures and dry measures.

5. Explain why 1 cup does not always equal 8 ounces, especially for heavy liquids like honey and dry ingredients that may have a lot of air space around them, like grated cheese.

# Converting Units of Measurement

## Instructor Reference

From the Metric System to the Imperial System

Instructor's Note: Online conversion tools are readily available. Here's an example of one:

<https://www.aqua-calc.com/calculate/food-volume-to-weight>

**Pro tip:** If you are doing both conversions as well as changing the overall quantity of the recipe, make sure to carefully do the unit conversions before you do the overall quantity adjustment.

Use a conversion chart to change each ingredient from the metric system to the imperial system.

| Ingredient        | Grams | Imperial          |
|-------------------|-------|-------------------|
| All-purpose flour | 120   | 1 cup             |
| Baking powder     | 4     | 1 tsp             |
| Sugar             | 198   | 1 cup             |
| Butter            | 113   | 8 tbsp or 1 stick |

### Did you know?

Most recipes in the United States measure ingredients by volume. In other parts of the world, it's more common for ingredients to be listed by metric weight. For example, a recipe developed in a U.S. test kitchen might call for 3 tablespoons of butter, while a similar recipe from Europe might list this quantity as 40 grams. For this reason, it's a good idea for anyone who does a lot of cooking to own a good metric kitchen scale to make use of any recipe they might come across.

# Application Activity: Kitchen Measuring Tools – Answer Key

## Measuring Techniques for Liquids and Dry Ingredients

### Method 1

1. Fill a liquid measuring cup to the 1-cup mark with water.
2. Place the cup on a flat surface and position yourself at eye level with the water before attempting to read the water level.
3. Zero out the scale to eliminate the tare weight.
4. Weigh the water on the scale and record the weight in the table in ounces and grams.

### Method 2

1. Fill a 1-cup dry measuring cup with flour.
2. Overfill the cup and level it with a butter knife or other straight edge.
3. Zero out the scale to eliminate the tare weight.
4. Weigh the flour on the scale and record its weight in the table in ounces and grams.

Table for Evaluation of 1 Cup Liquid Weight and 1 Cup Dry Weight

| Method     | Ounces | Grams |
|------------|--------|-------|
| 1          | 8      | 228   |
| 2          | 4 ½    | 128   |
| Difference | 3 ½    | 100   |

### Question:

Was there a difference in measurement between the two methods? Why?

**Answer: There was a significant difference. There is a difference between weight ounces and volume ounces. There is also a difference between liquid measures and dry measures.**

### Explain Why:

**1 cup does not always equal 8 ounces, especially for heavy liquids like honey and dry ingredients that may have a lot of air space around them, like grated cheese.**

## Lesson Five – Culinary Math: Kitchen Measuring Tools

### REVIEW: Converting Yield

20 minutes

**Purpose:**

Participants will practice converting recipe yield.

**Materials:**

- *Culinary Math Student Workbook*
- *Culinary Math: Converting Recipe Yield*  
– Answer Key

**Facilitation Steps (this may have been completed as part of the lecture):**

1. Have participants complete the practice questions in the *Culinary Math: Converting Recipe Yield* section in the student workbook.
2. Answer any questions participants may have on the calculations.
3. Have participants self-check or peer-check their answers as you share them from the *Culinary Math Converting Recipe Yield* – Answer Key.



# Converting Recipe Yield – Answer Key

## Directions

Convert the recipe below:

## Brownies

1/2 cup butter  
1 cup white sugar  
2 eggs  
1 teaspoon vanilla extract  
1/3 cup unsweetened cocoa powder  
1/2 cup all-purpose flour  
1/4 teaspoon salt  
1/4 teaspoon baking powder



## Answer

### **Halve the recipe**

1/4 cup butter  
1/2 cup white sugar  
1 egg  
1/2 teaspoon vanilla extract  
1/6 cup unsweetened cocoa powder  
1/4 cup all-purpose flour  
1/8 teaspoon salt  
1/8 teaspoon baking powder

### **Double the recipe**

1 cup butter  
2 cups white sugar  
4 eggs  
2 teaspoons vanilla extract  
2/3 cup unsweetened cocoa powder  
1 cup all-purpose flour  
1/2 teaspoon salt  
1/2 teaspoon baking powder

**Directions**

Convert the recipe below.

**Easy Party Punch**

4 cups cranberry juice  
2 cups pineapple juice  
1/2 can frozen lemonade concentrate or limeade concentrate  
4 cups ginger ale  
3 cups ice cubes  
2 lemon slices  
15 fresh berries for garnish

**Answer**

**Convert the recipe to 1/3**

1-1/3 cups cranberry juice  
2/3 cups pineapple juice  
1/6 can frozen lemonade concentrate or limeade concentrate  
1-1/3 cups ginger ale  
1 cup ice cubes  
2/3 lemon slice  
5 fresh berries

**Times the recipe by 1-1/2**

6 cups cranberry juice  
3 cups pineapple juice  
3/4 can frozen lemonade concentrate or limeade concentrate  
6 cups ginger ale  
4-1/2 cups ice cubes  
3 lemon slices  
22-23 fresh berries



## Lesson Six – Culinary Math: Converting Standardized Recipes

### Lesson Overview

*Participants will learn how to calculate the recipe conversion factor to increase or decrease the yield of a recipe as well as understand the importance of using standardized recipes in a commercial setting. Additionally, they will understand culinary ratios and the baker's percentage.*

### Lesson Objectives

After completing this lesson, participants will be able to:

- Determine conversion factor to change yield of a recipe
- Convert a recipe from smaller yield to larger yield
- Convert a recipe from larger yield to smaller yield
- Use culinary ratios (weight, volume, mixed methods)
- Understand baker's percentage and baker's math

### Lesson at a Glance

| Activity | Materials                                                                                                                                                                                                                                                                                                             | Preparation                                                                                                                                                                                                                                                   | Approximate class time |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| FOCUS    | <ul style="list-style-type: none"> <li>• <i>Culinary Math Student Workbook</i></li> <li>• <i>Culinary Math: Converting Standardized Recipes Pre-Quiz – Answer Key</i></li> </ul>                                                                                                                                      | <ul style="list-style-type: none"> <li>• Access <i>Culinary Math: Converting Standardized Recipes Pre-Quiz</i> section in the student workbook</li> </ul>                                                                                                     | 10 minutes             |
| LEARN    | <ul style="list-style-type: none"> <li>• <i>Converting Standardized Recipes</i> slide presentation</li> <li>• <i>Culinary Math Student Workbook</i></li> <li>• <i>Culinary Math: Converting Standardized Recipes</i> online lesson</li> <li>• Pen/paper</li> <li>• Calculator(s)</li> <li>• Sample recipes</li> </ul> | <ul style="list-style-type: none"> <li>• Become familiar with specialized vocabulary</li> <li>• Prepare <i>Culinary Math: Converting Standardized Recipes</i> slide presentation for viewing</li> <li>• Gather materials and make team assignments</li> </ul> | 60 minutes             |
| REVIEW   | <ul style="list-style-type: none"> <li>• <i>Culinary Math Student Workbook</i></li> <li>• <i>Culinary Math: Converting Standardized Recipes – Answer Key</i></li> <li>• <i>Culinary Math Summative Quiz</i></li> </ul>                                                                                                | <ul style="list-style-type: none"> <li>• Access the <i>Culinary Math: Converting Standardized Recipes</i> section of the student workbook</li> </ul>                                                                                                          | 20 minutes             |

## Culinary Math Curriculum

|  |                                                                                                    |                                                                                                                                      |  |
|--|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <ul style="list-style-type: none"><li>• <i>Culinary Math Summative Quiz – Answer Key</i></li></ul> | <ul style="list-style-type: none"><li>• Print off and review the <i>Culinary Math Summative Quiz</i> (one per participant)</li></ul> |  |
|--|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--|

## Lesson Six – Culinary Math: Converting Standardized Recipes

### FOCUS: Converting Standardized Recipes Pre-Quiz

10 minutes

#### Purpose:

To assess participants' current knowledge of increasing and decreasing the yield of recipes.

#### Materials:

- *Culinary Math Student Workbook*
- *Culinary Math: Converting Standardized Recipes Pre-Quiz – Answer Key*

#### Facilitation Steps:

1. Instruct participants to complete the *Culinary Math: Converting Standardized Recipes Workbook Pre-Quiz*, located in the student workbook, prior to or at the start of the class.
2. Have the *Culinary Math: Converting Standardized Recipes Pre-Quiz – Answer Key* available for instructor reference.
3. Review the answers with participants with the aim of identifying strengths and weaknesses. This should be done with the purpose of guiding future instruction. What concepts do you need to spend more time on? What concepts do participants already have a firm understanding of?

# Converting Standardized Recipes Pre-Quiz – Answer Key

Read each question and calculate the correct answer.

1. What is a standardized recipe?
  - a) A recipe that makes one portion
  - b) A recipe that is the same in every cookbook
  - c) A recipe that makes four portions
  - d) A recipe tailored to the needs of an individual kitchen**
2. A standardized recipe yields 10 servings and requires  $\frac{1}{4}$  cup of beaten egg. You want to serve 30. How much egg should you use?
  - a)  $\frac{3}{4}$  cup**
  - b)  $1\frac{1}{3}$  cups
  - c) 3 cups
  - d) 12 cups
3. Which is an optional part of a standardized recipe?
  - a) Recipe categories**
  - b) Yield
  - c) Ingredient list
  - d) Method
4. A standardized recipe yields 2 qt. You want to serve 10 servings of 2 cups each. What recipe conversion factor (RCF) should you use to scale the recipe?
  - a)  $\frac{1}{4}$
  - b)  $\frac{3}{5}$
  - c)  $2\frac{1}{2}$**
  - d) 10
5. Which of the following are NOT equivalent measures?
  - a) 1 cup = 8 ounces
  - b) 1 cup = 10 tablespoons**
  - c) 1 quart = 2 pint
  - d) 1 tablespoon = 3 teaspoons
6. A standardized recipe uses  $\frac{1}{2}$  cup of minced garlic to make 20 servings of  $\frac{3}{4}$  cup each. How much minced garlic should you use to make 15 servings of  $\frac{1}{2}$  cup each?
  - a) 2 tablespoons
  - b) 4 tablespoons**
  - c)  $\frac{1}{2}$  cup
  - d) 1 cup

7. Mr. Chan is the head chef for a popular bakery. Three dozen of his world-famous yeast rolls call for 4 ounces of yeast to be dissolved into 2 cups of warm water. If Mr. Chan is commissioned to make 1,000 rolls for a Thanksgiving feast, approximately how many pounds of yeast will he need?
- a) **7 pounds**
  - b) 38 pounds
  - c) 73 pounds
  - d) 111 pounds
8. Which of the following is NOT an advantage of a standardized recipe?
- a) Control of portion size and cost
  - b) Consistency in quality and quantity
  - c) Elimination of errors in food orders
  - d) **Decrease efficiency**
9. What is the formula for calculating the RCF?
- a) Dividing the old yield by the new yield
  - b) **Dividing the new yield by the old yield**
  - c) Multiplying the old yield by the new yield
  - d) Multiplying the new yield by the old yield
10. Which of the following is NOT a component of a standardized recipe?
- a) Recipe name
  - b) Yield
  - c) Portion size
  - d) **Safety procedures**

## Lesson Six – Culinary Math: Converting Standardized Recipes

# LEARN: Converting Standardized Recipes Slide Presentation

60 minutes

### Purpose:

Participants will learn how to calculate recipe conversion factor to increase or decrease the yield of a recipe.

### Materials:

- *Converting Standardized Recipes* slide presentation
- *Culinary Math Student Workbook*
- *Culinary Math: Converting Standardized Recipes – Answer Key*
- *Culinary Math: Converting Standardized Recipes* online lesson
- Pen/paper
- Calculator(s)
- Sample recipes

### Facilitation Steps:

1. Share the following information with participants as you show the slide presentation.

Note to instructor: In lieu of the slide presentation, you may assign the *Culinary Math: Converting Standardized Recipes* online lesson. It covers all the same content but allows participants to learn at a self-paced speed.

**Slide 1:** Introduction slide.

### Slide 2: Objectives

At the end of this lesson, you will be able to:

- Determine conversion factor to change yield of a recipe
- Convert a recipe from smaller yield to larger yield
- Convert a recipe from larger yield to smaller yield
- Understand culinary ratios (weight, volume, mixed methods)
- Figure baker's percentage and baker's math

### Slide 3: What is a Standardized Recipe?

Have participants access the *Converting Standardized Recipes Vocabulary Graphic Organizer* in the workbook. Participants should complete the columns as the information is shared in the slide presentation.

The definition: A set of written instructions used to consistently prepare a known quantity and quality of a certain food for a food service operation. A standardized recipe is a recipe that has been carefully adapted and tested to ensure that it will produce a consistent product every time it is used. Measurements are listed in weight and volume.

### Slide 4: A Consumer Recipe Versus a Standardized Recipe

Consumer recipes are different from standardized recipes in several areas.

Note: Other differences may be added.



### **Slide 5: Benefits of a Standardized Recipe**

Each standardized recipe goes through quality control to ensure that everything will meet the standards of the food service establishment. The results will benefit the venue and the customers.

### **Slide 6: Components of a Standardized Recipe**

- Recipe name: the name on the recipe and on the menu should reflect the same product
- Yield: the number of servings or portions the recipe produces
- Portion size: the amount or size of an individual serving
- Ingredient quantity: the measured portion of each ingredient
- Preparation procedures: the step-by-step directions to produce recipe
- Cooking temperatures: used for range tops and ovens in which preheating may be required
- Cooking time: important to cook the food the recommended time

Other items that may be included:

- Chef notes
- Equipment and utensils
- Plating instructions

### **Slide 7: Check for Understanding**

Answers to the questions are found on previous slides or may vary with class discussion.

### **Slide 8: Determining Conversion Factor to Change Yield of a Recipe title slide**

### **Slide 9: Discussion Questions**

When you need to serve more people than the recipe is written for or vice versa. Some day you may need to make more than your recipe calls for. Other days you may need to make less. What do you do when your recipe's yield doesn't match your needs? You can scale the recipe. To **scale** a recipe means that you change the amount of ingredients to get the yield you

need. You can scale up to increase the yield or scale down to decrease it.

### **Slide 10: Converting a Recipe from Smaller to Yield to Larger Yield title slide**

### **Slide 11: Scaling Recipes Up or Down**

You will need to find the recipe conversion factor (RCF).

First find the recipe conversion (RC) and then multiply each ingredient amount by the RCF.

### **Slide 12: Try Scaling a Recipe**

You will use the basic recipe that yields 10 servings of boiled white rice. For this example, you will need 40 servings of boiled white rice. You may need to review converting a fraction to a decimal.

### **Slide 13: Converting a Recipe from Larger Yield to Smaller Yield title slide**

### **Slide 14: Try Scaling a Recipe**

You will again use the basic recipe that yields 10 servings of boiled white rice. However, this time you need only 5 servings of boiled white rice. You may need to review converting a fraction to a decimal.

### **Slide 15: Culinary Ratios: Weight, Volume, Mixed Methods title slide**

### **Slide 16: Definition of Culinary Ratios**

While every professional kitchen uses recipes for certain preparations, the bulk of food production falls into routine techniques and procedures that cooks learn through practice and repetition.

Ratios aid in recipe analysis and formulation. They inspire a chef's creativity to modify and create new recipes while helping achieve a better understanding of the science of cooking. Instead of measuring by cups or pounds, ingredients are defined in "parts" that are relative to each other in quantity.

## Culinary Math Curriculum

By using ratios, production can easily be scaled to the desired quantity.

### **Slide 17** Types of Ratios

Examples of ratios by weight include a *roux* (equal parts fat and flour) or a *bread dough* (flour and water). By volume, they include a *simple syrup* (equal parts water and sugar) or a *rice pilaf* (2 parts liquid to 1 part rice). A ratio by count example is a *hollandaise sauce* (6 egg yolks for every 1 lb. of butter).

### **Slide 18** How to Use Ratios

For example, a ratio for preparing a stock calls for 3 parts liquid to 2 parts bones (3 lbs. water to every 2 lbs. of bones), which means converting the water to a liquid measure (knowing that a 1-pint liquid measure equals 1 pound takes out some of the mystery).

Ratios include only the major components of a preparation and don't include additional ingredients, flavorings, or seasonings that may alter their mix or cause yields to fluctuate (large-scale cooking often requires seasoning or leavening adjustment).

In the case of a stock, start by thinking of a part as a specific weight, such as 1 part equaling 1 pound, so for every 2 pounds of bones, 3 pounds (or 3 pints) of water is needed.

If a gallon of stock is desired, multiplying the ratio quantity by 3 will require 9 pounds or 9 pints of water (which equals 4 ½ quarts or a little over 1 gallon) and 6 pounds of bones.

For each gallon of stock desired, aromatic vegetables (onions, celery, carrots) in the form of a mirepoix are also added at 1 lb/450 g per gallon. Remember that ratios are general guidelines that will not always add up to even quantities.

**Slide 19:** Baker's Percentage and Baker's Math title slide

### **Slide 20:** Baker's Percentage/Baker's Math

If flour is not an ingredient in the preparation, substitute the ingredient of highest proportion, for example cream in a custard. All ingredients, including eggs and liquid, are scaled not by volume or count, but by weight.

Since each ingredient is weighed based on its mass, bakers can work with precision using a single unit of measure that can be easily scaled up or down.

### **Slide 21:** Comparison of Ratios, Baker's Percentage/Baker's Math, and Simple Percentage

Since culinary professionals may encounter various measuring theories, it's helpful to understand the differences in these methods of scaling ingredients. Simple percentages can be found in both cooking and baking. They are also used extensively in determining food, labor, and operating costs.

### **Slide 22:** Closing slide.

## Lesson Six – Culinary Math: Converting Standardized Recipes

### REVIEW: Converting and Adjusting Recipes

20 minutes

**Purpose:**

Participants will practice converting and adjusting standardized recipes.

**Materials:**

- *Culinary Math Student Workbook*
- *Converting Standardized Recipes – Answer Key*
- *Adjusting Recipes – Answer Key*
- *Culinary Math Summative Quiz*
- *Culinary Math Summative Quiz – Answer Key*

**Facilitation Steps (this may have been completed as part of the lecture):**

1. Have participants complete the practice questions in the *Converting Standardized Recipes* section in the student workbook.
2. Answer any questions participants may have on the calculations.
3. Have participants self-check or peer-check their answers as you share them from the answer keys.
4. At the conclusion of the lesson, allow time for students to complete the *Culinary Math Summative Quiz*. If desired, this could be completed in a subsequent class or as an open-book quiz. The answer key is provided for ease of grading.

# Converting Standardized Recipes

## Answer Key

Calculate the conversion factor for each recipe.

Round conversion to nearest cooking fraction.

Formula to increase or decrease yield:  
**New Yield ÷ Old Yield = Conversion Factor**  
**Old Yield \* Conversion Factor = New Yield**

1. Two-Step Chicken Yield: Serves 4. New Yield: 16

| Ingredient                        | Quantity     | Conversion Factor | New Quantity |
|-----------------------------------|--------------|-------------------|--------------|
| Vegetable oil                     | 1 tablespoon | $16 \div 4 = 4$   | 4 tbsp       |
| Boneless chicken breast halves    | 4            | $16 \div 4 = 4$   | 16           |
| Cream of chicken soup (10 ounces) | 1 can        | $16 \div 4 = 4$   | 4 cans       |
| Water                             | 1/2 cup      | $16 \div 4 = 4$   | 2 cups       |

2. "Super Drink" Smoothie Yield: Serves 12. New Yield: 75

| Ingredient               | Quantity      | Conversion Factor   | New Quantity |
|--------------------------|---------------|---------------------|--------------|
| Strawberries, sliced     | 4 cups        | $75 \div 12 = 6.25$ | 25 cups      |
| Peaches, canned, drained | 2 cups        | $75 \div 12 = 6.25$ | 12-1/2 cups  |
| Yogurt, plain, low-fat   | 4 cups        | $75 \div 12 = 6.25$ | 25 cups      |
| Lemon juice              | 2 tablespoons | $75 \div 12 = 6.25$ | 12-1/2 tbsp  |
| Bananas                  | 1/2 cup       | $75 \div 12 = 6.25$ | 3-1/8 cup    |

# Adjusting Recipes Answer Key

Instructor's Note: Have sample recipes available to participants. There are many online resources for recipes, or you can use magazines and cookbooks. As an engagement activity, have the participants research and choose their own recipe. Participants can do this individually or in pairs.

1. Locate a recipe and increase or decrease the yield.
2. Round conversion to nearest cooking fraction.

## Example

Angel Food Cake (increase) Yield: 12. New Yield: 30

| Ingredient      | Quantity     | Conversion Factor  | New Quantity    |
|-----------------|--------------|--------------------|-----------------|
| Egg whites      | 1-1/2 cups   | $30 \div 12 = 2.5$ | 3-3/4 cups      |
| Cream of tartar | 1 teaspoon   | $30 \div 12 = 2.5$ | 2-1/2 teaspoons |
| Sugar           | 1-1/2 cups   | $30 \div 12 = 2.5$ | 3-3/4 cups      |
| Vanilla extract | 1 teaspoon   | $30 \div 12 = 2.5$ | 2-1/2 teaspoons |
| Salt            | 1/4 teaspoon | $30 \div 12 = 2.5$ | 3/4 teaspoon    |
| Flour (sifted)  | 1 cup        | $30 \div 12 = 2.5$ | 2-1/2 cups      |

## Example

Angel Food Cake (decrease) Yield: 12. New Yield: 8

| Ingredient      | Quantity     | Conversion Factor  | New Quantity |
|-----------------|--------------|--------------------|--------------|
| Egg whites      | 1-1/2 cups   | $8 \div 12 = 0.66$ | 1 cup        |
| Cream of tartar | 1 teaspoon   | $8 \div 12 = 0.66$ | 3/4 teaspoon |
| Sugar           | 1-1/2 cups   | $8 \div 12 = 0.66$ | 1 cup        |
| Vanilla extract | 1 teaspoon   | $8 \div 12 = 0.66$ | 3/4 teaspoon |
| Salt            | 1/4 teaspoon | $8 \div 12 = 0.66$ | 1/8 teaspoon |
| Flour (sifted)  | 1 cup        | $8 \div 12 = 0.66$ | 3/4 cup      |

Name: \_\_\_\_\_ Class: \_\_\_\_\_

# Culinary Math Summative Quiz

Read each question and calculate the correct answer.

- 1) A dough recipe makes 150 lbs. of dough. Your cost to make the recipe is \$18. What is the batch cost per pound?
  - a) \$2,700
  - b) \$0.12
  - c) \$132
  - d) \$8.30
  
- 2) A sourdough recipe uses 50 lbs. of flour. Your cost per lb. for the flour is \$0.20. What is the cost of this ingredient in the recipe?
  - a) \$10
  - b) \$2.50
  - c) \$20
  - d) \$2,500
  
- 3) You purchased 5 lbs. of flour. It cost you \$3.07. What is the cost per unit?
  - a) \$1.62
  - b) \$1.93
  - c) \$8.07
  - d) \$0.61
  
- 4) You buy 12 lbs. of tomatoes to make a marinara sauce. You paid \$15.84. What is the unit cost of tomatoes?
  - a) \$19.08
  - b) \$1.32
  - c) \$3.84
  - d) \$27.84
  
- 5) The menu price for a bowl of gumbo is \$10.59. Your food cost per serving \$3.18. What is your food cost percentage?
  - a) 3.33%
  - b) 7.49%
  - c) 13.77%
  - d) 30%

- 6) The food cost for a gumbo recipe is \$88.76. The recipe yields 28 servings. What is the food cost per serving?
- a) \$60.76
  - b) \$116.76
  - c) \$3.17
  - d) \$2,485.28
- 7) The menu price for a chicken quesadilla is \$10.99. Your food cost per serving is \$3.73. What is the contribution margin for that menu item?
- a) \$14.27
  - b) \$7.26
  - c) \$2.94
  - d) \$0.34
- 8) Your food cost for a steak taco is \$4.47. You want a 30% food cost. What should the menu price be for the taco?
- a) \$14.90
  - b) \$1.34
  - c) \$0.15
  - d) \$34.47
- 9) The food cost for a menu item is \$3.50. The chef wants a 34% food cost. What should the menu price be?
- a) \$10.29
  - b) \$1.19
  - c) \$37.50
  - d) \$3.16
- 10) A menu item is priced at \$12 and has a 32% food cost. What is the food cost in dollars for the menu item?
- a) \$35.29
  - b) \$11.68
  - c) \$3.84
  - d) \$12.32

# Culinary Math Summative Quiz – Answer Key

Read each question and calculate the correct answer.

- 1) A dough recipe makes 150 lbs. of dough. Your cost to make the recipe is \$18. What is the batch cost per pound?  
a) \$2,700  
**b) \$0.12**  
c) \$132  
d) \$8.30
  
- 2) A sourdough recipe uses 50 lbs. of flour. Your cost per lb. for the flour is \$0.20. What is the cost of the ingredient in the recipe?  
**a) \$10**  
b) \$2.50  
c) \$20  
d) \$2,500
  
- 3) You purchased 5 lbs. of flour. It cost you \$3.07. What is the cost per unit?  
a) \$1.62  
b) \$1.93  
c) \$8.07  
**d) \$0.61**
  
- 4) You buy 12 lbs.. of tomatoes to make a marinara sauce. You paid \$15.84. What is the unit cost of tomatoes?  
a) \$19.08  
**b) \$1.32**  
c) \$3.84  
d) \$27.84
  
- 5) The menu price for a bowl of gumbo is \$10.59. Your food cost per serving \$3.18. What is your food cost percentage?  
a) 3.33%  
b) 7.49%  
c) 13.77%  
**d) 30%**



- 6) The food cost for a gumbo recipe is \$88.76. The recipe yields 28 servings. What is the food cost per serving?
- a) \$60.76
  - b) \$116.76
  - c) \$3.17**
  - d) \$2,485.28
- 7) The menu price for a chicken quesadilla is \$10.99. The food cost per serving is \$3.73. What is the contribution margin for that menu item?
- a) \$14.27
  - b) \$7.26**
  - c) \$2.94
  - d) \$0.34
- 8) Your food cost for the steak taco is \$4.47. You want a 30% food cost. What should the menu price be for the taco?
- a) \$14.90**
  - b) \$1.34
  - c) \$0.15
  - d) \$34.47
- 9) The food cost for a menu item is \$3.50. The chef wants a 34% food cost. What should the menu price be?
- a) \$10.29**
  - b) \$1.19
  - c) \$37.50
  - d) \$3.16
- 10) A menu item is priced at \$12 and has a 32% food cost. What is the food cost in dollars for the menu item?
- a) \$35.29
  - b) \$11.68
  - c) \$3.84**
  - d) \$12.32