Basic Culinary MATH

for School Nutrition Professionals

Instructor's Manual

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Time: 6 hours

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Key Area(s): 2 – Operations, 3 – Administration

INSTITUTE OF child nutrition
RESOURCES • TRAINING • RESEARCH

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Institute of Child Nutrition

The University of Mississippi

The Institute of Child Nutrition was authorized by Congress in 1989 and established in 1990 at The University of Mississippi in Oxford and is operated in collaboration with The University of Southern Mississippi in Hattiesburg. The Institute operates under a grant agreement with the United States Department of Agriculture, Food and Nutrition Service.

PURPOSE

The purpose of the Institute of Child Nutrition is to improve the operation of child nutrition programs through research, education and training, and information dissemination.

MISSION

The mission of the Institute of Child Nutrition is to provide information and services that promote the continuous improvement of child nutrition programs.

VISION

The vision of the Institute of Child Nutrition is to be the leader in providing education, research, and resources to promote excellence in child nutrition programs.

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For more information, please contact helpdesk@theicn.org.

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Background Information

Instructor's Note: The purpose of the background information section is to help you become familiar with the context of the lesson. It is not a part of the lesson detail.

The goal of this training is to provide participants the opportunity to review and practice basic culinary math skills. A portion of this training will refresh the participants' knowledge of the basic math principles of addition, subtraction, multiplication, and division. The remainder of the training will focus on measuring and converting measurements, scaling recipes, and calculating food costs.

The Participant's Workbook contains information sheets, handouts, and activities. As a result of using these math skills daily, school nutrition professionals can gain valuable information that will support strong financial management of their school nutrition programs. Consequently, real-world scenarios are provided to introduce how each of the mathematical concepts are utilized in school nutrition programs.

It is important to keep in mind that math plays a vital role in every aspect of child nutrition services; therefore, this resource focuses on the math skills needed to be successful in the various levels and specialties of child food service. Specific guidelines and rules that are unique to any one program will not be addressed, rather the focus will be on foundational skills needed to be successful, regardless of the program. As a result, some food items may be listed in unique amounts and/or units that are not common in child nutrition settings. Do not allow this to take your attention away from the focus: the math skills. An example may be skewed simply for the purpose of the example and does not come from a realistic scenario. Again, focus on the objective at hand and do not become distracted by the oddity of the problem. The design of each problem, as well as the curriculum as a whole, was started with the end in mind.

The following prompts are used throughout this manual:

- SAY:
    - This prompt indicates what the instructor is to say to participants.
- ASK:
    - This prompt is used when the instructor should ask the participants a question. If the question warrants feedback, it will be followed by the FEEDBACK prompt.
- FEEDBACK:
    - This prompt is used to ensure certain elements are covered in discussions.
- DO:
    - This prompt is used to explain what the instructor/participants are to do.
- SHOW:
    - This prompt is used for showing slides. Each slide has a unique title.

Competencies & Knowledge Statements

From *Competencies, Knowledge, and Skills of Effective School Nutrition Assistants and Technicians*, there are two competencies in the functional area of program regulation and accountability central to this training.

Competency 4.1: Maintains integrity and accountability of the school nutrition program (SNP) through compliance with all federal, state, and local regulations.

Knowledge Statement(s):

- Follow the collection and recording procedures approved for point of service at the school.

Competency 4.2: Maintains accountability of recorded documentation for compliance with federal, state, and local regulations.

Knowledge Statement(s):

- Knows the importance of completing accurate production records.
- Knows the importance of accurate record-keeping.

Competencies, Knowledge, and Skills of Effective School Nutrition Assistants and Technicians available on the ICN website: www.nfsmi.org/documentlibraryfiles/PDF/20080716085837.pdf

Key Areas

2: Operations
3: Administration

Professional Standards Learning Topics

2000 Operations

2100 Food Production – Employee will be able to effectively utilize food preparation principles, production records, kitchen equipment, and food crediting to prepare foods from standardized recipes, including those for special diets.

3000 Administration

3300 Financial Management – Employee will be able to manage procedures and records for compliance with Resource Management with efficiency and accuracy in accordance with all Federal, State, and local regulations, as well as the Administrative Review.

"Professional Standards for School Nutrition Professionals" available on the USDA website: professionalstadards.nal.usda.gov

Lesson Objectives

At the end of the course, participants will be able to accomplish the following objectives:

LESSON I: REVIEW BASIC CULINARY MATH SKILLS

- Apply the basic mathematical operations and their properties.
- Solve addition, subtraction, multiplication, and division problems using whole numbers, fractions, and decimals in culinary application.
- Demonstrate how to convert fractions to decimals and decimals to fractions.

LESSON II: KITCHEN MEASURING TOOLS FOR INGREDIENTS

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

LESSON III: CONVERTING STANDARDIZED RECIPES

- Determine the conversion factor to change the yield of a recipe.
- Convert a recipe from a smaller yield to a larger yield.
- Convert a recipe from a larger yield to a smaller yield.

LESSON IV: CALCULATING FOOD COSTS

- Calculate the unit costs of food items.
- Recognize the difference between "As Purchased" (AP) and "Edible Portion" (EP) in determining costs.
- Calculate recipe costs to determine yield costs of recipes.

Course-at-a-Glance

Time Allowed	Topics	Activities	Materials
15 minutes	· Overview and Introduction	· Pre-Assessment	· Participant's Workbook · Pre-Assessment
Lesson I: Review Basic Culinary Math Skills			
90 minutes	· Apply basic mathematical operations · Solve basic math problems · Convert decimals and fractions	· Apply basic math skills · Solve math problems · Convert fractions and decimals	· Participant's Workbook
Lesson II: Kitchen Measuring Tools for Ingredients			
45 minutes	· Identify standard units and tools · Convert measurements to change yield	· Measuring tools · Measurement conversion	· Participant's Workbook
Lesson III: Converting Standardized Recipes			
90 minutes	· Determine conversion factor to change yield · Convert recipe yield – small to large · Convert recipe yield – large to small	· Conversion factor · Change recipe yield – small to large · Change recipe yield – large to small	· Participant's Workbook
Lesson IV: Calculating Food Cost			
60 minutes	· Calculate unit costs of food items · Recognize the difference in AP and EP · Calculate recipe costs to determine yield costs	· Calculate unit cost · AP and EP costs · Recipe costs	· Participant's Workbook
Skills Practice			
45 minutes	· Review of course objectives	· Teach Me!	· Teach Me! word problem cards
Wrap-up			
15 minutes		· Wrap-up and Post-Assessment	· Post-Assessment
Total: 6 hours Instructional Time			

Preparation Checklist

Instructions: The following tasks are necessary for presenting this lesson. Assign each task to a specific person and determine the date that each task must be completed. Keep track of the progress by recording information on the tracking form, and checking off tasks as they are completed. (Items may vary according to needs of particular lessons.)

Task	Person Responsible	Completion Date	✓
Reserve equipment and gather supplies as needed for use on the day of class (6 weeks prior). Instructor's Manual · Roster of participants attending for instructor · Participants' sign-in sheets List of equipment and supplies needed · Microphone (preferably wireless) · Computer to present slides and/or DVD · Projector/Screen · Wireless presenter device and laser pointer · Calculators (one per participant) · Flip chart paper (self-adhesive strip sheets) · Painter's tape (do not use masking tape) · Markers (flip chart) · Pens, pencils, note paper, highlighters, self-adhesive notes, page markers, index cards (each table) · Name tags and table tents · A white board for demonstrating calculations if possible; otherwise flip charts can be used · "Basics at a Glance" poster for each participant · Set of Teach Me! word problem cards	**Instructor**		
Participant's Workbook · Agenda, roster of presenters/participants, handouts, pre/post-Assessments, evaluations			

Introduction

Instructor's Note: Have the first slide on the screen as participants enter the room.

SHOW: *Basic Culinary Math for Child Nutrition Professionals*

DO:
State your name and welcome the participants to the class.

SAY:
Welcome to *Basic Culinary Math for Child Nutrition Professionals*. Math is required to accomplish numerous jobs in a school nutrition program (SNP). This training will provide a review of the basic math skills and their application in real-life situations of a SNP. Some of the applications that will be covered include: preparing and ordering food, determining the correct serving portion size, using the correct measuring or weighing tools, using and changing the yield of standardized recipes, and determining the food costs of recipes.

The Institute of Child Nutrition (ICN) has provided each of you with a Participant's Workbook. The information and activities in the workbook were developed to help you gain a better understanding of the mathematical applications used in SNPs.

It is important to keep in mind that math plays a vital role in every aspect of child nutrition services; therefore, this resource focuses on the math skills needed to be successful in the various levels and specialties of child food service. Specific guidelines and rules that are unique to any one program will not be addressed, rather the focus will be on foundational skills needed to be successful, regardless of the program. As a result, some food items may be listed in unique amounts and/or units that are not common in child nutrition settings. Do not allow this to take your attention away from the focus: the math skills. An example may be skewed simply for the purpose of the example and does not come from a realistic scenario. Again, focus on the objective at hand and do not become distracted by the oddity of the problem. The design of each problem, as well as the curriculum as a whole, started with the end in mind.

HOUSEKEEPING

SAY:
Now, we have a few "housekeeping" items to review.

- The restrooms and water fountain(s) are located...
- Be sure you are signed in on both of the sign-in sheets; there is one for ICN and one for the training sponsor.
- Although I'll try to answer questions throughout the training, sometimes a question requires research or a longer answer than time allows at that point. Because all your questions are important, I've posted a "Bike Rack." Write your question on a sticky note,. and post it to the Bike Rack page. This procedure ensures that I will address all of your questions and share the answers with the class.

GROUND RULES

SAY:

Ground Rules help the class run smoothly and allow all participants to benefit from the course instruction and information. Some examples of the Ground Rules are:

- Be in the classroom at least five (5) minutes before scheduled starting time.
- Turn your cell phones off or to vibrate. If you must take a call or answer a text message before a scheduled break, leave the room quietly. We encourage you to keep the conversation as short as possible so you do not miss important information.
- Be respectful of everyone. Do not carry on sidebar conversations with your neighbor or others in your group. We recognize that most conversations are about the topics we are discussing, but constant talking or whispering interferes with others' ability to hear and understand information that may be extremely important to them. Please be considerate.
- Consider all ideas. Always be considerate of other people's ideas. If you disagree, do so politely.
- Clear your table of trash such as cups, napkins, or empty water bottles at the end of the training.
- Always ask for clarification if you do not understand.

PRE-ASSESSMENT

SHOW: *Pre-Assessment*

SAY:

To review what you already know about basic culinary math, you will take a pre-assessment. The assessments are anonymous, so please write a unique, personal identifier in the upper right-hand corner on the first page. You may use any combination of numbers or letters. It is important to remember your identifier because you will use it again on a post-assessment at the end of the training. These assessments will be sent to ICN where they will be scored to determine the amount of information learned, as well as the effectiveness of the course. Individual scores are not reported.

You have approximately 10 minutes to complete the pre-assessment, and you may use a calculator if you wish.

DO:

Collect the pre-assessments.

LESSON I
REVIEW BASIC CULINARY MATH SKILLS

Objective: Apply the basic mathematical operations and their properties.

SHOW: *Basic Mathematical Operations*

SAY:
A solid understanding of basic mathematics is important for all employees in the school nutrition profession. Consequently, we will cover a large amount of information in a short period of time, which will require you to stay on track with the class. Please make every effort to stay on track and not work ahead. In Lesson I, we will review the basic culinary math skills required for school nutrition professionals to use while producing healthy, nutritional meals that meet today's standards. This lesson will review addition, subtraction, multiplication, and division of whole numbers, fractions, and decimals. We will also review converting fractions to decimals and decimals to fractions.

ASK:
Our first objective is to apply basic mathematical operations and their properties. Think about an example of a basic mathematical operation that is used daily in the school nutrition program and how it is used. For example, we may use addition to determine the total number of adult meals sold for the day. What are other examples of mathematical operations and how they are used in SNPs? There is a space for your answers in your workbook on the page for Lesson I. Please list at least five ways in your workbook now.

Instructor's Note: *Allow 2 or 3 participants to respond voluntarily after giving them a few minutes to write the answers in their workbook.*

FEEDBACK:
Here are some possible answers: production records, daily student meal counts, meal equivalents, costs per meal, sales of à la carte items, daily participation rates, bank deposits, cost of food used, and meals per labor hour.

SAY:
Thank you for your answers. These are just a few of the ways we use math in SNPs. Over the next couple of hours, we will discuss others.

Objective: Solve addition, subtraction, multiplication, and division problems using whole numbers, fractions, and decimals in culinary application.

SAY:
The second objective in the lesson is to solve addition, subtraction, multiplication, and division problems using whole numbers, fractions, and decimals in culinary applications. This objective will include a review of basic math skills that are used almost daily in SNPs. We will start with whole numbers. Remember, whole numbers may be any one or combination of the following digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

As part of the review process, we will solve a practice problem and an application problem for each math operation. Application problems are real-life situations that most of you encounter on a regular basis which require the use of math. All of the problems are in your participant's workbook. You may use your calculator.

Instructor's Note: *Some participants may want to use their phones; if not, calculators are provided for the class.*

Addition of Whole Numbers

SHOW: *Addition (+)*

SAY:

Let's start with addition. Addition is used on a daily basis. In a school nutrition program, it is used to determine purchase quantities, to calculate the number of servings needed for food items, to calculate inventory, and to find the solutions for many other simple problems. Take a few minutes to practice your addition skills. The first problem is basic addition. The second is an example of how we might use addition.

DO:

Workbook Activity: Solve addition problems using whole numbers.

Practice Set:

$$\begin{array}{r} 2{,}146 \\ +\ 1{,}869 \\ \hline \mathbf{4{,}015} \end{array}$$

Application: ABC Elementary School serves grades K – 6. The school does not offer choices or offer versus serve. Each morning the manager receives a count of the number of students who plan to eat the school lunch by grade. How many students should the manager plan to serve on this day?

Grades	Number
kindergarten	88
first	123
second	107
third	92
fourth	119
fifth	86
sixth	121
Total	**736**

Instructor's Note: *Monitor participants as they work; allow a couple of minutes for each problem. When the majority finish, call on someone to give the answer.*

ASK:
Are there questions that we need to address before going to the next mathematical operation?

Instructor's Note: *If participants ask questions that will be covered in later lessons, acknowledge the question is important and that it will be covered during the class.*

Subtraction of Whole Numbers

SHOW: *Subtraction (-)*

SAY:
The next basic mathematic function that we are going to review is subtraction of whole numbers. We use subtraction for such tasks as to compare the leftover food items against the number prepared minus the number served, to determine quantities to purchase after subtracting items in inventory, and to complete production records. Complete the two problems in your workbook, and then we will check your answers. The problems should take no more than a couple of minutes.

DO:
Workbook Activity: Solve subtraction problems using whole numbers.

Practice Set:

$$\begin{array}{r} 15{,}654 \\ -\ 8{,}287 \\ \hline \mathbf{7{,}367} \end{array}$$

Application: Based on the previous school orders, Greenleaf School District needs 378 cases of sausage pizza for the next menu cycle. Records show there are 49 cases on hand in the warehouse. How many cases should be ordered? **329 cases to order**

$$\begin{array}{r} 378 \\ -\ 49 \\ \hline \mathbf{329} \end{array}$$

Instructor's Note: *If someone wants to volunteer answers, call on them for the answer.*

Multiplication with Whole Numbers

SHOW: *Multiplication (x)*

SAY:
Multiplication is the next basic mathematics operation that is important in school nutrition. We use multiplication to determine total price on multiple quantities of items listed on a purchase order, to calculate the total money due from meals served in various categories, and to find the total costs of multiple servings of a menu item.

Instructor's Note: *Depending on the skill level of the class, it might help to model the following example: If we have 435 reduced price meals at $0.40 each, how much money should we have in the reduced meal price account at the end of service?*

435 x $0.40 = $174.00

SAY:
Look in your workbook for a couple of practice problems.

DO:
Workbook Activity: Solve multiplication problems using whole numbers.
Practice Set: 1,232 x 8 = **9,856**

Application: The manager at ABC Elementary School is ordering 29 cases of hamburger patties at a price of $52.00 a case. What will be the total cost for the 29 cases of hamburger patties? Multiply 29 cases by $52 to get the total costs for the hamburger patties.

29 x $52 = **$1,508**

Instructor's Note: *Call on volunteers to give answers to the multiplication problems. Check for understanding to see if anyone needs further explanation.*

Division with Whole Numbers

SHOW: *Division (÷)*

SAY:
We will complete our review of whole numbers by making a couple of calculations.

ASK:
Can someone tell me how we use division in SNPs?

FEEDBACK:
Division is used in school nutrition programs to calculate the cost per portion of the total recipe, to determine the average cost per meal, and to find the inventory turnover rate.

SHOW: *Rounding*

SAY:
Often when dividing, we end up with an answer that needs to be rounded. Just a reminder: If the number to the right of the place you are rounding is five or greater, you round up to the next number. If it is four or less, the number stays the same. For consistency today, we are going to round all of our answers to the hundredths place, which is the second number to the right of the decimal. Now, complete the two problems in your workbook. *(Go over answers.)*

DO:

Workbook Activity: Solve problems using division of whole numbers.
Practice Set: 1800 ÷ 360 = **5**

Application: The manager wants to know the cost per serving of chicken patties if the case price is $48.00, and there are 96 servings in each case. To calculate the cost per serving, the manager divides the cost per case by the number of servings in each case. How much will each serving cost? $48.00 ÷ 96 = $0.50. **Each serving costs 50 cents.**

Instructor's Note: *Call on volunteers to provide answers to problems.*

Addition with Decimals

SHOW: *Decimals*

SAY:

There are times when the school nutrition professional must solve a problem that contains a decimal. Basic operations with decimals are similar to whole numbers, except a decimal point is needed to express a number or part of a number that is less than one. For example, 25.5 pounds means 25 whole pounds and .5 means half of a pound, which is less than one half pound.

Adding with two or more decimal numbers is fairly easy. The key is to line up the decimal points. Look in your workbook for a couple of addition problems with decimals. Take a minute to solve the problems, and then we will check answers.

DO:

Workbook Activity: Solve addition problems using numbers with decimals.
Practice Set: 3.56 + 7.42 + 12.10 =

Tip: Rewrite the practice set so that you line up the decimal points and then add.

$$\begin{array}{r} 3.56 \\ 7.42 \\ +\ 12.10 \\ \hline \mathbf{23.08} \end{array}$$

Application: Lynn is assigned to track the actual amount of money received from three categories of meal service, and then to enter the total amount received in a revenue account. Calculate the total revenue received from the three categories:
Adult meal sales – $48.60
Extra milk sales – $16.75
Á la carte sales – $81.93

$$\begin{array}{r} \$48.60 \\ \$16.75 \\ +\ \$81.93 \\ \hline \mathbf{\$147.28} \end{array}$$

Instructor's Note: *Call on participants to share their answers. Ask if there are questions.*

Subtraction with Decimals

SAY:

The same principles apply to subtracting numbers with decimals as with adding decimals. The next two problems are practice problems using decimals in a subtraction problem. After you solve them, we will check answers.

DO:

Workbook Activity: Solve subtraction problems using numbers with decimals.
Practice Set: 18.34 – 6.26 =

Practice lining up the decimal points by rewriting.

$$\begin{array}{r} 18.34 \\ -\ 6.26 \\ \hline \mathbf{12.08} \end{array}$$

Application: The cashier is reconciling her cash box. She started with $12.35 in change cash. At the end of the meal, she had $79.32 in the cash box which included the change cash. How much did the cashier collect for food sales? Rewrite the problem lining up the decimal points and then solve.

$$\begin{array}{r} \$79.32 \\ -\ 12.35 \\ \hline \mathbf{\$66.97} \end{array}$$

Instructor's Note: *Allow approximately one minute to make each calculation, and then call on someone, or ask for volunteers. Remember to keep this section moving due to time constraints.*

Multiplication with Decimals

SAY:

Multiplication with decimals is a little different than with whole numbers. Once the multiplication process is finished, the total number of decimal places in the problem are counted and inserted in the answer. Then, the answer can be rounded to the nearest hundredth, and any extra zeros can be dropped.

Instructor's Note: *Model the manual calculation on a whiteboard or flip chart to show how to count decimals places.* 3.45 x 10.21 = 35.2245 = **35.22** (rounded to the nearest hundredth)

SAY:

Solve the two multiplication problems with decimals in your workbook. Use your calculators and remember to round your answer to two decimal places.

DO:

Workbook Activity: Solve multiplication problems using numbers with decimals.

Practice Set: 11.49 x 0.51 = **5.8599 or 5.86**. Show the total number of decimal places in the answer; you may round to two decimal places.

Application: A recipe calls for 4.5 quarts of chicken stock that costs $0.66 a quart. Calculate the cost of the chicken stock for the recipe by multiplying the number of quarts needed times the cost per quart.

4.5 x $0.66 = $2.97. The cost of the chicken stock for the recipe is $2.97.

Instructor's Note: *Allow a couple of minutes to complete the two calculations. Call on a participant or volunteer to share their answers with the class.*

Division with Decimals

SAY:

Our final two decimal problems are division. Division with decimals is similar to division with whole numbers, except the first step is to move the decimal to the right in the divisor until you are dividing by a whole number. The next step is to move the decimal in the dividend the same number of places to the right. If, there are not enough digits in the dividend to move the decimal, add zeros to create the places. The final step before dividing is to move the decimal point from the dividend up to the quotient. At this point, it will now look like you are dividing whole numbers.

DO:

Work this example of division with decimals on a white board or flip chart. (9.26 ÷ 3.8 = 2.44)

SAY:

Our final answer is 2.436, but we are rounding all of our answers today to the hundredths place, so the answer would be **2.44**.

ASK:

If you are asked to divide 9.26 by 3.18 instead of 3.8, how many places would you move the decimal?

FEEDBACK:

The answer is two. If the divisor is not a whole number, move the decimal point to the right to make it a whole number and then move the decimal point in the dividend the same number of places.

SAY:

Complete the next two problems in your workbook. Remember to place the decimals as you enter the numbers.

DO:

Workbook Activity: Solve division problems using numbers with decimals.
Practice Set: 3.35 ÷ 0.45 = **7.4444 or 7.44**

Application: How many 0.25-pound servings of ready-to-cook broccoli can be obtained from 18.5 pounds of fresh, trimmed, ready-to-use broccoli florets? 18.5 ÷ 0.25 = **74**

Instructor's Note: *Allow a couple of minutes and check answers with participants.*

Addition of Fractions

SHOW: *Fractions*

SAY:

Fractions are another way to express a number or part of a number that is less than one. The top number in a fraction is called the numerator, and the bottom number is the denominator. Although there is no simple way to use a regular calculator when working with them, there are free apps available for mobile devices that will allow you to calculate fractions.

Adding fractions with a common denominator is a simple operation. You add all the numerators and place their sum over the denominator. For example, to solve the problem, $1/8 + 5/8$, add the numerators for an answer of $6/8$. Always reduce the fraction to its lowest terms by divding the numerator and the denominator by their greatest common factor (GCF), which is the largest number by which both the numerator and denominator can be divided. What is the GCF for $6/8$?

Instructor's Note: *Work problem on flip chart. Ask for volunteers to give the answer.*

FEEDBACK:

In this case, the factor is 2, so the proper fraction is $3/4$.

SAY:

Since a fraction tells the number of parts of a whole, what does it mean if the top number (numerator) and the bottom number (denominator) are the same, like in the fraction $4/4$?

SAY:

In the fraction $4/4$, there are 4 parts out of a total of 4 selected; therefore, it is a whole, or the same as one. Consequently, anytime the numerator and denominator are the same in a fraction, it can be rewritten, or simplified, to one whole. Complete the two fraction addition problems in your workbook. You may work together if you choose.

DO:

Workbook Activity: Solve addition problems with fractions.

Practice Set: $1/5 + 3/5 =$ **$4/5$** $1/3 + 1\ 1/3 =$ **$1\ 2/3$** $7/8 + 5/8 = 12/8 =$ **$1\ 4/8$ = $1\ 1/2$**

Application: Susan needs $1/3$ cup of flour for a cheese sauce and $2/3$ cup of flour for brown gravy. How much total flour will she need to record on the storeroom withdrawal sheet?
$1/3 + 2/3 =$ **$3/3$ = 1 cup**

The mixed fruit cup was a combination of $1/4$ cup of mandarin oranges, $1/4$ cup of blueberries, and $1/4$ cup cherries. What was the total amount of fruit in the cup?
$1/4 + 1/4 + 1/4 =$ **$3/4$ cup**

Subtraction of Fractions

SAY:

Fractions with common denominators are subtracted by the same process used when adding. Subtract the numerators, and place the answer over the common denominator. Let's consider this problem: $8/9 – 5/9$. Find the answer by subtracting 5 from 8, and placing the answer over the common denominator of 9. The answer is $3/9$ or $1/3$, reduced.

SAY:

Solve the fraction subtraction problem in your workbook.

DO:

Workbook Activity: Solve subtraction problems with fractions.

Practice Set: $7/8 – 5/8 =$ **$2/8 = 1/4$** $4/5 - 1/5 =$ **$3/5$** $1\ 2/4 - 1/4 =$ **$1\ 1/4$**

Application: There was $4/5$ lb of flour reserved for the morning's recipes. If the staff only used $3/5$ lb of flour, how much was left? **$1/5$**

Addition or Subtraction of Fractions without a Common Denominator

SAY:

Some fractions have uncommon denominators. There are a couple of ways to solve these problems. The first example is an addition problem.

Example #1

$1/5 + 2/3 =$ ____

1. The first step is to cross-multiply the numerators and denominators.
   (1 x 3 = **3**) and (5 x 2 = **10**)

Next, add those two products. 3 + 10 = **13**

The resulting sum is the numerator for the original problem:
$1/5 + 2/3 =$ **13/__**

2. Now, multiply the denominators. 5 x 3 = **15**
   This product is the denominator for the original problem:
   $1/5 + 2/3 =$ **$13/15$**
3. The final step is to determine if the fraction can be reduced by searching for the GCF. Other than 0 or 1, there are no common factors, so the fraction cannot be reduced.

Answer: $1/5 + 2/3 =$ **$13/15$**

Example #2

Another way to solve fraction problems that involve addition or subtraction is to find a common denominator. The least common multiple (LCM or LCD) is the smallest multiple the denominators of all the fractions have in common. For example, if you want to add $3/8$ and $1/4$, the number 8 is the smallest multiple all of the denominators have in common. By converting $1/4$ to $2/8$, we can now add $3/8 + 2/8 = 5/8$.

SAY:
Are there questions? (*Allow one or two questions.*) Complete the practice problems in your workbook.

DO:
Workbook Activity: Solve fraction problems without a common denominator.

Instructor's Note: *Instruct participants to show work. Encourage group work. Allow a couple of minutes and then call on someone to share their answer.*

Practice Set:
$2/3 + 3/10 = \mathbf{29/30}$ $\quad$ $3/4 + 7/8 = \mathbf{1\ 5/8}$ $\quad$ $1/2 + 3/4 = \mathbf{1\ 1/4}$

ASK:
Are there any questions?

SAY:
We can use a similar procedure to subtract fractions without a common denominator.

Example #3:
Look in your workbooks for an example of subtracting fractions: $2/3 - 3/10$ **=**

When subtracting, it is important to remember to first multiply 2 x 10 and then multiply 3 x 3. The numerators to subtract are 20 – 9. Multiply 3 x 10 for the denominator. We can now solve the problem.

$$\frac{20 - 9}{30} = \mathbf{\frac{11}{30}}$$

The fraction cannot be reduced.

Multiplication with Fractions

SAY:
When multiplying fractions, the numerators of each fraction are multiplied to determine the numerator of the product. Then, the denominators of each fraction are multiplied to find the denominator of the product.

For example: $5/6 \times 4/9 = \frac{(5 \times 4) = 20}{(6 \times 9) = 54} = \mathbf{20/54} = \mathbf{10/27}$

The fraction $20/54$ can be reduced to $10/27$. The GCF is 2.

SAY:
Find the practice problems in your workbook and calculate the answers.

Instructor's Note: *Allow about one minute to solve the problem, then call on someone to share.*

DO:
Workbook Activity: Solve multiplication problems with fractions.

Practice Set:
$2/3 \times 4/9 =$ **$8/27$** $6/7 \times 2/3 =$ **$4/7$** $5/8 \times 3/5 =$ **$3/8$**

Division with Fractions

SAY:
We will finish Lesson I with a review of division of fractions. Division of fractions is similar to multiplication, except in division the second fraction in the equation must be inverted. This inverted fraction is known as the reciprocal. For example, if you want to solve $3/4 \div 5/6$, you must invert the second fraction so that it becomes $6/5$. Then, proceed as if you are multiplying fractions. $3/4 \div 5/6 = 3/4 \times 6/5 =$ **$18/20$** $=$ **$9/10$**

SAY:
Work the last few problems in Lesson I, and then we will share answers. (*Allow 2 to 3 minutes.)*

Instructor's Note: *Ask participants to show the steps used to solve the problem.*

DO:
Workbook Activity: Solve division problems with fractions.
Practice Set:
$3/8 \div 3/5 =$ **$15/24$** $=$ **$5/8$** $4/5 \div 1/2 =$ **$8/5$** $=$ **$1\ 3/5$** $7/12 \div 5/6 =$ **$42/60$** $=$ **$7/10$**

Application:
- How many $3/8$ cup servings are there in $3/4$ of a cup of yogurt? $3/4 \div 3/8 =$ **$24/12$** $=$ **2**
- Each spice pack holds $1/4$ teaspoon of the chef's secret spice. If there is only $2/3$ of a teaspoon of the secret spice remaining, how many spice packs can be made? **$2\ 2/3$**

SAY:
It is important to remember that solving problems with fractions requires attention to the denominators, and all answers should be reduced to a proper fraction or mixed number.

ASK:
Are there any questions before we learn about converting fractions and decimals?

Objective: Demonstrate how to convert fractions to decimals and decimals to fractions.

SHOW: *Converting Fractions to Decimals*

SAY:

In school nutrition, it is important to analyze the operational sites by comparing financial and operational data. Often this process includes converting fractions to decimals. To accomplish that, divide the numerator, the top number of the fraction, by the denominator, the bottom number of the fraction. Look in your workbook for an example. (*Instructor can summarize scenario.)*

> Ms. Jones, the school nutrition director, is concerned about the overproduction of yeast rolls in the district's elementary schools where neither offer verses serve is used nor extra rolls are sold. It is rumored some schools are making extra rolls to give additional servings to teachers. To analyze overproduction, she needs to know the percent of leftover rolls from each school daily. She requests a daily count of the number of rolls prepared and the exact meal count of lunches served with rolls. Ms. Jones then uses the information to calculate the percentage of leftover rolls for each school. The first school sends the following information: "Rolls prepared – 120. Total meals served with a roll – 95. One roll was dropped on the floor and discarded." What percentage of rolls were leftover at this school?

ASK:

What fraction will Ms. Jones use to determine the percentage?

FEEDBACK:

From the 120 prepared rolls, 95 were served and 1 discarded. The remaining 24 rolls are considered leftover. The fraction of remaining rolls is **$^{24}/_{120}$** or **$^{1}/_{5}$**.

ASK:

How do we convert the fraction to a percent?

FEEDBACK:

To find the percentage of leftovers, first, convert the fraction to a decimal. To do this, divide the number of rolls left over, 24, by the total number of rolls, 120. Next, convert the decimal answer to a percent by multiplying times 100. (24 ÷ 120 = 0.20); (0.20 x 100 = **20%**)

The school had not accounted for 20% of the rolls produced. By doing this procedure for each school, the director was able to see a trend of leftover rolls and whether some schools consistently run a higher percentage.

SHOW: *Converting Decimals to Fractions*

SAY:
There are times when a school nutrition professional may conduct an analysis that requires converting a decimal to a fraction. Look in your workbook for an example of how to convert 0.25 to a fraction.

- Write down 0.25 divided by 1 and then multiply both numerator and denominator by 100. Reduce your answer.
  $0.25/1 \times 100/100 =$ **25/100** = **1/4**

DO:
Workbook Activity: Convert decimals and fractions.

Practice Sets:

1. Convert 3/5 to a decimal.
   3 ÷ 5 = **0.60**
2. Convert 0.10 to a fraction.
   $0.10/1 \times 100/100 = 10/100 =$ **1/10**

ASK:
Are there questions about any of the mathematics functions we covered in Lesson I?

SAY:
We are now ready to move to Lesson II, which reviews the standard tools for measuring and weighing.

LESSON II

KITCHEN MEASURING TOOLS FOR INGREDIENTS

Objective: Identify the standard units and tools for measuring and weighing.

SHOW: *Standard Units of Measurement*

SAY:

Measurement tools are essential for preparing and serving quality food products. In Lesson II we will identify the culinary tools used for measuring and weighing food in the preparation of standardized recipes. In addition, participants will learn the standard units of measure for volume and weight and how to convert measurements in a standardized recipe to change the yield.

ASK:

Why do you think a lesson about measuring tools has been included in a class on basic culinary math skills?

FEEDBACK:

It is necessary to know how to properly measure food, so the food we produce is consistent. Being successful when measuring ingredients means the end result is better and is more reliable.

SAY:

Most United States Department of Agriculture (USDA) or other standardized SNP recipes list the amount of ingredients by weight and measures. These fixed quantities that are accepted as standards of measurement are known as units of measure and can denote volume, weight, time, or temperature. As a general rule, we measure liquids and small amounts of dry ingredients. Larger amounts of dry ingredients and other solid ingredients, we generally weigh. Since weighing is a quicker, easier, and more accurate method of measurement, it is the method used most frequently when preparing large quantities of food. The chance for an error is much smaller when weighing six pounds of flour than 24 cups of flour.

ASK:

If you are making a stir-fry recipe that specifies using fresh, chopped carrots, which of these measurements would be the most accurate: **11 lbs 4 ozs** or 2 gals 3 qts?

FEEDBACK:

It is always more accurate to use weight.

SHOW: *Understanding Measurement*

SAY:
Understanding measurement is important in SNP's. Standard measurements for portion size must be documented to meet the nutrition standard guidelines. To meet meal pattern requirements, schools must use tools that measure food items in both cups and ounces. Standardized recipes must document ingredient amounts to ensure proper preparation methods along with dietary specifications. Each tool used has its unique purpose. If SNP's are to ensure quality food products, employees must be trained to use these tools accurately.

DO:
Workbook Activity: Common Measurement Tools
Think about the measurement tools used in your school nutrition operation. Take a minute to list as many as you can in the space provided in your workbook.

FEEDBACK:
Mention the following items. Remind participants to list the tools in their workbook.

- graduated measuring containers
- nested measuring cups
- nested measuring spoons
- scales (bakers, portion, etc.)
- scoops
- ladles

SAY:
Most often the SNP staff use graduated cylinders for measuring liquids, use dry measures for measuring small amounts of dry ingredients, and use scales to weigh most items. The ICN *Basics at a Glance* poster is a great resource to help the school nutrition staff understand measurement and measurement tools. A copy of the poster is provided with your workshop materials today.

SHOW: *Volume*

SAY:
Any time we measure the physical space an ingredient occupies, we are measuring the volume. In a SNP kitchen, the most commonly used units of measurement for volume include:

- milliliter (mL)
- teaspoon (tsp)
- tablespoon (Tbsp)
- fluid ounce (fl oz)
- cup (c)
- pint (pt)
- quart (qt)
- liter (L)
- gallon (gal)

SHOW: *Fluid Ounces vs. Ounces*

SAY:

When considering standards of measurement, it is essential to know the difference between fluid ounces (fl oz) and ounces (oz). As stated on the previous slide, a fluid ounce is used when measuring volume, which is how much physical space an ingredient occupies. An ounce is a standard unit of weight, which is how dense an ingredient is. Costly errors can be made if someone does not know the difference in these units because most ingredients have a higher density if compared to the amount of space they occupy. This difference results in the ingredient weighing more in ounces than in fluid ounces. Honey is a great example. A graduated measuring container filled with 8.0 fl oz (volume) of honey will actually weigh 12.0 oz because it has a higher density. Water, however, has a volume and density that is the same: 8.0 fl oz of water = 8.0 oz of water.

SHOW: *Measuring Volume and Weight*

DO:

Workbook Activity: Measuring Volume and Weight

SAY:

Look in your workbook at the activity, Measuring Volume and Weight. There is a list of food items typically found in SNP recipes. Consider the list of measurement tools created in the last activity. Then, in the second column, list the tool that will provide the most accurate measure for each food item listed. In the third column, specify whether the tool measures volume or weight.

Measuring Volume and Weight		
Food Item	Tool	Volume or Weight
1 gallon beef stock	liquid measuring cup	volume
1 tablespoon salt	nested measuring spoons	volume
2 lbs of chopped carrots	scale	weight
3 cups of vegetable oil	liquid measuring cup	volume
1.5 lbs butter	scale	weight
2 teaspoons garlic powder	nested measuring spoons	volume
¼ cup cornstarch	nested measuring cups for dry ingredients	volume
6 lbs ground beef	scale	weight
1 portion-size serving of spaghetti sauce	ladle	volume

Instructor's Note: *Reveal answers on slide one at a time to check as a class. Remind participants to justify the reason they chose each tool. Answers may differ.*

FEEDBACK:

When measuring dry ingredients such as small amounts of sugar, spices, and leavening (baking powder, baking soda), you will want to fill the measuring cup or spoon without packing the ingredient and then level it off gently so that it is even with the top of the measuring utensil. Use a butter knife or straight edge spatula to cut across the top of the measuring cup or spoon parallel to the surface. This technique will remove any excess and keep the measurement accurate.

Objective: Convert measurements in a recipe to change the yield.

SHOW: *Converting Measurements*

Instructor's Note: *Work the problem on a flip chart.*

SAY:

Adjusting recipes to get the desired number of servings is important. Understanding how to convert measurements in a recipe to change the yield is an easy skill to master by following two rules:

1. When converting from a larger to a smaller unit of measurement, multiply the number in the original problem by the number of smaller units that make up the larger unit.
   - For example: *3 pints = ? cups*
     There are 2 cups in 1 pint, so multiply the number in the original problem (3 pints) by the number of smaller units that make up the larger unit (2 cups), so 3 x 2 = 6.
     3 pints = **6** *cups*
2. When converting from a smaller to a larger unit of measurement, divide the number in the original problem by the number of smaller units that make up the larger unit.
   - For example: *6 pints = ? quarts*
     There are 2 pints in 1 quart, so divide the number in the original problem (6 pints) by the number of smaller units that make up the larger unit (2 cups), so 6 ÷ 2 = 3.
     6 pints = **3** *quarts*

If you are converting a measurement that does not have a direct equivalent, just repeat the process using different units of measure until the desired unit is reached.

ASK:

What do we mean by the phrase "changing the yield"?

FEEDBACK:

We are actually referring to changing the number of servings.

SAY:
The yield for most standardized recipes used in the SNP is either 50 or 100 servings. Since few programs prepare exactly 50 or 100 servings, recipes must be adjusted for the actual number of forecasted servings. When adjusting recipes, it is important that measurement standards be consistent. As previously stated, weighing ingredients is the most accurate method of measuring many ingredients. For liquid items, measurement of volume may be preferred.

Regardless of the method used, it is important to use a tool that results in the least number of measurements possible. Often, the result of recipe adjustment results in a quantity that is hard to measure or the new amount necessitates repeated measurements of small amounts. These quantities should be converted to a more common measure. For example, if a recipe is adjusted so that it calls for 7 teaspoons of salt, the cook staff should measure 2 tablespoon and 1 teaspoon instead of measuring 7 teaspoons. A better measurement is ⅛ cup plus 1 teaspoon.

ASK:
Why should the cook staff never attempt to measure 7 teaspoons of an ingredient using a single teaspoon measure?

FEEDBACK:
There are more chances for error.

SHOW: *Measurement Conversions table*

SAY:
In the next activity, we will practice converting ingredients to utilize the most accurate measurement. To help you make the conversions, there is a chart in your workbook. You are given ingredients and amounts. Now, decide on a converted amount that will result in the least number of times an ingredient will have to be measured. After you make the adjustment, select the best measuring tool to use for the amount listed. The first ingredient in the activity has been done for you.

DO:

Workbook Activity: Measurement Conversions

Instructor's Note: *Allow about 2 minutes for completion of the activity. Call on participants to provide answers. (Click to reveal answers on slide one at a time.)*

Measurement Conversions			
Ingredient	**Original Amount**	**Measurement Tool**	**Adjusted Amount**
Example: black pepper	*6 teaspoons*	*tablespoon*	*2 tablespoons*
flour	12 tablespoons	dry measuring cup	¾ cup
vegetable oil	2 cups	liquid measuring pitcher	16 fluid ounces
water	4 cups	liquid measuring pitcher	1 quart
baking powder	4 tablespoons	dry measuring cup	¼ cup

Culinary Measurement Conversions		
Unit	Equivalents	
1 tablespoon	3 teaspoons	½ fluid ounce
⅛ cup	2 tablespoons	1 fluid ounce
¼ cup	4 tablespoons	2 fluid ounces
⅓ cup	5 tablespoons + 1 teaspoon	2 ¾ fluid ounces
½ cup	8 tablespoons	4 fluid ounces
⅔ cup	10 tablespoons + 2 teaspoons	
¾ cup	12 tablespoons	6 fluid ounces
1 cup	16 tablespoons	8 fluid ounces
1 pint	2 cups	16 fluid ounces
1 quart	2 pints	32 fluid ounces
1 gallon	4 quarts	128 fluid ounces
1 pound	16 ounces	

ASK:

Are there any questions about measurement before we begin the next lesson?

LESSON III
CONVERTING STANDARDIZED RECIPES

Objective: Determine the scaling factor to change the yield of a recipe.

SAY:

As we discussed in Lesson II, USDA standardized recipes list the quantities needed to produce 50 or 100 servings. While many schools have software in their schools that will adjust recipes for them, it is important for all staff members to receive training on quantity adjustment for recipes so they understand the process. In most SNP's there are several steps used to increase or decrease the ingredients in a standardized recipe. In Lesson III you will learn to use a scaling factor to change the yield of a standardized recipe. Next, you will apply the method to increase and decrease a standardized recipe.

ASK:

How many of you have used a scaling factor to change the yield of a recipe?

Instructor's Note: *Note the number of participants that indicate they are unfamiliar with the factor method. This information will help you, as the instructor, know which participants may need extra assistance.*

SHOW: *Weight Equivalence chart*

EQUIVALENCY CHART		
Weight	**Decimal Equivalent**	**Fraction Equivalent**
1 oz	0.0625 lb	1/16
2 oz	0.125 lb	1/8
3 oz	0.1875 lb	3/16
4 oz	0.25 lb	1/4
5 oz	0.312 lb	5/16
6 oz	0.375 lb	3/8
7 oz	0.437 lb	7/16
8 oz	0.5 lb	1/2

EQUIVALENCY CHART		
Weight	**Decimal Equivalent**	**Fraction Equivalent**
9 oz	0.562 lb	9/16
10 oz	0.625 lb	5/8
11 oz	0.687 lb	11/16
12 oz	0.75 lb	3/4
13 oz	0.812 lb	13/16
14 oz	0.875 lb	7/8
15 oz	0.937 lb	15/16
16 oz	1 lb	1

SAY:

First, please note the Weight Equivalence chart in your workbook. It includes decimal and fraction equivalents for weights in ounces. You may need to reference this information throughout the upcoming sections.

SHOW: *Scaling Factor*

SAY:

Now, follow along in your workbook as we practice scaling a recipe. In the first scenario provided, the school nutrition program manager at School A forecasts the staff will serve 225 students a menu item that has ground beef as one of its ingredients. The standardized recipe yield is for 100 servings. In order to determine how much ground beef it will take to prepare a recipe that yields 225 servings, the staff must first determine the scaling factor.

SAY:

The factor is determined by dividing the number of servings needed by the number of servings listed in the original recipe. For example, if you plan to prepare 225 servings and the recipe yield is 100, divide 225 by 100 to get a factor of 2.25.

Increase: $\dfrac{\text{number of servings needed}}{\text{original number of servings}} = \dfrac{225}{100} =$ **2.25 scaling factor**

SHOW: *Yield*

SAY:

The next step is to calculate the new total yield for each ingredient. To do this we multiply the original amount of each ingredient by the scaling factor. However, as we learned in Lesson II, it may be necessary to first convert the weight or volume to a common unit of measurement for some ingredients.

ASK:

What do we mean by a common unit of measurement?

SHOW: *Convert to a Common Unit*

SAY:

Assume the recipe you are using calls for 5 lbs 8 oz of ground beef to make 100 servings. In this example, there are two units of measure, pounds and ounces. Before multiplying by the scaling factor, we must convert the 5 lbs 8 oz to one common measure. In this example, since we know 16 ounces equals 1 pound that means 8 ounces is equal to ½ pound (0.5 lb). Therefore, it is easier to convert the entire amount to pounds.

5 lbs <u>8 oz</u> = 5 lbs + <u>0.5 lbs</u> = **5.5 lbs**

ASK:

How do we determine the amount of ground beef needed for 225 servings if we use 5.5 pounds as the measure for 100 servings?

SAY:
Multiply the number of pounds by the scaling factor (5.5 x 2.25 = **12.375 lbs**). Notice the answer is in decimal form and will need to be converted back to mixed units so we will have whole numbers.

SHOW: *Another Example*

SAY:
If the original amount of ground beef had not easily converted to pounds, we would have converted it to ounces before multiplying by the scaling factor.

a. Multiply 5 pounds x 16 (number of ounces in a pound) = 80 ounces
b. Add this amount to the 8 ounces you originally had = **88 ounces**
   5 lbs 8 oz = **88 ounces**

Now we can determine the amount of ground beef needed for 225 servings by using 88 ounces as the measure for 100 servings.

a. Multiply 88 (total ounces) by 2.25 (factor) = 198 ounces, the scaled amount
b. Then, to convert back to the mixed units, divide 198 oz by 16 (oz in a lb) = 12.375 lbs

Notice the answer is in decimal form and will need to be converted back to mixed units so we will have whole numbers.

c. Multiply 0.375 lbs by 16 (oz in a lb) = 6
   Adjusted Amount for 225 servings ounces: **12 lbs 6 oz**

ASK:
Using ounces as the measure, is the amount of ground beef the same as in the calculation using pounds? (*Yes; both converted to 12.375 pounds.*)

FEEDBACK:
It is always a good idea to have a conversion chart posted near each preparation station. In this case, it definitely made the calculations much easier.

SHOW: *Final Conversion*

SAY:
There are times when we need to decrease a recipe yield. The steps are basically the same as increasing a yield. Look at the example in your workbook. The school nutrition program manager at School B forecasts they will serve 80 students for lunch. They are serving a menu item that has ground beef as one of its ingredients. The standardized recipe yield is for 100 servings. What is the scaling factor?

FEEDBACK:

The scaling factor is 0.80. All steps to making the conversion are the same as for increasing a yield.

Decrease:

$$\frac{\text{number of servings needed}}{\text{original number of servings}} = \frac{80}{100} = \textbf{0.80 scaling factor}$$

SAY:

Assume a recipe with a recipe yield of 100 requires 16 pounds 4 ounces of ground beef. You need 80 servings. Convert the yield to 80 servings. For this example, convert both weight units to ounces.

ASK:

Will someone volunteer to share the calculations necessary to determine the amount of ground beef needed for 80 servings?

Instructor's Note: *Write the calculations on the white board or flip chart as the participant gives the steps. If using a flip chart, you may want to do this before class and share with participants. Remind participants to make notes in their workbook.*

FEEDBACK:

1. Multiply 16 pounds x 16 ounces = 256 ounces + 4 ounces = 260 ounces.
2. Multiply 260 ounces x 0.80 (factor) = 208 ounces
3. Divide 208 ounces by 16 ounces = **13 pounds**

The food production staff needs **13 pounds of ground beef** on hand to make 80 servings.

SHOW: *Decisions*

SAY:

There are special situations that require decisions to be made when scaling a recipe. Some recipe adjustment calculations will result in a fraction or decimal that is not easy to convert or measure. For example, if you have 2 ounces of bell pepper in an original recipe that yields 100 servings and your scaling factor is 2.4, the adjusted amount of bell pepper is 4.8 ounces. If your scale cannot weigh to the accuracy of 0.8 ounces, round up to the next nearest measurable amount. In this example, the decimal 0.8 can be increased to 1 ounce, so the adjusted amount would be 5 ounces.

Increasing or decreasing spices or seasonings may require a different proportion from other ingredients. Be careful when adjusting seasonings. *Culinary Techniques for Healthy School Meals* published by ICN offers this recommendation: In general, double the spices and herbs in a recipe when increasing from 50 to 100 servings. Increase the spice or herb by 25% for each additional 100 servings.

In some cases, it may be difficult to adjust eggs using the scaling factor method, so the manager and technician will need to make the final decision. If the recipe adjustment results in 1 ⅔ eggs, rounding up to 2 eggs is usually the best option.

Objective: Convert a standardized recipe from a smaller to a larger yield.

SAY:

In your workbook, find the activity, *Using a Scaling Factor to Increase a Recipe Yield*. Notice you have the ingredients to make 50 servings of Sunshine Salad. You are asked to adjust the recipe to make 100 servings. Work with your table team or a learning partner to find the factor and complete the worksheet.

SHOW: *Sunshine Salad – Recipe Yield Increase*

Instructor's Note: *Allow about 3 or 4 minutes for completing the exercise. Remind participants the scaling factor will be the same for all ingredients.*

DO:

Workbook Activity: Using a Scaling Factor to Increase a Recipe Yield

SUNSHINE SALAD Recipe Yield Increase to 100 Servings					
Ingredient	**For 50 Servings**	**Quantities Converted**	**Scaling Factor**	**Calculated Amount**	**For 100 Servings**
Lettuce, romaine	1 lb 3 oz	**19 oz**	**2**	38 oz	2 lbs 6 oz
Lettuce, green leaf	1 lb	16 oz		32 oz	**2 lbs**
Carrots, shredded	7 oz	7 oz		14 oz	**0.88 lbs**
Mandarin oranges, canned, drained	1 qt 1 cup	**5 cups**		**10 cups**	2 ½ qts
Orange juice	4 ¼ cups	4.25 cups		**8.5 cups**	**8 ½ cups**
Sugar, light brown, packed	⅓ cup	⅓ cup		**2/3 cup**	**2/3 cup**
Vanilla extract	½ tsp	½ tsp		**1 tsp**	**1 tsp**

Instructor's Note: *Show answers on slide one at a time by clicking.*

FEEDBACK:

Let's take a look at your calculations and compare them with the answers on the slide. If you have errors on the sheet, you may want to correct them as we go over the worksheets.

Objective: Convert a standardized recipe from a larger to a smaller yield.

SHOW: *Tuna Salad – Recipe Yield Decrease*

SAY:

Look at the next workbook activity, *Using the Factor Method to Decrease a Recipe Yield*. This time, you are given the ingredients and amounts to make 100 servings of Tuna Salad. You must adjust the recipe to make only 75 servings. Work with your table team or a learning partner to find the scaling factor, and complete the worksheet.

DO:

Workbook Activity: Using the Factor Method to Decrease a Recipe Yield

TUNA SALAD Recipe Yield Decrease to 75 Servings					
Ingredient	**For 100 Servings**	**Quantities Converted**	**Scaling Factor**	**Calculated Amount**	**For 75 Servings**
canned chunk-style tuna	16 lbs 4 oz	260 oz	0.75	195 oz	**12 lbs 3 oz**
fresh onion, chopped	2 lbs 8 oz	40 oz		**30 oz**	1 lbs 14 oz
fresh celery, chopped	4 lbs	4 lbs		**3 lbs**	**3 lbs**
dill pickle relish	2 cups	2 cups		**1.5 cups**	**1 ½ cups**
hard-cooked eggs	16 eggs	16 eggs		**12 eggs**	**12 eggs**
low-fat mayonnaise	5 lbs 3 oz	**83 oz**		62.25 oz	3 lbs 14 oz

SAY:

Let's check your answers. If you have errors, please correct them as we go.

Instructor's Note: *Show answers on slide, one at a time, by clicking.*

ASK:

Are there any questions about using the factor method for recipe conversions? If not, we are ready to begin our final lesson today. Look in your workbook for Lesson IV.

LESSON IV
CALCULATING FOOD COST

Objective: Calculate the unit cost of food items.

SAY:
In Lesson IV you will learn how to calculate the unit cost of food items, the difference between "As Purchased" (AP) and "Edible Portion" (EP), and why these terms are important when determining food costs. You will also have the opportunity to calculate the cost of a recipe to determine a per-meal cost.

ASK:
How many of you pre-cost recipes that you use to prepare meals in the SNP?

FEEDBACK:
Although calculating the average cost-per-meal is a common practice in most schools, it is much less common to determine the portion cost for each item served in the meal.

SHOW: *Calculating Unit Cost*

SAY:
Determining the cost of food is critical to a well-managed program, and the school nutrition staff needs to know the cost of preparing each food item. Overspending on food is often the problem if a SNP is losing money. As SNPs face rising costs for the foods they purchase, it is essential for management to calculate the cost of each food item they serve on a regular basis.

Units are food products that can often be divided into smaller portions. These products are usually sold in cases. Calculating the unit cost is necessary in order to determine the portion cost. Look in your workbook for the methods used to calculate unit and portion costs. For example, if several whole pizzas are sold as a case, one pizza represents a unit. The pizza unit is further divided into portions, slices.

SHOW: *Calculating Unit and Portion Costs*

SAY:
The way to calculate unit cost is to divide the case cost by the number of units. Then, for the portion cost, divide the unit cost by the number of portions. Let's try an example.

ASK:
If a school serves pre-prepared pizza that costs $36.00 per case and there are 6 whole pizzas in each case, what is the unit cost for each pizza?

FEEDBACK:
Divide the case cost of $36.00 by the number 6 which represents the number of whole pizzas in the case. **The cost per unit is $6.00.**

ASK:
Assume the school cuts each pizza into 8 portions. What is the portion cost of the pizza?

FEEDBACK:
Divide the unit cost $6.00 by the 8 portions in the pizza for a portion cost of **$0.75.**

DO:
Workbook Activity: Determine unit and portion costs.

The school nutrition director orders pre-prepared lasagna at a cost of $91.20 per case. Each case contains 4 pans of lasagna. The manager determines there are 24 servings in each pan.

1. What is the cost per unit for a pan of lasagna? $91.20 ÷ 4 = **$22.80**
2. What is the cost per portion for a serving of the pre-prepared lasagna? $22.80 ÷ 24 = **$0.95**

Instructor's Note: *Call on participants to share answers for each question.*

SAY:
There are times when the unit cost is also the portion cost. For example, if the SNP director orders 4 ounce boneless chicken breasts that are packed 24 to a case for $19.20, only one calculation is needed to obtain both the unit and portion costs.

ASK:
Can someone tell me the portion cost of each chicken breast?

FEEDBACK:
Divide the case price of $19.20 by 24 for a unit or portion cost of **$0.80.**

SAY:
If the SNP is serving an item that is measured in ounces or cups, the unit cost will need to be calculated as weight or volume. For example, if the school receives a case that contains several bags of food product, the cost of each bag is the unit price. The portion cost is determined by the number of servings in each bag according to the weight or volume required for a serving. Find the workbook activity, *Determine Unit and Portion Cost Using Weight*. You will now have an opportunity to practice calculating the cost of a serving using a volume measure.

DO:
Workbook Activity: Determine unit and portion cost using weight.

The SNP director wants to know the food cost per serving for a ¼ cup of baked fries. The cost for a case is $21.00. Each case contains 6 bags of oven-ready fries that weigh 5 pounds. According to the product label, each 5 pound bag contains 70 servings measured by ¼ cup.

1. Determine the cost of each bag (unit).
2. Determine the cost per ¼ cup portion or serving.

FEEDBACK:

1. Determine the cost of each bag by dividing the price per case by the number of bags in the case.
   $21.00 per case ÷ 6 bags per case = **$3.50 per bag**
2. Determine the cost per ¼ cup serving by dividing the cost per bag by the number of servings listed on the product label.
   $3.50 cost per bag ÷ 70 servings per bag = **$0.05 per portion/serving**

SAY:

In this scenario, we used the number of servings listed on the product label. The SNP staff can verify the number of servings using the *Food Buying Guide for Child Nutrition Programs* published by the USDA, which we will discuss more in the next section.

ASK:

Are there questions before we discuss the use of "As Purchased" versus "Edible Portion" in determining cost of food served?

Objective: Recognize the difference between the "As Purchased" (AP) form and the "Edible Portion" (EP) form in determining food costs.

SHOW: *"As Purchased" Foods*

SAY:

Many food products are delivered in what is called the "As Purchased" (AP) form that needs some preparation before they are ready to be served in the "Edible Portion" (EP) form. The AP amount refers to the food products as they were ordered and received; the EP amount refers to the amount of the food that is available to serve after it is trimmed and/or prepared.

SHOW: *"Edible Portion" Foods and Yield Percentage*

SAY:

SNPs must factor in the unused portions of food, so they perform calculations using the AP and EP amounts to determine the yield percentage of food items. For example, if 5 pounds of radishes weigh 4.5 pounds once they are prepared, their yield percentage can be determined by dividing the EP (4.5 lbs) by the AP amount (5 lbs) and then, multiplying the answer by 100 to convert it to a percentage.

4.5 ÷ 5 = 0.9 x 100 = **90% - The radishes will have a 90% yield.**

If any two of these amounts are known, the third one can be determined. Using these calculations is an important skill in many situations such as, when ordering food, determining cooking loss, and calculating how many servings can be made from a pork tenderloin.

SHOW: *Food Buying Guide for Child Nutrition Programs*

The *Food Buying Guide for Child Nutrition Programs,* published by the USDA, (**fns.usda.gov/tn/food-buying-guide-school-meal-programs**) provides information on the edible yield percentages of various foods. This information is important to assist menu planners in determining the amount to purchase. Not only can it save the menu planner time, it can increase accuracy since manual calculations often lead to errors.

SHOW: *Food Buying Guide Calculator*

There is also a *Food Buying Guide Calculator* available on the Institute of Child Nutrition's website (**fbg.theicn.org**). There are individual calculators for each of the food groups outlined in the *Food Buying Guide* that can save valuable time when determining how much product to purchase. The URLs for both the *Food Buying Guide* and the *Food Buying Guide Calculator* are listed in your workbook.

ASK:

How many of you have used the *Food Buying Guide Calculator*?

SAY:

In your workbook is an example of selected information provided in the *Food Buying Guide*. Three products are listed along with the description and yield. The *Food Buying Guide* provides other descriptions of the food such as AP, purchase unit, servings per purchase unit, serving size per meal contribution, and how much to purchase for 100 servings.

Selected Food Products from the *Food Buying Guide*

Product	Description	Yield
ground beef, fresh/frozen raw	No more than 26% fat	1 lb AP = 0.72 cooked, drained lean meat
chicken breast, fresh/frozen raw	Portion without backs; with skin	1 lb AP = 0.64 lb cooked, boned chicken meat with skin
pork sausage, Italian-style, fresh/ frozen raw	No more than 35% fat (3% water maximum)	1 lb AP = 0.62 cooked, drained Italian-style sausage

SAY:

Look at the information provided for ground beef. The product description tells us that the ground beef is fresh or frozen raw with no more than 26% fat, and each purchased pound yields about 72% of drained lean meat when cooked.

SHOW: *Determining the Amount to Order*

SAY:

If the menu planner wants to purchase enough ground beef (AP) to serve 2 ounces (EP) to 100 students, several calculations are necessary to determine the amount to purchase. Examples of the calculations are provided in your workbook. Follow along as we go over each step.

1. Determine the total number of ounces needed. Multiply ounces per student times the number of students. 100 students x 2 ounces = 200 ounces EP
2. Divide the number of ounces needed by the yield percentage. 200 ÷ 0.72 = 277.78 ounces AP
3. Convert to pounds. 277.78 ounces ÷ 16 ounces = **17.36 (rounded to 17.50)**

The menu planner will need 17.5 pounds of ground beef to serve 2 ounces EP to 100 students.

SAY:

Find the workbook activity, *Calculate the Amount of AP Product to Purchase*. Now, while taking the AP and EP forms of a product into consideration, you will calculate the amount of food you need to order to meet the meal requirements for a specific serving size.

DO:

Workbook Activity: Calculate Amount of AP Product to Purchase.

The menu planner needs enough Italian-style pork sausage to serve 2 ounces (EP) to 200 students. Using the information provided in the food product table in your workbook, calculate the amount of AP Italian-style pork sausage the menu planner should order.

FEEDBACK:

The following calculations must be made.

1. 200 student x 2 ounces = 400 ounces
2. 400 ounces ÷ 0.62 percentage yield = 645.16 ounces
3. 645.16 ounces ÷ 16 ounces in a pound = **40.32 (40.50 rounded)**

The menu planner will need 40.5 pounds to serve 2 ounces EP to 200 students.

ASK:

Are there questions before we learn how to calculate recipe cost?

SAY:

The cost of food used in producing a meal is an essential piece of financial information needed when making financial management decisions about the SNP. In the first two objectives for this lesson, we learned how to calculate unit costs, portion costs, and as-served costs. In our final activity, we will learn how to calculate the portion or serving cost of a recipe.

ASK:
The school nutrition manager wants to try a recipe for pasta salad that calls for whole grain-rich rotini pasta, olive oil, onions, celery, olives, and seasonings. What else does the menu planner need to know to determine how much a serving of the pasta salad will cost the SNP?

Instructor's Note: *List responses on a white board or flip chart paper.*

FEEDBACK
1. Number of servings or recipe yield
2. Amount of each ingredient needed for preparing the recipe
3. Unit price of each item in the recipe

SAY:
The recipe calls for 10 ounces of pasta for 50 servings of salad, and the purchase price for 1 lb of pasta is $8.00. What is the cost of the pasta for the recipe?

a. Since the pasta is priced by the pound but the pasta is in ounces, first, convert the cost to a price per ounce.
   $8 per pound ÷ 16 ounces = $0.50 per ounce
b. Next, multiply the cost per ounce by the number of ounces required by the recipe.
   $0.50 per ounce x 10 ounces called for in recipe = **$5.00 cost of pasta in the recipe**

To determine the cost for each serving since the recipe yield is 50, it only requires one additional step.

c. Divide the cost of the pasta in the recipe by the number of servings.
   $5.00 recipe cost ÷ 50 (servings) = **$0.10 per serving for pasta**

ASK:
Are there any questions? We will now calculate the cost for an entire recipe.

Objective: Calculate recipe costs to determine yield costs of recipes.

SHOW: *Costing Recipes*

SAY:
To simplify the process when calculating the cost for an entire recipe, first determine the cost of each ingredient. Then, add the cost of all ingredients, and divide the total cost of the recipe by the yield for the as-served cost.

ASK:
Are there any questions about calculating the cost of a recipe before we complete the workbook activity?

Instructor's Note: *Go over the workbook activity with the group to ensure they understand the assignment. If time is limited, place participants in groups and have each group work on total costs for two or three ingredients. Results can be shared with the class.*

SHOW: *Powerhouse Chili*

DO:

Workbook Activity: Calculate Recipe Costs

Calculate both the recipe cost and as-served portion cost for the menu item, Powerhouse Chili. If you need a memory jog about conversions, refer back to Lesson II.

POWERHOUSE CHILI Recipe Yield: 100 servings			
Ingredient	**Amount (100 servings)**	**Unit Cost**	**Total Cost**
Fresh onions, diced	6 lbs	$0.95/lb	**$5.70**
Fresh garlic, minced	8 oz	$6.20/lb	**$3.10**
Low-sodium vegetable stock	12 ½ cups	$3.88/qt	**$12.13**
Canned low-sodium black beans drained, rinsed	12 lbs	$1.28/lb	**$15.36**
Fresh red bell peppers, diced ½"	2 lbs 8 oz	$1.25/lb	**$3.13**
Canned low-sodium diced tomatoes	11 lbs 12 oz	$1.38/lb	**$16.22**
Canned low-sodium tomato sauce	3 ½ qts	$2.70/qt	**$9.45**
Chili powder	4 oz	$9.53/lb	**$2.38**
		Total Recipe Cost:	**$67.47**
		As-Served Portion Cost:	**$0.67**

SAY:

It's time to review the answers for the workbook activity. (*Call on individuals to provide answers. Reveal answers on slide one at a time by clicking.)*

ASK:

Are there questions about calculating recipe costs?

Skills Practice

SHOW: *Teach Me!*

SAY:

We covered quite a bit of material today from basic calculations with whole numbers, fractions, and decimals, to choosing appropriate measurement tools, to scaling recipes. Now we are going to practice a variety of those skills by teaching each other how to work some word problems.

Each table will receive one deck of the *Teach Me!* word problem cards. Each card has a math word problem on one side and the correct answer on the other. By table, pass out all the cards in the deck; some people may receive more than one problem. Once you receive your card or cards, I will give you about 10 minutes to plan how you will teach the problem. Keep in mind it is important to not get side-tracked by specific guidelines and rules that are unique to any one program. Rather the focus will be on foundational skills needed to be successful, regardless of the program. As a result, some food items may be listed in unique amounts and/or units that are not common in child nutrition settings. Do not allow this to take your attention away from the focus: the math skills.

After the 10 minutes is up, you will work with a partner at your table, taking turns to teach a short 30 – 45 second demonstration of how to complete the word problem on the card.

Instructor's Note: *Cards are color coded by topic. You may choose to use all or to limit topics in the review. Please make markers and flip charts available for participants to use if necessary.*

DO:

Hand out one deck of cards to each table, and remind them to pass out all the cards in the deck. Give them 10 minutes to plan how they will teach their selected word problem to their partner.

SAY:

There was some really great teaching going on. Is there anyone one who would like to share their problem with everyone?

Instructor's Note: *If no one volunteers, continue on to the Wrap-up and Post-Assessment.*

Wrap-up

SHOW: *Post-Assessment*

SAY:
We will wrap up the training today by completing the post-assessment. Please write the same personal identifier you used on the pre-assessment in the upper right hand corner. When you complete the assessment, you may place them face down at the edge of the table and someone will pick them up.

DO:
Pass out evaluations.

SHOW: *Institute of Child Nutrition*

SAY:
Evaluations have been distributed. Please take a moment to complete the evaluations and place them face down on your table. ICN values your input and comments regarding this training.

DO:
Collect post-assessments and present completion certificates.

Instructor's Note: *Check to see that a representative of the training sponsor collects evaluations for return to ICN.*

Appendix

References

Dopson, L. R. & Hayes, D. K. (2011). *Food and beverage cost control.* Hoboken, NJ: John Wiley & Sons.

Gilchrist, J. (Ed.). (2009). *Kitchen math everyday math skills*. Northwest Territories Literacy Council. Retrieved from www.nwt.literacy.ca

Institute of Child Nutrition. (2006). *Competencies, knowledge, and skills of effective school nutrition assistants and technicians*. University, MS: Author.

Institute of Child Nutrition. (2009). *Culinary techniques for healthy school meals: Seasonings* (p. 13-14). Retrieved from www.theicn.org/documentlibraryfiles/PDF/20100210102351.pdf

Jones, T. (2008). *Culinary calculations: Simplified math for culinary professionals*. Hoboken, NJ: John Wiley & Sons.

McGreal, M. & Padilla, L. J. (2014). *Culinary math principles and applications*. Orland Park, IL: American Technical Publishers.

Smith, J. A. (2010). "Kitchen math and measuring: How it all adds up." *Learning seed.* Retrieved from www.learningseed.com/catalog/kitchen-math-and-measuring

Strianese, A. J. & Strianese, P.P. (2012). *Math principles for food service occupations*. Clifton Park, NY: Thomson Delmar Learning.

United States Department of Agriculture, Food and Nutrition Services. (2014). *Food buying guide for child nutrition programs.* Retrieved from www.fns.usda.gov/tn/ foodbuying-guide-child-nutrition-programs

Glossary of Key Terms

as purchased (AP) amount: the food item as it is purchased from the supplier

as-served cost: the cost of a menu item served to the customer

decimal number: a number that uses a decimal point followed by a digit or digits to represent a value that is smaller than one

denominator: the bottom number in a fraction that represents the number of parts into which the whole is divided

dividend: a number to be divided by another number

divisor: a number that divides into another number

edible portion (EP): the amount of a food product that remains after it has been trimmed

factor: the numbers multiplied together to get another number

fraction: two quantities shown as a numerator over a denominator that represents the parts of whole

greatest common factor (GCF): the largest number that is a common divisor of a given set of numbers; also called greatest common divisor (GCD)

ingredient: one or more parts of a recipe

least common multiple (LCM): the smallest positive number that is a multiple of two or more numbers; also called least common denominator (LCD)

measurement tool(s): a device for measuring a physical quantity

mixed number: a whole number greater than zero and a proper fraction

multiple: a number that can be divided by another number without a remainder

numerator: the top number in a fraction that represents the parts of the whole

percent: the parts per 100; represented by the symbol "%"

portion: the amount of food item or beverage served to an individual person

product: the answer to a multiplication problem

proper fraction: a fraction whose numerator is less than the denominator

quotient: the answer to a division problem

reciprocal: a fraction that results from switching the numerator and denominator in an existing fraction

rounding: reducing the places in a number to gain a specific level of accuracy

scaling factor: the number used to multiply all of a recipe's ingredients in order to adjust the yield of the recipe

standardized recipe: a recipe that has been tried, adapted, and retried several times for use by a specific school nutrition operation

yield: the total amount of food or beverage made from a standardized recipe

yield percentage (YP): the percentage found when dividing the edible-portion (EP) amount by the as-purchased (AP) amount

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