5.2

Converting Recipes

READING PREVIEW

Key Concepts

- Scaling recipes based on portion size
- Scaling recipes based on available ingredients
- Finding recipe yield based on available ingredients
- Using scaled recipes
- Finding the raw food cost
- Converting between professional and consumer versions of recipes

Vocabulary

- denominator
- edible quantity
- numerator
- purchase quantity
- purchase unit
- raw food cost
- recipe conversion factor (RCF)
- scale (a recipe)
- yield percentage

ırce: Culinary Institute of America

Scaling Recipes Up or Down

Some days 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 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.

Scaling a Recipe Up or Down

To scale a recipe up or down:

1. Find the **recipe conversion factor (RCF)**.

$$RC = \frac{\text{yield you want}}{\text{yield of original recipe}} = \frac{\text{new yield}}{\text{old yield}}$$

2. Multiply each ingredient amount by the RCF.

Try scaling a recipe now. First, you will scale up a basic recipe for boiled white rice. Then you will scale the recipe down.

RECIPE 125 CARD

Boiled White Rice

YIELD: 10 Serving **SERVING SIZE: 1 Cup**

Ingredients

2½ cups	White rice
1 tsp	Salt
64 fl oz	Water

Recipe Categories
Boiled White Rice

Scaling Up Your kitchen's basic recipe calls for for boiling 2½ cups of rice, which yields 10 servings (each serving is 1 cup). However, you need 40 servings. How much of each ingredient do you need?

Scaling Up

To scale the recipe up:

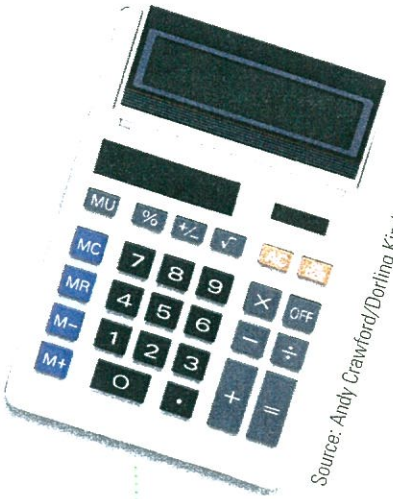
1. Find the RCF.

$$\text{RCF} = \frac{\text{new yield}}{\text{old yield}} = \frac{40}{10} = 4$$

2. Multiply the amount of each ingredient by the RCF (as shown in the following table).

Scaling Up

Ingredient	Old Amount	RCF	New Amount
White rice	2½ cups	× 4	= 10 cups
Salt	1 tsp	× 4	= 4 tsp
Water	64 fl oz	× 4	= 256 fl oz



Source: Andy Crawford/Dorling Kindersley Limited

To make 40 servings, you will need 10 cups of rice, 4 tsp of salt, and 256 fl oz (2 gal) of water.

CULINARY **MATH**

Converting Fractions

When we scaled a recipe up, the RCF was 40/20. You can change the form of this fraction to make multiplication easier.

You can either convert the fraction to a decimal, or you can simplify the fraction. Both methods give the same results.

Converting a Fraction into a Decimal

Divide the **numerator** (top number) by the **denominator** (bottom number).

$$\begin{matrix}\text{Numerator} \rightarrow \\ \text{Denominator} \rightarrow\end{matrix} \frac{40}{20} = 2$$

Simplifying a Fraction

Divide both the numerator and denominator by the same factor.

$$\frac{40}{20} \div \frac{10}{10} = \frac{4}{2}$$

Continue dividing until the fraction is in a convenient form. You can use a different factor, provided you divide both the numerator and the denominator by the same factor. This time, divide the numerator and denominator by 2.

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

Computation

1. Convert the following fractions to decimals (you may have to round off): $^{5}/_{20}$, $^{30}/_{15}$, $^{25}/_{5}$, $^{16}/_{32}$, $^{15}/_{12}$, $^{8}/_{40}$, $^{4}/_{9}$, $^{5}/_{27}$.
2. Simplify the following fractions: $^{5}/_{15}$, $^{4}/_{20}$, $^{6}/_{36}$, $^{45}/_{7}$, $^{16}/_{32}$, $^{100}/_{5}$, $^{3}/_{9}$, $^{17}/_{9}$.

Scaling Down 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. How much of each ingredient do you need?

Scaling Down

To scale the recipe down:

1. Find the RCF.

$$\text{RCF} = \frac{\text{new yield}}{\text{old yield}} = \frac{5}{10} = \frac{1}{2} = 0.5$$

2. Multiply the amount of each ingredient by the RCF (as shown in the following table).

Scaling Down

Ingredient	Old Amount	RCF	New Amount
White rice	2½ cups	× 0.5	= 1¼ cups
Salt	1 tsp	× 0.5	= ½ tsp
Water	64 fl oz	× 0.5	= 32 fl oz

CULINARY **MATH**

Multiplying Fractions

When you scaled down the recipe, you had to multiply a fraction (2½) by the RCF, which can be shown as a fraction or as a decimal.

Multiplying Fractions

Convert whole numbers and fractions into one single fraction.

$$2\frac{1}{2}\text{ tsp} = \frac{2}{1} + \frac{1}{2} = \frac{4}{2} + \frac{1}{2} = \frac{5}{2}\text{ tsp}$$

Multiply this fraction by the RCF expressed as a fraction. Multiply the numerators and then the denominators.

$$\begin{aligned}\text{Numerator} &\rightarrow 5 \times 3 = 15\\ \text{Denominator} &\rightarrow 2 \times 10 = 20\end{aligned}$$

Then simplify the fraction.

$$\frac{15}{20} \div \frac{5}{5} = \frac{3}{4}$$

Multiplying a Fraction by a Decimal

Convert the fraction to a decimal. (Convert whole numbers and fractions into one single fraction. Then divide the numerator by the denominator.)

$$2\frac{1}{2}\text{ tsp} = \frac{2}{1} + \frac{1}{2} = \frac{4}{2} + \frac{1}{2} = \frac{5}{2} = 2.5\text{ tsp}$$

Multiply the amount of the ingredient by the RCF.

$$2.5\text{ tsp} \times 0.3 = 0.75\text{ tsp}$$

Convert the decimal to a fraction, using 100 as the denominator.

$$0.75 = \frac{75}{100}\text{ tsp}$$

Then simplify the fraction. In this case, you can divide both the numerator and the denominator by 25.

$$\frac{75}{100} \div \frac{25}{25} = \frac{3}{4}$$

Computation

1. Multiply the following fractions: ¾ by ½, ½ by ½, ⅔ by ½, ⅗ by ½, ⅘ by ⅔.
2. Multiply the following fractions by the specified decimal: ¾ × 0.5, 12 × 0.25, ⅔ × 0.5, ⅗ × 0.25, ⅘ × 0.60.

To scale down the recipe to make only 5 servings, you will need 1¼ cups of rice, ½ tsp of salt, and 32 fl oz (1 qt) of water.

READING CHECKPOINT *What is the formula for the recipe conversion factor (RCF)?*

Scaling Recipes Based on Portion Size

A foodservice establishment may decide to change its portion size. Perhaps it is offering a main dish as an appetizer and wants to reduce the portion. Perhaps the kitchen wants to increase the size of a portion because customers have complained that the portion is too small.

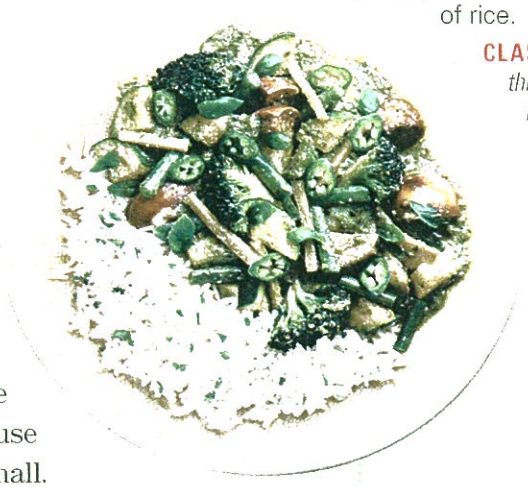


FIGURE 5-4
Different Portion Sizes
Different rice-based dishes require different-sized portion of rice.

CLASSIFYING *Can you think of dishes that mig require large portions rice? Small portions of rice?*

Source: Ian O'Leary/ Dorling Kindersley

Chef's Tip

Scaling Errors

Be careful when scaling. An error can dramatically change your results. For example, if you scale the amount of salt incorrectly, the dish may be inedible.

When you scale a recipe by changing the portion size, you always work with the recipe's yield. Remember that a recipe's yield can be expressed as the number of portions multiplied by the size of a portion.

Finding RCF when Scaling by Portion

To find the RCF when changing the portion size:

1. Find the old yield.

$$\text{Old yield} = \text{old number of servings} \times \text{old portion size}$$

2. Find the new yield.

$$\text{New yield} = \text{new number of servings} \times \text{new portion size}$$

3. Find the RCF.

$$\text{RCF} = \frac{\text{new yield}}{\text{old yield}}$$

4. Multiply each ingredient amount by the RCF.

Your kitchen's basic recipe for boiled white rice yields 10 servings of 1-cup portions. But you need 40 servings of ¾-cup portions. How much of each ingredient do you need?

Scaling a Recipe Based on Portion Size

To scale the recipe based on the new portion size:

1. Find the old yield.

$$\text{Old yield} = \text{number of portions} \times \text{size}$$
$$\text{Old yield} = 10 \text{ servings} \times 1 \text{ cup} = 10 \text{ cups}$$

2. Find the new yield.

$$\text{New yield} = \text{number of portions} \times \text{size}$$
$$\text{New yield} = 40 \text{ servings} \times \frac{3}{4} \text{ cup} = 30 \text{ cups}$$

3. Find the RCF.

$$\text{RCF} = \frac{\text{new yield}}{\text{old yield}}$$

$$\text{RCF} = \frac{30}{10} = \frac{3}{1} = 3$$

4. Multiply the amount of each ingredient by the RCF.

(Continued)

Scaling to Change Portion Size

Ingredient	Old Amount	RCF	New Amount
White rice	2½ cups	× 3	= 7½ cups
Salt	1 tsp	× 3	= 3 tsp
Water	64 fl oz	× 3	= 192 fl oz

For 40 servings, with each portion measuring ¾ cup, you need 7½ cups of rice, 3 tsp of salt, and 192 fl oz (6 qt) of water.

READING CHECKPOINT

What are the steps for scaling a recipe when the portion size is changed?

Scaling Recipes Based on an Available Ingredient

Occasionally a restaurant may need to scale a recipe to match the amount of a key ingredient available. This may happen because the restaurant purchased a large amount of an ingredient that is in season, for example, or because the restaurant receives a last-minute reservation and needs to plan the menu.

Scaling a Recipe Based on an Ingredient

To scale a recipe based on an ingredient:

1. Express the ingredient amount in the recipe and the ingredient amount that is available in the same measure.
2. Find the RCF.

$$\text{RCF} = \frac{\text{available ingredient amount}}{\text{ingredient amount in recipe}}$$

3. Find the new yield.

$$\text{New yield} = \text{old yield} \times \text{RCF}$$

4. Find the new amounts of each ingredient.

$$\text{New amount} = \text{old amount} \times \text{RCF}$$

Chef's Tip

Calculate Yield First

When scaling a recipe based on an ingredient, determine the new yield before you calculate the new amounts for the remaining ingredients. Once the yield works, you can calculate the new amounts for the remaining ingredients.

Source: Ian O'Leary/Dorling Kindersley

Your restaurant has just rented its banquet room at the last minute. You have 5 pounds of organic, skinless, boneless chicken breasts available. Will that be enough to serve 40 portions of your restaurant's special chicken dish? The recipe calls for 18 ounces of chicken breast and yields 12 cups of the dish. Portions are 1½ cups, so this recipe yields 8 servings.

Finding RCF when Scaling By Ingredient

To scale the recipe based on the available chicken:

1. Express the old and new ingredient amounts in the same measure.

Old (recipe) amount of chicken = 18 oz
New (available) amount of chicken = 5 lb
There are 16 oz per lb, so 5 lb = 80 oz.

2. Find the RCF.

$$\text{RCF} = \frac{\text{new amount}}{\text{old amount}} = \frac{80}{18} = \frac{40}{9} \text{ or } 4.44$$

3. Find the new yield.

New yield = old yield × RCF
New yield = 8 servings × 4.44 = 35.52 servings

Using only the 5 pounds of chicken you have on hand, you will have only about 35 servings—not enough for the 40 guests. After you made this recipe-scaling calculation, you could decide to purchase enough chicken for five more servings or you could reduce the portion size.

READING CHECKPOINT *How do you scale a recipe based on an available ingredient?*

FOCUS ON **Safety**

Temperature, Not Time

Scaling up a recipe often makes a recipe's cooking time incorrect. Always check the internal temperature of potentially hazardous food when scaling up.

Using Scaled Recipes

When you make a recipe larger or smaller, preparation factors can change. You may need to cook the dish at a different temperature or for a different time. You may need a pan of a different size. You also may need to adjust the seasonings.

Cooking Temperature and Time Use the original cooking temperature and time as starting points. Watch closely for the results you

Changing Measurement Units

A magazine recipe for a shrimp dish serves 3. You want to scale down the recipe for a single serving, so your RCF is ⅓.

$$\text{RCF} = \frac{\text{new yield}}{\text{old yield}} = \frac{1}{3}$$

Your next step is to multiply each ingredient amount by the RCF.

The new amounts that are shown in the table are not very convenient. There is no measuring tool for ⅑ or 1/12 of a cup. And most measuring spoons do not include ⅓ or ⅔ of a tablespoon.

To convert these inconvenient measurements to ones that are easier to use, you will need to find equivalent units. (In the previous section of this book, measurement equivalents are listed in the two tables titled "Volume Measurements" and "Weight Measurements.")

Scaling a Recipe Based on an Ingredient

Ingredients	Old Amount	RCF	New Amount
Shrimp, large, cleaned	1½ lb	× ⅓	= ½ lb
Butter	⅓ cup	× ⅓	= ⅑ cup
Garlic, minced	4 Tbsp	× ⅓	= 1⅓ Tbsp
Green onions, thinly sliced	6	× ⅓	= 2
Fish stock	¼ cup	× ⅓	= 1/12 cup
Lemon juice	2 Tbsp	× ⅓	= ⅔ Tbsp
Parsley, fresh, chopped	2 Tbsp	× ⅓	= ⅔ Tbsp

Source: Culinary Institute of America

To convert ⅑ cup to a convenient equivalent:

Find equivalents for 1 cup.

1 cup = 16 Tbsp
1 Tbsp = 3 tsp
so, 1 cup = 16 × 3 = 48 tsp

You could find the equivalent in tablespoons, but because ⅑ cup is a small amount, you should find the equivalent in teaspoons.

Find the equivalents for ⅑ of a cup in teaspoons.

1 cup = 48 tsp
⅑ cup = 48/9 tsp
⅑ cup = 5 tsp

Computation

1. A recipe serves 8. You want to scale it down to serve 2. Scale down the amounts required for your recipe. The amounts from the original recipe are: 2 lb, 3 cups, 1 cup, ½ cup, ¼ cup, 1 Tbsp, and 2 tsp.
2. A recipe serves 6. You want to scale it down to serve 1. Scale down the amounts required for your recipe. The amounts are: 1½ lb, 1 lb, 2 cups, 1 cup, ¼ cup, 4 Tbsp, 2 tsp, and ½ tsp.

want. Check for the correct internal temperature of food. When cooking several dishes in an oven together, expect a longer cooking time. (You could also try raising the temperature about 25°F.) When baking a half recipe of bread, cakes, or pies, the cooking time may be about ⅔ to ¾ of the original time.

Pan Size Choose a pan that comes closest to keeping the ingredients at the same depth as the original. If you are doubling a recipe, use a pan that has double the volume.

Sometimes your pot will not maintain the original ingredient depth. When this happens, you may need to adjust the time, temperature, and amount of liquid.

Seasonings When adjusting seasonings, especially salt, start with less than you expect to need. Season to taste, a little at a time. Taste after adding more. For example, when doubling a recipe, start with about 1½ times the original amount of seasonings. Then adjust to taste. If you record the amounts you add, you can revise the recipe for use again.


Source: C Squared Studios/Getty Images

Baked items do not scale well

Limits on Scaling Recipes Some recipes do not scale well. For instance, delicate foods (such as soufflés) or baked items that use yeast (such as breads) do not scale well. In general, do not scale recipes that prepare a single large item, such as cakes, pies, or breads. For these recipes, scale to get a preparation list, but cook several batches to meet your needs.

Recipes cannot be scaled indefinitely. Some chefs recommend never scaling up or down beyond a factor of 4. More cautious chefs stay within a factor of 2. Large-scale changes require adjustments to equipment and method for the recipe.

READING CHECKPOINT *How can scaling a recipe change preparation methods?*

Raw Food Cost

One benefit of writing recipes in a standard format and scaling them to the appropriate yield is that the chef can use the recipe to accurately determine how much food to purchase.

Some additional measuring conversions must be completed, because kitchens often purchase an ingredient that is measured in a different way than the ingredient is measured for a recipe. The quantities called for in your recipe must be converted to a purchase unit. A **purchase unit** describes the way the ingredient is sold, whether in pounds, bags, cans, cases, bunches, or by the piece.

Certain ingredients, especially fruits, vegetables, meats, fish, and poultry, have to be trimmed, boned, skinned, cored, or peeled before they can be used in a recipe. The adjustment that accounts for this loss is known as the **yield percentage**. If you need 2 cups of chopped parsley for a sauce, for instance, you must first convert the cups into ounces. Then if you know that you lose about 60 percent of the parsley when you remove the stems, you can determine how much parsley to buy. The amount you need to purchase for a recipe is called the **purchase quantity**. The amount that you use in the recipe and serve to guests is the **edible quantity**.

The money spent on the ingredients purchased for a recipe is known as **raw food cost**. You can look at the raw food cost in two ways. You can calculate the *total raw food cost* for a recipe by adding up the cost of all the raw ingredients. You can determine the *cost of a single portion* by dividing the total raw food cost by the number of portions the recipe makes.

Chefs consider the cost of the foods they buy, and they also consider the quality of the food. Being able to compare the raw food cost of a recipe using different types of ingredients can help the chef decide whether it is best to buy foods that are already trimmed and portioned. The higher cost may be justified if the product is of a higher quality and more consistent in size. Another factor the chef may consider is whether the kitchen staff has the appropriate time, equipment, and skill to transform whole birds or fish into breast portions or fish fillets.

Accurate information about what a recipe costs to prepare, as well as what a single portion costs, is critical to a successful restaurant. It can be used to set menu prices, as will be discussed in Chapter 21.

READING CHECKPOINT *How would you use the total raw food cost to determine the cost of a single portion?*

Converting Between Professional and Consumer Versions of Recipes

Standardized recipes, as we have already learned, are meant for use in a professional kitchen. They are customized to produce the right number of servings. They are based on the types of ingredients that are purchased in professional kitchens as well. In order to turn these standardized recipes into a recipe that could appear in a local newspaper, on a general-interest blog, or in a cookbook, you must modify the recipe. There are five things to consider:

- Level of difficulty
- Number of servings
- Ingredients
- Equipment used
- Use of professional terms

First, you must read through the recipe and decide whether it is easy, moderately difficult, or complex. An easy recipe has a short list of ingredients and a short method and does not call for unusual or expensive ingredients and equipment. A moderately difficult recipe may call for a longer list of ingredients and some advance steps (such as making a sauce or marinating an ingredient) and may include a subrecipe such as a stuffing. A complex recipe usually involves several subrecipes—for instance, a dough, a filling, a sauce, and a garnish—and may need to be completed over the course of a few days.

If a recipe is complex, you can make it simpler by using prepared or convenience foods where appropriate or by eliminating a subrecipe or two. If it is moderately difficult, you can help the reader by describing steps carefully and suggesting places to find unfamiliar ingredients or tools.

Next, you must adjust the number of servings the recipe makes. Most home cooks prefer recipes that make four to six servings, so you may need to scale large recipes down.

FIGURE 5-5

Purchased Quantity and Edible Quantity

The raw food cost for a recipe must be recorded properly to take into account any inedible parts of the food.

PREDICTING *When might it a good idea to buy pre-trimmed and pre-portioned meats or fish?*

Source: Culinary Institute of America

FIGURE 5-6
Subrecipes
This pie has at least two subrecipes: the crust and the filling.
ANALYZING *What type of food do you think would tend to have the most subrecipes?*
Source: Culinary Institute of America

After you make that change, you will also need to think about the types of pots and pans that the home cook has. You may need to make some adjustments to the cooking times and temperatures, since home ovens may not be able to reach the same temperatures as restaurant equipment.

The terms used in standardized recipes may not be familiar to a home cook. It may be necessary to rewrite the recipe in language that is easy to understand. The best way to be certain that you have done a good job of converting a professional recipe for home use is to ask a nonprofessional friend or family member to prepare the recipe and ask them for their feedback.

READING CHECKPOINT *What are five things to consider when you convert a professional recipe for home use?*

5.2 ASSESSMENT

Reviewing Concepts

1. How do you scale a recipe up?
2. How do you scale a recipe by changing the portion size?
3. How do you scale a recipe based on an available ingredient?
4. Can all recipes be scaled up or down?
5. How would you use the total raw food cost to determine the cost of a single portion?
6. What are five things to consider when you convert a professional recipe for home use?

Critical Thinking

7. **Solving Problems** A recipe yields 10 servings. You want to serve 15. If you keep the serving size the same, what is the RCF?
8. **Relating Concepts** If you increase the number of servings but decrease the serving size, what will happen to the total yield? Explain your answer and include an example.
9. **Inferring** Why might you need to increase oven temperature and cooking time when baking several items at once?

Test Kitchen

Bring in a recipe you like. Scale up the ingredients list as though you were going to make enough for the class. Compare the amount of the main ingredient you need to the amount your school kitchen has on hand. Would the school kitchen have enough of the ingredient to allow you to make the recipe? If not, scale the recipe based on the amount of the main ingredient that is currently available.

SOCIAL STUDIES

Origin of American Measurements

Research the history of the American system for measuring weights, liquid volume, and dry volume. Compare and contrast the American system and the English system. Describe your findings.

PROJECT 5 **Scaling a Recipe** You are now ready to work on Project 5, "Scaling a Recipe," which is available in "My Culinary Lab" or in your *Student's Lab Resources and Study Guide* manual.

Chapter 5 Review and Assessment

Reviewing Content

Choose the letter that best answers the question or completes the statement.

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 ¼ cup of beaten egg. You want to serve 30. How much egg should you use?
   a. ¾ cup
   b. 1⅓ 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 RCF should you use to scale the recipe?
   a. ¼
   b. ⅖
   c. 2½
   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 ½ cup of minced garlic to make 20 servings of ¾ cup each. How much minced garlic should you use to make 15 servings of ½ cup each?
   a. 2 tablespoons
   b. 4 tablespoons
   c. ½ cup
   d. 1 cup

Understanding Concepts

7. Explain the PRN method for reading a recipe.

8. Describe a situation that would require you to scale a recipe by the number of portions. Explain how to do this.

9. What is the purpose of recipe categories? Name two or more categories that could fit a recipe for egg salad.

10. Explain how and why you might adjust a recipe after scaling it.

11. If the total raw food cost for a recipe is $66 and the recipe creates 8 portions, what is the raw food cost of a portion?

Critical Thinking

12. **DRAWING CONCLUSIONS** Why is it necessary to read the mark in a clear measuring cup at eye level?

13. **PREDICTING** A recipe is scaled up by a factor of 1.5. What is the RCF to scale the larger recipe back to its original size? If the larger recipe served 24, how many did the smaller recipe serve? Show your work and explain your answers.

Culinary Math

14. **SOLVING PROBLEMS** The food tray on a kitchen's meat scale weighs 8 ounces. An assistant weighs 2 pounds of beef for stew, but forgets to set the tare. How much beef (measured in ounces) will go into the stew? If the stew must serve 8, how much beef will go into each serving? How much smaller is the beef serving than expected? Explain the consequences to the restaurant for the assistant's mistake.

On the Job

15. **APPLYING CONCEPTS** Your supervisor scales up a stew recipe so that it will serve 10, instead of 4, as in the original. She hands you a copy of the recipe with the scaled amounts written in pencil next to the original amounts. You notice that the original recipe called for 1 pound of beef, and the new recipe calls for 3 pounds of beef. Does this seem right? Are you sure? What should you do?