

# Baking and Pastry Applications

## Chapter

- 26 Baking Techniques
- 27 Yeast Breads and Rolls
- 28 Quick Breads
- 29 Desserts

### EXPLORE THE PHOTO

Baking and pastry chefs can make many tasty treats. *What do you think are the differences between cooking and baking?*





## Culinary Project Preview

### *Creative Desserts*

After completing this unit, you will know how to prepare a variety of baked goods and desserts. In your unit culinary project, you will choose and research a dessert recipe. Then, you will create a visual presentation to show how to make a dramatic dessert presentation.



### *My Journal*

Write a journal entry about special desserts that you have eaten.

- What desserts have you tried?
- What made the desserts special?
- Did the desserts enhance a special event?



JOHNSON & WALES  
UNIVERSITY

*"I feel that any job can be taught given enough time. However, without drive and determination, you cannot grow your career."*

Kendra Mellar  
Assistant Chocolatier  
Garrison Confections

# Baking Techniques

## SECTIONS

26.1 Bakeshop Formulas and Equipment

26.2 Bakeshop Ingredients

## WRITING ACTIVITY

### Brochure

A brochure is a persuasive document that advertises for something or conveys information in small amounts. Imagine that you are opening a bakery in a small community. Write a brochure introducing the local residents to your bakery.

### Writing Tips

- 1 Keep your mind on the purpose of the brochure.
- 2 Develop the text first, then figure out the design.
- 3 Try to appeal to the customers' emotions as well as their logic.

### EXPLORE THE PHOTO

Bakeshops have special equipment and ingredients. *Can you name some special bakeshop equipment?*



# Bakeshop Formulas and Equipment

## Reading Guide

### Before You Read

**Stay Engaged** One way to stay engaged when reading is to turn each of the headings into a question, then read the section to find the answers. For example, “Use a Balance Scale” might be, “How do you properly use a balance scale?”

### Read to Learn

#### Key Concepts

- **Explain** baking formulas.
- **Describe** the function of various bakeshop equipment.
- **Identify** bakeshop tools.

#### Main Idea

Baking requires precise measurement and accuracy to achieve a good result. It also requires special baking equipment to produce professional quality products.

#### Graphic Organizer

As you read, use this chart to list the three different types of ovens used in bakeshops and their characteristics.

| Type of Oven | Characteristics |
|--------------|-----------------|
|              |                 |
|              |                 |
|              |                 |

 **Graphic Organizer** Go to this book’s Online Learning Center at [glencoe.com](http://glencoe.com) for a printable graphic organizer.

*Cooking is an art, but baking is a science.*

### ACADEMIC STANDARDS

#### English Language Arts

**NCTE 5** Use different writing process elements to communicate effectively.

#### Mathematics

**NCTM Number and Operations** Compute fluently and make reasonable estimates.

**NCTE** National Council of Teachers of English

**NCTM** National Council of Teachers of Mathematics

**NSES** National Science Education Standards

**NCSS** National Council for the Social Studies

## Bakeshop Formulas

Baking is an exact science that requires precise measuring and accuracy. Baking also requires the use of special baking equipment and smallwares to produce professional products. The type of equipment found in a bakeshop is customized for that particular operation. The size of the operation and how many baked goods it produces will determine the need for specific equipment and tools.

Although you may add a dash of this and a pinch of that when you make a pot of chili, you will never use such **imprecise**, or inexact, measurements in a commercial bakeshop. A baker uses a formula. This is a recipe that includes the exact amount of each ingredient. These amounts are often listed as percentages of the total formula. The success of a formula is determined in large part by accurate ingredient measurement and following instructions carefully.

Accuracy is crucial in baking because most baked products are made from the same

basic ingredients: flour, liquids, fat, sugar and sweeteners, eggs, leavening agents, and flavorings. You will learn more about these ingredients in Section 26.2. The difference between two baked products is often the proportion of each ingredient in the formula. If the proportions are off, you will end up with a different product or an unacceptable product. That is why it is important to read through a formula several times to make certain you understand all of the instructions.

It is also important to add ingredients in the exact order specified in the formula. Remember, you cannot make adjustments once an item goes into the oven. A baked product's ingredients must be measured accurately from the start.

## Bakeshop Measurements

Bakeshop ingredients are measured by weight or volume. Volume is the space an ingredient occupies. Weight measures the mass or heaviness of something. These two



**Precise Baking** You must use precise measurements to create beautiful baked products.  
*What is the difference between baked products?*

methods of measurement often produce very different results. For example, if a formula calls for 8 ounces of flour, you cannot substitute 1 cup of flour. Assuming that 8 ounces is the same as 1 cup can ruin the final product.

Because accurate and consistent measurement is so important, bakers tend to weigh most ingredients on a balance scale. Bakers refer to weighing as **scaling**. Many of the dry ingredients used in baking, such as flour, are easily and accurately weighed. Liquid ingredients, such as eggs and milk, can also be weighed, but are sometimes measured. Corn syrup, honey, and molasses are always weighed. Measuring ingredients by weight gives consistent, reliable results.

### Use a Balance Scale

Professional bakers use a balance scale or a digital electronic scale to measure ingredients for a baked good formula. When you use a balance scale, it must balance before and again after you use it.

To properly use a balance scale, follow these steps:

1. Place the scale scoop or container on the left side of the scale. You can also use waxed paper if the ingredient amount is small.
2. It is important to compensate for the weight of the scoop or container. Do this by placing pound weights on the right side of the scale and adjusting the ounce weights on the horizontal bar until the left and right sides balance. Once this is done, you can measure ingredients.
3. To get a specific amount of an ingredient, add weights to the right side of the scale that equal the desired weight of the ingredient. You may have to make adjustments using the scale and the ounce weights on the horizontal bar.
4. Add the ingredient to the scoop, container, or waxed paper on the left side of the scale until the scale is balanced.

## Gourmet Math

### The Baker's Percentage

The baker's percentage allows you to change the yield of a formula without changing the quality of the final product. You first need to calculate the weight of flour for the new yield. Then, multiply each ingredient's baker's percentage by the new flour weight to find the new weights for each ingredient.

Convert the formula for Quick Coffee Cake below to yield a total of 10 pounds.

| Ingredient        | Amount          | Baker's Percentage |
|-------------------|-----------------|--------------------|
| Pastry flour      | 1 lb., 12 oz.   | 100%               |
| Whole eggs        | 10 oz.          | 36%                |
| Vegetable oil     | 12 oz.          | 43%                |
| Water             | 1 lb., 8 oz.    | 86%                |
| Baking powder     | 1 ¼ oz.         | 4%                 |
| Dried milk solids | 3 oz.           | 11%                |
| Salt              | ½ oz.           | 2%                 |
| Granulated sugar  | 1 lb., 8 oz.    | 86%                |
| TOTAL             | 6 lbs., 6 ¾ oz. | 368%               |

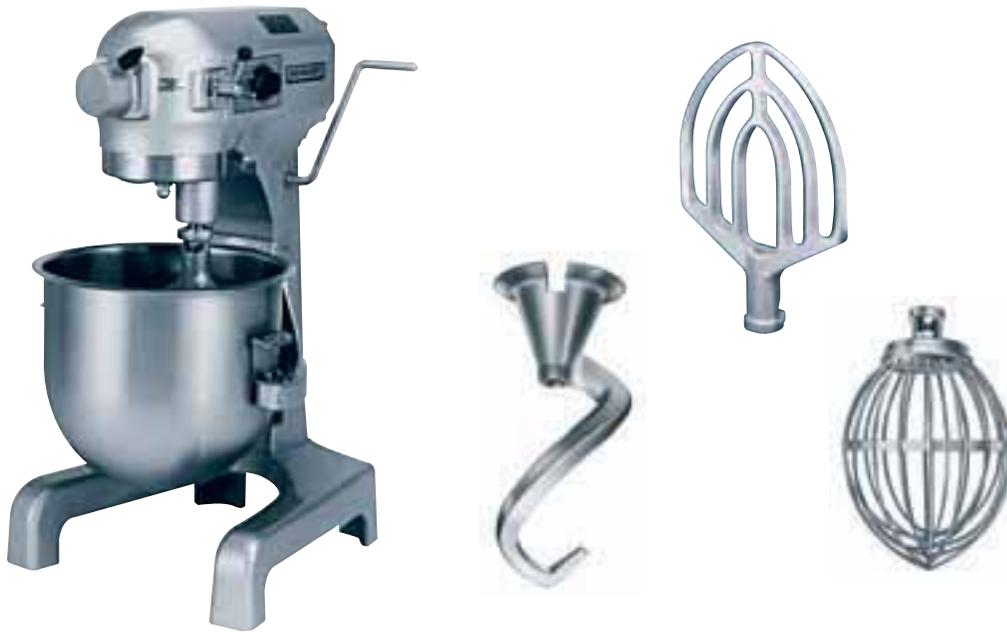
**Math Concept Equivalent Weights** There are 16 ounces in 1 pound. Convert pounds to ounces by multiplying by 16. Convert ounces to pounds by dividing by 16, writing the remainder as ounces. For example, 20 ounces equates to 1 pound, 4 ounces.

**Starting Hint** Convert the new yield to ounces:  $10 \text{ pounds} \times 16 = 160 \text{ ounces}$ . Because the baker's percentages remain the same, you know that in the new formula, 160 ounces is 368% of the weight of flour. Thus, you can calculate the new flour weight by dividing 160 ounces by 368% ( $160 \div 3.68$ ). Then, find the new weight of each of the other ingredients by multiplying their percentages by the new weight of the flour. Round all weights to the nearest one.

**NCTM Number and Operations** Compute fluently and make reasonable estimates.

### Use Math Skills

Bakers often convert an entire formula to make the desired number of servings.



**Professional Mixers** A bench mixer usually comes with three attachments: a spiral dough hook, a flat beater, and a whip. *When would you use the spiral dough hook?*

What if a cake formula makes five 8-inch cakes, but the bakeshop where you work needs to make 10 cakes?

| Original Formula<br>(Five 8-inch; Cakes) |                      | New Formula<br>(10 8-inch; Cakes) |  |
|--|----------------------|-----------------------------------|--|
| 2 lbs.                                   | egg whites           | 4 lbs.                            |  |
| 12 oz.                                   | cake flour           | 1 lb., 8 oz.                      |  |
| 12 oz.                                   | confectioners' sugar | 1 lb., 8 oz.                      |  |
| ¼ oz.                                    | cream of tartar      | ½ oz.                             |  |
| 1 lb., 4 oz.                             | granulated sugar     | 2 lbs., 8 oz.                     |  |
| ⅛ oz.                                    | salt                 | ¼ oz.                             |  |
| ¼ oz.                                    | vanilla extract      | ½ oz.                             |  |
| ⅛ oz.                                    | almond extract       | ¼ oz.                             |  |

Notice that the new formula simply doubles each ingredient. That is because you are making 10 8-inch cakes instead of five.

Many professional bakers use formulas that contain percentages. A **percentage** is a rate or proportion of 100. In other words, if 5% of the

eggs are cracked, this means that 5 out of 100 eggs are cracked. Formulas are often expressed in baker's percentages. A baker's percentage means that each ingredient is a certain percentage of the weight of the total flour in the formula. The weight of flour is important because it is the core ingredient of baked goods.

For example, if one kind of flour is used in a formula, its weight is 100%. If two kinds of flour are used in a formula, their total weight is 100%. To find the percentage of each ingredient used in a formula, all ingredients must be expressed in the same unit, such as pounds. Once all the units are the same, you can use this calculation:

$$\frac{\text{weight of ingredient}}{\text{weight of flour}} \times 100\% = \% \text{ of ingredient}$$

For example, imagine you are trying to find the percentage of water used in a formula for bread dough. The formula calls for 15 pounds of bread flour and 9 pounds of water. Calculate the percentage as follows:

$$\frac{9 \text{ lb. (weight of water)}}{15 \text{ lb. (weight of flour)}} \times 100\% = 60\% \text{ water}$$

So, the baker's percentage of water is 60%.

Baker's percentages allow you to compare the weight of each ingredient. What is especially convenient about baker's percentages is that one ingredient can be changed without recalculating percentages for each ingredient. Remember that the total percentages of all the ingredients will always add up to more than 100%.



**Reading Check** **Explain** Why is accurate measurement so important in baking?

## Large Bakeshop Equipment

Bakeshop equipment is exposed to wet, sticky ingredients and extreme changes in temperature. It is important for bakeshop equipment to be durable, of good quality, and well maintained. You must keep all bakeshop equipment and tools clean and maintained. (See Chapter 9 for more information.)



**Climate Control** Proofing cabinets keep dough at a consistent temperature while it rises prior to baking. *What two elements does a proofing cabinet control?*

## Mixers

Mixers are essential to every bakeshop. They perform a variety of functions. They are used to mix, knead, or whip batters and doughs. The most common mixer in the bakeshop is the bench, or tabletop, mixer. It comes with three basic attachments: a spiral dough hook, a flat beater or paddle, and a whip.

There are bench mixers for small volumes and floor mixers for larger volumes. Mixer capacity ranges from 5 to 140 quarts. Commercial bakeshops typically use floor models with at least a 30-quart capacity. These mixers have adapter rings that allow you to use several different-size bowls on one machine.

## Sheeter

A **sheeter** is a piece of equipment that rolls out large pieces of dough to a desired thickness. It is used mostly for rolling and folding doughs, such as puff pastries, croissants, and Danish pastries. It also can be used to flatten pie or pizza dough.



**Dough Sheeters** Industrial sheeters are used to roll and fold doughs. *What else could a sheeter do?*

## Proofing Cabinets

A proofing cabinet, also called a proofer, is a freestanding metal box on wheels that is temperature- and humidity-controlled. Proofing cabinets can be used to keep baked products warm or to proof yeast doughs. A proofing cabinet allows dough to rise slowly in a humidity controlled, low-heat environment before it is baked. This is vital to creating baked products of high quality.

## Bakery Ovens

Commercial ovens are **invaluable**, or extremely helpful, pieces of equipment in the bakeshop. These ovens are used to produce a large variety of baked products. Both electric and gas models can be equipped with convection fans that circulate the oven's heated air. Some ovens even come with steam injection for proper volume and crust development in bread baking. Certain specialty bread bakers use old-world types of ovens that are brick-lined and fueled by wood.

## Deck Oven

This freestanding rectangular oven, also known as a **stack oven**, has a series of well-insulated compartments stacked on top of one another. Because each of these shelves has a separate door and temperature control, you can bake a variety of items at once. Deck ovens are used to bake a variety of items. You will find the deck oven in most bakeries and pizza kitchens.

Deck ovens offer bakers a lot of flexibility. Bakers who use deck ovens can produce large or small amounts of baked goods because each deck has a separate control. Different products can be baked in each deck.

## Convection Oven

A **convection oven** has a fan that circulates the oven's heated air. This fan allows you to cook foods in about 30% less time and at temperatures approximately 25° to 35° lower than temperatures in a conventional oven. Convection ovens range in size, and are available in either gas or electric models.



**Dual Baking** Deck ovens are used in high-volume baking to cook a variety of products at once. *Where would you most likely find deck ovens?*



Sheet Pan



Soufflé Mold



Brioche Pan



Ramekin



Fluted, Oblong Tart Pan



Tube Pan



Muffin Pan



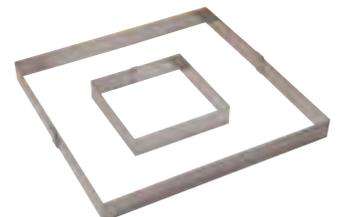
Tart Pan



Springform Pan



Rings



Cake Frames

**Pans and Molds** The type of mold or pan used will depend on the type of baked good that is being made. *What type of pan or mold would you commonly choose to bake a cheesecake?*



 **Bread Molder** This bread molder can mold bread products, and can produce rolls, buns, or specialty breads. *What type of establishment would be likely to use this machine?*

## Reel Oven

With shelves that move or rotate like a Ferris wheel, a **reel oven** is used when all items need the same baking conditions. In other words, a reel oven bakes a quantity of similar items evenly. All items are exposed to the same temperature and humidity.

A reel oven is also called a rotating or revolving oven because its shelves rotate within the oven chamber. Also, the movement of the baked goods creates convection currents similar to those made by a convection fan. Reel ovens are easier to load and unload than deck ovens because you do not have to bend down or reach up.



**Reading Check** **Define** What is a sheeter?

## Bakeshop Smallwares

A commercial bakeshop needs many different hand tools for cutting, molding, scooping, dividing, and finishing. Many tools are used to form, cut, glaze, and decorate

different baked products. Depending on the function of a particular bakeshop, however, the equipment used may vary greatly.

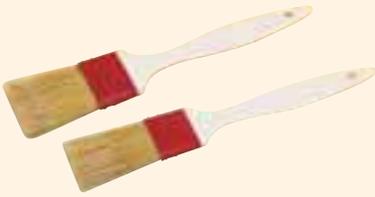
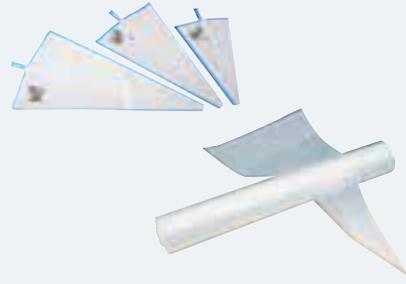
## Pans, Molds, and Rings

Bakeshop pans are available in many types, sizes, shapes, and thicknesses. Choosing the correct pan for the job is important because it can affect the final outcome of the product. The surface of a pan will affect the outcome of the product, too. A pan with a shiny surface will reflect some heat away during the baking process so there is less surface browning. A pan with a darker surface tends to retain the heat.

The correct size and shape of baking pan is important in obtaining good texture, height, and appearance. If you put too much batter in a cake pan, the cake will rise and spill over the top. The cake may also collapse. On the other hand, if the pan is too large or the sides too high, the sides will shield the batter from the heat of the oven and slow down the baking process. This results in an overbrowned cake with poor volume and texture.

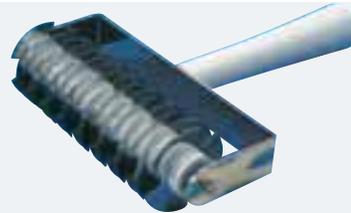
## Baking and Pastry Tools

**Pastry Bags** Pastry bags can be made of nylon, plastic-lined cotton, canvas, polyester, or plastic. They are cone-shaped with two open ends. The smaller end is pointed and can be fitted with decorator tips of different sizes and shapes. The larger end can be filled with doughs, fillings, icing, or whipped cream. When the bag is squeezed, the contents are forced through the decorator tip.



**Pastry Brushes** These flat-edged brushes are used to brush liquids such as butter on dough before, during, or after cooking.

**Pastry Pattern Cutters** Pastry pattern cutters are used to cut dough into specific shapes.



**Bench Scraper** Also called a dough cutter, this handheld rectangular tool has a stainless steel blade and a handle made of slip-resistant plastic or wood. The bench scraper can be used to clean and scrape surfaces and to cut and portion dough.

**Rolling Pins** These long, cylindrical tools are used to roll out bread and pastry doughs and shape cookies. The bakers' rolling pin is made from hardwood and has handles on each side. The French rolling pin is also made from hardwood, but does not have handles. Rolling pins should not be submerged in water for cleaning.



## Sanitation Check

### ✓ Sanitize Pastry Bags

If you use a non-disposable pastry bag, wash the bag in warm, soapy water after each use. To do this, remove the decorator tip, and turn the bag inside out. Wash both the bag and tip thoroughly. Then, rinse and sanitize them. Stretch and hang the bag to let it air dry.

**CRITICAL THINKING** *What should you do if you want to use a pastry bag, but it has not been sanitized?*

Some pans have removable bottoms that make it easier to free the baked product. A **springform pan** has a clamp that is used to release the pan's bottom from its circular wall. These pans are used to bake cheesecakes.

Some tart pans also have removable bottoms. A **tart pan** is a shallow pan that ranges in diameter from 4½ to 12½ inches. They can be round, square, or rectangular and have fluted sides that slope slightly.

Sheet pans are another common bakeshop pan. A **sheet pan** is a shallow, rectangular pan that comes in full, half, and quarter sizes. Sheet pans are used to make a variety of baked goods, including rolls, biscuits, and cookies.

A **mold** is a pan with a distinctive shape. They range from small, round, ceramic pans to long, narrow molds used for breads. A **ring** is a type of container that has no bottom. They come in various heights and are usually round, but they can also be square.



### Reading Check

**Analyze** How does a pan's surface affect the outcome of the baked product?

## SECTION 26.1



### After You Read

#### Review Key Concepts

1. **Explain** how to use a balance scale.
2. **Describe** the function of a proofing cabinet.
3. **Identify** different types of pans used in a bakeshop.

#### Practice Culinary Academics



#### English Language Arts

4. Imagine that you are going to be a pastry chef in a shop that will make all different types of specialty cupcakes. Write a letter to your business partner detailing which equipment you want to be purchased for the shop, and why. Be sure to explain the purpose of each piece of equipment. Your letter should be in a standard business letter format. Check your grammar and spelling before turning in your letter.

**NCTE 5** Use different writing process elements to communicate effectively.



#### Mathematics

5. Calculate the baker's percentages for the following bread formula: Bread flour, 3 kilograms; rye flour, 1 kilogram; water, 2.8 kilograms; yeast, 80 grams; salt, 120 grams. Total, 7 kilograms.

#### Math Concept

**Metric Equivalents** In the metric system, the prefix kilo- indicates 1,000. Thus, 1 kilogram equals 1,000 grams. To convert kilograms to grams, multiply by 1,000. To convert grams to kilograms, divide by 1,000.

**Starting Hint** Remember, both types of flour added together will equal 100%. Thus, 100% = 3 kilograms + 1 kilogram = 4 kilograms. Divide each weight by 4 kilograms and multiply by 100%. You will need to convert grams to kilograms for the salt and yeast.

**NCTM Number and Operations** Compute fluently and make reasonable estimates.



Check your answers at this book's Online Learning Center at [glencoe.com](http://glencoe.com).

# Bakeshop Ingredients

## Reading Guide

### Before You Read

**Preview** Understanding causes and effects can help clarify connections. A cause is an event or action that makes something happen. An effect is a result of a cause. Ask yourself, “Why does this happen?” to help you recognize cause-and-effect relationships in this section.

### Read to Learn

#### Key Concepts

- **Identify** the different categories of ingredients and their roles in the baking process.
- **Compare and contrast** different dough mixing methods.

#### Main Idea

The basic ingredients in baking are flour, liquids, fat, sugar and sweeteners, eggs, leavening agents, and flavorings. The ingredients determine the flavor, texture, and visual appeal of a baked good.

### Content Vocabulary

- hard wheat flour
- gluten
- crumb
- soft wheat flour
- bread flour
- cake flour
- pastry flour
- staling
- dried milk solids
- shortening
- oil
- leavening agent
- baking soda
- baking powder
- yeast
- fermentation
- dough
- beat
- blend
- cream
- cut-in
- fold
- knead
- sift
- stir
- whip

### Academic Vocabulary

- surround
- contribution

### Graphic Organizer

Before you read, use a KWL chart to write down three things that you already know about bakeshop ingredients and three things you would like to learn. As you read, write what you have learned.

| What I Know | What I Want to Know | What I Learned |
|-------------|---------------------|----------------|
|             |                     |                |

 **Graphic Organizer** Go to this book’s Online Learning Center at [glencoe.com](http://glencoe.com) for a printable graphic organizer.

*Each basic baking ingredient has a specific function.*

### ACADEMIC STANDARDS

#### English Language Arts

**NCTE 4** Use written language to communicate effectively.

#### Mathematics

**NCTM Algebra** Use mathematical models to represent and understand quantitative relationships.

#### Science

**NSES F** Develop an understanding of personal and community health.

#### Social Studies

**NCSS II D Time, Continuity, and Change** Employ processes to validate and weigh evidence for claims.

**NCTE** National Council of Teachers of English

**NCTM** National Council of Teachers of Mathematics

**NSES** National Science Education Standards

**NCSS** National Council for the Social Studies

# Basic Ingredients

From a simple list of ingredients such as flour, liquids, fat, sugar and sweeteners, eggs, leavening agents, and flavorings, you can make an endless variety of baked products. Ingredients are more than just parts of a baking formula. They add flavor, texture, and visual appeal to all types of baked products. In this section, you will learn about basic baking ingredients and mixing techniques.

## Use Exact Ingredients

Baking, unlike cooking, leaves little margin for error. You cannot just substitute the same amount of cake flour for bread flour and expect to come up with the same end result. To become a successful baker, you must understand how key ingredients work together. Baking formulas have been developed using exact types of ingredients. If the formula is not followed precisely, the product's texture and taste will be affected.

## Wheat Flour

Wheat flour is the main ingredient in many baked goods. The proteins and starch in flour give these products structure. The classification of flour is based on the type of wheat it comes from: soft or hard. **Hard wheat flour** comes from kernels that are firm, tough, and difficult to cut. Bread flour is one type of hard wheat flour.

Hard wheat has a high protein content. When wheat flour is mixed with water, certain proteins form gluten. **Gluten** is a firm, elastic substance that affects the texture of baked products. The higher a flour's protein content, the more potential it has to form gluten.

Gluten is the substance that makes bread dough strong and elastic. Without gluten, you could not stretch the dough and hold in the gases that make it rise. The dough would collapse, resulting in poor volume and a coarse crumb. **Crumb** is the internal texture of a baked product.

**Soft wheat flour**, such as cake flour and pastry flour, comes from a soft wheat kernel.

This type of flour has a low protein content, making it ideal for tender baked products such as cookies and pastries. Bread flour, cake flour, and pastry flour are all types of wheat flour.

**Bread Flour** Breadmakers use **bread flour**. It has a high gluten-forming protein content. These proteins allow the bread to rise fully and develop a fine crumb. They also give the bread a chewier, firmer texture. Bread flour is used to make yeast breads, pizza, and bagels.

**Cake Flour** **Cake flour** is lower in protein than bread flour and pastry flour. Cake flour produces a softer and more tender product than bread flour. Cake flour is bleached with chlorine ('klòr-ēn) to help produce a fine, white crumb in cakes.

**Pastry Flour** The protein content of **pastry flour** is between that of bread flour and cake flour. It is used in pie dough, cookies, muffins, and quick breads. It is used for cakes only if cake flour is unavailable.

Other types of flours used in the bakeshop are listed in **Figure 26.1** on page 689.

## Liquids

Liquids are an essential part of baking. The most common liquids used in baking are water, milk, and cream. Liquids can also be found in eggs, sugar syrups, and butter, which contains about 15% water.

Accurate measurement of liquids is important because too much or too little can affect the outcome of the baked product. For example, adding too much water in pie dough will cause excess gluten formation, which may result in a tough texture.

**Water** Water is the most common liquid ingredient used in baking, especially for breads. It has many uses besides moistening dry ingredients. Water is necessary for gluten structure to form in flour. Also, water temperature is used to adjust temperatures in dough. This applies to bread dough in particular, where dough temperature is important. Because water is tasteless, odorless, and colorless, it does not affect the flavor or color of baked products. It also adds no fat or calories.

## FIGURE 26.1 Flour Characteristics

**Flour Choices** Different types of flour are used for different types of baked goods.

*Why might you want to choose a non-wheat flour for some baked goods?*

| Other Types of Flour       | Characteristics   |
|----------------------------|---|
| <b>Whole-wheat flour</b>   | <ul style="list-style-type: none"><li>• Dark flour made from whole-wheat grains; only the outer hull is removed</li><li>• Fine or coarse ground</li><li>• May be combined with bread flour or all-purpose flour for better volume and milder flavor</li><li>• High protein, but moderate gluten content</li><li>• Often combined with bread flour for better gluten structure in breads</li></ul> |
| <b>Cracked wheat flour</b> | <ul style="list-style-type: none"><li>• Dark flour made from cut, not ground, whole-wheat grains</li><li>• Usually soaked or partially cooked before adding to dough to soften the flour</li><li>• Must be mixed with bread flour or whole-wheat flour when used in baked goods</li></ul>   |
| <b>Non-wheat flours</b>    | <ul style="list-style-type: none"><li>• Whole or milled flours made from corn, rye, barley, buckwheat, oat, and other grains as well as from potatoes and soybeans</li><li>• Varying colors, textures, and gluten levels</li><li>• Usually mixed with bread flour to provide a better gluten structure.</li></ul>   |

**Milk and Cream** Milk is another important liquid ingredient. Its protein, fat, and sugar content make it a valuable addition to baked products, ice creams, and custards. Milk also improves the flavor and texture of bread and other baked goods.

Some of the improvements milk can make include:

- Creating a soft, rather than crispy, crust on items such as cream puffs or *éclairs* (ā-'klers).
- Adding more color or flavor to crusts when it is applied to the surface of the baked product.
- Extending shelf life by delaying staling.

**Staling** is the process by which moisture is lost, causing a change in the texture and aroma of food. Staling causes the crumb to be dry and the crust to become soft and moist.

**Dried milk solids** are also used in baked goods. Since milkfat can reduce milk's shelf life, dried milk solids are usually purchased as nonfat dry milk. Nonfat dry milk can be reconstituted with water or used dry. If kept dry, it is easier to use and can be stored without refrigeration. You can sift it with dry

ingredients or mix it with shortening, before you add the water separately.

Dairy products such as buttermilk, yogurt, and sour cream are also used in the bakeshop. These products contain live bacteria that convert milk sugar into acid. The acid in buttermilk, for example, provides a whiter, more tender crumb in biscuits.

Another common dairy product, heavy cream, has a high fat content. This fat content allows it to tenderize baked goods. Cream is often whipped for toppings, chilled desserts, and fillings such as pastry cream. It is used as a liquid ingredient in custards, sauces, and ice creams. (You will learn more about desserts in Chapter 29.)

## Fats

During the baking process, fats **surround**, or **enclose**, the flour particles and prevent long strands of gluten from forming. This tenderizes the baked good. Fats also add to the flavor, moistness, browning, flakiness, and leavening, depending on the type of fat. In baking, solid fats are referred to as **shortening**. Purified oils are made solid by a process called hydrogenation. In hydrogenation, the oils are made



◀ **Gluten Benefits** Gluten gives dough its stretchiness, allowing it to be pulled and shaped. *What other benefits does gluten give to dough?*

solid by adding hydrogen to the oil. The most common types of fat used in the bakeshop include all-purpose shortening, emulsified shortening, oil, butter, and margarine.

**Vegetable Shortening** When most people hear the word shortening, they think of a solid, white, flavorless fat used for baking. This type of shortening, known as vegetable shortening, is made from purified oils that have been hydrogenated to make them solid and less likely to become rancid. Vegetable shortening has a fairly high melting point, which makes it ideal for forming flaky pie doughs. It is also a good choice for frying and for making cookies and cakes.

**Emulsified Shortening** Some shortenings contain emulsifiers. Emulsified shortenings are also called high-ratio shortenings because they allow the baker to add a high ratio of water and sugar to a cake or icing. Some high-ratio shortenings look like all-purpose shortenings.

High-ratio liquid shortenings look like creamy oils. Some cake formulas are designed to use high-ratio liquid shortenings. These cakes will be extra moist, airy, and tender and

will have a longer shelf life than cakes made with other fats. Other fats cannot replace high-ratio liquid shortenings because of their unique characteristics.

Trans fat-free shortenings are also widely available on the market. Hydrogenated fats are responsible for most of the trans fats that people consume. Trans fat-free shortenings can provide a more healthful alternative.

**Oil** An **oil** is a fat that is extracted from plants such as soybeans, corn, peanuts, and cottonseed. They are liquid at room temperature and neutral in flavor and color because they are highly refined. Because oil blends more easily throughout a mixture, it can coat more strands of gluten. Therefore, oil causes baked products to be more tender. Oil is used in quick breads, some pie crusts, deep-fried products like doughnuts, and rich sponge cakes like chiffon (shi-'fān).

**Butter** Have you ever tasted a frosting that seemed to melt in your mouth? That frosting was probably made with butter. Butter can be purchased with or without salt. Unsalted butter is used in baking because of its pleasant flavor. Because butter is soft at room

temperature, however, doughs made with butter are sometimes hard to handle. Butter is only 80% fat, so it produces a less tender baked product than shortening.

**Margarine** Margarine is typically a hydrogenated vegetable oil that has color, flavor, and water added. Margarines have improved over the years. While they cannot match butter's superior flavor, they are less likely to spoil and are usually lower in saturated fat. Margarines can be purchased either salted or unsalted.

## Sugars and Sweeteners

Sugars and sweeteners add a sweet, pleasant flavor to baked products. Flavor, however, is not their only **contribution** to, or role in, baking. The other functions of sugars and sweeteners include:

- Creating a golden-brown color.
- Stabilizing mixtures such as beaten egg whites for meringue (mə-'rɑŋ).
- Providing food for yeast in yeast breads.
- Retaining moisture for a longer shelf life.
- Tenderizing baked products by weakening the gluten strands and delaying the action of other structure builders such as egg protein.
- Serving as a base for making icings.

Sugar is produced from sugarcane or sugar beets. The cane or beet is crushed to extract the juice. The juice is then filtered and gently heated to evaporate the water. Through a series of heat-induced steps, the sugar is crystallized ('kris-tə-'līzd), or turned into crystals, and separated from the dark, thick molasses that forms. It must be refined to produce sugar grains of different sizes. Various sugars and sweeteners are used in the bakeshop.

### Small Bites

**Oil for Shortening?** In general, oil should never be substituted for a solid shortening in baking formulas. It will result in baked goods with lower volume and pie crusts that lack flakiness and crumble easily. It is better to make sure that you have the proper bakeshop ingredients on hand before you begin to bake.

**Molasses** Molasses is the thick, sweet, dark liquid made from sugarcane juice. There are many grades of molasses available. Premium grades have a golden-brown color and a mild, sweet flavor. Lower grades are typically darker in color with a less sweet, stronger flavor. This stronger color and flavor is often desirable in baked products.

**Brown Sugar** Brown sugar is a soft-textured mixture of white sugar and molasses. It can be light or dark in color. Store brown sugar in air-tight containers to prevent moisture absorption.

**Turbinado Sugar** Turbinado sugar is raw sugar that has been steam-cleaned. Its coarse crystals are blond colored and have a delicate molasses flavor. Turbinado sugar is used in some baked products and beverages.

**Coarse Sugar** Coarse sugar, also known as sanding sugar, consists of large, coarse crystals that do not dissolve easily. It is used to decorate items such as doughnuts or cakes.

**Granulated Sugar** Regular granulated sugar is often referred to as superfine white sugar or table sugar. It is the most common sugar used in the bakeshop. Granulated sugar is used in cooked icings, candies, and other baked products.

**Confectioners' Sugar** Confectioners' sugar, also known as powdered sugar, is granulated sugar that has been crushed into a fine powder. Confectioners' sugar also contains about 3% cornstarch, which helps keep the sugar from clumping. It is often used in uncooked icings and glazes and as a decorative dusting on baked products.

**Superfine Sugar** Superfine sugar is more finely granulated than regular white sugar. As a result, it dissolves almost instantly. Superfine sugar is perfect for making sweetened cold liquids and egg white meringues less gritty. Meringues can be used for such items as toppings on pies.

**Corn Syrup** Corn syrup is produced from the starch in corn. The starch granules are removed from corn kernels and treated with acids or enzymes to create a thick, sweet syrup.

# Apple Wheat Germ Cake

YIELD: 8 SERVINGS  
SERVING SIZE: 9 OZ.

## Ingredients

- 2 ¼ c. Whole wheat pastry flour

---

- ¼ c. Non-fat dry milk solids

---

- 4 tsp. Baking powder

---

- 1 tsp. Salt

---

- 3 tsp. Ground cinnamon

---

- ¾ c. Wheat germ

---

- 1 c. Honey

---

- ½ c. Peanut oil

---

- 4 each Eggs

---

- 1 tsp. Orange rind, grated

---

- 1 tsp. Vanilla extract

---

- 6 small Sweet apples, peeled, cored, and thinly sliced

## Method of Preparation

1. Preheat oven to 350°F (177°C).
2. Sift together in a bowl the flour, milk solids, baking powder, salt, and cinnamon.
3. In another bowl, combine the wheat germ, honey, peanut oil, eggs, orange rind, and vanilla, and stir into the dry ingredients. The batter will be liquid.
4. Place ½ of the batter in an oiled, 3-qt. baking dish and spread ½ of the sliced apples over the batter.
5. Top with another ½ of the batter and spread remaining apples over batter.
6. Top with the remaining batter.
7. Bake 40 to 45 minutes. Cover with aluminum foil if the cake starts to brown before it is baked.
8. Cool slightly in the pan and serve warm.

## Cooking Technique

### Combining

1. Prepare the components to be combined.
2. Add one to the other, using the appropriate mixing method (if needed).

## Chef Notes

Wheat germ contains vitamin E, a powerful antioxidant. It is the fatty part of the wheat kernel.

### Substitutions

- Although MacIntosh apples are recommended for this recipe, any apple variety may be used in its place.

## International Flavor

Research the following recipes to discover what types of apples they use. Then, research the apples and write a paragraph on each type.

- Scandinavian Apple Cake (Scandinavia)
- Irish Potato Apple Cake (Ireland)
- Apfeltorte (Germany)

## Glossary

**Antioxidant** substance that works against the chemical reactions to oxygen  
**Staple** an item that is used or needed frequently

## HACCP

- Store shell eggs at 41°F (5°C) or lower

## Hazardous Foods

- Eggs

## Nutrition

**Calories** 540      **Calories from Fat** 160  
**Total Fat** 19g  
     Saturated Fat 3.5g  
     Trans Fat 0g  
**Cholesterol** 120mg  
**Sodium** 590mg  
**Total Carbohydrate** 83g  
     Fiber 9g  
     Sugars 47g  
**Protein** 11g  
 • Vitamin A 4%      • Vitamin C 10%  
 • Calcium 20%      • Iron 20%

## A TASTE OF HISTORY

1840

The first postage stamp is introduced in England

1847

The first commercial chocolate bar is produced

Light corn syrup has no color, while dark corn syrup has a molasses-like flavor. Corn syrup does not crystallize easily, so it is a popular ingredient to use in frostings, candies, jams, and jellies.

**Maple Syrup** Maple syrup adds a unique flavor to baked products. It is made from the sap of a maple tree. Syrups are graded according to their color and flavor. The lighter and milder the syrup, the higher grade it will receive.

**Honey** Honey is a thick, sweet liquid made by bees from flower nectar ('nek-tər). The type of flower affects the final flavor and color of the honey. Honey is widely used to give baked products a distinct, sweet flavor. It should be stored in a cool, dry place. Refrigerated honey will crystallize and form a gooey mass. If this happens, the honey can be heated in the microwave in small amounts or in a pan of hot water over low heat.

### Eggs

Eggs are the second most important ingredient in baked products. Eggs come in a variety of sizes. Formulas listing the amount of eggs by number instead of weight have based the formula on large eggs, which weigh about 2 ounces each.

Commercial bakeshops use egg yolks instead of whole eggs when they want a richer, more tender product. They also use egg whites in place of whole eggs when they bake low-fat products. Eggs serve these functions during baking.

- **Structure** Because of their protein content, eggs give structure to baked products such as cakes. They also help thicken some products such as custard sauces.
- **Emulsification** Egg yolks have natural emulsifiers that help blend ingredients smoothly.
- **Aeration** (,er-'ā-shən) Beaten or whipped eggs assist in leavening because they trap air that expands when heated, causing baked products to rise.

### Chocolate

Long before chocolate was a sweet candy, it was a spicy drink dating back to the ancient Mayans and Aztecs. Later, Christopher Columbus brought the seeds from the cacao tree back home to Spain, and eventually the drink's popularity spread throughout Europe. Since then, new technologies and innovations have changed the texture and taste of chocolate, but it still remains one of the world's favorite flavors.

### History Application

Everyone has his or her favorite chocolate bar. Create a survey that will identify which chocolate bar is a favorite of your family and friends. In the survey, ask them why they prefer a particular type. Gather the results and discuss them as a class.

**NCSS II D Time, Continuity, and Change** Employ processes to validate and weigh evidence for claims.

- **Flavor** Eggs add a distinct flavor.
- **Color** Egg yolks add a rich, yellow color to baked products and crusts.

Shell eggs and egg products, such as liquid frozen eggs, dried eggs, and liquid refrigerated eggs, are used in baking.

**Shell Eggs** Shell eggs are eggs sold in their shells. They are often called fresh eggs. If stored properly at 41°F (5°C) or below, they will last up to four weeks beyond the packing date. Shell eggs are purchased in flats, each of which holds 2½ dozen, or 30 eggs. There are 12 flats in a case, meaning that one case contains 30 dozen, or 360, eggs. Shell eggs can be separated into yolks and whites by carefully cracking the egg and pouring off the white while leaving the yolk in the shell. You may also use an egg separator.

**Egg Products** Egg products have been removed from the shell, and pasteurized.

The whites can be separated from the yolks, and additives included if necessary. For example, frozen egg yolks have 10% sugar added to prevent them from gelling. The egg products are then packaged and refrigerated, frozen, or dried and packed in pouches.

Egg products are popular because of their convenience. They can be substituted for shell eggs in many baked products. Frozen egg products must be thawed in the refrigerator, so plan ahead when using them. Do not let them sit at room temperature, as egg products are highly perishable. Dried eggs are often used in prepared mixes such as for cakes. High-quality, dried egg whites are often preferred for making meringues over liquid egg whites because they are more stable.

## Leavening Agents

A **leavening agent** is a substance that causes a baked good to rise by introducing carbon dioxide (CO<sub>2</sub>) or other gases into the mixture. The gases expand from the heat of the oven, stretching the cell walls in the baked product. The end result is a light, tender texture and good volume. The main leavening agents are air, steam, baking soda, baking powder, and yeast.

**Air** Air is an important leavening agent in all baked products since air is added during the mixing process. Angel food cake is a good example of a baked product that relies on air as a leavening agent. You can add air to a mixture by whipping egg whites.

**Steam** Steam is another important leavening agent. It is created during the baking process when water evaporates to steam and expands. Because water in one form or another is in all baked products, steam is an important leavening gas. It is especially important to items such as puff pastries and croissants.

**Baking Soda** **Baking soda**, or sodium bicarbonate ('sō-dē-əm bī-'kär-bə-net), is a chemical leavening agent that must be used with acid to give off CO<sub>2</sub> gas. There are many sources of acid used in baking, such as buttermilk, sour cream, and yogurt; fruits and

## Small Bites

**Egg Freshness** You can tell whether an egg is fresh by putting the whole egg in a glass of water. If it floats, the egg is old.

fruit juices; most syrups, including honey and molasses; and chocolate. The CO<sub>2</sub> gas is what causes the baked products to rise. Mix baking soda thoroughly, or it will leave an unpleasant aftertaste.

**Baking Powder** **Baking powder** is made up of baking soda, an acid such as cream of tartar, and a moisture-absorber such as corn starch. When mixed with a liquid, baking powder releases CO<sub>2</sub>. The type used in the bakeshop is double-acting. This means that when it first comes in contact with moisture, it gives off CO<sub>2</sub>. When it comes into contact with heat, it gives off more CO<sub>2</sub>. Double-acting baking powder can be fast- or slow-acting. Fast-acting varieties react more quickly when mixed with liquids. The slow-acting varieties need more heat to release CO<sub>2</sub>. Baking powder is used as a leavening agent in cakes, cookies, muffins, and quick breads.

**Yeast** **Yeast** is a living organism. During a process called **fermentation** (fər-mən-'tā-shən), yeast breaks down sugars into carbon dioxide gas and alcohol, which are necessary for the rising process in products such as bread. Yeast products get their distinctive aroma and flavor from this process. The types of yeast most commonly used in bakeshops are compressed yeast, dry active yeast, and quick-rise dry yeast.

Sometimes called fresh or wet compressed yeast, compressed yeast is moist and must be refrigerated. Compressed yeast is available in 0.6-ounce cubes or 2-pound blocks. It should be creamy white, have a crumbly texture, and smell like freshly baked bread. To use compressed fresh yeast, crumble it into warm water. Do not use compressed yeast that looks brown, feels slimy, or smells sour.

# Whisk Mixtures

- 1** When you whisk light mixtures, hold the whisk like a pencil, with the balloon end pointing away from you.



- 2** When you whisk heavier mixtures, it is less tiring if you hold the whisk with the balloon end facing you, and slightly bend your wrist.



Compressed yeast rapidly deteriorates at room temperature.

Dry active yeast has had most of its moisture removed by hot air, which leaves granules of dormant yeast that are asleep. Dry yeast must be reactivated in liquid that is between 100°F and 110°F (38°C and 43°C) before being added to other ingredients. Dry active yeast is available in ¼-ounce packets, 4-ounce jars, or 1- to 2-pound vacuum-sealed bags. Unopened packages can be stored in a cool, dry place for several months. Once opened, containers of dry active yeast should be kept frozen. When you substitute active dry yeast for compressed yeast, use 50% less than called for in the formula.

Also called instant yeast, quick-rise dry yeast is similar in appearance to dry active yeast. However, its leavening action is much quicker, speeding the rising of dough. Quick-rise dry yeast provides closer results to compressed yeast. To use quick-rise dry yeast, first blend it with the dry ingredients.

Then, add water that is between 100°F and 110°F (38°C and 43°C) to activate the yeast. Quick-rise dry yeast lasts at least one year in unopened packages or when it is stored frozen.

## Salt

Salt also has an important role in baking. It enhances the product through its own flavor as well as bringing out the flavor of other ingredients. Salt also acts on gluten and results in an acceptable texture. A certain amount of salt is also necessary to slow down or control fermentation in yeast products. However, salt can negatively react in baked goods if it is not measured accurately or if it is added at the wrong point in the mixing process.

## Flavorings

Flavorings include extracts and spices. Although flavorings do not usually influence the baking process, they do enhance the flavor of the final baked product.

**Extracts** Extracts are liquid flavorings that contain alcohol. They are mostly concentrated, volatile oils or essences diluted with alcohol. Vanilla extract is the exception. It is made by passing alcohol through the vanilla bean, with little or no heat, to extract flavor.

**Spices** Spices add to the enhancement of food and baked goods by adding flavor, color, or aroma. Most spices come from the bark, roots, flower buds, berries, or seeds of aromatic plants or trees. Although they are not commonly thought of as spices, coffee beans and vanilla pods also fall into this category. Citrus zest, or the outer skin of oranges, lemons, and limes, is considered a spice, too.

Ground spices release their flavor quickly and are often purchased in quantities that can be used within three months. The flavor of whole spices comes out over long cooking periods such as those used in baking. Spices should be used carefully so that they do not overpower the food. Spices used frequently in baking are listed in **Figure 26.2**.

## ❖ Nutrition Notes ❖

### Chocolate Nutrition

Most people enjoy eating chocolate. Some researchers have found health benefits to eating some types of chocolate:

- Cocoa and dark chocolate have antioxidants, which can help lower LDL cholesterol.
- Some studies have found a reduction in blood pressure after eating dark chocolate. However, too much chocolate in a diet can cause overweight and obesity. It is important to eat foods like chocolate in moderation and to maintain a healthful diet.

**CRITICAL THINKING** *Who could benefit from lowered LDL cholesterol?*

### Chocolate and Cocoa

Chocolate and cocoa add body, bulk, and a unique color and flavor to a wide variety of baked products. Both items are made from the cacao (kə-ˈkā-ō) bean.

#### FIGURE 26.2 Spices Used in Baking

**Spice of Life** Spices are used to give interesting flavor to baked goods. *What baked goods do you think anise is used in?*

| Spices            | Uses in the Bakeshop  |
|-------------------|---|
| <b>Allspice</b>   | Used in cakes and puddings; allspice is the dried, unripe berry of a tropical tree; available whole or ground; combines flavors of cinnamon, nutmeg, and cloves             |
| <b>Anise</b>      | Used in cakes, cookies, and candies; anise is the dried seed of a plant; available whole or ground; licorice-like flavor  |
| <b>Cardamom</b>   | Used in pastries and baked goods; cardamom is the seed of a native Indian herb; available whole or ground; sweet, peppery flavor  |
| <b>Cinnamon</b>   | Used in cakes, cookies, pies, breads, and desserts; cinnamon is the thin, dried inner bark of an evergreen tree; available ground or in sticks; warm, spicy flavor          |
| <b>Cloves</b>     | Used in baked goods such as breads and pies; cloves are the dried flower buds of an evergreen tree; available whole or ground; warm, spicy flavor                           |
| <b>Ginger</b>     | Used in baked goods such as cookies and cakes; ginger is the underground stem of a tropical plant; available dried or fresh; sweet, peppery flavor                          |
| <b>Nutmeg</b>     | Used in custards, pies, breads, and other baked goods; nutmeg is the kernel or seed of the fruit of an evergreen tree; available whole or ground; sweet, warm, spicy flavor |
| <b>Poppy Seed</b> | Used in breads, rolls, and other baked goods; poppy seed is the dried, ripened seed of a Middle-Eastern plant; nutty flavor   |



**Chocolate and Cocoa** All varieties of chocolate and cocoa come from the cacao bean. *What is the difference between cocoa powder and Dutch-process cocoa powder?*

The meat of the cacao bean is roasted and ground into a thick substance called chocolate liquor. Cocoa butter is a by-product of cocoa powder production. More steps are then taken to create a variety of chocolate or cocoa products. The most common varieties in the bakeshop are unsweetened chocolate, semi-sweet chocolate, white chocolate, cocoa powder, and Dutch-process cocoa powder.

Chocolate must be tempered when it is used. Tempering allows crystals in chocolate to be distributed evenly. This creates a creamy, shiny final product.

**Unsweetened Chocolate** This form of chocolate is also known as bitter or baking chocolate. It is the pure, hardened substance that results from roasted and ground cacao beans. Unsweetened chocolate has no added sugar or milk solids. It is bitter because it contains no sugar. Unsweetened chocolate gives baked products an especially rich taste because it still contains all of the cocoa butter from the bean.

**Semi-sweet Chocolate** Sugar, lecithin ('le-sə-thən), and vanilla are added to

unsweetened chocolate to create semi-sweet or bittersweet chocolate. Semisweet chocolate is often used in chocolate chip cookies and glazes.

**White Chocolate** White chocolate is made from cocoa butter, sugar, vanilla, lecithin, and dried or condensed milk. There is no chocolate liquor in white chocolate.

**Cocoa Powder** Cocoa powder is the dry, brown powder that remains once the cocoa butter is removed from the chocolate liquor. It is used mostly in baking and has no added sweeteners or flavorings. Cocoa powder absorbs moisture and provides structure, the same way that flour does.

**Dutch-Process Cocoa Powder** Adding an alkali, or base, to cocoa powder makes Dutch-process cocoa powder. Dutch-process cocoa has a darker color and milder flavor than regular cocoa. It is less likely to lump and produces a milder, smoother chocolate flavor. Dutch-process cocoa can be substituted for unsweetened chocolate when adjustments are made to the amount of cocoa and shortening that is used.

## Additives and Nuts

Additives are used in the bakeshop to color, thicken, provide texture in, and replace fat in baked products. (See **Figure 26.3** for a list of common additives that are used in the professional bakeshop.)

Nuts are often used to provide flavor, texture, and color in baked products. **Figure 26.4** on page 699 shows the nuts most commonly used in commercial bakeshops. (For more information on nuts, see Chapter 16.)

 **Reading Check** **Analyze** Why is gluten so important in the baking process?

## Mixing Batters and Doughs

Batters and doughs are formed when the dry and liquid ingredients are combined to create baked products. Batters contain almost equal parts of dry and liquid ingredients. Batters are usually easy to pour. Cakes and muffins are baked products made from batters.

A **dough** contains less liquid than a batter, making it easy to work doughs with your hands. Doughs may even be stiff enough to be cut into shapes. Many types of breads are made from dough.

**FIGURE 26.3** **Dessert Additives**

**Helpful Additions** Additives can help color, thicken, replace fat, and preserve moisture in baked goods and desserts. *What additive would you choose if you wanted to keep a wedding cake's icing smooth and moist?*

| Additive   | Food Items  | Purpose  |
|--|---|--|
| Thiamin<br>Niacin<br>Riboflavin<br>Iron                            | • Flours, breads  | • Nutrients  |
| Beta carotene<br>Red No. 3<br>Green No. 3<br>Yellow No. 6          | • Margarine<br>• Candies<br>• Various baked products                        | • Coloring agents  |
| Lecithin   | • Chocolate, baked products, margarine                                      | • Emulsifier   |
| Carrageenan<br>Pectin<br>Modified starches                         | • Ice cream, cream cheese, sherbets, fruit fillings, puddings, pie fillings | • Thickeners and stabilizers   |
| Glycerine  | • Cake icings   | • Humectant (used to retain moisture and keep foods soft)                        |
| Chlorine<br>Potassium bromate<br>Benzoyl peroxide<br>Ascorbic acid | • Cake flour<br>• Bread flour<br>• All flour<br>• Bread flour               | • Bleaching and maturing agents  |
| Sodium bicarbonate   | • Baking powder   | • Acids, alkalis, and buffers (used to adjust and control acidity or alkalinity) |
| Potassium carbonate  | • Dutch-processed cocoa powder  |  |
| Gum and starch derivatives   | • Frozen desserts   | • Fat replacers  |
| Polydextrose   | • Baked products, puddings  | • Bulking agent (used to provide texture and body in reduced-fat goods)          |

## Mixing Methods

There are many ways to mix batters and doughs. The mixing method that you choose will depend on the type of baked product you will make. Many baked goods require you to use more than one type of mixing method.

- **Beating** Agitating (<sup>1</sup>a-jə-,tāt-ŋ) ingredients vigorously to add air or develop gluten is called **beating**. You may use a spoon or a bench mixer with a paddle attachment for beating.
- **Blending** Mixing or folding two or more ingredients together until they are evenly combined is called **blending**. Use a spoon, whisk, rubber spatula, or bench mixer with a paddle attachment for blending.
- **Creaming** Vigorously combining softened fat and sugar to add air is called **creaming**. Use a bench mixer on medium speed with a paddle attachment.
- **Cut in** To **cut in**, mix solid fat with dry ingredients until lumps of the desired size remain. Use a pastry cutter, a bench mixer and paddle attachment, or two knives to cut in fat. You may also rub the fat and flour between your fingers.
- **Folding** Gently adding light, airy ingredients such as eggs to heavier ingredients by using a smooth circular movement is called **folding**. Folding is a good technique to use to keep mixtures from deflating.

### **FIGURE 26.4 Common Baking Nuts**

**Flavorful Texture** Nuts provide flavor and texture to baked goods. *What nuts might you choose to bake into a banana bread?*

| Nuts                  | Uses in Baking   |
|-----------------------|--|
| <b>Almonds</b>        | Used in breads, cakes, pastries, marzipan, and as decorations; sweet almonds are eaten, bitter almonds are used as a source of flavorings and extracts; available whole, slivered, ground, sliced, and in flour or meal form |
| <b>Chestnuts</b>      | Used to flavor buttercreams and fillings, and as a decoration for cakes and cookies; sweet flavor; available dried, chopped, and canned as a paste   |
| <b>Coconuts</b>       | Used in cakes, cookies, pies, and desserts; available grated or flaked and may be sweetened or unsweetened; desiccated (,de-si-'kāt-əd) coconut is dried, unsweetened coconut that has been ground to a fine meal            |
| <b>Hazelnuts</b>      | Also known as filberts; used in candies, baked goods, and desserts; can be made into a paste for flavoring buttercreams and fillings; available whole in the shell, whole shelled, or chopped                                |
| <b>Macadamia Nuts</b> | Used in cakes, cookies, and ice creams; smooth, buttery flavor; available roasted and salted; very expensive   |
| <b>Peanuts</b>        | Used in pastries and candies, such as peanut brittle; often combined with chocolate creations; available raw, dry roasted, in granules   |
| <b>Pecans</b>         | Used in pies, breads, and desserts; mild and sweet flavor; available shelled in halves or pieces; expensive, but other nuts can easily be substituted  |
| <b>Pine Nuts</b>      | Used in breads, cookies, and pastry; available raw or toasted; resemble almonds in flavor  |
| <b>Pistachios</b>     | Used in cakes, pastries, and to flavor buttercreams and ice creams; mild flavor and fine texture; available shelled, roasted, and salted   |
| <b>Walnuts</b>        | Used in cookies, brownies, cakes, muffins, and ice creams; available in halves, which are mostly used for decoration, and pieces   |

## Small Bites

**Carryover Baking** Baked products continue to bake for a short time after being removed from a hot oven. This process is called carryover baking. The chemical and physical changes that occur during the baking process do not stop immediately. The product continues to bake because of the heat contained in the product. If you do not take carryover baking into account, you will end up with overbaked products.

- **Kneading** Working a dough by hand or in a bench mixer with a dough hook to develop gluten and evenly distribute ingredients is called **kneading**.

- **Sifting** Passing dry ingredients such as flour through a wire mesh to remove lumps, blend, and add air is called **sifting**. Use a rotary sifter or a mesh strainer for sifting.
- **Stirring** Gently blending ingredients until they are combined is called **stirring**. Use a spoon, rubber spatula, or whisk for stirring.
- **Whipping** Vigorously beating ingredients to add air is called **whipping**. Use a whisk or a bench mixer with a whip attachment for whipping.

 **Reading Check** **Contrast** What are the differences between batters and doughs?

## SECTION 26.2 After You Read

### Review Key Concepts

1. **Identify** the most common types of fat used in a bakeshop.
2. **Compare and contrast** folding with kneading.

### Practice Culinary Academics

#### English Language Arts

3. Choose one of the ingredient types described in the chapter, and write a dialogue in which an instructor introduces that ingredient type to a student. You may give general information about that ingredient type or distinguish between the different kinds of that ingredient.

**NCTE 4** Use written language to communicate effectively.

#### Science

4. **Procedure** In addition to flavor and texture, nutrition is also a consideration when you bake. Obtain nutrition labels for unsweetened chocolate, semisweet chocolate, white chocolate, cocoa powder, and Dutch-process cocoa powder.

**Analysis** Compare the nutrition information for each. Graph the data.

**NSES F** Develop an understanding of personal and community health.

### Mathematics

5. Erica needs 24 cups of 2% milk to prepare a cake formula. However, her kitchen only has reduced fat (1%) milk and whole (4%) milk available. How many cups of each type of milk should she use?

#### **Math Concept** Writing Equivalent Equations

Performing the same operation to both sides of an algebraic equation will result in an equivalent equation. For example, to remove decimals from the equation  $.06x + .2y = .54$ , you can multiply both sides by 100 to get  $6x + 20y = 54$ .

**Starting Hint** Let  $x$  = cups of 1% milk and  $y$  = cups of 4% milk. You know that  $x + y = 24$ , and you also know that  $0.01x + 0.04y = (0.02)(24)$ , or  $1x + 4y = 48$ . Rewrite the first equation as  $x = 24 - y$ , and substitute  $(24 - y)$  for  $x$  in the second equation.

**NCTM Algebra** Use mathematical models to represent and understand quantitative relationships.



Check your answers at this book's Online Learning Center at [glencoe.com](http://glencoe.com).

**Chapter Summary**

Commercial bakers use formulas because their accuracy ensures a consistent final product. Commercial bakers prefer to use weight measurements for greater accuracy. Bakeshop equipment must be properly cared for.

Flour, liquids, fats, sugars and sweeteners, eggs, leavening agents, and flavorings are ingredients of baked goods. The main difference among baked products is the proportion of ingredients in the formulas.

**Content and Academic Vocabulary Review**

1. Write each of the terms below on an index card, with definitions on the back. Use them to review.

**Content Vocabulary**

- scaling (p. 679)
- percentage (p. 680)
- sheeter (p. 681)
- stack oven (p. 682)
- convection oven (p. 682)
- reel oven (p. 684)
- springform pan (p. 686)
- tart pan (p. 686)
- sheet pan (p. 686)
- mold (p. 686)
- ring (p. 686)
- hard wheat flour (p. 688)
- gluten (p. 688)
- crumb (p. 688)
- soft wheat flour (p. 688)
- bread flour (p. 688)
- cake flour (p. 688)
- pastry flour (p. 688)
- staling (p. 689)
- dried milk solids (p. 689)
- shortening (p. 689)
- oil (p. 690)
- leavening agent (p. 694)
- baking soda (p. 694)
- baking powder (p. 694)
- yeast (p. 694)
- fermentation (p. 694)
- dough (p. 698)
- beat (p. 699)
- blend (p. 699)
- cream (p. 699)
- cut in (p. 699)
- fold (p. 699)
- knead (p. 700)
- sift (p. 700)
- stir (p. 700)
- whip (p. 700)

**Academic Vocabulary**

- imprecise (p. 678)
- invaluable (p. 682)
- surround (p. 689)
- contribution (p. 691)

**Review Key Concepts**

2. **Explain** baking formulas.
3. **Describe** the function of various bakeshop equipment.
4. **Identify** bakeshop tools.
5. **Identify** the different categories of ingredients and their roles in the baking process.
6. **Compare and contrast** different dough mixing methods.

**Critical Thinking**

7. **Analyze** measuring techniques. What might happen if a baker measured dry ingredients in measuring cups instead of weighing them on a scale?
8. **Imagine** you are looking at different ovens to purchase for a new bakery. What factors would you consider?
9. **Explain** Why is it important for a baker to know the protein content of different types of flour?
10. **Evaluate** baking methods. If 10 cherry pies all have dry crusts that are too dark after being baked according to a formula, what could have happened, and how could it have been prevented?

## Academic Skills

**English Language Arts**

- 11. Write Formula Procedures** Find baking formulas for three different baked goods. Look at the formulas and see if you can figure out how to follow them. Write down the procedure you would follow in order to make the baked good. Make sure that each step of the procedure is easy to follow and clear, even to a new bakeshop employee.

**NCTE 3** Apply strategies to comprehend texts.

**Science**

- 12. Gluten** The gluten in flour affects the texture of a baked good. Gluten makes bread dough strong and elastic. The amount of gluten in the flour you use will change the texture of the final product.

**Procedure** Follow your teacher's directions to form groups. Choose a bakeshop formula as a group. As a group, make the same product using flours with two different gluten levels.

**Analysis** Compare the finished products. What are the differences? What can you conclude about the importance of gluten in baking? Write a summary of your answer.

**NSES B** Develop an understanding of chemical reactions.

**Mathematics**

- 13. Use Baker's Percentages** Danielle needs to make 100 pounds of bread using the formula listed below. Calculate the exact weight (to the nearest ounce) of each ingredient that Danielle will need: Bread flour, 100%. Water, 65%. Salt, 2%. Yeast, 2%. Shortening, 5%. Sugar, 4%. Dry milk solids, 7%. Total, 185%.

**Math Concept** **Decimal Weights** There are 16 ounces in 1 pound. To convert a decimal pound amount into pounds and ounces, take the amount to the right of the decimal point and multiply by 16, then round that product to the nearest whole number. The result becomes the ounce portion of the weight. For example, given a weight of 4.28 pounds, multiply  $0.28 \times 16$  to get 4.48, which rounds to 4. The weight is thus 4 pounds, 4 ounces.

**Starting Hint** Divide the total pounds needed (100) by the total formula percentage (185%) to find the weight of the flour. To do so, first convert the percentage into a decimal by dividing by 100 (simply move the decimal point two places to the left). Multiply each ingredient's percentage by the weight of the flour to find the weight of each ingredient.

**NCTM Number and Operations** Compute fluently and make reasonable estimates.

## Certification Prep



**Directions** Read the questions. Then, read the answer choices and choose the best possible answer for each.

- 14.** Which is an individual soufflé mold?
- brioche pan
  - ramekin
  - tart pan
  - springform pan
- 15.** What is the process in which oils become solid?
- staling
  - hydrogenation
  - leavening
  - fermentation

*Sharpen your test-taking skills to improve your kitchen certification program score.*

**Test-Taking Tip**

If a new term is a compound phrase of two or more words, try to figure it out by looking at the meanings of the individual words before looking it up for yourself. This will help you remember the word's meaning.

## Real-World Skills and Applications

## Interpersonal and Collaborative Skills

- 16. Start a Bakeshop** Follow your teacher's instructions to form a business team. Divide into chefs, marketers, and dieticians. Chefs will create five baked good product ideas. Marketers will create names and descriptions for the products. Dieticians will evaluate the nutrition content for each. Share your work with the class.

## Information Literacy

- 17. Read Flour Labels** Obtain and examine labels for different types of flours. What is their gluten content? What additives, if any, do they contain? How does the nutrition compare? Write your findings and conclusions in a chart and share it with the class.

## Technology Applications

- 18. Baking Equipment PowerPoint** Using the information in the chapter on different baking equipment, create a PowerPoint presentation that describes the various equipment used in a bakeshop. Use words, graphics, and/or photos. Share the presentation with the class.

## Financial Literacy

- 19. Purchase Eggs** You need to purchase egg products for use in your bakeshop. Shell eggs cost \$7.50 per flat. Liquid egg products cost \$6.00 per 32 ounces. There is the equivalent of half an egg per ounce in a package of liquid egg product. How much per egg does each option cost? Which option has the best price?

## Culinary Lab



*Use the culinary skills you have learned in this chapter.*

## Measure Ingredient Yields

- 20. Practice Measuring** Working in teams, you will practice converting and measuring ingredients for baking using the appropriate equipment.
- A. Review ingredients.** Working in teams, review the ingredients for the formula of Chocolate Applesauce Cake, shown below. The formula yields six 9-inch cakes, or 8 pounds, 9½ ounces. You want to make 10 9-inch cakes, or 14 pounds, 5 ounces. Create a chart and determine the amount of ingredients needed to yield 10 9-inch cakes.
- |   |                                  |
|---|----------------------------------|
| Cake flour, sifted, 1 lb., 11 oz., 100% | Brown sugar, 2 lbs., 4 oz., 133% |
| Cocoa powder, sifted, 1½ oz., 6%        | Vegetable oil, 1 lb., 5 oz., 78% |
| Baking soda, sifted, ¾ oz., 3%          | Eggs, whole, 13 oz., 48%         |
| Baking powder, sifted, ¾ oz., 3%        | Applesauce, 12 oz., 44%          |
| Salt, ¾ oz., 3%                         | Buttermilk, 1 lb., 8 oz., 89%    |
| Cinnamon, ground, ¾ oz., 3%             | TOTAL 8 lbs., 9½ oz., 510%       |
- B. Use the baker's percentage.** Add the baker's percentage and change the total to a decimal. Convert the new yield to ounces by multiplying pounds by 16. Divide the new yield by the decimal figure to determine the weight of the flour. Change each ingredient's baker's percentage to a decimal. Multiply each of these numbers by the weight of the flour to determine the new ingredient amount. If needed, round the results to the next highest number.
- C. Measure ingredients.** After filling out your chart, practice measuring each ingredient with the appropriate tool: baker's or electronic scale, measuring cups or spoons, or volume measures.

## Create Your Evaluation

Write out an evaluation of each ingredient and how difficult or easy it was to measure. What made some ingredients more difficult to measure? Discuss each ingredient as a class and share your observations with the other students. Compare your results. Did everyone have the same difficulties, or was it varied?