

THIRD EDITION UPDATE

ON BAKING

A TEXTBOOK OF BAKING AND PASTRY FUNDAMENTALS



Approach and Philosophy of **ON BAKING**

On Baking, Third Edition Update, follows the model established in our previous editions, which has prepared thousands of students for successful careers in the baking and pastry arts by building a strong foundation based upon sound fundamental techniques. *On Baking* focuses on teaching the hows and whys of baking. *On Baking* starts with general procedures, highlighting fundamental principles and skills, and then presents specific applications and sample recipes. Core baking and pastry principles are explained as the background for learning proper techniques. Once mastered, these techniques can be used in the preparation of a wide array of baked goods, pastries and confections. The baking and pastry arts are shown in a cultural and historical context as well so that students understand how different techniques and flavor profiles developed.

Chapters focus on four areas essential to a well-rounded baking and pastry professional:

- ➊ **Professionalism** Background chapters introduce students to the field with material on culinary and baking history, food safety, tools and ingredients.
- ➋ **Breads** Four chapters focus on breadmaking, from basic quickbreads to yeast breads and advanced artisan specialties such as sourdough breads and laminated doughs.
- ➌ **Desserts and Pastries** Fundamental baking techniques used in the preparation of cookies, pies, cakes, custards and frozen desserts are explained and then demonstrated with a wide range of recipes. Healthy baking concludes this section.
- ➍ **Advanced Pastry Work** Chapters on tortes and modern entremets, petits fours, plated desserts, chocolate and sugar work demonstrate advanced concepts and techniques.

UPDATES

- ▶ More than **230 new photographs and illustrations** provide clear representations of core preparations that are the foundation of any good baking textbook.
- ▶ Over **40 new recipes** reflect up to the minute trends in bakeries and foodservice.
- ▶ New **step-by-step photographs emphasize stages** in making key products such as flaky biscuits, pie crust and meringue.
- ▶ New **photographs that show contemporary plate presentation styles** to help students in their mastery of plating and presentation.
- ▶ **Coverage of the construction of tiered specialty cakes** has been expanded to include new photographs of celebration cakes from professional cake decorators.
- ▶ Content updates reflect **current trends in the world of baking and pastry**, such as the interest in food science, ingredient function and specialty cake production.
- ▶ **Expanded coverage of flavors** and **advanced pastry techniques** is offered in new sidebars and recipes.
- ▶ **Additional troubleshooting content** is included to help students master challenging bakeshop items such as puff pastry, meringues, éclair paste and pastry cream.
- ▶ MyCulinaryLab for *On Baking* features new culinary math questions with step-by-step remediation that instructors can assign as homework. Topics covered in these problem sets include measurement conversions, metric conversions, formula conversions, baker's percentages, and yield percentages. Updated chapter tests, chapter quizzes, and dynamic study modules can also be assigned for homework.

GUIDED TOUR

Easy to navigate, *On Baking* is divided into bite-sized subsections to optimize your learning experience. We invite you to explore this new edition with the following Guided Tour through the features presented.

HALLMARK FEATURES

After studying this chapter, you will be able to:

- understand the various mixing methods used in the bakeshop
- understand how heat affects batters and doughs, the basis of most bakeshop items
- identify and understand the basic baking and cooking methods employed in the bakeshop
- understand the science of taste and basic flavor principles

► Chapter Introduction

Introductory paragraphs summarize the main themes in each chapter and help reinforce topics.

◀ Learning Objectives

Each chapter begins with clearly stated objectives that guide you to focus on what can be achieved by completing the chapter.

BREAD MAKING IS AN ART THAT DATES BACK TO ANCIENT TIMES. Over the centuries, bakers have learned to manipulate the basic ingredients—flour, water, salt and leavening—to produce a vast variety of breads. Thin-crust baguettes, tender Parker House rolls, crisp flatbreads and chewy bagels derive from careful selection and handling of the same key ingredients. A renewed interest in the traditional craft of baking has seen many new artisan bread bakeries open in recent years. Customers are demanding, and more restaurants are serving, exciting bread assortments to their guests at every meal. Although few baked goods intimidate novice bakers as much as yeast breads, few baked goods are actually as forgiving to prepare. By mastering a few basic procedures and techniques, restaurants and bakeshops can offer their customers delicious, fresh yeast products.

Yeast breads can be divided into two major categories: lean doughs and rich doughs. Lean doughs, such as those used for crusty French and Italian artisan breads, contain little or no sugar or fat. Traditional sourdough and rye breads are lean doughs that require special handling to bring out their unique flavor. Rich doughs, such as brioche and challah, contain significantly more sugar and fat than lean doughs. Rich dough bakes into softer products with a tender crust and interior crumb and is discussed in Chapter 8, Enriched Yeast Breads. A specific type of rich, flaky dough is made by incorporating layers of fat and flour and is covered in Chapter 9, Laminated Doughs.

This chapter covers in detail the basic production techniques for making lean and sourdough bread products. The principles discussed in this chapter apply to working with all types of yeast-raised products, including artisan-style breads also discussed here. Rereading the discussion of the function of ingredients found in Chapter 4, Bakeshop Ingredients, is recommended before beginning this chapter.

► Margin Definitions

Important terms are defined in margin notes to help you quickly master new terminology.

flavor an identifiable or distinctive quality of a food, drink or other substance perceived with the combined senses of taste, touch and smell

mouthfeel the sensation created in the mouth by a combination of a food's taste, smell, texture and temperature

aroma the sensations, as interpreted by the brain, of what we detect when a substance comes in contact with sense receptors in the nose

taste the sensations, as interpreted by the brain, of what we detect when food, drink or other substances come in contact with our taste buds

SAFETY ALERT Milk Storage

Canned milks, aseptically packaged milks and dry milk powders are shelf-stable products needing no refrigeration. After the can or box is opened or the powder is reconstituted with water, however, these become potentially hazardous foods and must be handled just as carefully as fresh milk. Do not store an open can of milk in its original container, and keep all milk products refrigerated at or below 40°F (4°C).

◀ Safety Alerts

Brief notes remind you of safety concerns and encourage you to incorporate food safety and sanitation into your regular kitchen activities.



❶ A vol-au-vent cutter looks like a double cookie cutter with one cutter about 1 inch (2.5 centimeters) smaller than the other. To cut the pastry, simply position the cutter and press down.



❷ To shape with rings, use two rings, one approximately 1 inch (2.5 centimeters) smaller than the other. The larger ring is used to cut two rounds. One will be the base and is set aside. Use the smaller ring to cut out an interior circle from the second round, leaving a border ring of dough.

◀ Procedures

Step-by-step color photographs of various stages in the preparation of ingredients and dishes help you visualize unfamiliar techniques and encourage you to organize kitchen activities.

▶ Product Identification

Hundreds of original color photographs help you identify ingredients. Descriptions let you explore a huge variety of items such as fruits, sugars, nuts or chocolates.



Pomegranates

MISE EN PLACE

- ▶ Allow the butter, eggs and buttermilk to come to room temperature.
- ▶ Zest the lemon and orange.
- ▶ Grease pans.
- ▶ Preheat oven to 400°F (200°C).

◀ Mise en Place

French for “put in place,” this margin feature accompanying in-chapter recipes lists what needs to be done *before* starting to prepare the recipe, such as preheating the oven, chopping nuts or melting butter.

▶ Line Drawings

Detailed line drawings illustrate tools and equipment commonly used in a bakeshop.



Pastry Wheel

▼ Formulas

Recipes, more appropriately called *formulas* in professional bakeshops, demonstrate techniques and provide delicious laboratory experiments for all skill levels.



BRAN MUFFINS WITH RAISINS

Yield: 36 Muffins, 3 ½ oz. (105 g) each

Method: Muffin

Buttermilk	1 qt.	960 ml	152%
Wheat bran	10 oz.	300 g	47%
Salt	0.75 oz.	22 g	3.5%
All-purpose flour	1 lb. 5 oz.	630 g	100%
Baking powder	0.6 oz. (4 tsp.)	18 g	3%
Baking soda	0.6 oz. (4 tsp.)	18 g	3%
Cinnamon, ground	0.4 oz. (2 Tbsp.)	12 g	2%
Eggs	6.5 oz. (4 eggs)	195 g	31%
Vegetable oil	12 fl. oz.	360 ml	57%
Brown sugar	1 lb. 8 oz.	720 g	114%
Raisins, conditioned	1 lb.	480 g	75%
Streusel Topping (page 145; optional)	as needed	as needed	
Total batter weight:	7 lb. 11 oz.	3697 g	587%



Rasp-Style Grater

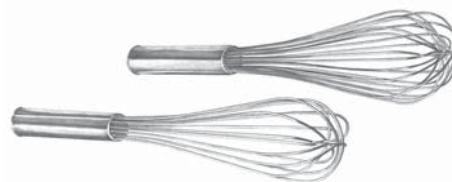
▼ Icons



Our adaptation of the MyPlate icon identifies healthy formulas.



The scale icon identifies formulas for which larger quantity measurements are provided in Appendix III.



Balloon and Rigid Whisks

► Photographs

Formulas are illustrated with both step-by-step photographs showing procedural techniques, as well as photographs of finished products or plated desserts.



Measurements

All formulas include ingredient quantities in both U.S. and metric measurements. U.S. and metric measurements for all temperatures, pan sizes and other quantities are provided throughout the text.

Baker's Percentage

A way of expressing the ratio of ingredients unique to professional baking, baker's percentages are used primarily with breads, cakes and dough products and are provided with those formulas.

Variations

Variations show how to modify a formula to create different flavor profiles and new dishes.

Nutritional Analysis

All formulas include a nutritional analysis prepared by a registered dietitian.

TRADITIONAL SHORTBREAD



Yield: 7 Dozen Cookies, approximately ½ oz. (15 g) each

Method: Icebox cookies

Unsalted butter, softened	1 lb.	480 g	84%
Powdered sugar	8 oz.	240 g	42%
Vanilla extract	0.5 fl. oz.	15 ml	3%
Salt	0.2 oz. (1 tsp.)	5 g	1%
Pastry or all-purpose flour	1 lb. 3 oz.	570 g	100%
Egg wash	as needed	as needed	
Total dough weight:	2 lb. 11 oz.	1310 g	230%

- 1 Blend the butter and powdered sugar in a mixing bowl without creaming. Stir in the vanilla and salt, mixing thoroughly. Add the flour and mix until just combined.
- 2 Divide the dough into four equal portions. Roll each piece of dough into 8-inch (20-centimeter) disks. Wrap in plastic. Freeze until hard, approximately 30 minutes.
- 3 Remove from the freezer and unwrap, then lightly brush each disk with egg wash. Cut each disk into eight wedges. Dock the wedges with a fork.
- 4 Bake at 375°F (190°C) until pale golden brown, approximately 15 to 20 minutes.

VARIATIONS:

Bergamot Shortbread—Add 12 drops of oil of bergamot with the vanilla in Step 1. Divide the dough into four equal portions. Roll each piece into a 10-inch- (25-centimeter-) long cylinder. Freeze until hard, approximately 30 minutes. Brush each cylinder with egg wash. Roll each cylinder in granulated sugar. Cut the cylinders into ½-inch- (1.2-centimeter-) thick slices, then place the slices cut side down on paper-lined sheet pans. Dock the cookies with a fork and bake.

Pecan Shortbread—Add 7 ounces (210 grams/37%) of finely chopped pecans to the dough in Step 1.

Approximate values per cookie: **Calories** 70, **Total fat** 4.5 g, **Saturated fat** 3 g, **Cholesterol** 10 mg, **Sodium** 30 mg, **Total carbohydrates** 8 g, **Protein** 1 g



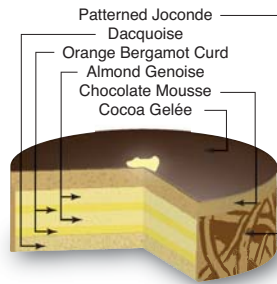
Bergamot Shortbread



Pecan Shortbread

► Color Illustrations of Torte Assembly

Full-color illustrations accompany torte formulas to show the internal assembly of these finished desserts.



▼ Flavor Sidebars

These features show how flavoring ingredients may be used to change the character of a dessert preparation.

VARIETAL HONEY

More than three hundred types of varietal honey are available in the United States. Each nectar source contributes a distinct color and flavor to the honey. Use this to advantage when selecting honey to use in ice cream, mousses and custards. From the rich buttery flavor of avocado honey to the delicate floral taste of tupelo honey, alternating honeys will change the flavor profile of a dish. Do taste these honeys before using them. The pronounced taste of buckwheat or heather blossom honey may be better suited to baked goods or chocolate desserts. Edible honeycomb makes an attractive garnish, as do granules of dried honey.

▼ Troubleshooting Charts

Troubleshooting charts enhance the learning experience by clarifying “how” and “why,” and by helping you diagnose and correct problems.

TABLE 10.2 TROUBLESHOOTING CHART FOR COOKIES

PROBLEM	CAUSE	SOLUTION
Cookies too dense or hard	Too little liquid in the dough	Adjust formula or measure carefully; add more eggs
	Too little fat in the dough	Adjust formula or measure fat carefully
	Too much flour in the dough	Adjust formula or measure flour carefully
	Dough overmixed	Cream properly; avoid overmixing after adding dry ingredients
Cookies tough	Cookies overbaked	Remove cookies from oven promptly
	Improper flour used	Use lower-protein flour
	Too much flour in the dough	Adjust formula or measure flour carefully
	Too little fat in the dough	Adjust formula or measure fat carefully
	Too little sugar in the dough	Adjust formula or measure sugar carefully
	Dough overmixed	Avoid overmixing after adding dry ingredients
Cookies too crumbly	Dough reworked during rolling	Roll dough carefully; do not re-roll scrap dough
	Dough lacks gluten development	Mix longer; use higher-protein flour
	Too much chemical leavening, fat or sugar used in the dough	Adjust formula or measure carefully
	Too few eggs in the dough	Adjust formula
Cookies flatten and spread too much	Dough too thin	Roll or cut dough thicker
	Wrong type of flour used	Use higher-protein flour
	Too little flour in the dough	Adjust formula or measure flour carefully
	Too much chemical leavening, fat or liquid in the dough	Adjust formula or measure ingredients carefully
	Too much grease on baking sheets	Grease equipment carefully
	Dough too warm before baking	Chill dough thoroughly before using
	Oven too cool	Adjust oven

▼ Tables

Tables and charts offer visual support and organization of material to enhance your understanding.

TABLE 10.1 COOKIE TEXTURES

DESIRED TEXTURE	FAT	SUGAR	LIQUID	FLOUR	SIZE OR SHAPE	BAKING
Crispness	High	High; use granulated sugar	Low	Strong	Thin dough	Well done; cool on baking sheet
Softness	Low	Low; use hygroscopic sugars	High	Weak	Thick dough	Use parchment-lined pan; underbake
Chewiness	High	High; use hygroscopic sugars	High	Strong	Not relevant; chilled dough	Underbake; cool on rack
Spread	High	High; use coarse granulated sugar	High; especially from eggs	Weak	Not relevant; room-temperature dough	Use greased pan; low temperature

▼ Sidebars

Sidebars present additional information on food history, food in culture and the background of professional food service. These sidebars help you understand baking and pastry arts in a wider social context.

THE RISE OF YEAST BREADS

How and when the first yeast-leavened breads came into being, no one knows. Perhaps some wild yeasts—the world is full of them—drifted into a dough as it awaited baking. Perhaps some ancient baker substituted fermented ale or beer for water one day. In any case, the resulting bread was different, lighter and more appetizing.

Based on models, images and writings found in excavated tombs, historians are fairly certain that the ancient Egyptians saved a bit of fermented dough from one day's baking to add to the next day's. This use of sourdough starter continues today, enjoying widespread popularity.

Other cultures developed their own leavening methods. The Greeks and Romans prepared a wheat porridge with wine, which caused their doughs to ferment. The Gauls and Iberians added the foamy head from ale to their doughs. Both methods resulted in lighter breads that retained their fresh textures longer. Since ancient times, bread baking has been one of the first household tasks readily turned over to professionals. The first cooks to work outside homes during the Greek and Roman empires were bakers. The bakery trade flourished during the Middle Ages, with a wide variety of breads being produced. Yeast-leavened breads remained the exception, not the



norm, until well into the 17th century, however. The first real collection of bread recipes is found in Nicolas Bonnefon's *Les Délices de la campagne*, published in 1654. Bonnefon's instructions, meant for those dissatisfied with commercial products of the time, included the use of beer yeast. By the end of the 17th century, published works included recipes for breads leavened with sourdough starter and the yeasts used in breweries.

Louis Pasteur finally identified yeast as a living organism in 1857. Soon after, a process for distilling or manufacturing baker's yeast was developed. By 1868, commercial baking yeast was available in stores.

▼ Questions for Discussion

Questions for Discussion appear at the end of each chapter to encourage you to integrate theory and technique into a broader understanding of the material. Web-based activities, as indicated by the WWW icon, encourage you to conduct research and seek answers from outside your primary classroom material.



- 1 Explain the differences among active dry yeast, instant dry yeast and compressed yeast. Describe the correct procedures for working with these yeasts.
- 2 Explain the differences between a sponge and a sourdough starter. How is each of these items used?
- 3 Describe the straight dough mixing method and give two examples of products made with this procedure.
- 4 List the 10 production stages for yeast breads. Which of these production stages would also apply to quick bread production? Explain your answer.
- 5 Locate a professional organization for bread bakers. What services are available to its members? 
- 6 Locate two recipes each for typical French, German and Italian yeast breads and determine whether they are made with the straight dough, sponge or other pre-fermentation method. 

QUESTIONS FOR DISCUSSION

Terms to Know

leavening	kneading
active dry yeast	windowpane test
instant dry yeast	pickup stage
starter	punching down
dough	rounding
temperature	proofing
straight dough	scoring
method	refresh
sponge method	lactic acid
sourdough	acetic acid
method	poolish
old dough	biga

◀ Terms to Know

A list of important terms used in each chapter is provided to help enhance your vocabulary and reinforce professionalism.

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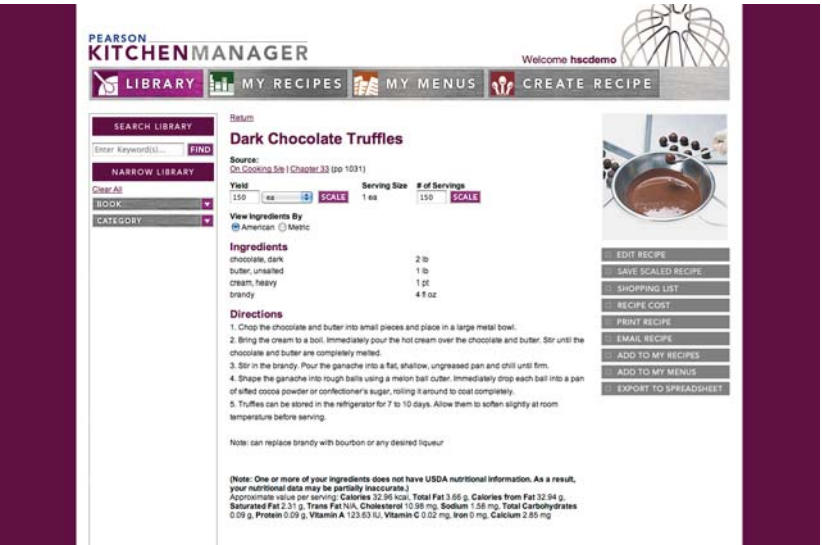
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An indispensable resource, the **Study Guide** (ISBN-10: 0-13-388693-X) assists the student in learning terminology and theory. It includes review questions with answers to help the student comprehend the techniques and processes illustrated in the textbook. The Student Study Guide may be purchased through local bookstores or at www.pearsonhighered.com.

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PREFACE

On Baking: A Textbook of Baking and Pastry Fundamentals builds on the successful approach developed in *On Cooking: A Textbook of Culinary Fundamentals*. This is a carefully designed text intended to teach both the principles and practices of baking and the pastry arts. The baking information presented in *On Cooking* is suitable for culinary students seeking a general knowledge of baking. *On Baking* takes the same clear, organized approach and expands the material into far greater depth, covering techniques and formulas required for core and advanced baking and pastry programs.

This book aims to teach professional culinary students core baking principles and the skills necessary to produce a wide array of baked goods and confections. Our goal is not merely to offer a collection of recipes, although there are over 775 recipes for a wide variety of baked goods and confections. We include these formulas to illustrate the techniques presented in the teaching sections of each chapter. Throughout the text, we discuss both the “how” and “why” of baking. Extensive step-by-step photographs help you visualize the techniques used to form bread dough, shape cookies or temper chocolate while recipes illustrate the baking principles and procedures. Throughout the book we provide extensive illustrated sections identifying bakeshop ingredients and equipment. We believe that a thorough understanding of the function of ingredients will serve you well throughout your baking career.

Winner of the 2004 **Gourmand World Cookbook Award** as the “**Best Book for Food Professionals in the World,**” *On Baking* has been uniformly praised for its organization, clarity, ease of use and use of quality photography to illustrate professional techniques. This third edition update seeks to further enhance the content included in prior editions.



THE STORY BEHIND THIS UPDATE

Baking programs vary in terms of content and depth. After speaking with instructors and hearing from reviewers, we wanted to incorporate material at a wide range of skill levels and interests.

Our commitment to offering a range of formulas for various skill levels led us to institute an in-classroom testing program for many of the recipes in both the second and third editions. The testing enabled chef instructors to share useful feedback about how they approach a particular topic.

Much of the feedback we received since *On Baking* was first published indicated that students and instructors appreciate a book with clear, thorough explanations of fundamental techniques used in professional bakeries. Users also look for an assortment of formulas for making classic pastries and items served at modern bakery cafes, as well as dishes that reflect a wider ethnic influence. We have expanded this coverage and sought to add more formulas that speak to these trends. All of the formulas featured in *On Baking*, Third Edition Update, as well as many formulas found in previous editions, are available online through the Pearson Kitchen Manager application, which is accessible at www.pearsonhighered.com/pkm or integrated within MyCulinaryLab™ at www.myculinarylab.com. By creating an online database of formulas, we are able to expand the content covered and support the book with photographs and illustrations while maintaining an acceptable size and cost.

A NOTE ON RECIPES AND FORMULAS

The featured recipes are designed to reinforce and demonstrate techniques that are presented within the text. Many of these formulas intentionally produce low yields, which are more appropriate for students beginning to learn about baking and for small schools and teaching kitchens. Selected larger volume formulas appear in Appendix III and are noted with the scale icon shown at left. We provide volume measurements only when the quantity of an ingredient is difficult to weigh without specialized equipment: less than ½ ounce of salt, leavening or spices, for example. We list all ingredients



in both **U.S. and metric measurements**. In most instances we round off the metric equivalents to even, easily measured amounts.

Consider the U.S. and metric ingredient lists as separate recipes or formulas; do not measure some ingredients according to the metric amounts and other ingredients according to the U.S. amounts or the proportions will not be accurate and the intended result will not be achieved.

Baker's percentages are included with many formulas, especially those for breads. Widely used in the professional bakeshop, baker's percentages are very useful for increasing or decreasing yields as needed. We provide **yields** in either total batch weight or total yield and offer suggested portion sizes where appropriate.

We present detailed procedures for standard techniques, then generally do not repeat them in each recipe (for example, "apply egg wash" or "divide the dough"). A **mise en place** feature is included with recipes that appear in the front section of recipe chapters. Ingredients that require preparation before beginning to prepare the recipe are listed in the margin. You should consult this brief checklist after you read the recipe but before you begin to bake. No matter how detailed the written recipe, however, we must assume that you possess certain knowledge, skills and judgment.

Variations appear at the end of selected recipes. These variations enable you to see how a set of techniques or procedures can be used to prepare different dishes with only minor modifications. Variations also provide the advanced baker or pastry chef the opportunity to customize recipes for different applications. **Headnotes** that describe the cultural or historical background of a bread or pastry or the unique techniques used in its preparation appear with many of the recipes. This short text should enhance your understanding of a baking style or technique.

A registered dietitian analyzed each recipe using nutritional analysis software that incorporates data from the U.S. Department of Agriculture, research laboratories and food manufacturers. The **nutrient information** provided here should be used only as a reference, however. A margin of error of approximately 20 percent can be expected because of natural variations in ingredients. Preparation techniques and serving sizes may also significantly alter the values of many nutrients. In the nutritional analysis for a recipe that offers a choice of ingredients, the first-mentioned ingredient is the one used unless stated otherwise. Ingredients listed as "as needed" are omitted from the analysis. Corn oil and whole milk are used throughout for "vegetable oil" and "milk," respectively. In cases of a range of ingredient quantities or numbers of servings, the average was used.



Throughout this book the MyPlate symbol, shown at left marks various recipes. This symbol identifies dishes that are particularly low in calories, fat, saturated fat or sodium; if appropriate, they may also be a good source of vitamins, protein, fiber or calcium.

Bakeshop products are often challenging to produce from start to finish in a single two- to three-hour class session. Formulas that can be produced in a limited amount of time are printed in blue in the master recipe list on pages xxiii through xxx. If a dough, pastry or frozen dessert base needs to chill overnight before using, it will not be highlighted even if the preparation can be made quickly. Should components such as tart dough or puff pastry be available, additional formulas in this book may be prepared in a two- to three-hour class time. As in restaurant and bakery settings, however, many breads and pastries will need to be made in stages. For example, puff pastry can be produced one day, then refrigerated for baking and assembly during a subsequent day. This reinforces the component approach to pastry preparation, in which fillings, doughs, toppings, icings and such can be prepared in advance and assembled in various ways to complete desserts and pastries. Similarly, starters for yeast breads, doughs for Danish pastries and many dessert sauces can be prepared days in advance of final use.

Baking is both an art and a science. It is best learned through hands-on experience combined with study of the principles that underlie each technique. You should rely on the knowledge and skills of your instructor for guidance. Although some skills and an understanding of theory can be acquired through reading and study, no book can substitute for repeated, hands-on preparation and observations. We hope you enjoy *On Baking!*

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ON BAKING

