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A BAKER'S DOZEN LAB: BAKING FOR SPECIAL NEEDS

Volume 60 / High School

Developed with Sharon Davis, FCS Teacher,
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Introduction:

Consumers with special food needs often find their food costs double to 10 times as much. Have students experiment with building baking skills for changing ingredients for low-sodium, food allergies, or increased nutrition, while controlling food costs.

National FCS Standards:

1.3.3 – Analyze personal and family assets and skills that provide service to the community
8.5.10 – Prepare breads, baked goods, and desserts using safe handling and professional preparation techniques
9.5.3 – Prepare food for presentation and assessment
9.5.6 – Conduct sensory evaluations of food products
9.6.6 – Analyze new products
9.6.7 – Implement procedures that provide cost effective products

Objectives:

Students will...

- Prepare a specialty baked food to meet a special food need that is whole grain and nutrient-rich
- Learn the specifications needed to prepare a whole grain breakfast bar that will meet FDA food label specifications for low- or reduced-sodium, gluten-free, egg-free, or lactose-free diets
- Analyze the acceptability of the product with a student or adult consumer taste group
- Demonstrate problem-solving abilities by providing an alternative method or ingredient to improve the product if needed
- Assist consumers in controlling specialty food costs by developing food preparation skills

The Baking for Special Needs Lesson Is an Excerpt From:

Lab Two, *A Baker's Dozen Labs* by the Home Baking Association that features 13 labs, each with three skill levels; ingredient science; and career, community, and computer connections teaching multiple 2008 National FCS Education Standards. The labs were developed and tested by FCS teachers and baking professionals. For more information on to order *A Baker's Dozen Labs* (WA27798), or go to NascoEducation.com.

Download and copy ready resources...

- *Gluten and the Diet*, www.wheatfoods.org
- *Wholegrain Made Easy*, www.wheatfoods.org or www.bellinstitute.com
- Quick Bread Mixing Method, Do-It-Yourself Videos (Confetti Cornbread), www.homebaking.org
- The Food Allergy Network, www.foodallergy.org
- Celiac Disease Foundation, www.celiac.org
- Gluten-free member resources, www.homebaking.org

Materials List (Per Lab Team):

- Food labels/costs of food products that meet special needs for low-sodium or food allergy diets
- Commercial gluten-free flour blend
- Ingredients to prepare the gluten-free blend
- Flax meal
- Electronic scales
- Equipment and ingredients for the ABC Breakfast Bar Recipe

DAY 1

Computer Lab – Get the facts. Divide the class into teams to prepare reports based on three websites.

1. Visit www.fda.gov to discover five ways the Food and Drug Administration helps consumers regarding food labels. List 10 consumer food resources offered by the FDA.
2. Visit the American Heart Association website at www.americanheart.org. List definitions of no-sodium, low-sodium, and reduced sodium in foods. Describe how much sodium is healthy for teens and how we get too much sodium. Tell why too much sodium isn't good for us.
3. Some people may have food allergies. Learn the difference between food allergy and food sensitivity. Visit www.foodallergy.org. Find out how many Americans have food allergies.
4. Learn five facts about gluten allergies and Celiac disease at www.csaceliacs.org. List 10 gluten-free grains/ingredients.
5. Use the nutrient-rich shopping list at www.nutrientrichfoods.org and identify 5-10 ingredients to combine in baking.
6. What is whole grain? Go to www.bellinstitute.com.

GLUTEN-FREE FLOUR BLEND RECIPE

Use this do-it-yourself mix to replace all-purpose and whole wheat flour one-for-one:

Ingredients

2 cups brown or white rice flour (finely ground)*
⅔ cup potato starch (not potato flour)
⅓ cup tapioca flour
1 tsp. xanthan gum

Preparation

Whisk or blend ingredients together with mixer wire attachment. Makes 3 cups.

*Sorghum flour may be substituted.

Recipe courtesy of www.landolakes.com.

DAY 2

Baking for Special Needs – Low-Sodium, No-Egg, Gluten-Free, Lactose-Free

Each lab selects one change variable in the ABC Breakfast Bar:

- egg-free
- reduced and low-sodium
- lactose- or casein-free
- gluten-free

Bake one recipe of standard ABC Breakfast Bars to compare with specialty products. Identify students or adults with specialty needs that could sample your products on Day 4.

Start Up Ideas:

1. **Egg Replacement:**
   1 large egg = 1 tbsp. flax meal + 3 tbsp. water
2. **Reduced- or Low-Sodium:** Substitute sodium-free cereal or oat bran for bran flakes cereal; cut salt in half
3. **Lactose- or Casein-Free:** Use soy milk or rice milk in place of cow's milk
4. **Do-It-Yourself Gluten-Free Flour Blend:** Use the mix recipe shown above to replace all-purpose and whole wheat flour one-for-one.
   Reminder: Always make sure your work surfaces, utensils, pans, and tools are free of gluten. Always read product labels. Manufacturers can change product formulations without notice. When in doubt, do not buy or use a product before contacting the manufacturer for verification that the product is free of gluten.

DAY 3

Each lab prepares and labels one product for specialty needs. Check with family, FCS students, or school food service director to see if the products could be sampled by those who have a need.

DAY 4

Use the Lab Rubric and A Matter of Taste forms to evaluate each lab's results. Keep one piece of each product stored in plastic wrap at room temperature (68° F, draft-free) overnight to see how its quality holds.

See the Sites – Online Labs and Resources

- ABC Breakfast Bar Recipe, Lab Rubric/A Matter of Taste Lab Evaluation Form and Glossary – Terms to Know
- *A Baker's Dozen Labs*, Gluten-Free Baking, Glossary, and DIY resources. www.homebaking.org

Careers and Tech Explorations – Explore test kitchen website links at www.homebaking.org/members and careers in baking science: www.grains.k-state.edu.

Nasco education
1.800.558.9595
NascoEducation.com

FCS recipe

ABC BREAKFAST BAR

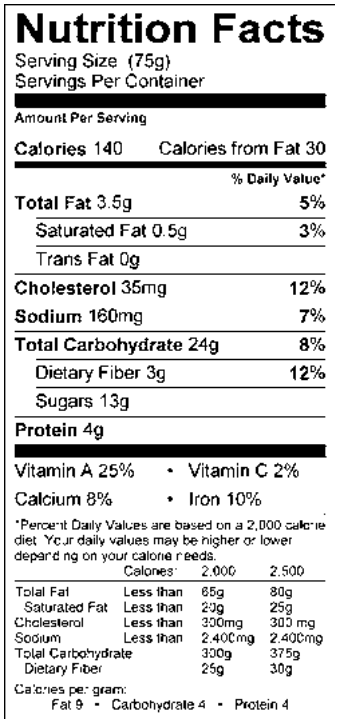
Volume 60

Makes 12, 2.7 oz. (75 g) bars

Ingredients	Measurements	Weight
Whole wheat flour	¾ cup	____oz. (____ g)
All-purpose flour	¼ cup	____oz. (____ g)
Brown sugar, packed,	¼ cup	____oz. (____ g)
Ground cinnamon	1½ tsp.	____oz. (____ g)
Baking powder	1 tsp.	____oz. (____ g)
Baking soda	½ tsp.	____oz. (____ g)
Salt	¼ tsp.	____oz. (____ g)
Whole wheat flakes, crushed	1 cup	____oz. (____ g)
Milk, 1%	1 cup	____oz. (____ g)
Eggs, large	2	____oz. (____ g)
Apple, small, cored & grated	1	____oz. (____ g)
Banana, medium, ripe, mashed	1	____oz. (____ g)
Carrot, medium, grated	1	____oz. (____ g)
Raisins/dried fruit, conditioned	½ cup	____oz. (____ g)
Nuts, chopped, or mini chocolate chips	⅓ cup	____oz. (____ g)

Directions:

1. Preheat oven to 375° F. Lightly grease an 8" x 8" square baking pan.
2. Condition raisins or dried fruit: Cover raisins/dried fruit with water. Drain.
3. Measure, then crush whole wheat flakes; grate apple and carrot; mash banana; chop and measure nuts or mini chocolate chips.
4. In a medium bowl, combine the flours, sugar, cinnamon, baking powder, baking soda, and salt with a wire whisk to blend well.
5. In a small bowl, combine thoroughly milk, eggs, carrot, banana, and raisins. Add chopped nuts or mini chocolate chips as desired.
6. Combine moist ingredients with dry mix. Bake at 375° F for 25-30 minutes, until golden.
7. Cool bars on wire cooling rack; cut into 12 bars. Determine the average net weight of the 12 bars.



Nutrition Facts

Serving Size (75g)
Servings Per Container

Amount Per Serving

Calories 140 Calories from Fat 30

	% Daily Value*
Total Fat 3.5g	5%
Saturated Fat 0.5g	3%
Trans Fat 0g	
Cholesterol 35mg	12%
Sodium 160mg	7%
Total Carbohydrate 24g	8%
Dietary Fiber 3g	12%
Sugars 13g	
Protein 4g	

Vitamin A 25% • Vitamin C 2%
Calcium 8% • Iron 10%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Calories:	2,000	2,500
Total Fat	Less than 65g	80g
Saturated Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300 mg
Sodium	Less than 2,400mg	2,400mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Source: Home Baking Association, A Baker's Dozen Labs, Lab 2, www.homebaking.org
Recipe used with permission from The Sugar Association, www.sugar.org

FCS handout

BAKING GLOSSARY

Volume 60

All-Purpose Flour: Wheat flour milled from hard wheat or a blend of soft and hard wheat. Used in homes for some yeast and quick breads, cakes, cookies, pastries, and noodles. All-purpose flour may be whole wheat, bleached or unbleached, and enriched with four vitamins (niacin, riboflavin, folic acid, and thiamin) and iron.

Bran: The outer layers of a kernel of grain that lie just below the hull. Whole grain flour is about 14.5% bran. Bran adds dietary fiber, multiple nutrients, and antioxidants.

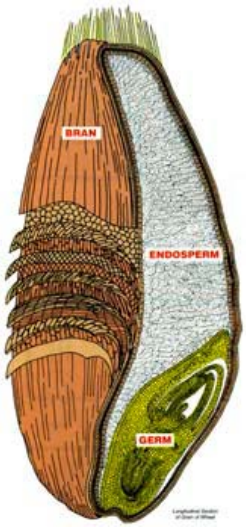
Degerminated: To remove the germ portion of a grain kernel, leaving bran and/or endosperm.

Endosperm: The starch granules in grain embedded in gluten-forming proteins from which flour or meal is produced. 80-85% of a wheat kernel is endosperm. (See kernel of wheat illustration at right.)

Flour: Flour is a major ingredient in most baked goods. Although wheat flours are the most common and often essential flour to a product's quality, flour may be produced from many kinds of grains, potatoes, legumes, beans, and seeds. Example: Flour may be made from amaranth, brown or white rice, buckwheat, corn, oats, spelt, teff, quinoa, rye, sorghum, soybeans, and more. View grain milling at www.namamillers.org.

Food Label: The label on food products with specific information required by the Food and Drug Administration such as Nutrition Facts, an ingredient list, the manufacturer, net weight, and dates. For more about Food Labeling go to www.fda.gov.

Granola: Cereal mixture of toasted rolled oats, barley, or other grains, plus dried fruits, seeds, nuts, and sweeteners.



Kernel of Wheat
www.wheatfoods.org

Gluten: A protein found in wheat and other cereal flours that form the structure of the bread dough. It holds the carbon dioxide (CO_2) produced by the yeast and expands during fermentation. Gluten is developed when flour is combined with water and liquids, mixed, and kneaded. It provides the elasticity and extensibility (stretch) in bread dough. Glutenin and gliadin form gluten.

Gluten-Free: Grains, meal, mixes, or flours that do not contain gluten or the components of gluten, the peptides glutenin and gliadin. Some gluten-free grains or flours include amaranth, rice, corn, milo, sorghum, soy, and potato. For a complete list visit the Celiac Sprue Association's website at www.csaceliacs.org. For additional gluten-free baking resources and ingredients go to www.argostarch.com, www.bettycrocker.com, www.bobsredmill.com, www.foodallergy.org/recipes, www.hodgsonmill.com, www.homebaking.org, www.kingarthurflour.com, www.landolakes.com, www.rabbitcreekgourmet.com, www.redstaryeast.com, www.wheatfoods.org.

Ingredient List: Ingredients making up a food and appearing on a food label in order, most to least.

Net Weight: The weight of the contents in a package, excluding the packaging weight; the edible portion's weight.

Preheat: Heating an empty oven to the recommended temperature before placing the product to be baked in it.

Serving: A specific amount of food adequate for nutrition management and health. Serving sizes vary and guidelines are offered on recipes or the Nutrition Facts Label.

Whole Grain: Using rolled or milled whole kernels of any grain (such as barley, corn, oats, wheat, rice, rye, sorghum, etc.) in a food. A food must be 51% or more whole grain to carry a whole grain label and may contain 8 g (½ serving), 16 g (1 serving) or more whole grain. Currently a minimum of 3 servings or 48 g whole grain is recommended. More resources at: www.bellinstitute.com, www.wheatfoods.org, and www.wholegrainscouncil.org

Whole Wheat Flour: Flour produced from the whole kernel of wheat—bran, germ and endosperm. Whole wheat flour is made from six classes of soft or hard wheat that may be red or white wheat varieties. Whole wheat flour may be coarsely to very finely milled. Whole wheat flour may also be labeled stone ground or graham flour.

Source: Home Baking Association Glossary, www.homebaking.org

Variable flour/meal used in lab test: _____

	Very Acceptable	Just OK	Not Acceptable
Top and Bottom Crust	Evenly golden Not burned or pale	Edges browned	Very pale appearance Greasy or doughy Brown on only top OR bottom
Volume	Doubled in height	Raised somewhat	No change in volume/flat
Interior Crumb	Moist, tender Not too dry	Moist and doughy Oily or greasy to eat	Dense, wet crumbly, or too dry Not baked completely
Flavor	Rich, a little sweet Wheaty, pleasant	Pleasant flavor	Too much oil or fat flavor Coats mouth; unpleasant
Keeping Quality After 1 Day	Still flavorful Good aroma/flavor	Edible But not best	Crumbly or off flavor Fat flavor; dry or tough

A MATTER OF TASTE Lab Evaluation Form

Product tasted: _____ Lab group: _____ Date: _____

I think the food product tastes:

_____ very good _____ good _____ OK _____ improvements needed

The food tastes: _____ just right _____ sweet _____ bitter _____ salty _____ sour ____ not what I expected

The color is: _____ great _____ too pale _____ too dark _____ not right for the product

The aroma (smell) is: _____ inviting _____ too strong _____ too weak _____ not good

The food looks: _____ yummy _____ OK _____ improvement needed

I would enjoy eating this food again: _____ yes _____ no _____ maybe

Comments: _____

FCS worksheet

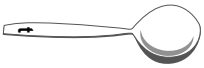
MEASURE UP! WORKSHEET

Volume 60

Name _____ **Date** _____ **Class** _____

Baking requires the most accurate measurements possible so the product turns out the same each time. Scales are most accurate. It is always best to use the fewest number of measuring steps or units possible for the most accuracy. EXAMPLE: It is more accurate to measure ¾ cup flour with ½ cup + ¼ cup (I+K) than it is to use ¼ + ¼ + ¼ (K+K+K). Also, it's best to measure liquids with a liquid cup unless the recipe calls for less than 4 tablespoons (¼ cup).

A. tablespoon



B. teaspoon

C. ½ teaspoon

D. ¼ teaspoon

E. electronic scale

F. liquid measuring cup

G. hand

H. 1 cup

I. ½ cup

J. ⅓ cup

K. ¼ cup

L. ⅛ cup

Directions:
For each ingredient listed, write in the blank the combination of letters you would use for the BEST way to measure that ingredient. In some cases, two answers may work. List all the best options. Use the Measurement Guide for equivalents and abbreviation help.

1. _____ 1 cup sugar
2. _____ 1 large egg
3. _____ 1½ tablespoons oil
4. _____ 4 tablespoons oil
5. _____ 2¼ teaspoons dry yeast
6. _____ ⅔ cup cornmeal
7. _____ 2 tablespoons corn starch
8. _____ dash nutmeg
9. _____ 4 tablespoons corn syrup
10. _____ 1 lb. powdered sugar
11. _____ 1 medium zucchini
12. _____ ½ cup moist raisins
13. _____ 3 tablespoons flax meal
14. _____ 3 teaspoons baking powder
15. _____ ½ cup butter/4 oz.
16. _____ 1½ cups (6 oz.) grated cheese
17. _____ 1 pkg. (7 g) active dry yeast
18. _____ 3 medium apples (1 lb.)
19. _____ 1, 11-oz. spice muffin mix
20. _____ ¾ teaspoon ground cinnamon
21. _____ ½ cup baking cocoa
22. _____ 8 oz. cheddar cheese
23. _____ 1, 15-oz. can pumpkin
24. _____ 1, 12-oz. pkg. chocolate chip
25. _____ ⅓ cup brown sugar
26. _____ 6 oz. water
27. _____ ¾ cup baking mix
28. _____ 2 tablespoons butter
29. _____ 2 egg whites/2 oz.
30. _____ 115 g pastry flour
31. _____ ⅓ cup oil
32. _____ a pinch of salt
33. _____ ¾ cup milk
34. _____ 1 cup applesauce
35. _____ 4 cups (312 g) rolled oats
36. _____ ⅓ tablespoon baking soda

Source: A Baker's Dozen Labs, www.homebaking.org

MEASURE UP! WORKSHEET ANSWER KEY

Volume 60

Name _____ **Date** _____ **Class** _____

Baking requires the most accurate measurements possible so the product turns out the same each time. Scales are most accurate. It is always best to use the fewest number of measuring steps or units possible for the most accuracy. EXAMPLE: It is more accurate to measure ¾ cup flour with ½ cup + ¼ cup (I+K) than it is to use ¼ + ¼ + ¼ (K+K+K). Also, it's best to measure liquids with a liquid cup unless the recipe calls for less than 4 tablespoons (¼ cup).

A. tablespoon

B. teaspoon

C. ½ teaspoon

D. ¼ teaspoon

E. electronic scale

F. liquid measuring cup

G. hand

H. 1 cup

I. ½ cup

J. ⅓ cup

K. ¼ cup

L. ⅛ cup

Directions:
For each ingredient listed, write in the blank the combination of letters you would use for the BEST way to measure that ingredient. In some cases, two answers may work. List all the best options. Use the Measurement Guide for equivalents and abbreviation help.

1.	H	1 cup sugar	13.	L+A	3 tablespoons flax meal	25.	J	⅓ cup brown sugar
2.	G	1 large egg	14.	A	3 teaspoons baking powder	26.	F	6 oz. water
3.	A+B+C	1½ tablespoons oil	15.	G (1 stick)	½ cup butter/4 oz.	27.	I+K	¾ cup baking mix
4.	F (¼ cup)	4 tablespoons oil	16.	E or H+I	1½ cups (6 oz.) grated cheese	28.	G	2 tablespoons butter
5.	B+B+D or G	2¼ teaspoons dry yeast	17.	G or E	1 pkg. (7 g) active dry yeast	29.	G or E	2 egg whites/2 oz.
6.	J+J	⅔ cup cornmeal	18.	G or E	3 medium apples (1 lb.)	30.	E	115 g pastry flour
7.	L	2 tablespoons corn starch	19.	G	1, 11-oz. spice muffin mix	31.	F	⅓ cup oil
8.	G	dash nutmeg	20.	C+D	¾ teaspoon ground cinnamon	32.	G	a pinch of salt
9.	F (¼ cup)	4 tablespoons corn syrup	21.	I	½ cup baking cocoa	33.	F	¾ cup milk
10.	E	1 lb. powdered sugar	22.	E	8 oz. cheddar cheese	34.	F or H	1 cup applesauce
11.	G	1 medium zucchini	23.	G or E	1, 15-oz. can pumpkin	35.	E	4 cups (312 g) rolled oats
12.	I	½ cup moist raisins	24.	G	1, 12-oz. pkg. chocolate chip	36.	B	⅓ tablespoon baking soda

Source: A Baker's Dozen Labs, www.homebaking.org