INTEGRATING MATH IN THE REAL WORLD

THE MATH OF FOOD

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Contents

Introduction

In 1989, the National Council of Teachers of Mathematics (NCTM) developed the *Curriculum and Evaluation Standards for School Mathematics* to help teachers take their mathematics classes into the twenty-first century. The document calls for a curriculum that will help students solve problems and make connections between mathematics and other curricular areas, such as science, social studies, language arts, consumer education, and art. For math to be relevant, students must see how it relates to their lives outside of the mathematics classroom.

The lessons, activities, and projects in *Integrating Math in the Real World* have been designed to help students see interrelationships between subjects. Many of the lessons emphasize critical-thinking skills. Many of the activities are open-ended and encourage students to:

- work collaboratively to develop problem-solving strategies
- make connections between their life experiences and the math classroom
- develop self-confidence in their abilities to solve math problems

The Math of Food, one of the books in the *Integrating Math in the Real World* series, provides a comprehensive examination of many different aspects of nutrition, including proper diet, exercise, and information from food labels. *The Math of Food* also examines international issues, such as the problems of world hunger. The material in this book is designed to help students develop good nutritional habits and a regular exercise routine while they are still young enough to develop lifelong habits. The lessons and activities will get students actively involved in significant math projects while providing them with important links to nutritional information.

Each of the lessons is introduced with a Teacher Page. These Teacher Pages include the following sections:

Areas of Study

This section lists the mathematics skills of the lesson. Many of the activities are multifaceted and make use of a variety of math skills.

Concepts

This section contains a concise list of tasks for which the student will be accountable. If a rubric or grading matrix is being used, this list will be invaluable in developing specific criteria for assessment.

Materials

This section contains a list of materials that each student will need for the lesson unless otherwise specified. Collecting these items in advance will assure a smoother flow to the lesson.

Procedures

This section gives a brief description of the lesson with suggestions for the teacher. It is not meant to be a step-by-step recipe but merely a guide to help organize the lesson.

Assessment

Suggestions made are for effective, nontraditional ways to evaluate student achievement. It is suggested that student products be examined and that students be observed during the activity and questioned about their progress. Each lesson has one or more recommendations for journal questions that require a more in-depth understanding of the lesson concepts.

Extensions

Often some students need a more advanced or extended lesson. The suggestions discussed in this section can be used with a select group of students or with the entire class (if the lesson has been motivating and successful).

The lessons in *Integrating Math in the Real World: The Math of Food* have been designed to be teacher- and student-friendly. In many cases, these lessons can be substituted for more traditional lessons found in mathematics texts.

Observation of Students

When students are active and working together, it is essential that the teacher walk around the room to become aware of the progress of the student groups and any problems that might arise. During these times it is possible to assess student understanding in a more formal way. While not every student can be observed each time, it is possible to perform a formal-type assessment at least twice during each grading period for each student. These observations can be shared with both parents and students during parent-teacher conferences.

A form, such as the one below, can be used to make the observations more consistent and simplify the process.

Name of Student _____

Criteria	4	3	2	1
How actively are students participating in group project?				
How well does student appear to understand concept of lesson?				
Is student actively listening to other members of group?				
Is student assuming positive leadership or problem-solving role?				
Comments:				

Using a Rubric for Performance Assessment

Authentic assessment is based on the performance of the student and should be closely tied to the objectives of the lesson or activity. A rubric can be used to quantify the quality of the work. If the rubric is explained before the activity or project, the students become aware of the requirements of the lesson. A grading matrix should be developed in which each of the objectives is examined using a five-point scale.

5 Student shows mastery and extends the concepts of the activity in new and unique ways

4 Student shows mastery of the concepts of the lesson

3 Student shows understanding, but there is a flaw in the presentation or reasoning

2 Student shows some understanding and has attempted completion, but there are some serious flaws in the presentation or reasoning

1 Student makes an attempt but exhibits no understanding

0 Student makes no attempt

Teacher Page

What Do I Eat?

Areas of Study

Data collection, reading tables and charts, computation, estimation, fractions, problem solving

Concepts

Students will:

- collect personal nutrition data
- use charts and tables to find information
- calculate the total calories, grams of fat, etc., in their diet for one day
- present an accurate record of one day's diet

Materials

- What Do I Eat? handouts
- additional resource books containing nutritional information
- calculator
- overhead transparencies of the What Do I Eat? handout for the teacher

Procedures

Read through the What Do I Eat? handouts with students. Discuss the problems involved with keeping accurate records over a long period of time and have students make suggestions as to how they might be able to record their intake of food. Stress the importance of accuracy.

While a limited number of foods are supplied on the Nutrition Counter sheets, it will be necessary to have additional resource materials available for students to use. Two recommendations are *The Supermarket Nutrition Counter,* by Natow and Heslin, and the *Encyclopedia of Food Values,* by Netzer. Students can also be encouraged to use the information on the labels of the foods they eat.

This activity serves as an introduction to lessons that follow in which students are asked to design a healthy menu for themselves.

Assessment

1. Student products:
   - completion of accurate data collection tables
2. Observation of students
3. Journal question:
   - Explain the strategies you used to collect your data. Do you believe the food data you collected gives an accurate picture of your normal diet? Why or why not?

Extension

- Students can collect data on their diets for three days and then average the results. While this is more difficult to do, it will probably reflect a more accurate picture of their diets.

Name _____ Date _____

What Do I Eat?

The teenage years are a time of fast growth. What you eat, or how you fuel the engine of your body, can affect how healthy and strong you are. The statement "You are what you eat" should be "What you become depends on what you eat." This activity will help you develop a healthy diet. But before you can figure out what you should be doing, you need to gather some data on what you are doing now (diet-wise, that is).

You must collect some data for this activity. Be sure to keep track of everything you eat for the entire day. You must try to estimate the quantities of food you eat as well. For example, one piece of bread has about 70 calories, but if you have a sandwich, you have to count two pieces of bread (140 calories) and what is between the pieces of bread, also.

The table on the next page will help you organize your data. Be sure to:

1. Write down everything you eat for an entire day.

2. Eat what you would normally eat. Do not change because you are writing down what you are doing.

3. Estimate quantities as best you can.

4. Use the information on the Nutrition Counter or in reference books in your classroom to help find calories, protein, fat, calcium, and carbohydrates in the foods you eat.

After you collect this data, you will learn more about nutritional values and your personal eating habits.

Name _____ Date _____

What Do I Eat?

Foods	Calories	Protein	Fat	Carbohydrates	Calcium
Breakfast					
Lunch					
Snacks					
Dinner					

Name _____ Date _____

What Do I Eat?

The Nutrition Counter

The following table shows a variety of foods, the size of a small portion, and the calories, protein, fat, carbohydrates, and calcium contained in that size portion. You can use this information to help you with many of the activities in this unit. These data are approximate as they may vary with brands.

Food	Portion Size	Calories	Protein g	Fat g	Carbohydrates g	Calcium mg
Apple	1	80	0.3	-	21	10
Bagel	1	195	9	1	38	29
Banana	1	110	1.2	-	-	7
Baked beans	$\frac{1}{2}$ cup	160	6.1	2	28	64
Beef patty	4 oz.	312	27.5	22	0	13
Bologna	1 slice	90	3.7	8	1	3
Bread (whole wheat)	1	90	3	2	18	20
Bread (Wonder® white)	1	70	3	1	13	32
Breakfast bars	1	150	2	5	25	20
Broccoli (cooked)	$\frac{1}{2}$ cup	22	3	-	4	36
Brownie	1	150	2	7	25	13
Butter	1 pat	36	-	4	-	3
Cake (pound)	1 slice	130	2	7	14	8
Cake (Pop-Tarts®)	1	210	2	6	37	-
Cake (Little Debbie's®)	1 pkg. (2.6 oz)	300	2	15	29	-
Cake (Twinkies®)	1	140	2	4	25	-
Cake (cheesecake)	$\frac{1}{12}$ cake	456	3	9	32	52
Cantaloupe	$\frac{1}{2}$	94	2.3	1	22	28
Carrots	1	30	0.7	-	7	19
Cauliflower (cooked)	$\frac{1}{2}$ cup	14	1.5	-	3	14
Cereal (hot instant)	1 pkg.	100	4	2	25	170
Cereal (Alpha-Bits®)	1 cup	110	2	1	25	10

(continued)

Name _____ Date _____

What Do I Eat?

The Nutrition Counter *(continued)*

Food	Portion Size	Calories	Protein g	Fat g	Carbohydrates g	Calcium mg
Cereal (Raisin Bran®)	3/4 cup	120	3	1	32	16
Cereal (cornflakes)	1 cup	100	2	0	24	3
Cereal (Special K®)	1 cup	100	6	0	20	10
Cheese (American)	.75 oz.	70	6.4	5	-	174
Chicken	3 oz.	135	16	12	-	17
Chocolate chip cookie	1	78	1	5	9	13
Cream cheese	1 oz.	100	2	10	1	23
Eggs (scrambled)	2	200	6.8	15	2	44
Fish sticks	4	200	7	10	18	6
Hot dog (beef)	1	150	6	14	1	24
Ice cream (chocolate)	1/2 cup	140	2	7	19	88
Ice cream (vanilla)	1/2 cup	140	2	7	16	88
Margarine	1 oz.	100	-	11	-	-
Mayonnaise	1 T	100	-	11	-	-
Milk (2%)	1 cup	120	8	5	12	297
Milk (1%)	1 cup	100	8	3	-	300
Milk (whole)	1 cup	150	8	8	11	290
Milk (chocolate)	1 cup	190	8	5	29	-
Orange	1	65	1.2	-	16	56
Pasta	2 oz.	210	4.3	1	-	10
Peanut butter sandwich	1	340	9	19	33	10
Pickle	1/4	4	-	0	1	6
Pizza	1/5	320	13	16	29	200
Popcorn	3 cups	100	2	6	11	1
French fries	1 large	355	4.6	19	44	18
Potato chips	17 chips	150	2	9	15	7
Pudding (chocolate snack pack)	1	170	3	6	28	75
Raisins	1/2 cup	260	3	0	63	36