

**Math and Cooking – Marlene Bumgarner
California Association for the Education of Young Children
March 28, 2009**



Preschool Learning Outcomes for Cooking Activities¹

The mathematics foundations cover the following five strands:

***Number Sense*, which includes understanding of counting, number relationships, and operations**

Examples: How many berries are on this plate? Let's put SIX berries in each cup. What happens if we put FOUR more berries in each cup? Is SIX more than FOUR or less than FOUR?

***Algebra and Functions (Classification and Patterning)*, which focuses on sorting and classifying objects and recognizing and understanding simple, repeating patterns**

Examples: Let's put four cookies in the top row, and five in the second row. Put the oatmeal cookies on the blue plate, and the chocolate chip cookies on the green plate. If I put two spoonfuls of yoghurt in the cup, then a spoonful of berries and a spoonful of granola, then two spoonfuls of yoghurt, what comes next?

***Measurement*, which includes comparison and ordering**

Examples: Is the apple bigger than the peach? How can we tell? Put the carrots in order from smallest to biggest.

***Geometry*, which focuses on properties of objects (shape, size, position) and the relation of objects in space**

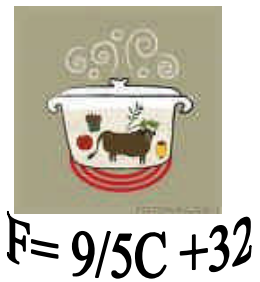
*Examples: Which carrot is **longer**? Which one is **fatter**? Can you put the slices of radish on **top** of the lettuce? What **shape** is the apple? Let's cut the cheese into **cubes**. Be sure you have the place mat **under** the plates.*

***Mathematical Reasoning*, which addresses how young children use mathematical thinking to solve everyday problems**

This bowl is too small to hold all the bananas. How shall we put them on the table? We need to share the pie with the other children. How many pieces do we need? We only have four cookies left. How can we be sure we give the same amount of cookie to each of the eight people in the group?

¹ Adapted from Preschool Learning Foundations, Volume 1, Mathematics Domain, copyright California Department of Education, Child Development Division, January 2008.

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School-Age Learning Outcomes for Cooking Activities²

- 1. Problem Solving.** Children will use problem solving techniques to investigate situations, formulate problems based on observation, generalize solutions, and acquire confidence by using math meaningfully.
- 2. Math as Communication.** Children can model situations, reflect on the mathematics and then discuss ideas meaningfully.
- 3. Math as Reasoning.** Younger children can apply deductive and inductive reasoning to a problem. Older children can make and evaluate math conjectures and arguments.
- 4. Math Connections.** Children will explore problems and describe results in graphical models.
- 5. Estimation.** Children can make educated guesses about quantity.
- 6. Number and Number Relationships.** Children can represent numerical relationships in two dimensional graphs.
- 7. Number Systems and Number Theory.** Children can use fractions of whole numbers and decimal representations of fractions. Older children can order decimals.
- 8. Computation.** Younger children can use arithmetic functions. Older children can use algebraic and geometric functions and solve proportion problems.
- 9. Patterns and Functions.** Children can describe, extend, analyze, and create a wide variety of patterns, tables, graphs, and rules.
- 10. Algebra.** Middle school children can turn correlation graphs into algebraic functions. Younger children can categorize objects by color, shape, function and write simple algebraic equations to describe how many of each they have.
- 11. Statistics & Probability.** Older children can systematically collect, organize, and describe data and use it to construct charts and graphs then make comparisons. Younger children can tally the occurrences of an event and make a simple bar graph.
- 12. Geometry and Spatial Sense.** Children can comprehend shapes and relationships in space.
- 13. Measurement.** Children can use different systems of measurement in practical applications.

² Adapted from the National Council of Teachers of Mathematics' (NCTM) Thirteen Standards

Recipe 1. Tacos. For each taco:

1 Taco shell – spoon into shell each of the following:
2 T lean ground beef
2 T chopped tomatoes
2 T lettuce torn into small pieces
2 T grated cheese

Recipe 2. Quesadillas – for each quesadilla:

2 whole wheat tortillas
2 T grated cheese
2 T finely chopped chicken (purchased in packages)
2 T finely chopped tomatoes
1 T thinly sliced lettuce

Grill and cut into wedges.

Recipe 3. Berry Parfaits – For each parfait:

1 6-ounce plastic tumbler. Layer, starting with yoghurt and ending with fruit:

Vanilla low-fat yoghurt
Low fat granola
Fresh or frozen berries (rasberries, strawberries, boysenberries, blueberries)

Older Children

Recipe 4 -- Mouthwatering Cookies

1 cup flour
½ tsp baking soda
½ tsp salt
½ cup butter
½ cup brown sugar
1/3 cup white sugar
1 egg
½ tsp vanilla
1 cup chocolate chips

Makes 3 dozen cookies

Questions for older children to ponder while making cookies:

How would you alter this recipe if you need 9 dozen cookies?
How about 2 dozen? What kinds of mathematical challenges does that offer? (hint: proportions are important)

What calculations would you need to make if you only had metric measuring cups and spoons to work with?

This recipe should be baked at 375°F for 11-13 minutes.
What temperature would you set the oven to if you are baking it in London while on vacation – and the oven is marked in Celsius?

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Other mathematical concepts/questions to consider:

What is the correct proportion of baking powder, baking soda, and acid to use in quick breads, cakes, and cookies?

How much flour and how much oil to combine to make a roux (base for cream sauce)? How much roux will it take to thicken a given amount of liquid?

How much cornstarch will it take to thicken the same amount of gravy?

Your recipe, taken from the internet, tells you to bake your casserole at 220°. Your oven is calibrated in Fahrenheit with 50° increments.

You're visiting your aunt in Canada and plan to make her some cookies as a surprise. Your recipe calls for ½ cup of butter but the measuring equipment in her cupboard is labeled in mL (milliliters). How will you know which measurement to use?

If it takes turkey 24 hours per 5 pounds to thaw in the refrigerator, how long should you allow for an 8 pound turkey to thaw?

If we are instructed to cook the turkey for 20 minutes per pound, how long do we cook a 12 pound turkey?

The brownie recipe calls for a 9" square pan, but I only have an 8" x 10" and a 10" x 12" pan. Which one should I use?

Selected References Children's Books and Videos

Alice in Pastaland: A Math Adventure, by Alexandra Wright

Cooking With Kids: Exploring Chinese Food, Culture, and Language, by Ni Hao Productions,

Math in the Kitchen, by William Amato

Pigs in the Pantry: Fun with Math and Cooking, by Amy Axelrod

The Math Chef, Joan D'Amico & Karen Erich Drummond

Professional Literature:

Schreiber, D. & Bloom, A. (2008) Recipe for Success: Serving nutrition education through cooking programs. *The Afterschool Review, Journal of the National AfterSchool Association*. Fall 2007.

Crowley, R. (2008) The Consequences of Poor Nutrition and Obesity in Children. *Connections, Journal of the California Association for the Education of Young Children*, Volume 37, No 1.

Books by Marlene Bumgarner

The New Book of Whole Grains, 1979, rev 1997 St. Martin's Press

Organic Cooking for (not-so-organic) Mothers, 1982, Chesbro Press

Working With School-Age Children, 1999 (Revision in publication)