FOSS and Common Core Math — Grade 2

Contents

INTRODUCTION

The adoption of the Common Core State Standards for Mathematics calls for shifts in focus, coherence, and rigor. The teaching of the standards should be focused on the important content, coherent from one grade level to the next, and rigorous in requiring conceptual understanding, fluency, and application. Within this area of application, FOSS provides fertile ground for the use of mathematics.

The FOSS Program integrates mathematics with science in two ways throughout the grade 2 modules. In active investigations, students apply mathematics during data gathering and analysis. In addition, the Interdisciplinary Extensions at the end of each investigation usually include a math problem of the week. These problems enhance the science learning by providing hypothetical data for students to analyze or in some way relate to the context of the investigation. The notes explain for the teacher the problem and describe how students might approach its solution. The problems are prepared for distribution to students on duplication masters in the Teacher Masters chapter of *Teacher Resources*.

This chapter gives an overview of how FOSS addresses the Common Core State Standards for Mathematics through science. It also points out specific instances in which students exercise those skills during science instruction.

Mathematical Practices

Mathematical practices consist of eight processes and proficiencies that are important for all students.

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Within the context of science, students use some of these mathematical practices on a regular basis. According to *Next Generation Science Standards* (volume 2, appendix L, p. 138),

The three CCSSM practice standards most directly relevant to science are:

- MP.2. Reason abstractly and quantitatively.
- MP.4. Model with mathematics.
- MP.5. Use appropriate tools strategically.

When students reason abstractly and quantitatively and model with mathematics, they are using math in context. They work with symbols and their meanings and represent and solve word problems. Students choose and correctly use the available tools to collect data and solve problems. In the grade 2 modules, students engage with these three practices during the active investigation and by completing the problems at the end of each investigation. Here are some examples.

In solving Math problem B for Investigation 1 of the **Insects and Plants Module**, students make direct comparisons and use their ability to use and create a graph. In order to solve this, students reason quantitatively and use mathematics in the context of science. They use the data about larvae, pupae, and adult mealworms and model how the population changes overnight and create a second graph.

In the **Pebbles, Sand, and Silt Module**, students are presented with data about the number of rocks various students have found during a rock hunt. Students model using addition and subtration strategies to determine what happens under different situations of combining and comparing rocks. The story problems provide opportunities for students to ulitilze tools to determine the solutions to one- and two-step problems.

In the **Solids and Liquids Module**, students are asked to reason abstractly to determine the receipe of a soft drink. This requires students to manipulate the receipe either abstractly by using number sentences such as 4 + 4 + 4 + 4 or using concrete counters to respresent the spoons, ounces or drops of the different ingredients.

Mathematical Content

The mathematical content in second grade is organized around four concepts.

- Operations and algebraic thinking
- Number and operations in base ten
- Measurement and data
- Geometry

The following pages have a table that identifies the opportunities to engage students in developing these mathematical concepts as well as those learned in grade 1. It lists some of the math content for first and second grades and points out relevant opportunities in the three FOSS modules to address the math standards for grade 2.

OPERATIONS AND ALGEBRAIC THINKING

Grade 2

Standard	Solids and Liquids Module
Represent and solve problems involving addition and subtraction.	
1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.	Investigation 4, Math problem B
Add and subtract within 20.	
2. Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.	
Work with equal groups of objects to gain foundations for multiplication.	
4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.	

Common Core State Standards for Mathematics (National Governors Association Center for Best Practices and Council of Chief State School Officers, 2010).

Insects and Plants Module	Pebbles, Sand, and Silt Module
Investigation 2, Math problem B	Investigation 1, Math problems A and B Investigation 4, Math problem A
Investigation 1, Math problem A	Investigation 3, Math problem A
	Investigation 3, Math problem B

NUMBER AND OPERATIONS IN BASE TEN FOR

Grade 2

Standard	Solids and Liquids Module
Understand place value.	
2. Count within 1000; skip-count by 5s, 10s, and 100s.	
Use place value understanding and properties of operations to add and subtract.	
5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.	

Insects and Plants Module	Pebbles, Sand, and Silt Module
Investigation 3, Math problem A	
Investigation 1, Math problem A Investigation 3, Math problem A	

MEASUREMENT AND DATA FOR GRADES 1–2

	Standard	Solids and Liquids Module
Grade 1	**Measure lengths indirectly and by iterating length units.**	
	1. Order three objects by length; compare the lengths of two objects indirectly by using a third object.	Investigation 3, Part 4, Step 7, Answer the focus question
Grade 2	**Measure and estimate lengths in standard units.**	
	1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.	Investigation 1, Part 3, Step, Test and measure towers
	Work with time and money.	
	7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.	Investigation 4, Math problem A
	8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. *Example: If you have 2 dimes and 3 pennies, how many cents do you have?*	Investigation 2, Math problem
	Represent and interpret data.	
	9. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.	
	10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.	Investigation 3, Math problem A

Insects and Plants Module	Pebbles, Sand, and Silt Module
Investigation 2, Part 2, Step 8, Record in science notebook Investigation 2, Part 2, Step 13, Answer the focus question Investigation 2, Part 3, Step 8, Chart plant growth	
Investigation 4, Math problems A and B	Investigation 2, Math problems A and B
Investigation 2, Part 3, Step 8, Chart plant growth	
Investigation 1, Math problem B Investigation 3, Math problem B Investigation 3, Math extension. Graph variation in your class	Investigation 1, Math extension. Graph rock sorts Investigation 2, Part 1, Step 20, Create a graph

GEOMETRY FOR GRADE 2

Grade 2

Standard	Solids and Liquids Module
Reason with shapes and their attributes.	
1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.	Investigation 1, Math problem A

Insects and Plants Module	Pebbles, Sand, and Silt Module
	Investigation 1, Part 5, Step 3, Introduce sorting activities