FOSS and Common Core Math — Grade 1

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 1 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 1 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 4 of the **Air and Weather Module**, students make direct comparisons and use their ability to use and create a graph. In order to solve this problem, students reason quantitatively and use mathematics in the context of science. They use the data about temperature and model how the temerperature changes for two different weeks. They use this graph to determine which week was during the summer and which one was during the winter.

In the Math Problem A for Investigation 2 of the **Plants and Animals Module**, students are presented with data about the number of nodes on a potato as well as how many new potatoes grew from each node. Students model using addition strategies to determine the number of potatoes that grew from the original. The story problems provide opportunities for students to ulitilze tools to determine the solutions to one- and two-step problems.

In the **Sound and Light Module**, students are asked to reason abstractly to determine if a mirror can reflect an image to make a shape. This requires students to manipulate the tool, observe the resulting reflect, determine whether a shape is made, and recall the appropriate name of the geometric shape.

Mathematical Content

The mathematical content in first grade is organized around three concepts.

- Operations and algebraic thinking
- 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 K. It lists the math content for kindergarten and first grades and points out relevant opportunities in the three FOSS modules for grade 1.

OPERATIONS AND ALGEBRAIC THINKING FOR GRADES K–1

	Standard	Sound and Light Module
Grade K	**Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.**	
	5. Fluently add and subtract within 5.	
Grade 1	**Represent and solve problems involving addition and subtraction.**	
	1. Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.	Investigation 1, Math Problem A Investigation 1, Math Problem B
	2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.	
	8. Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = ❑ – 3, 6 + 6 = ❑.*	

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

Plants and Animals Module	Air and Weather Module
	Investigation 1, Math Problem A
Investigation 2, Math Problem A Investigation 2, Math Problem B Investigation 3, Math Problem B Investigation 4, Math Problem B	
	Investigation 1, Math Problem B Investigation 3, Math Problem B
Investigation 3, Math Problem A Investigation 4, Math Problem A	

MEASUREMENT AND DATA FOR GRADES K–1

	Standard	Sound and Light Module
Grade K	**Describe and compare measurable attributes.**	
Grade K	2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter*.	
Grade 1	**Measure lengths indirectly and by iterating length units.**	
Grade 1	1. Order three objects by length; compare the lengths of two objects indirectly by using a third object.	Investigation 3, Math Problem
Grade 1	2. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*	Investigation 3, Math Problem
Grade 1	**Tell and write time.**	
Grade 1	3. Tell and write time in hours and half-hours using analog and digital clocks.	
Grade 1	4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.	

Plants and Animals Module	Air and Weather Module
Investigation 2, Part 2, Step 18, Discuss patterns Investigation 4, Part 1, Step 12, Discuss bulbs	
Investigation 1, Part 3, Step 13, Record growth and label straws Investigation 4, Part 3, Step 14, Observe adopted plants over time	
	Investigation 2, Part 2, Step 19, Discuss sunrise and sunset
Investigation 1, Part 3, Step 15, Make bar graph after 1 week	Investigation 1, Math Problem A Investigation 3, Math Problem A Investigation 4, Part 1 , Steps 4 and 7, Weather graphs Investigation 4, Part 2 , Step 5, Introduce bar graph Investigation 4, Part 3 , Step 4, Record weather graph Investigation 4, Math Problems A and B

GEOMETRY FOR GRADES K–1

Grade 1

Standard	Sound and Light Module
Reason with shapes and their attributes.	
1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.	Investigation 4, Math Problem

Plants and Animals Module	Air and Weather Module