FOSS and Common Core Math — Grade K

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 kindergarten 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 kindergarten modules, students engage with these three practices during the active investigation and by completing the math extensions at the end of each investigation. Here are some examples.

In the **Animals Two by Two Module**, students count and answer questions about the number of different fish in a tank. In order to solve this problem, students reason quantitatively and use mathematics in the context of science. They count the fish and model using counters to compare the quanitities of the fish.

In the **Trees and Weather Module**, students make a list of items made of wood found in their home. The teacher guides students to sort these items into categories such as furniture and count them. The story problems provide opportunities for students to ulitilze tools to answer questions about the quanity of items.

In the **Materials and Motion Module**, students are asked to reason abstractly to determine the cost of caps. This requires students to count the number of caps and then add the cost of each cap. The teacher can modify the cost of the caps to challenge students.

Mathematical Content

The mathematical content in kindergarten is organized around five concepts.

- Counting and Cardinality
- 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 in grade K.

COUNTING AND CARDINALITY FOR GRADE K

Standard	Materials and Motion Module
Count to tell the number of objects.	
4. Understand the relationship between numbers and quantities; connect counting to cardinality. a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object. b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted. c. Understand that each successive number name refers to a quantity that is one larger.	Inv 1, Part 3, Step 8, Ask questions to guide discussion Inv 1, Part 3 Step 18, Discuss bar graphs Inv 2, Part 2, Step 10, Count number of folds
5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.	Inv 3, Part 4, Step 5, Ask questions about the graph Inv 3, Math Extension, Count seams, count pockets and make graphs

Grade K

Trees and Weather Module	Animals Two by Two Module
Inv 1 Part 1, Step 5, Go outdoors	Inv 1 Part 1, Step 4, Guide observations and discussions Inv 2, Part 2, Step 5, Observe shells
	Inv 1, Math Extension, Count the fish in the tanks

OPERATIONS AND ALGEBRAIC THINKING FOR GRADE K

Standard	Materials and Motion Module
Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.	
1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.	
2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.	Inv 3, Math Extension, Make colorful caps

Grade K

Trees and Weather Module	Animals Two by Two Module
	Inv 1, Math Extension, Add and subtract with fish Inv 2, Math Extension, Use shells for addition and subtraction
	Inv 1, Math Extension, Add and subtract with fish Inv 2, Math Extension, Use shells for addition and subtraction

MEASUREMENT AND DATA FOR GRADE K

Standard	Materials and Motion Module
Describe and compare measurable attributes.	
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.*	Inv 4, Math Extension, Math Problem A
Classify objects and count the number of objects in each category.	
3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.	Inv 1, Math Extension, List wooden items from home Inv 3, Part 4, Step 5, Ask questions about the graph Inv 3, Part 4, Step 7, Make other graphs

Grade K

Trees and Weather Module	Animals Two by Two Module
Inv 3, Math Extension, Hang up trunk circumference strings and Measure the circumference strings Inv 2, Part 1, Step 9, Find leaves that go together Inv 2, Part 3, Step 5, Distribute reference cards	Inv 1 Part 1, Step 4, Guide observations and discussions Inv 1 Part 4, Step 4, Guide observations and comparisons Inv 1 Part 5, Step 5, Go outdoors Inv 2, Part 2, Step 7, Seriate shells Inv 3, Part 3, Step 3, Compare worms Inv 3, Math Extension, Compare the lengths of night crawlers
Inv 1, Math Extension, Make a leaf-shape bar graph Inv 4, Part 1, Step 3, Sort tree items	Inv 1, Math Extension, Count the fish in the tanks

GEOMETRY FOR GRADE K

	Standard	Materials and Motion Module
Grade K	**Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).**	
	1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.	

Trees and Weather Module	Animals Two by Two Module
Inv 2, Part 2, Step 4, Introduce geometric shapes	