Topic A

Concepts of Volume

5.MD.3, 5.MD.4

Focus Standards:

5.MD.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
   a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.
   b. A solid figure which can be packed without gaps or overlaps using \(n\) unit cubes is said to have a volume of \(n\) cubic units.

5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

Instructional Days: 3

Coherence -Links from:

G2–M8 Time, Shapes, and Fractions as Equal Parts of Shapes
G3–M4 Multiplication and Area
G3–M5 Fractions as Numbers on the Number Line

-Links to:

G6–M5 Area, Surface Area, and Volume Problems

In Topic A, students extend their spatial structuring to three dimensions through an exploration of volume. They come to see volume as an attribute of solid figures and understand that cubic units are used to measure it (5.MD.3). Using unit cubes, both customary and metric, students build three-dimensional shapes, including right rectangular prisms, and count to find the volume (5.MD.4). By developing a systematic approach to counting the unit cubes, they make connections between area and volume.

Next, students pack rectangular prisms, folded from box templates, with centimeter cubes. This helps them visualize the layers of cubic units that compose volumes—an understanding that allows them to reasonably predict the number of cubes required to fill the containers and then test their predictions by packing the containers. Finally, students compose and decompose a rectangular prism from and into layers of unit cubes and reason that the number of unit cubes in a single layer corresponds to the number of unit squares on a face. They begin to conceptualize the layers themselves, oriented in any one of three directions, as iterated units.
## A Teaching Sequence Toward Mastery of the Concepts of Volume

**Objective 1:** Explore volume by building with and counting unit cubes.  
(Lesson 1)

**Objective 2:** Find the volume of a right rectangular prism by packing with cubic units and counting.  
(Lesson 2)

**Objective 3:** Compose and decompose right rectangular prisms using layers.  
(Lesson 3)