Intro to Volume

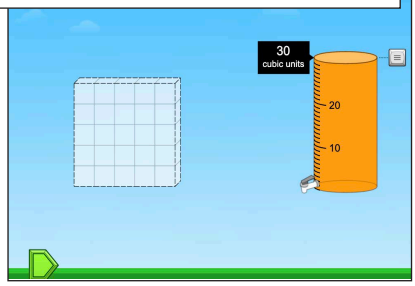
Grade 5 Volume 3 levels

Probing Questions
- What do the blocks on the left represent?
- What does the cylinder on the right represent?
- How many blocks would it take to build the shape on the left?
- What does the word "cubic" mean?"

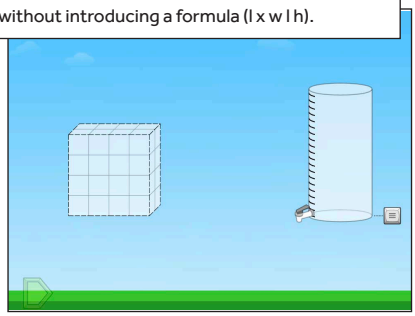
Supporting Struggling Students
Provide blocks so students can build the shapes they see on the screen. Focus students' attention on the blocks that are there but can't be seen in the drawings.

Something to Think About
Some of your students may struggle with visualizing the line drawing as a 3-dimensional figure. This ability is developmental and dependent on a student's experience. Providing blocks so they can build the shape and then count the blocks can help them develop spatial visualization skills.

Relate the word cubic to cube.



Let students explore these ideas visually without introducing a formula (l x w l h).



STMath

Helicopter Volume

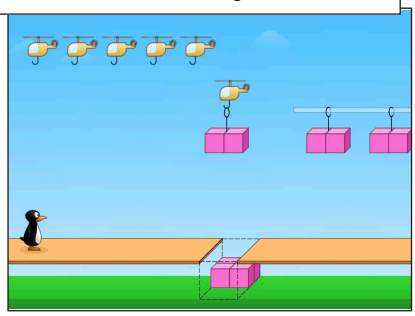
Grade 5 Volume 6 levels

Probing Questions
- What do you have to do to help JiJi cross?
- What do the helicopters do?

Uncover the Thinking
What strategies are your students using to figure out the solutions in the upper levels? Are they counting all the blocks, using numbers, or do they have another strategy? Having students share their strategies with others helps students think about the problems in different ways.

What Do the Standards Say?
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. CCSS.Math. Content.5.MD.3

Point out that the total number of blocks is what matters, not their arrangement.



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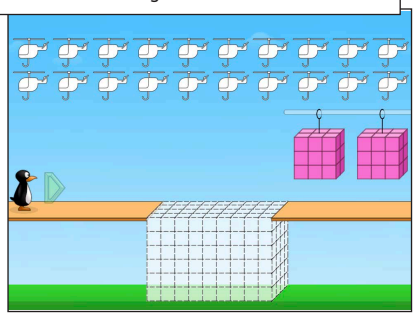


STMath

Helicopter Volume LI*

Grade 5 Volume 5 levels

Probing Questions

- What do each of the numbers stand for?
- What information does the puzzle give you and what do you have to figure out?
- What number stands for the helicopters? (Levels 2-4)

What's Important Here?

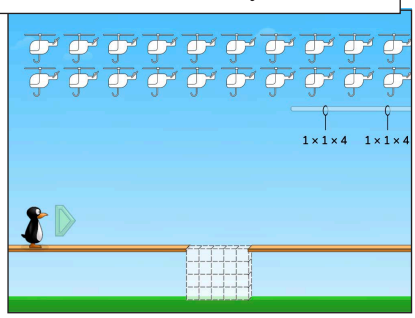
In this game, students are connecting the visual with the abstract. They must understand how to represent the number of blocks using multiplication as they develop an understanding of the formula for volume.

What Do the Standards Say?

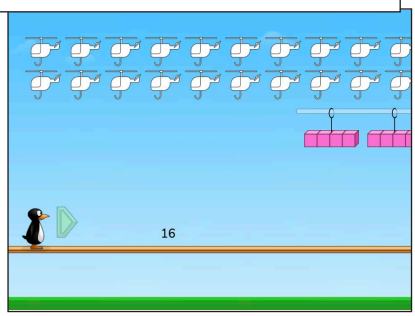
Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems. CCSS-MA 5.MD.5.c

*LI: Language Integration - Refers to the transition from a visual representation in ST Math to a gradual inclusion of words, mathematical symbols, and operators in higher levels of games.

In Levels 2-4, one factor is always 1.



Level 5 presents missing factor problems.



Volume Fill

Grade 5 Volume 5 levels

Probing Questions

- What do the numbers represent?
- How do you figure out what is missing?
- How many cubic units will it take to fill the shape?
- How many blocks would it take to build the shape? (Level 5)

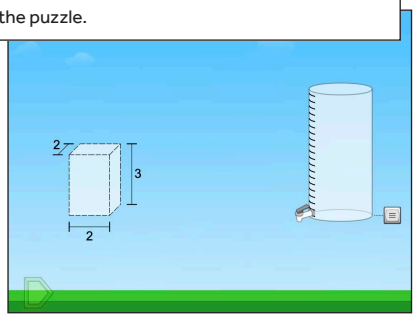
Supporting Struggling Students

Level 3 focuses on the concept of volume as students find the number of cubic units represented as liquid in a graduated cylinder. Struggling students might benefit from some hands-on practice (e.g., cooking).

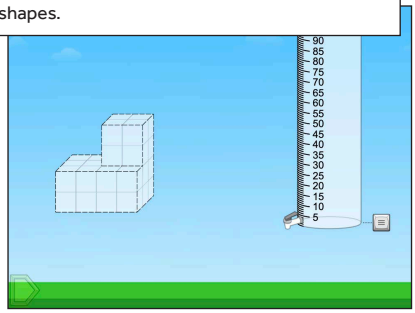
What Do the Standards Say?

Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. CCSS.Math.Content.5.MD.5a

Students must start using the formula to solve the puzzle.



Level 5 requires students to add volumes of 2 shapes.



Area, Perimeter, Volume Select

Grade 5 Volume 5 levels

Probing Questions

- What do the tick marks mean on the sides of the shapes?
- How do you measure perimeter/area/volume?

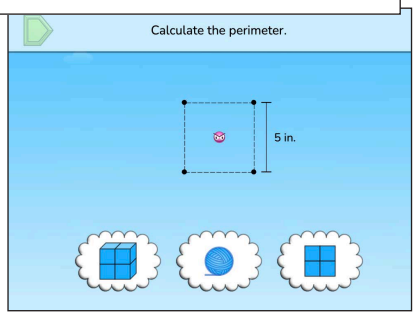
Emphasize the Connection

Help students understand that perimeter is a one-dimensional measurement (l) that uses units of length (e.g., centimeter), area is a two-d measurement (l x w) that uses a square unit (square centimeters), and volume is a 3-d measurement (l x w x h) that uses a cubic unit (e.g., cubic centimeters).

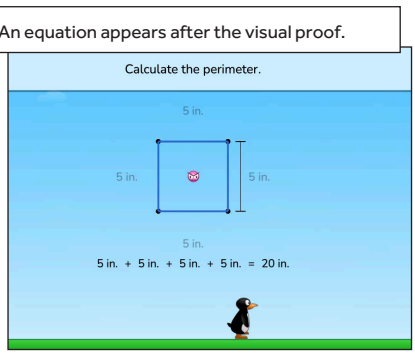
What Do the Standards Say?

Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects. CCSS.Math.Practice.2

In Levels 4 & 5, students choose the unit and then use it.



An equation appears after the visual proof.



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