Formative Instructional and Assessment Tasks

<table>
<tr><th colspan="2">Who Ran Farther?
5.MD.1 – Task 1</th></tr>
<tr><td>Domain</td><td>Measurement and Data</td></tr>
<tr><td>Cluster</td><td>Convert like measurement units within a given measurement system.</td></tr>
<tr><td>Standard(s)</td><td>5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.</td></tr>
<tr><td>Materials</td><td>Task handout, Calculators (optional)</td></tr>
<tr><td>Task</td><td>Who Ran Farther?
In order to prepare for next month's 5 kilometer (km) race, students ran last week. The table shows the amount that each person ran during the 4 running days.
<table>
<tr><th>Person</th><th>Day 1</th><th>Day 2</th><th>Day 3</th><th>Day 4</th></tr>
<tr><td>Tomas</td><td>6 and 1/2 km</td><td>3,750 m</td><td>5.15 km</td><td>2,500 m</td></tr>
<tr><td>Jackie</td><td>8,000 m</td><td>1,800 m</td><td>4,300 m</td><td>3.4 km</td></tr>
<tr><td>Ruby</td><td>5.9 km</td><td>1.7 km</td><td>4,250 m</td><td>5,270 m</td></tr>
<tr><td>Abe</td><td>2,790 m</td><td>3.2 km</td><td>4.91 km</td><td>6,200 m</td></tr>
</table>
Based on the data above:
1) How far did each person run during the 4 running days last week?
2) Which runner ran the longest distance on a day? How long was that run?
3) Which runner ran the shortest distance on a day? How long was that run?
4) Bobby ran farther than everyone in the table. He ran the same distance each day. How far could Bobby have run each day? Write a sentence to explain how you found your answer.
5) Sarah ran faster than 2 of the people in the table and slower than everyone else. She ran the same distance each day. How far could Sarah have run each day? Write a sentence to explain how you found your answer.</td></tr>
</table>

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Students have limited understanding of the concept.	Not Yet Proficient • Students provide correct answers but have an unclear or inaccurate explanation. OR • Students have one or two incorrect answers.	Proficient in Performance • Student provides correct answers and explanations. • 1) Tomas: 17.9 km or 17,900 m; Jackie: 17.5 km or 17,500 m; Ruby: 17.12 km or 17,120 m; Abe: 17.1 km or 17,100 m. • 2) Jackie on Day 1 ran 8,000m or 8 km. • 3) Ruby on Day 2 ran 1,700 m or 1.7 km. • 4) Bobby has to have run more than 17.9 km or 4.475 km each day. • 5) Sarah ran between 17.12 and 17.5 km total. Sarah ran between 4.28 and 4.375 km each day.

Formative Instructional and Assessment Tasks

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6**. Attends to precision.**
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Who Ran Farther?

In order to prepare for next month's 5 kilometer (km) race, students ran last week. The table shows the amount that each person ran during the 4 running days.

Person	Day 1	Day 2	Day 3	Day 4
Tomas	6 and 1/2 km	3,750 m	5.15 km	2,500 m
Jackie	8,000 m	1,800 m	4,300 m	3.4 km
Ruby	5.9 km	1.7 km	4,250 m	5,270 m
Abe	2,790 m	3.2 km	4.91 km	6,200 m

Based on the data above:

1) How far did each person run during the 4 running days last week?

2) Which runner ran the longest distance on a day? How long was that run?

3) Which runner ran the shortest distance on a day? How long was that run?

4) Bobby ran farther than everyone in the table. He ran the same distance each day. How far could Bobby have run each day? Write a sentence to explain how you found your answer.

5) Sarah ran faster than 2 of the people in the table and slower than everyone else. She ran the same distance each day. How far could Sarah have run each day? Write a sentence to explain how you found your answer.

Formative Instructional and Assessment Tasks

<table>
<tr><th colspan="2">Long Jumps
5.MD.1 –Task 2</th></tr>
<tr><td>Domain</td><td>Measurement and Data</td></tr>
<tr><td>Cluster</td><td>Convert like measurement units within a given measurement system.</td></tr>
<tr><td>Standard(s)</td><td>5.MD.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
Additional Standard:
5.NBT.7 Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.</td></tr>
<tr><td>Materials</td><td>Task handout, Calculators (optional)</td></tr>
<tr><td>Task</td><td>Long Jumps
The table below shows the longest jump from 4 fifth graders in the field day competition.
<table>
<tr><th>Person</th><th>Jump</th></tr>
<tr><td>Cindy</td><td>2 yards, 1 foot 3 inches</td></tr>
<tr><td>Tyrette</td><td>7 feet, 2 inches</td></tr>
<tr><td>Nina</td><td>2 yards, 1 foot, 1 inch</td></tr>
<tr><td>Monique</td><td>7 feet, 4 inches</td></tr>
</table>
Based on the data above:
6) Order the students from the longest to the smallest jump. Write a sentence explaining how you know that you are correct.
7) What was the difference between the longest and the shortest jump?
8) Drew jumped farther than all four students above but jumped shorter than 7 feet, 7 inches. How far could Drew have jumped? Write a sentence explaining how you know that you are correct.</td></tr>
</table>

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Students have limited understanding of the concept.	Not Yet Proficient • Students provide correct answers but have an unclear or inaccurate explanation. OR • Students have one or two incorrect answers.	Proficient in Performance • Student provides correct answers and explanations. • 1) Cindy: 7 feet, 3 inches OR 87 inches; Tyrette: 86 inches; Nina: 7 feet, 1 inch OR 85 inches; Monique: 88 inches. • 2) Monique was the longest and Nina was the shortest. 88-85 = 3 inches/ • 3) Drew jumped further than 88 inches but shorter than 91 inches. Drew could have jumped either 88 or 89 inches. • Sentences are clear and accurate.

Formative Instructional and Assessment Tasks

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6**. Attends to precision.**
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Long Jumps

The table below shows the longest jump from 4 fifth graders in the field day competition.

Person	Jump
Cindy	2 yards, 1 foot 3 inches
Tyrette	7 feet, 2 inches
Nina	2 yards, 1 foot, 1 inch
Monique	7 feet, 4 inches

Based on the data above:

1) Order the students from the longest to the smallest jump. Write a sentence explaining how you know that you are correct.

2) What was the difference between the longest and the shortest jump?

3) Drew jumped farther than all four students above but jumped shorter than 7 feet, 7 inches. How far could Drew have jumped? Write a sentence explaining how you know that you are correct.

Formative Instructional and Assessment Tasks

<table>
<tr><th colspan="2">How High Did it Bounce?
5.MD.2 – Task 1</th></tr>
<tr><td>Domain</td><td>Measurement and Data</td></tr>
<tr><td>Cluster</td><td>Represent and interpret data.</td></tr>
<tr><td>Standard(s)</td><td>5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.
Additional Standards:
5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.).</td></tr>
<tr><td>Materials</td><td>Task handout</td></tr>
<tr><td>Task</td><td>How High Did it Bounce?
Part 1
Based on the data, make a line plot to display the data. Write a sentence explaining how you know that you plotted the data correctly

<table>
<tr><td>3/4</td><td>5/8</td><td>1/8</td><td>5/8</td><td>3/8</td></tr>
<tr><td>1/2</td><td>3/4</td><td>3/8</td><td>5/8</td><td>3/8</td></tr>
</table>

Part 2
A) How many bouncy balls went halfway up the wall or higher?

B) What is the combined height of all of the heights of the bouncy balls in terms of wall heights?

C) What was the difference in height between the tallest bounce and the shortest bounce?</td></tr>
</table>

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Students make more than 2 errors.	Not Yet Proficient • Students make 1 or 2 errors	Proficient in Performance • Student provides correct answers and explanations. • Part 1: Data points are plotted correctly. The sentence is clear and accurate about how they plotted the points. • Part 2: A) 6 balls, B) 5 and 1/8 heights of the wall, C) 3/4 - 1/8 = 5/8 of the wall

Formative Instructional and Assessment Tasks

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6**. Attends to precision.**
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
How High Did it Bounce?

Part 1

A class measures how high a bouncy ball will bounce compared to the height of the wall.

Based on the data, make a line plot to display the data.

3/4	5/8	1/8	5/8	3/8
1/2	3/4	3/8	5/8	3/8

Part 2

A) How many bouncy balls went halfway up the wall or higher?

B) How many bouncy balls went 1/2 of the wall or higher?

C) What is the combined height of all of the heights of the bouncy balls?

D) What was the difference in height between the tallest bounce and the shortest bounce?

Formative Instructional and Assessment Tasks

<table>
<tr><th colspan="2">Punch at a Party
5.MD.2 – Task 2</th></tr>
<tr><td>Domain</td><td>Measurement and Data</td></tr>
<tr><td>Cluster</td><td>Represent and interpret data.</td></tr>
<tr><td>Standard(s)</td><td>5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.
Additional Standards:
5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)
5.NF.3 Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?</td></tr>
<tr><td>Materials</td><td>Task handout</td></tr>
<tr><td>Task</td><td>Punch at a Party
The table below shows the amount of liquid in 10 glasses at a party. The amount is in terms of cups.
<table>
<tr><td>1 and 5/8</td><td>7/8</td><td>1/2</td><td>1 and 1/2</td></tr>
<tr><td>1 and 1/4</td><td>1 and 3/8</td><td>1 and 3/4</td><td>1 and 1/8</td></tr>
</table>
Part 1
Based on the data, make a line plot to display the data. Line plot on the task handout
Write a sentence explaining how you know that you plotted the data correctly.

Part 2
D) How many glasses have more than 1 and 1/3 cups of punch?

E) What is the difference between the amount of punch in the glass with the most punch and the glass with the least amount of punch?

F) What is the combined amount of punch in all 8 glasses?

G) If all of the punch were to be poured into a container and then shared equally among the 8 people how much punch would each person receive?</td></tr>
</table>

Formative Instructional and Assessment Tasks

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Students have limited understanding of the concept.	Not Yet Proficient • Students provide correct answers but have an unclear or inaccurate explanation. OR • Students have one or two incorrect answers.	Proficient in Performance • Student provides correct answers and explanations. • Part 1: Data points are plotted correctly. The sentence is clear and accurate about how they plotted the points. • Part 2: A) 4 glasses, B) 1 and 1/8, C) 10 cups, D) 10/8 or 1 and 2/8 cups each.

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6**. Attends to precision.**
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Punch at a Party

Part 1

The table below shows the amount of liquid in 10 glasses at a party. The amount is in terms of cups. Based on the data, make a line plot to display the data. Write a sentence explaining how you know that you plotted the data correctly.

1 and 5/8	7/8	1/2	1 and 1/2
1 and 1/4	1 and 3/8	3/4	1 and 1/8

Part 2

A) How many glasses have more than 1 and 1/3 cups of punch?

B) What is the difference between the amount of punch in the glass with the most punch and the glass with the least amount of punch?

C) What is the combined amount of punch in all 8 glasses?

D) If all of the punch were to be poured into a container and then shared equally among the 8 people how much punch would each person receive?

Formative Instructional and Assessment Tasks

<table>
<tr><th colspan="2">Strips of Bubble Gum
5.MD.2 – Task 3</th></tr>
<tr><td>Domain</td><td>Measurement and Data</td></tr>
<tr><td>Cluster</td><td>Represent and interpret data.</td></tr>
<tr><td>Standard(s)</td><td>5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.
Additional Standards:
5.NF.1 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)
5.NF.3 Interpret a fraction as division of the numerator by the denominator (a/b = a ÷ b). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?</td></tr>
<tr><td>Materials</td><td>Task handout</td></tr>
<tr><td>Task</td><td>Strips of Bubble Gum
The table below shows the length of strips of bubble gum that each student has. Measurements are in feet.

<table>
<tr><td>2 and 5/8</td><td>2 and 5/8</td><td>1 and 3/8</td><td>2 and 1/4</td><td>2 and 1/4</td><td>2 and 5/8</td></tr>
<tr><td>2 and 1/4</td><td>2 and 1/2</td><td>1 and 3/4</td><td>1 and 7/8</td><td>2 and 1/2</td><td>2 and 3/8</td></tr>
</table>

Part 1
Based on the data, make a line plot to display the data.
Write a sentence explaining how you know that you plotted the data correctly.
Part 2
H) How many strips of gum are shorter than 2 and 1/3 feet?
I) What is the difference between the longest and shortest strips of gum?
J) What is the total length of all of the strips of gum?
K) If all of the strips were combined and equally distributed to the 10 students, how much gum would each student get?</td></tr>
</table>

Formative Instructional and Assessment Tasks

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Students have limited understanding of the concept.	Not Yet Proficient • Students provide correct answers but have an unclear or inaccurate explanation. OR • Students have one or two incorrect answers.	Proficient in Performance • Student provides correct answers and explanations. • Part 1: Data points are plotted correctly. The sentence is clear and accurate about how they plotted the points. • Part 2: A) 5 strips of gum, B) 2 and 5/8 minus 1 and 6/8 = 7/8 of a foot. C) 27 feet, D) 27/12 or 2 and 3/12 feet or 2 and ¼ feet or 2 feet and 3 inches.

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6**. Attends to precision.**
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Strips of Bubble Gum

The table below shows the length of strips of bubble gum that each student has. Measurements are in feet.

2 and 5/8	2 and 5/8	1 and 3/8	2 and 1/4	2 and 1/4	2 and 5/8
2 and 1/4	2 and 1/2	1 and 3/4	1 and 7/8	2 and 1/2	2 and 3/8

Part 1

Based on the data, make a line plot to display the data. Write a sentence explaining how you know that you plotted the data correctly.

Part 2

A) How many strips of gum are shorter than 2 and 1/3 feet?

B) What is the difference between the longest and shortest strips of gum?

C) What is the total length of all of the strips of gum?

D) If all of the strips were combined and equally distributed to the 10 students, how much gum would each student get?

Formative Instructional and Assessment Tasks

Carter's Candy Company 5.MD.3-Task 1	
Domain	**Measurement and Data**
Cluster	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**
Standard(s)	**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.
Materials	Paper and pencil, unit cubes, isometric graph paper
Task	Carter's Candy Company is selling a new type of chocolate. They have decided to sell the candy in packages of 24. You are leading a team in charge of developing a box for the candy. Use unit cubes to build all of the possible boxes for the package of candy. How many possibilities are there? Record the dimensions and volume of each box. What do you notice about all of the volumes? After determining all of the possible boxes, you must make a recommendation to the president of the company about which box should be used. Write a paragraph explaining which box would be best. Make sure to explain your reasons for choosing this box. Two of your team members get in an argument about the boxes. Cathy says that a 1x24 box is the same as a 24x1 box. Curtis says that these dimensions would lead to two different boxes. Who do you agree with? Why?

Formative Instructional and Assessment Tasks

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Student is able to build some boxes with a volume of 24. • Student is unable to explain whether Cathy or Curtis is correct. • Student may recommend a box but it unable to use math language to justify reasoning.	Not Yet Proficient • Student is able to build boxes that have a volume of 24 but may not find all of the possible combinations. • Student recognizes the connection between volume and dimensions. • Student recommends which box to use but explanation lacks detail or is unclear. • Student is unsure how to settle the argument between Cathy and Curtis.	Proficient in Performance • Student recognizes that all the boxes will have a volume of 24, since that is how many pieces of candy it must contain. • Student identifies all the combinations that will lead to a volume of 24: 1x24, 2x12, 3x8, 4x6 (and the reverse) • Student identifies relationship between volume and linear dimensions. • Student chooses a side – Cathy or Curtis. Student demonstrates that both boxes have the same volume and the same dimensions. However, because of packaging on the outside of the box, and depending on how the candy is shaped and needs to be stacked, these could be considered different boxes. Allow a variety of responses, as long as student demonstrates understanding of the concept of volume. • Student's written explanation chooses a box that would be best and uses mathematical language to justify the choice.

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Carter's Candy Company

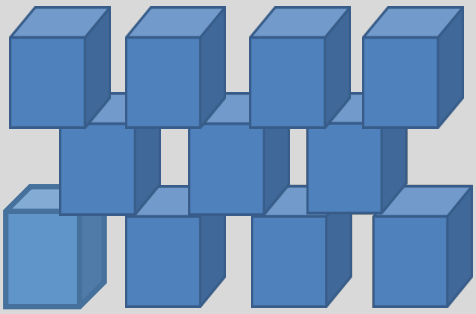
Carter's Candy Company is selling a new type of chocolate. They have decided to sell the candy in packages of 24. You are leading a team in charge of developing a box for the candy.

A. Use unit cubes to build all of the possible boxes for the package of candy. How many possibilities are there? Record the dimensions and volume of each box. What do you notice about all of the volumes?

B. After determining all of the possible boxes, you must make a recommendation to the president of the company about which box should be used. Write a paragraph explaining which box would be best. Make sure to explain your reasons for choosing this box.

C. Two of your team members get in an argument about the boxes. Cathy says that a 1x24 box is the same as a 24x1 box. Curtis says that these dimensions would lead to two different boxes. Who do you agree with? Why?

Formative Instructional and Assessment Tasks

Jeremy's Wall 5.MD.3-Task 2	
Domain	**Measurement and Data**
Cluster	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**
Standard(s)	**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.
Materials	Paper and pencil
Task	Jeremy is building a wall out of bricks that are cubes. He builds the bottom row by leaving some space between each brick. This is what his wall looks like:  Jeremy continues building his wall until the bottom row has 8 bricks in it and it is 5 bricks high. He fills in the space between the bricks with a special colorful plaster. Jeremy then calculates that the volume of his wall is 38 cubic units. Is Jeremy correct? Why or why not?

Formative Instructional and Assessment Tasks

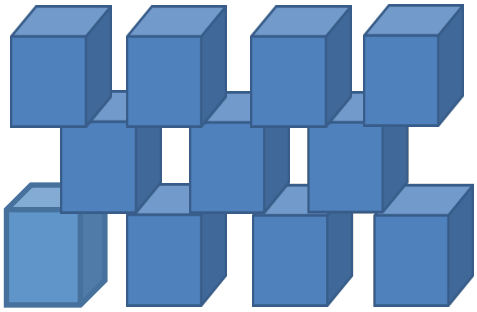
Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Student does not identify that Jeremy is incorrect. Explanation contains inaccuracies and unclear language and fails to mention the space between the blocks being an important factor.	Not Yet Proficient • Student identifies that Jeremy is not correct but is unable to clearly explain why.	Proficient in Performance • Student identifies that Jeremy is not correct. • Student recognizes that Jeremy was calculating the number of bricks in the wall, rather than finding the volume of the wall. • Student is able to explain that the number of bricks in the wall is not equal to the volume of the wall, because the bricks have been spread out with spaces between them.

Level IV: Student explains that to find the volume of the wall, you would need to use a tool (ruler, tape measure, meter stick, etc.) to measure the length, width, and height of the wall in order to calculate its volume accurately.

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Jeremy's Wall

Jeremy is building a wall out of bricks that are cubes. He builds the bottom row by leaving some space between each brick. This is what his wall looks like:



Jeremy continues building his wall until the bottom row has 8 bricks in it and it is 5 bricks high. He fills in the space between the bricks with a special colorful plaster. Jeremy then calculates that the volume of his wall is 38 cubic units. Is Jeremy correct? Why or why not?

Formative Instructional and Assessment Tasks

Measure a Box 5.MD.4 - Task 1	
Domain	**Measurement and Data**
Cluster	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**
Standard(s)	**5.MD.4** Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.
Materials	Paper and pencil, various rectangular boxes, centimeter cubes, inch cubes, other cubic units for measuring volume.
Task	Choose a box. Use cubic units to measure the volume of the box. What difficulties did you encounter when you were measuring the volume of your box? Choose a different unit and make a prediction about what the volume be when you measure with this unit. Then measure the same box using the new unit. How is this volume different? How does the size of the unit relate to the volume of the box? Which unit gives a more precise measurement?

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Student needs assistance to measure the volume of the box. • Student is unable to discuss the difficulties of measuring the box. • Student does not demonstrate any understanding of the compensatory principle. • Student does not demonstrate an understanding of why the smaller unit will result in a more precise measurement.	Not Yet Proficient • Student successfully measures the volume of the box using various units. • Student discusses some of the difficulties in measuring the volume of the box. • Student may have some foundational knowledge of the compensatory principle but is unable to clearly explain. • Student is unable to identify which unit is more precise, or student identifies that the smaller unit is more precise but is unable to explain why.	Proficient in Performance • Student successfully measures the volume of the box using various units. • Student clearly explains some of the difficulties in measuring the box (may not have enough cubes, may not be able to fill completely, etc.) • Student is able to explain that a larger unit results in a smaller volume – it takes fewer units to fill the same space (compensatory principle) • Student is able to explain that a smaller unit will be more precise. Since the units are smaller, you will be closer to filling the box as "full" as possible.

Formative Instructional and Assessment Tasks

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Measure a Box

Choose a box. Use cubic units to measure the volume of the box.

What difficulties did you encounter when you were measuring the volume of your box?

Choose a different unit and make a prediction about what the volume be when you measure with this unit. Then measure the same box using the new unit. How is this volume different?

How does the size of the unit relate to the volume of the box? Which unit gives a more precise measurement?

Formative Instructional and Assessment Tasks

Build a Box 5.MD.4-Task 2	
Domain	**Measurement and Data**
Cluster	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**
Standard(s)	**5.MD.4** Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.
Materials	Paper and pencil, centimeter grid paper
Task	Cut out a 10x10 square from your centimeter grid paper. From each corner of the square, cut out a 1x1 square. Fold up each flap and tape them together so that you have an open box. Use centimeter cubes to measure the volume of your box. How would your volume change if you cut out a 2x2 square from each corner instead of a 1x1 square? How would your volume change if you started with a 20x20 square instead of a 10x10 square?

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Student is able to build and calculate the volume of each box with support from teacher or classmates. • Student explanations are inaccurate, unclear, or missing. • Student shows no understanding of the relationship between the dimension and the volume.	Not Yet Proficient • Student is able to measure the volume of each box. • Student's explanations are inaccurate or unclear. • Student does now show any indication that he is beginning to generalize about the relationship between the linear measurements and the volume of each box.	Proficient in Performance • Student is able to correctly measure (or calculate) the volume of each box. • Student clearly explains how the volume changes from one box to the other. • Student is beginning to develop an idea of the relationships between linear dimensions (length, height, width) and the effect changing them has on the volume; however student has not yet generalized this knowledge.

Formative Instructional and Assessment Tasks

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Adapted from K-5MathTeachingResources.com

Formative Instructional and Assessment Tasks
Build a Box

A. Cut out a 10x10 square from your centimeter grid paper. From each corner of the square, cut out a 1x1 square.

B. Fold up each flap and tape them together so that you have an open box.

C. Use centimeter cubes to measure the volume of your box.

D. How would your volume change if you cut out a 2x2 square from each corner instead of a 1x1 square? How would your volume change if you started with a 20x20 square instead of a 10x10 square?

Formative Instructional and Assessment Tasks

Partner Prisms 5.MD.5 -Task 1	
Domain	**Measurement and Data**
Cluster	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**
Standard(s)	**5.MD.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. **5.MD.5 c**. 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.
Materials	Paper, pencil, Snap cubes
Task	Use Snap cubes to build 2 right rectangular prisms that have different lengths and widths. Connect your 2 prisms by stacking them on top of each other to make a new figure. Calculate the volume of your new figure and write an equation to match your figure. Trade figures with a partner. What is the volume of your partner's figure? Write an equation to match your figure. Write a sentence to explain how you found the volume of your figure. Possible prompt: How does knowing how to find the volume of the smaller right rectangular prism help you find the volume of these figures?

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Student cannot build and calculate volumes of figures without assistance.	Not Yet Proficient • Student builds solid figure made up of 2 right rectangular prisms. • Student calculates the volume of his figure and his partner's figure, with minor errors. • Student's explanation is unclear or contains misconceptions.	Proficient in Performance • Student correctly builds solid figure made up of 2 right rectangular prisms. • Student correctly calculates the volume of his figure and his partner's figure. • Student explains how to use the volume of right rectangular prisms to find the volume of composite figures made up of right rectangular prisms.

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Partner Prisms

A. Use Snap cubes to build 2 right rectangular prisms that have different lengths and widths. Connect your 2 prisms by stacking them on top of each other to make a new figure.

B. Calculate the volume of your new figure and write an equation to match your figure.

C. Trade figures with a partner. What is the volume of your partner's figure? Write an equation to match your figure.

D. Write a sentence to explain how you found the volume of your figure.

E. Possible prompt: How does knowing how to find the volume of the smaller right rectangular prism help you find the volume of these figures?

Formative Instructional and Assessment Tasks

Volume Argument 5.MD.5-Task 2	
Domain	**Measurement and Data**
Cluster	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**
Standard(s)	**5.MD.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. a. 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. b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. c. 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.
Materials	Paper and pencil
Task	Bennett and Seth are having an argument about the formula for finding the volume of a rectangular prism. Bennett says that to find volume you have to know the length, height, and width of the figure. Seth says that you only need to know the base and height of the figure. Which student do you agree with? Why? Write an expression that shows each boy's formula for finding volume. Draw a rectangular prism and label it with dimensions. How would Bennett find the volume of this prism? How would Seth find its volume?

Formative Instructional and Assessment Tasks

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Student is unable to explain why either boy's strategy is correct. • Student needs assistance to calculate the volume of the drawn.	Not Yet Proficient • Student chooses one boy's strategy and explains why it is correct, but does not recognize that both volumes are equivalent. • Student writes an expression for the selected strategy but not both. • Student uses the selected strategy (but not both formulas) to find the volume of the prism they draw.	Proficient in Performance • Student recognizes that both boys are correct. • Student explains that length times width is the same thing as the area of the base, and this is why Seth's formula is equivalent to Bennett's. • Student writes both expressions: A = l x w x h and A = b x h • Student draws a rectangular prism and calculates its volume using both formulas (Bennett's and Seth's).

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Volume Argument

Bennett and Seth are having an argument about the formula for finding the volume of a rectangular prism. Bennett says that to find volume you have to know the length, height, and width of the figure. Seth says that you only need to know the base and height of the figure.

Which student do you agree with? Why? Write an expression that shows each boy's formula for finding volume.

Draw a rectangular prism and label it with dimensions. How would Bennett find the volume of this prism? How would Seth find its volume?

Formative Instructional and Assessment Tasks

Transferring Teachers 5.MD.5-Task 3	
Domain	**Measurement and Data**
Cluster	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**
Standard(s)	**5.MD.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.
Materials	Paper and pencil, unifix cubes (optional)
Task	Ms. Webb is switching schools and needs to pack up her classroom. She has decided to rent a moving truck so that she can move her boxes in one trip. All of the trucks are 5 feet wide and 6 feet tall, but the trucks have different lengths. The choices of lengths are 10 feet, 14 feet, 17 feet, 20 feet, 24 feet, and 26 feet. Find the volume of each truck to determine how much it can hold. Ms. Webb stacked all of her boxes into a pile that is 12 feet wide, 7 feet long, and 3 feet high. Which truck should she rent? Ms. Bradley is also switching schools. She and Ms. Webb are thinking about renting a truck together. If Ms. Bradley's stack of boxes is 9 feet wide, 11 feet long, and 4 feet high, which truck would the two teachers have to rent in order to hold all their boxes?

Rubric

Level I	Level II	Level III
Limited Performance • Student is unable to calculate volume without assistance. • Student is unable to determine which truck is needed without assistance.	Not Yet Proficient • Student is able to calculate the volume for each truck but may have made some calculation errors. • Student makes errors in either process or calculation when determining which size truck the teachers will need.	Proficient in Performance • Student correctly calculates the volume for each truck: Length / Volume 10 ft / 300 ft^3 14 ft / 420 ft^3 17 ft / 510 ft^3 20 ft / 600 ft^3 24 ft / 720 ft^3 26 ft / 780 ft^3 • Student calculates that Mrs. Webb has 252 ft^3 of boxes, so the 10 ft truck should be enough for her. However, Mrs. Bradley has 396 ft^3 of boxes, so if the two teachers share, they will need the 24 foot truck.

Formative Instructional and Assessment Tasks

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Transferring Teachers

Ms. Webb is switching schools and needs to pack up her classroom. She has decided to rent a moving truck so that she can move her boxes in one trip. All of the trucks are 5 feet wide and 6 feet tall, but the trucks have different lengths. The choices of lengths are 10 feet, 14 feet, 17 feet, 20 feet, 24 feet, and 26 feet. Find the volume of each truck to determine how much it can hold.

Ms. Webb stacked all of her boxes into a pile that is 12 feet wide, 7 feet long, and 3 feet high. Which truck should she rent?

Ms. Bradley is also switching schools. She and Ms. Webb are thinking about renting a truck together. If Ms. Bradley's stack of boxes is 9 feet wide, 11 feet long, and 4 feet high, which truck would the two teachers have to rent in order to hold all their boxes?

Formative Instructional and Assessment Tasks

Taller Than PNC Plaza 5.MD.5-Task 4	
Domain	**Measurement and Data**
Cluster	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**
Standard(s)	**5.MD.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.
Materials	Paper and pencil
Task	PNC Plaza is the tallest and largest skyscraper in Raleigh. It is 538 feet high. Cassie's Construction Company wants to build a skyscraper that is even taller. The spot they have to build the building on is 40,000 square feet. What are some possible dimensions for the base of the building? If they build the skyscraper to be 550 feet high, what will its volume be?

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Student is unable to determine a base or calculate a volume for the building.	Not Yet Proficient • Student needs some assistance to determine a base for the skyscraper. • Student needs some assistance to calculate the volume of the building.	Proficient in Performance • Student is able to calculate a base for the skyscraper. (200 x 200 is acceptable). • Student is able to calculate the volume based on the base they have selected and a height of 550 feet.

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Taller Than PNC Plaza

PNC Plaza is the tallest and largest skyscraper in Raleigh. It is 538 feet high. Cassie's Construction Company wants to build a skyscraper that is even taller. The spot they have to build the building on is 40,000 square feet.

What are some possible dimensions for the base of the building?

If they build the skyscraper to be 550 feet high, what will its volume be?

Formative Instructional and Assessment Tasks

Draw Your Own Figure 5.MD.5-Task 5	
Domain	**Measurement and Data**
Cluster	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**
Standard(s)	**5.MD.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. c. 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.
Materials	Paper and pencil isometric dot paper
Task	Use isometric dot paper to sketch a structure. Be as simple or as complex as you like. Now calculate the volume of your figure. What strategies did you use to calculate its volume? How does understanding the formula for volume of a rectangular prism help you find the volume of other solid figures? NOTE: Students may need some practice using isometric dot paper to draw 3-dimensional figures prior to engaging in this task.

Rubric		
Level I	**Level II**	**Level III**
Limited Performance • Student needs a lot of assistance to calculate the volume of the figure they drew. • Student is unable to explain how knowing the formula for volume of a rectangular prism applies to finding the volume of other figures.	Not Yet Proficient • Student has an effective strategy for calculating the volume of their figure but makes some mistakes in calculation or implementation. • Student explains how to find the volume of their figure and discusses how understanding the formula for volume of a rectangular prism can help you find the volume of other figures. However, explanation is unclear at times or may contain inaccuracies.	Proficient in Performance • Student draws a figure and successfully calculates the volume of that figure. • Student finds the volume of individual rectangular prism "chunks" of their figure and adds them together to find the volume of the entire figure. • Student uses math language to clearly explain how they find the volume of their figure. Student explains how understanding the formula for volume of a rectangular prism can help them find the volume of figures that are made up of rectangular prisms put together.

Formative Instructional and Assessment Tasks

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

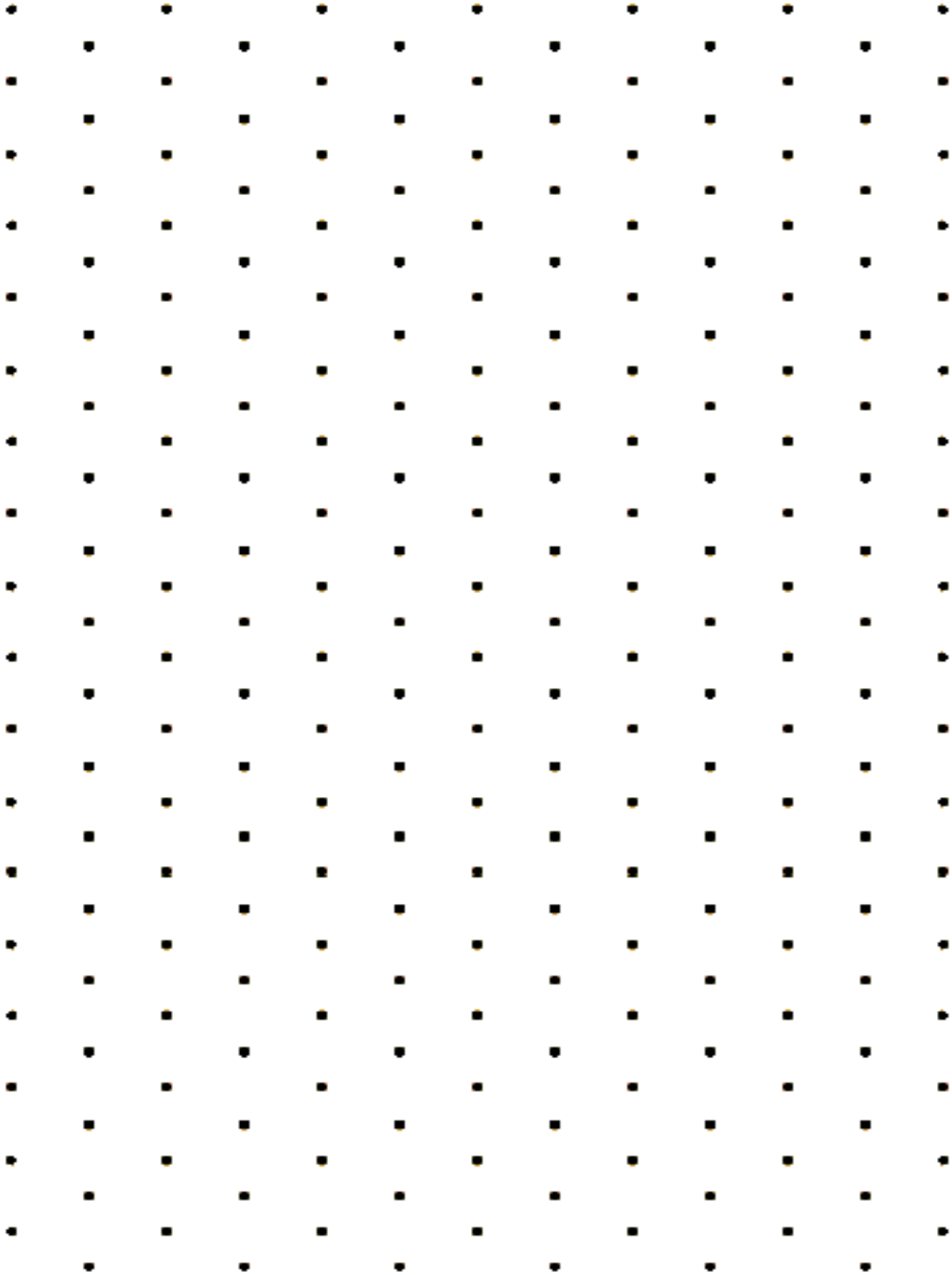
Formative Instructional and Assessment Tasks
Draw Your Own Figure

Use isometric dot paper to sketch a structure. Be as simple or as complex as you like.

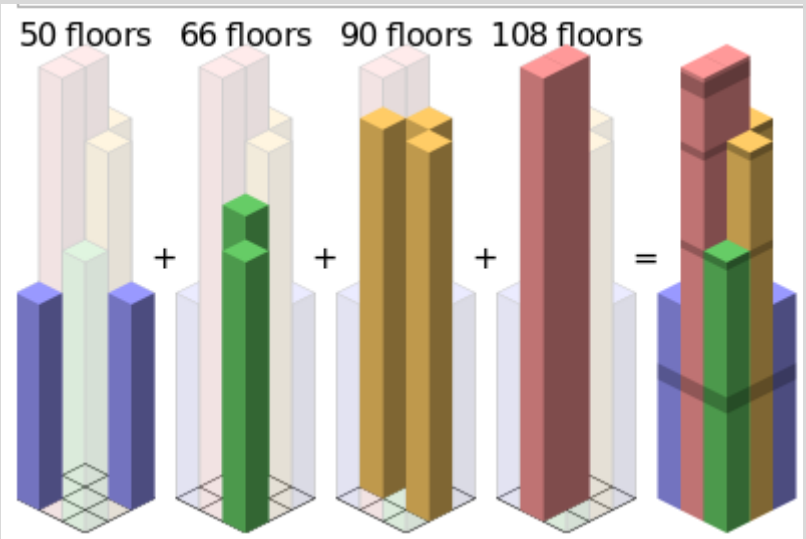
Now calculate the volume of your figure.

What strategies did you use to calculate its volume? How does understanding the formula for volume of a rectangular prism help you find the volume of other solid figures?

Formative Instructional and Assessment Tasks



Formative Instructional and Assessment Tasks

Sears Tower 5.MD.5-Task 6	
Domain	**Measurement and Data**
Cluster	**Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.**
Standard(s)	**5.MD.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. c. 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.
Materials	Paper and pencil isometric dot paper
Task	This is a diagram of the Sears Tower (now called the Willis Tower) skyscraper in Chicago.  The base of the tower is a 75 x 75 meter square. If each floor is 4 meters tall, what is the volume of the Sears Tower? TEACHER NOTE: This is a complex, many-step task. Many students will not be able to complete the entire process without making a calculation error or losing track of one of the towers. Instead of focusing on getting a right answer, focus on the student's process for attacking and solving the problem.

Formative Instructional and Assessment Tasks

Rubric

Level I	Level II	Level III
Limited Performance • Student is unable to develop a strategy for solving the task without assistance. • Student demonstrates a tenuous (shaky) understanding of the concept of volume. • Student does not persevere with the task and needs frequent encouragement and assistance in order to solve.	Not Yet Proficient • Student develops a strategy for solving the problem but the strategy may be inconsistent or lack understanding of part of the task. • Student's strategy demonstrates an understanding of the concept of volume. • Student may become frustrated with the task and need encouragement to persevere in solving it.	Proficient in Performance • Student develops a strategy for solving the problem and carries out the strategy. There may be organization or calculation errors in carrying out the strategy. • Student's strategy demonstrates a clear and strong understanding of the concept of volume. • Student perseveres in solving the problem. Answer Key: The base of each tower is 625 m^2, with the exception of the red tower, which has a base of 1250m^2. To find the height, you must multiply the number of floors by 4.

Color	Height	Volume
Blue	50 x 4 = 200 m	200 x 625 = 125,000 m^3
Green	66 x 4 = 264 m	264 x 625 = 165,000 m^3
Gold	90 x 4 = 360 m	360 x 625 = 225,000 m^3
Red	108 x 4 = 432 m	432 x 1250 = 540,000 m^3

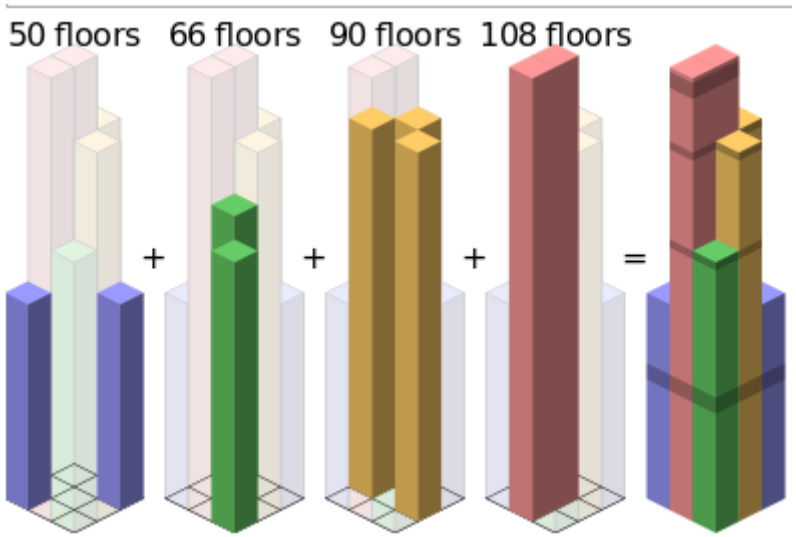
There are 2 blue towers = 250,000 m^3
There are 2 green towers = 333,000 m^3
There are 3 gold towers = 675,000 m^3
There is 1 red tower = 540,000 m^3
Total volume: 1,798,000m^3

Formative Instructional and Assessment Tasks

Standards for Mathematical Practice
1. Makes sense and perseveres in solving problems.
2. Reasons abstractly and quantitatively.
3. Constructs viable arguments and critiques the reasoning of others.
4. Models with mathematics.
5. Uses appropriate tools strategically.
6. Attends to precision.
7. Looks for and makes use of structure.
8. Looks for and expresses regularity in repeated reasoning.

Formative Instructional and Assessment Tasks
Sears Tower

This is a diagram of the Sears Tower (now called the Willis Tower) skyscraper in Chicago.



The base of the tower is a 75 x 75 meter square. If each floor is 4 meters tall, what is the volume of the Sears Tower?