Grade 5 Math Unit 1

Content Area: **Mathematics**
Course(s):
Time Period: **Trimester 1**
Length: **59 days**
Status: **Published**

Brief Summary of Unit

In this unit, students will learn volume as an attribute to three-dimensional figures and that it is the amount of space inside a solid figure. Students will express volumes in cubic inches, cubic centimeters, and cubic feet and explain volume formulas. This unit continues with students understanding place value with whole numbers and decimals to the thousandths. Students will be introduced to patterns with exponents and powers of ten. This unit also focuses on multiplying and dividing whole numbers using models and traditional algorithm to solve computational problems. They will compare, round and estimate to find the reasonableness of an answer as well. Students will also focus on a deep understanding of adding and subtracting decimals.

Revision Date: August 2024

Essential Questions/Enduring Understandings

Essential Questions:

- How do we measure volume?
- How are area and volume alike and different?
- How can you find the volume of cubes and rectangular prisms?
- How can we read, write, and represent decimal values?
- How can rounding decimal numbers be helpful?
- How can you decide if your answer is reasonable?
- How do we compare decimals?
- How does the placement of a digit affect the value of a decimal number?
- What strategies can I use to add and subtract decimals?
- How do you round decimals?

Enduring Understandings:

- Students will understand that volume is the amount of space inside a three-dimensional figure and

knowing how many unit cubes fit inside a figure determines its volume.

- Students will understand that you can use what you know about finding area of rectangles as the first step in calculating the volume of rectangular prisms.
- Students will understand that you can use place value, area models, and other strategies to multiply multi-digit numbers and divide by two-digit divisors.
- Students will understand place value in decimals follows the same base-ten patterns as whole numbers and knowing about place value will help you understand how many times more or less one decimal place is than another and will help you read, write, and round decimals.
- Students will understand that you can use what you know about patterns when multiplying by 10 to understand multiplying and dividing by powers of 10.
- Students will understand that knowing about adding and subtracting whole numbers will help you add and subtract decimals.

Students Will Know/Students Will be Skilled At

Students will know:

- How to find the volume of a solid figure by counting unit cubes.
- How to find volume by using a formula.
- How to break apart a solid figure into rectangular prisms to find its volume.
- How to multiply multi-digit whole numbers, for example: 410 x 16 = 6,560.
- How to divide a multi-digit whole number by a two-digit number, for example: 2,812 ÷ 38 = 74.
- How to recognize that a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
- How to use patterns to understand multiplying and dividing whole numbers and decimals by powers of 10.
- How to read and write decimals in different forms, for example, 80.63 = (8 x 10) + (6 x 1/10) + (3 x 1/100).
- How to compare decimals, for example: 3.47 > 3.096.
- How to round decimals. For example: 6.274 rounded to the nearest tenth is 6.3.

Students will be skilled at:

- Finding the volume of a solid figure by counting unit cubes.
- Finding volume by using a formula.
- Breaking apart a solid figure into rectangular prisms to find its volume.
- Multiplying multi-digit whole numbers, for example: 410 x 16 = 6,560.
- Dividing a multi-digit whole number by a two-digit number, for example: 2,812 ÷ 38 = 74.
- Recognizing that a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
- Using patterns to understand multiplying and dividing whole numbers and decimals by powers of 10.
- Reading and writing decimals in different forms, for example, 80.63 = (8 x 10) + (6 x 1/10) + (3 x 1/100).
- Comparing decimals, for example: 3.47 > 3.096.
- Rounding decimals. For example: 6.274 rounded to the nearest tenth is 6.3.

Learning Plan

Daily Warm-ups (5-10 minutes):

*As an opening to each math lesson, the instructor can use these different routines

- Number Talks- District Created Resource (Linked Below in Materials)
- Number Bounce- Begin this routine by telling your students that you will count forward or backward by ones starting with a specific number and ending with a specific number. Let your students know that when you tap them, they will have to say the next number. Here is one example using the start number 213 and the end number 235. Start counting forward by ones like: 213, 214, 215, 216. Next, tap a student on the shoulder. The student says 217. Then continue counting: 218, 219, 220. Tap a different student. The student says 221. Continue to count in this way until I have given most of the students an opportunity to answer. The student who says the last number in the sequence says, "235. Bounce" and gets the opportunity to do a 20-second celebratory dance. This routine also works well for fractions and decimals.
- Base Ten Toss- A beach ball or bean bag is recommended when implementing this routine. Begin this routine by telling your students that they will count in base ten language until they reach a base ten decade with no ones (example: 3 tens 0 ones or 30, 4 tens 0 ones or 40). For this routine, students stand in a circle. After one student counts in base ten language (ex. 7 tens 5 ones…75), he or she passes a beach ball or bean bag to the person standing next to them. When a student says a base ten decade with no ones (ex. 8 tens 0 ones…80) they get the opportunity to toss the beach ball to any classmate of their choice. For example: Count forward starting with 5 tens 9 ones…59. Next person 6 tens 0 ones..60, next person 6 tens 1 one…61, etc. This routine works for larger numbers and decimals as well. Students can add on hundreds (ex. 6 hundreds 9 tens and 8 ones…698) or hundredths (ex. 6

tens 7 ones and 37 hundredths…67.37). For more of a challenge, they can count backward.

- Amazing Race: Students work in pairs to decompose a given number in as many different ways as they can. You should provide each partner pair with a blank piece of paper or this sheet. You can give your students 5 – 10 minutes to record as many different ways to represent the number as possible. After the time is up, 1 or 2 partner pairs can randomly be selected to share what they recorded, in front of the class. This routine can easily be adapted to fractions or decimals. For example, you can write 7/10 or 0.7 as the number of the day. Students get a chance to be as creative as possible when recording. When you first start this routine, your students may only have 2 or 3 different ways. That's OKAY….. If you consistently use this routine your students will evolve and ultimately fill the page! As a quick tip, you can award team points to partner pairs that had the most inventive and correct ways. It is very important to check for accuracy.

- Number Strings- This routine helps to build students' mental math capabilities. The teacher writes a problem horizontally on the board in a whole group or small setting. The students mentally solve the problem and share with the whole group how they solved it. They must justify and defend their reasoning. The teacher records the students' thinking in an open number line and poses extended questions to draw out deeper understanding for all. The teacher can have students share other students' strategies to the whole group or with turn and talk. Eventually provide a few number sentences on the board to solve within 20 and multiplication to te and model how you can use mental math strategies to solve them in a snap just like they would on a fact test, then let them try solving in a snap as you point to each number sentence.

1. Fifth graders need to be fluent in multiplying and dividing to twelve. This is a skill that should be worked on throughout the year utilizing the Ready Math Program and supplemental resources that are located under materials.

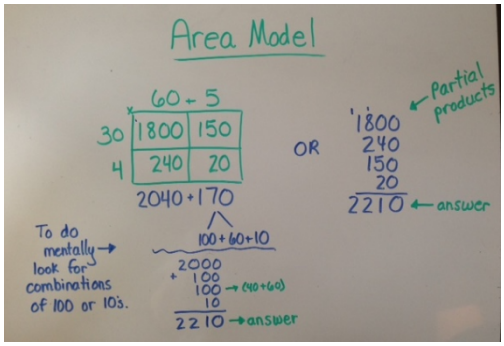
****Lesson 0 is a great way to review multiplication of larger numbers before moving into Lesson 1 on Volume.****

2. **Lessons for the First Five Days**- Students should be taught the math routine using prerequisite content and introducing discussion techniques. Students should learn the routine while multiplying two, two-digit numbers as well as finding the perimeter and area of rectangles

a. Complete Lesson 0, Sessions 1-5 (5 days)

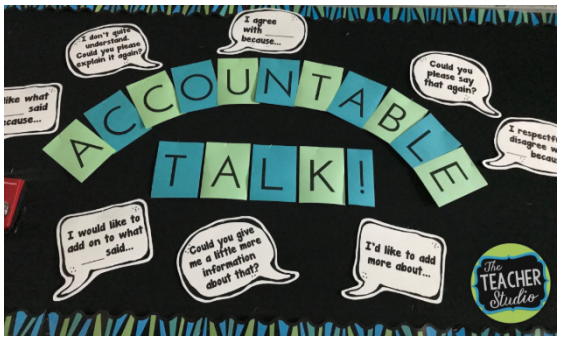
b. Possible strategies include but are not limited to:

i. Use area model and partial products to multiply two, two-digit numbers

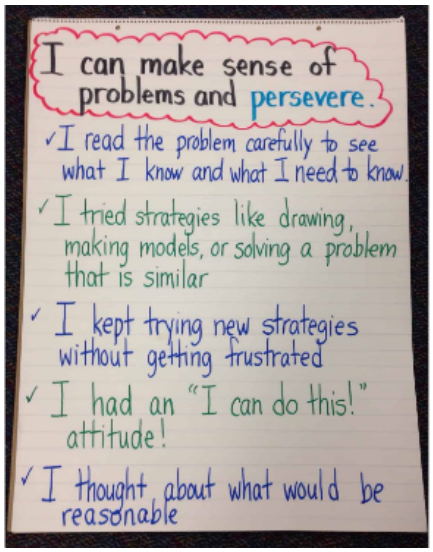


ii. Use perimeter and area formulas for rectangles to solve problems.

c. Emphasize "math talk" and give students lots of practice discussing their mathematical thinking with partners/groups. Sentence starters can be provided to prompt students to share their thinking.



d. Create an anchor chart that gives students strategies for persevering through something that is challenging for them in math.



e. Lesson Vocabulary: partial products, formula

3. **Understand Volume**- Students should be taught to understand volume as an attribute of three-dimensional figures. Instruct students that volume is the amount of space inside a solid figure. Students should be taught cubic units, to understand 1 cubic unit as the volume of a cube with side lengths of 1 unit. Students should find

volume of a rectangular prism packed with unit cubes without gaps or overlaps. Students should be taught to recognize that a rectangular prism can be decomposed into equal groups of unit cubes, allowing them to use repeated addition or multiplication to find volume.

a. Complete Lesson 1, Sessions 1-3 (3 days)

b. Students should spend time packing containers with unit cubes and then counting them to measure the volume of different containers. Students will begin to see structure in hoe rectangular prisms are built.

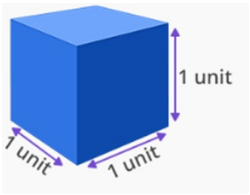
    i. Evidence of understanding in this lesson:

        1. Students can determine the volume of rectangular prisms by counting the cubes that fill it up.

        2. Students can build two different rectangular prisms that have the same volume and explains how they can be the same.

c. Possible strategies include but are not limited to:

    i. Review what a unit cube is, a cube that has side lengths of 1 unit.



ii. Allow students the opportunities to use Unifix cubes or other cubes and tell them to build a rectangular prism. Ask them to identify the dimensions of the shape and to write them down. Ask them to count the TOTAL number of cubes in their design. Be sure to draw attention to the fact that there aren't any spaces between the cubes etc.

1. While students are working discuss the different layers, how many cubes are in each layer etc,

2. Discuss how you name the total amount of cubes as cubic units

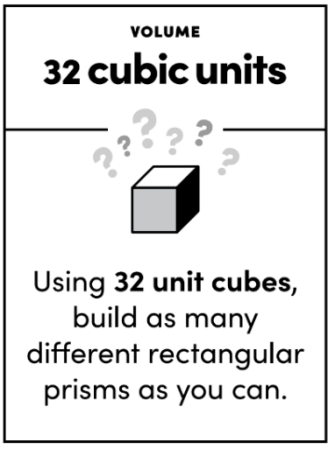
3. Have students share their prisms, adding and taking away layers to find different volumes.

iii. Scaffold the above activity to partially made prisms. Talk about how you could determine the amount of cubes with the prism was complete.

iv. Provide questions without the cubes to get the students thinking about the different dimensions such as: Dave says that a box is 2 units wide, 6 units long, and 3 units tall has a greater volume than a box

that is 3 units wide, 2 units long and 6 units tall. Is he correct? Explain

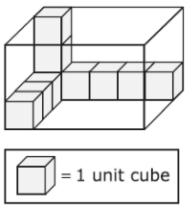
v. Provide opportunities for students to make different rectangular prisms that have the same volume.



vi. Volume Units Activity

d. Students should be exposed to questions like this:

What is the volume of the rectangular prism in cubic units?



e. Lesson Vocabulary: cubic unit, plane figure, solid figure, unit cube, unit square, volume, Review the following key terms: area, face, rectangular prism, square unit

4. **Find Volume Using Unit Cubes-** Students should be taught to extend their understanding of volume in solid figures to include volumes expressed in cubic inches, cubic centimeters, and cubic feet as well as improvised units. Instruct students to use visual models of rectangular prisms, filled or partially filled with unit cubes, to determine volume. Instruct students to recognize that the product of the length and width of the prism represents the number of cubes in one layer and the the height of the prism represents the number of layers. Students should find the unknown measure of one dimension (length, width, or height) when given a rectangular prism's volume and the measures of its other two dimensions.

a. Complete Lesson 2, Sessions 1-3 (3 days)

b. As students see structure in how rectangular prisms are built, they will think of more efficient ways to calculate volume instead of counting each cube. Students' understanding of area will help them from the rectangular prism's base. Since the base is repeated, students discover that volume can be found by multiplying the area of the base (length x width) by the number of layers (height) making up the prism.

i. Evidence that students understand this concept:

1. Students can identify the number of unit cubes that make up the length, width and

height of a rectangular prism.

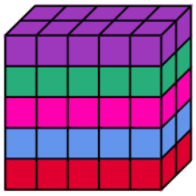
2. Students can find the volume of a rectangular prism using the area of the base and multiplying by the number of layers.

c. Possible strategies include but are not limited to:

i. Students are using repeated addition to determine the volume of rectangular prisms when given dimensions. Students determine how many cubes are in one layer and then use that information to complete the repeated addition.

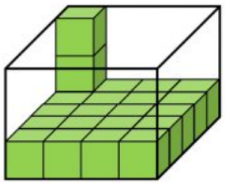
For example, in the picture below students would see/count that there are 5 layers. Each layer has 10 unit cubes.

The equation would be: **10 + 10 + 10 + 10 + 10 = 50 cubic units**

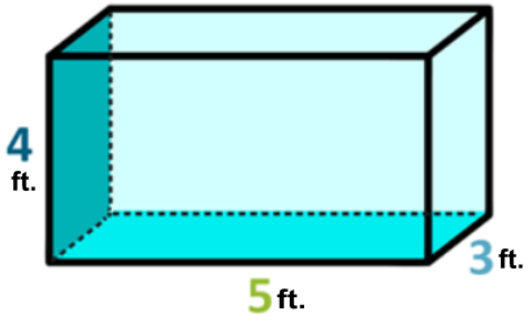


ii. Students should also have opportunities to see and/or build incomplete prisms and determine how many unit cubes the figure would have if it were complete.

From the figure below students would see that there should be three layers, each layer has 20 cubes. **20 + 20 + 20 = 30 cubic units**



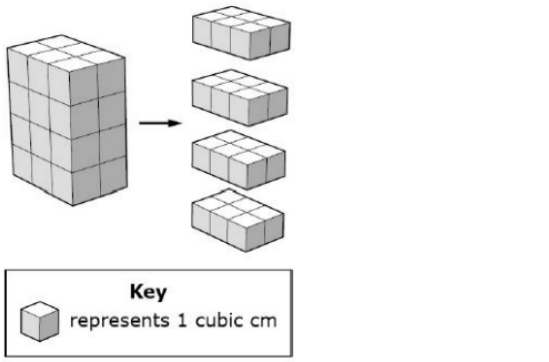
iii. Scaffold the students work union you move to figures that do not have any cubes and just have measurements marking the dimensions. Students will find the area of the base (l x w) and then multiply that number by the height. In the figure below students would multiply 5 x 3 = 15 and 15 x 4 = 60 cubic ft.



iv. Box of Clay Activity

d. Students should be exposed to questions like the following:

Example Stem: The layers of a rectangular prism are shown to the right of the prism.



Enter the volume, in cubic centimeters, of the rectangular prism.

e. Lesson Vocabulary: cubic unit, face, rectangular prism, unit cube, volume

5. **Find Volume using Formulas-** Instruct students to explain how volume formulas are related to finding volume as (number of cubes per layer) X (number of layers). Students should be taught to use volume formulas to find the volume of rectangular prisms and solid figures composed of non-overlapping rectangular prisms. Students should recognize volume as additive, understanding that the volume of a solid figure is the combined volume of the rectangular prisms that compose the solid figure, with no gaps or overlaps

a. Complete Lesson 3, Sessions 1-4 (4 days)

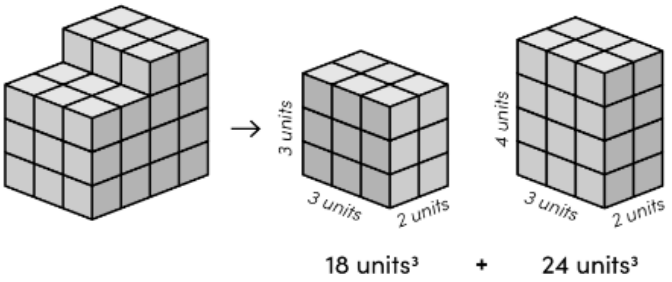
b. Students will extend their understanding of volume through working with composite figures. AS students build and break apart figures make of two rectangular prisms, they learn that the volume of the composite figure is equal to the sum of the volumes of each of the rectangular prisms. Encourage students to identify the two prisms that make up the composite figure.

   i. Evidence students understand this concept:

      1. Students can find the volume of a composite figure by decomposing it into two rectangular prisms and adding the volumes of the prisms together.

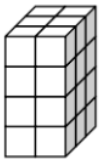
c. Possible strategies include but are not limited to:

   i. Students will solve problems that require finding the volume of solid figures composed of two rectangular prisms. Students should model ways to break apart the figure and develop strategies for finding the volume of the whole figure. Provide the Unifix cubes to students that have a difficult time determining the dimensions of these types of figures when on paper.



ii. At the end of this lesson students will understand that multiplying the length times the width of a right rectangular prism can be viewed as determining how many cubes would be in each layer if the prism were packed with or built up from unit cubes. They also learn that the height of the prism tells how many layers would fit in the prism.

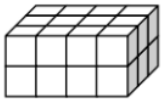
Build the rectangular prism below using unit cubes.



What is the volume of the rectangular prism?

.....

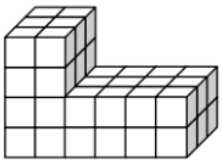
Build the rectangular prism below using new unit cubes.



What is the volume of the rectangular prism?

.....

Combine the two rectangular prisms to make the figure below.

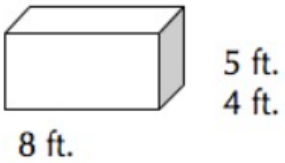


What is the volume of the new composite figure?

d. Once students understand the formula, present them with real world problems such as this one:

Cari is the lead architect for the city's new aquarium. All of the tanks in the aquarium will be rectangular prisms where the side lengths are whole numbers.

Cari's first tank is 4 feet wide, 8 feet long and 5 feet high. How many cubic feet of water can her tank hold?



Cari knows that a certain species of fish needs at least 240 cubic feet of water in their tank. Create 3 separate tanks that hold exactly 240 cubic feet of water. (Ex: She could design a tank that is 10 feet wide, 4 feet long and 6 feet in height.)

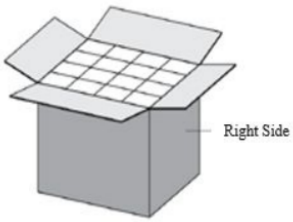
In the back of the aquarium, Cari realizes that the ceiling is only 10 feet high. She needs to create a tank that can hold exactly 100 cubic feet of water.

Name one way that she could build a tank that is not taller than 10 feet.

Note: There are many solutions to this problem.

e. Students should be exposed to problems like these:

A rectangular box is completely filled with 48 same-sized cubes arranged as shown. Julie opens the top of the box and sees 16 cubes.



Julie closes the top and then opens the right side of the box. How many cubes should she see?

Enter your answer in the response box.

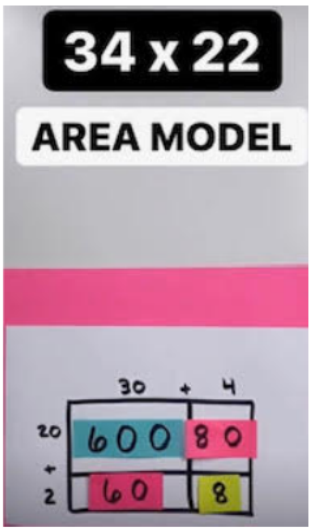
f. Lesson Vocabulary: base (of a prism), Review the following key terms: area, cubic unit, formula, volume

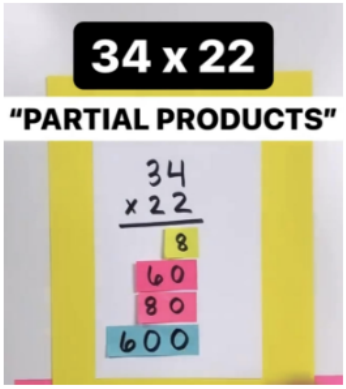
6. **Multiply Multi-Digit Numbers-** Instruct students to apply place-value understanding as they begin to use the standard algorithm for multiplication. Students should be taught to use the distributive property and area models to break apart factors and compute partial products. Instruct students to combine partial products to find products. Students should be taught and provided opportunities to multiply the multi-digit whole numbers with accuracy and efficiency using the standard algorithm.

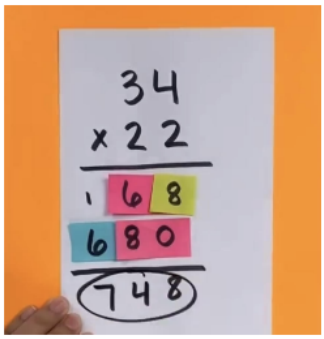
a. Complete Lesson 4, Sessions 1-4 (4 days)

b. Students will use what they know about the area model and partial products to learn and understand the standard algorithm for multiplying multi-digit numbers. It is important to show the relationship

between the area model, partial products, and standard algorithm so students do not think the algorithm is new. See the pictures below as one way to show this:







c. Possible strategies include but are not limited to:

i. Provide multiple opportunities for students to solve problems using partial products, including three- and four-digit by two-digit problems. Have the students use the order for multiplying the same order you would use for the algorithm. Start with multiplying the ones, then the tens, etc.

ii. A common misconception when teaching the algorithm is: Students may overlook the place value of digits, or forget to use zeros as place holders, resulting in an incorrect partial product and ultimately the wrong answer.

iii. Increase from two-digit by two-digit problems to three- and four-digit by two-digit problems.

iv. Use context when teaching instead of 'naked' equations.

d. Students should be exposed to problems like these:

Part A

A company sells phones for $515.00 each.

What is the total amount of money, in dollars, the company earns from selling 856 phones?

Enter your answer in the box.

$ ☐

Part B

The parts to build these phones cost $189.00 for each phone.

What is the total cost, in dollars, of parts to build 856 phones?

Enter your answer in the box.

$ ☐

Part A

Which pairs of factors have a product between 2,000 and 3,000?

Select the **three** pairs that apply.

- ☐ A. 8×200
- ☐ B. 9×300
- ☐ C. 70×30
- ☐ D. 90×20
- ☐ E. 700×3
- ☐ F. 800×4

Part B

Which two pairs of factors have a product of about 2,700?

Select the **two** pairs of factors that apply.

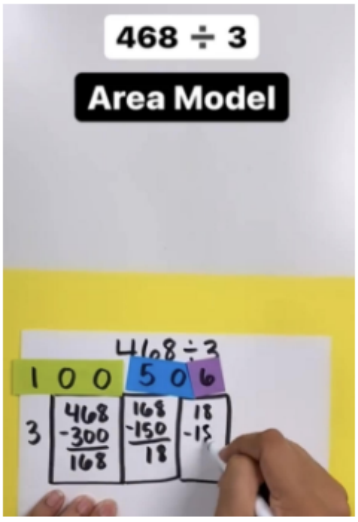
- ☐ A. 9×313
- ☐ B. 9×382
- ☐ C. 84×21
- ☐ D. 86×39
- ☐ E. 912×3

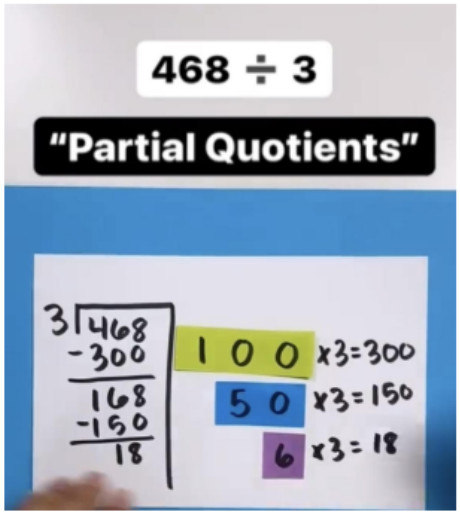
e. Lesson Vocabulary: algorithm, factor, partial products, product

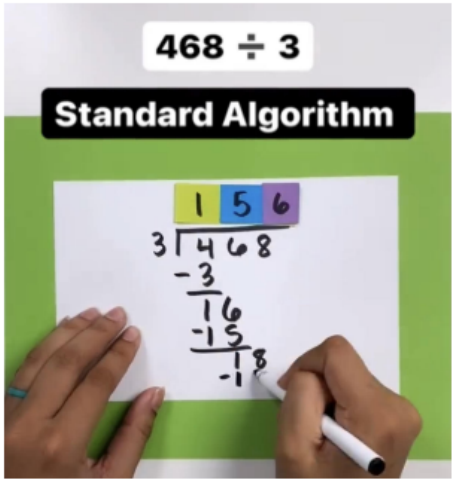
7. **Divide Multi-Digit Numbers**- Instruct students to divide dividends of up to four digits by two-digit divisors. Students should be taught to see division problems as missing factor problems in which the quotient is the unknown factor. Students should use estimation as a strategy to begin finding a quotient when dividing. Instruct students to apply place-value understanding to find partial quotients and record the quotient as the sum of the partial quotients

a. Complete Lesson 5, Sessions 1-5 (5 days)

b. Students will use what they know about the area model and partial quotients to learn and understand the standard algorithm for dividing multi-digit numbers. It is important to show the relationship between the area model, partial products, and standard algorithm so students do not think the algorithm is new. See the pictures below as one way to show this: **(According to the standards, students DO NOT have to master the standard algorithm)**



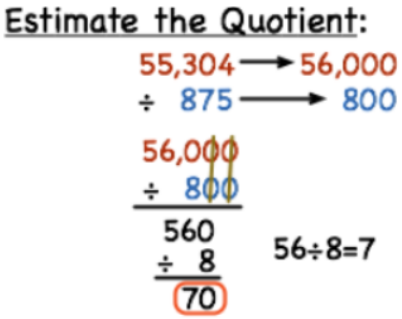




c. Possible strategies include but are not limited to:

i. When estimating a quotient, students should look for a compatible number, a common misconception is for students to find the exact answer and then round the quotient to estimate.

Compatible numbers are numbers that are close to the numbers they're replacing that divide evenly into each other



1. 56,000 is pretty close to 55,304
2. 800 is pretty close to 875, AND it divides evenly into 56,000
3. Divide the non-zero parts of each number, 56÷8, to get the first part of the estimate
4. Then add on however many zeros were left in the problem to get your estimate
5. In this case, we had

one zero left so the estimate is 70

d. Use context when teaching instead of ‘naked’ equations.

e. Students should be exposed to problems like the following:

Part A

An expression is shown.

$$\frac{257+18}{25}$$

Which expressions have the same value as the expression shown?

Select the **three** correct expressions.

- A. $\frac{257-18}{25}$
- B. $\frac{257}{25}+\frac{18}{25}$
- C. $(18+257)\div 25$
- D. $25\div(257+18)$
- E. $257\div 25+18\div 25$
- F. $257\div 25-18\div 25$

Part B

An area model for division is shown. It can be used to find the value of the quotient of $3,195\div 15$.

Area Model

	200	10	S
15	3,000	Q	45

- Determine the number that each letter represents in the area model.
- Explain completely how you determined the value of each letter.
- Explain how to determine the quotient of the division problem using the completed area model. Be sure to use the expression $3,195\div 15$ in your explanation.

Enter your answer and your explanations in the space provided.

A teacher drew an area model to find the value of $6{,}986\div 8$.

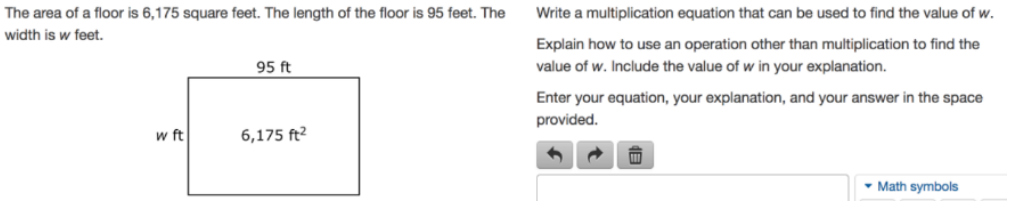
Teacher's Model for 6,986 ÷ 8

	800	N	P	R
8	M	560	Q	

not to scale

- Determine the number that each letter in the model represents and explain each of your answers.
- Write the quotient and remainder for $6{,}986\div 8$.
- Explain how to use multiplication to check that the quotient is correct. You may show your work in your explanation.

Enter your answers and your explanations in the space provided.



f. Lesson Vocabulary: inverse operations, Review the following key terms: divided, division, divisor, partial quotients, quotient.

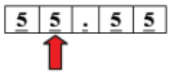
8. **Understand Decimal Place Value**- Instruct students to extend their understanding of place value to include decimals to the thousandths place. Students should be taught that for both whole numbers and decimals, a digit in the one place not only has ten times the value it would have in the place to its right but also has one-tenth of the value it would have in the place to its left. Students should be taught to connect dividing by 10 to finding 1/10 of a number and to multiplying the number by 1/10 . Instruct students to use visual models to explore place-value patterns in numbers. Students should be guided to write equations that show relationships between numbers based on multiplying or dividing by 10.

a. Complete Lesson 6, Sessions 1-3 (3 days)

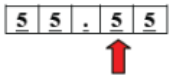
b. Oftentimes students have difficulty with understanding the value of a decimal even when using a place value chart. It can be confusing to students to rename the place value blocks that they know well. This technique is from Marilyn Zecher. Give students a cube of clay and explain that this cube represents 1 whole. (The cube should be close to the size of a place value block that is used as one because that is where your decimals come from, they are part of that 'one'.) Next, use a flosser to cut the cube into ten pieces (flat). Use a place value chart to show that these are "tenths" and that the pattern of place value continues to the right of the decimal point (these flat tenth pieces are the same shape as the hundreds blocks in base 10). Next, you can cut 1 tenth of clay into ten pieces, and name them "hundredths" (rod). And finally, 1 hundredth can be cut into 10 "thousandths". (These pieces will be rod and cube-shaped, respectively, imitating the base ten blocks for tens and ones on the left side of the decimal point.)This is a good small group activity however it can be used with the whole class.

Using this decimal in particular, students can visually see that a digit in one place represents ten times as much as it represents in the place to its right and 1/10 what it represents to its left. Students can see the pieces getting smaller.

In the number 55.55, each digit is 5, but the value of the digits is different because of the placement.



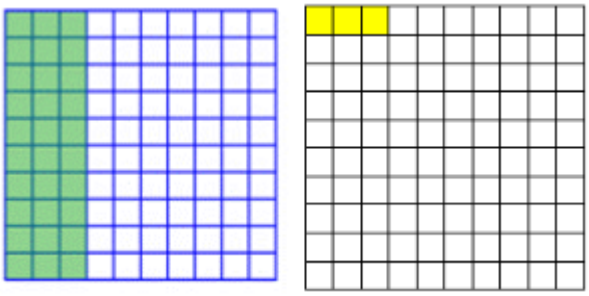
The 5 that the arrow points to is $\frac{1}{10}$ of the 5 to the left and 10 times the 5 to the right. The 5 in the ones place is $\frac{1}{10}$ of 50 and 10 times five tenths.



The 5 that the arrow points to is $\frac{1}{10}$ of the 5 to the left and 10 times the 5 to the right. The 5 in the tenths place is 10 times five hundredths.

c. Possible strategies include but are not limited to:

i. Use models and have students write equations the represent the relationship between the numbers:



0.3 ÷ 10 = 0.03

ii. Use context when providing examples for the students. For example: *A ping pong ball has a mass of 0.02 kg and a lacrosse ball has a mass of 0.2 kg. How is the mass of the lacrosse ball related to the mass of the ping pong ball? The mass of the lacrosse ball 0.2 kg, is 10 times the mass of the ping pong ball, 0.02 kg. The digit 2 in 0.02 is moved one place to the left in 0.2, so 0.2 is 10 times 0.02.*

d. A common misconception that students have when trying to extend their understanding of whole number place value to decimal place value is that as you move to the right of the decimal point, the number increases in value. Reinforcing the concept of powers of ten is essential for addressing this issue.

e. Students should be exposed to the following types of problems:

If the 9 were moved two places to the left, which statement describes the relationship between the present value of 9 and the new value of 9?

7,869

- A. The new value would be 100 times the present value.
- B. The new value would be 10 times the present value.
- C. The new value would be $\frac{1}{10}$ times the present value.
- D. The new value would be $\frac{1}{100}$ times the present value.

Which statement is true?

- A. The value of 7 in 0.75 is $\frac{1}{10}$ the value of 7 in 0.075.
- B. The value of 7 in 7.5 is $\frac{1}{100}$ the value of 7 in 0.75.
- C. The value of 7 in 75 is 10 times the value of 7 in 7.5.
- D. The value of 7 in 750 is 100 times the value of 7 in 75.

Drag and drop an operation symbol and a number into the appropriate blanks to make a true statement.

× ÷ 1/10 1 1/100 10 100

35 ☐ ☐ = 3.5

f. Lesson Vocabulary: base ten, thousandths, decimal, place value

9. **Understand Powers of 10**- Students should explore the concept of powers of 10. Students should be taught to recognize patterns in the number of zeros and in the placement of the decimal point when a number is multiplied or divided by a power of 10, understanding that the position of the decimal point is always between the ones place and the tenths place. Students should be introduced to exponents as a way to write the powers of 10. Students should be taught to relate an exponent to the number of zeros in a product or quotient when a number is multiplied or divided by a power of 10 as well as to the placement of the decimal point in the product or quotient and the place value of each digit.

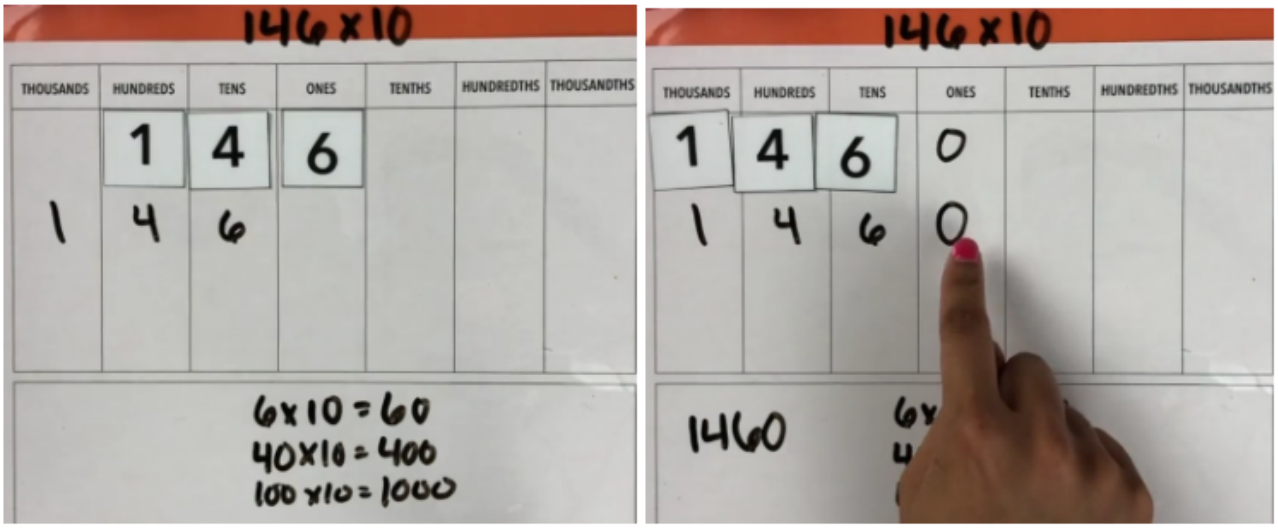
a. Complete Lesson 7, Sessions 1-3 (3 days)

b. Possible strategies include but are not limited to:

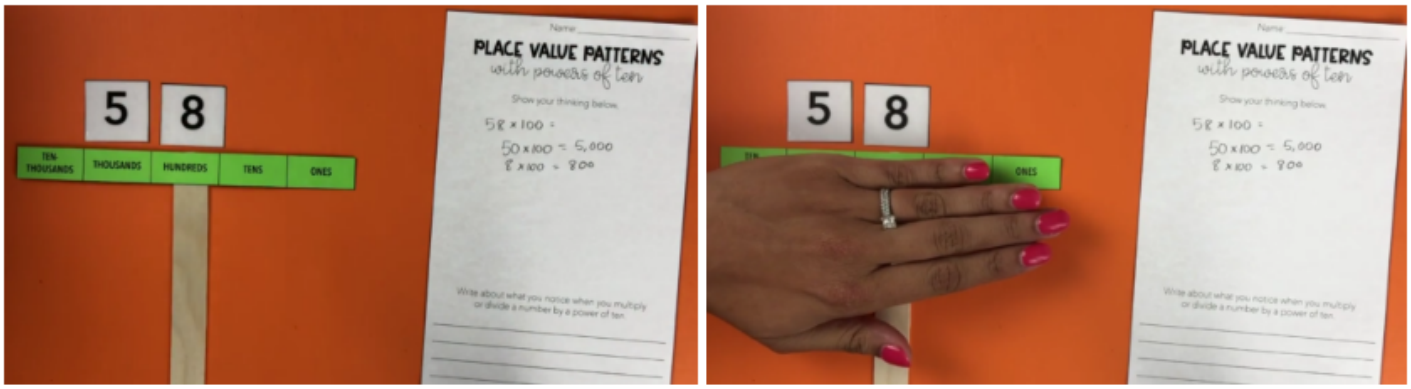
i. When teaching students about the powers of ten, it is important to avoid strictly teaching rules. Students will come up with their own rules based on what they see/do with the powers of ten. Students should understand powers of ten beyond adding zeros and moving a decimal.

1. With whole numbers, use a place value chart and share a multiplication problem like the one shown in the picture: 146 x 10. Take each number in the non-ten digit and break it up into its values and multiply each by ten (see the work below the place value chart.) Students will see that when multiplied the 6 is 60, which moves it over in the chart one place value. Continue with the rest of the digits. In the end, place a zero in the ones place to serve as a placeholder/ Without it, the number would read 146 and not 1,460.

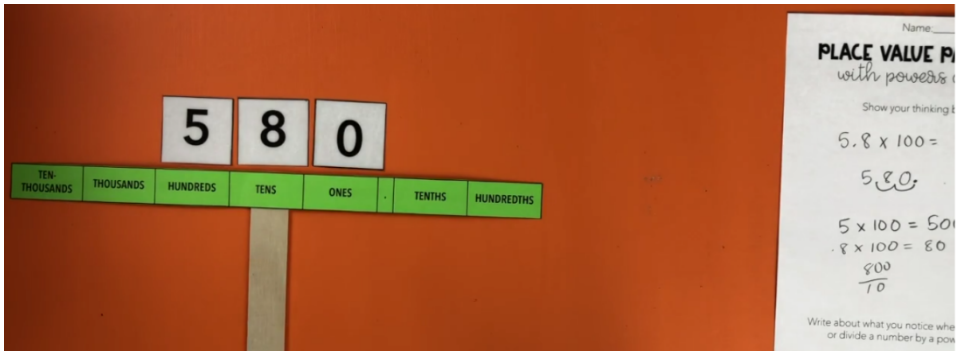
Continue this with students to show them when we are multiplying by a power of ten we are shifting the numbers to a new position based on that power of ten. (From Mix and Math 360°)



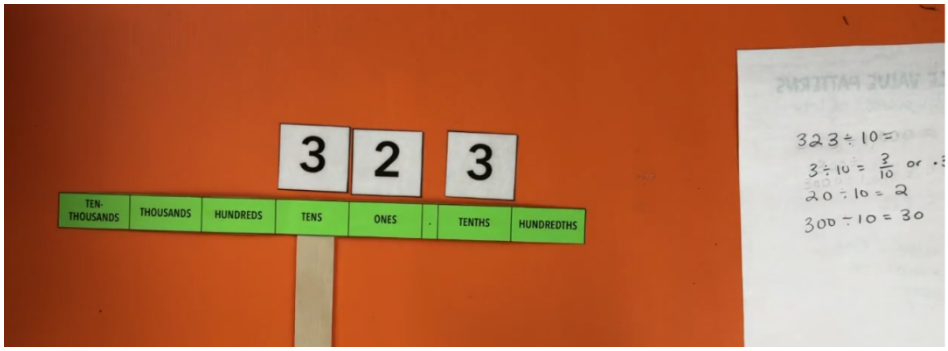
Another way would be to use an open place value chart like the one below. Students could physically shift the numbers or the chart based on what they are multiplying and see if they removed the place value chart you would have the number 58, therefore you need to add in the zero placeholder. (From Mix and Math 360°)



This can also be shown with decimals. See below:

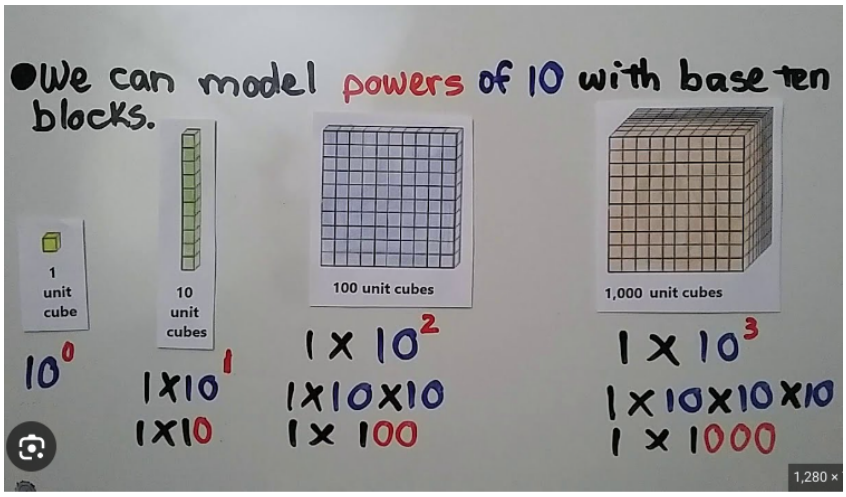


ii. You can use the same models to show dividing by the powers of ten. See below.



iii. Another way would be to use blue painter's tape, and make a "place value frame" on the floor of the classroom. Use a playground ball (handball, basketball, soccer ball, etc.) to represent the decimal point. Give students a piece of paper with a digit on it and then they stand in the "place value frame." Call out an operation and a power of ten ("Multiply by 100″ or " Divide by 1,000″) and the students shift accordingly. Have some "zeros" ready for when the students shift to the point that a place value is empty. This activity not only provides a great visual for the students but also adds an active element for your more kinesthetic learners.

iv. Exponents- the number in a power that tells how many times to use the base as a factor in repeated multiplication. One way to model this is with base ten blocks. See below.



c. Students should be exposed to the following types of problems:

Part A

The numbers shown are written using numerals, base-ten numerals, or expanded form.

Which number is equivalent to one million twenty-three thousand and which number is equivalent to one thousand twenty-three?

Drag and drop each number into the correct box.

One Million Twenty-Three Thousand	One Thousand Twenty-Three

1.023×10^3	1,023,000
1,023	$1 \times 1{,}000 + 2 \times 10 + 3 \times 1$
$1{,}023 \times 10^3$	$1 \times 1{,}000{,}000 + 2 \times 10{,}000 + 3 \times 1{,}000$

Part B

Which numbers show 1,034.17 rounded correctly to different place values?

Select the **three** correct answers.

- A. 1,000
- B. 1,030
- C. 1,035
- D. 1,100
- E. 1,034.1
- F. 1,034.2

\

About 100,000 people live in a town. The number 100,000 can be written as 10^n, where n is a whole number. What is the value of n?

Enter your answer in the box.

Select the expression that has a value equivalent to 10^4.

- A. $10 + 4$
- B. 10×4
- C. $10 \times 10 \times 10 \times 10$
- D. $4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4$

Solve these equations.

Part A

Enter your answers in the boxes.

$200 \times 10 =$ ☐

$200 \times 100 =$ ☐

$200 \times 1{,}000 =$ ☐

Part B

Enter your answers in the boxes.

$200 \times 0.1 =$ ☐

$200 \times 0.01 =$ ☐

$200 \times 0.001 =$ ☐

d. Lesson Vocabulary: base (of a power), exponent, power of 10, Review the key term decimal

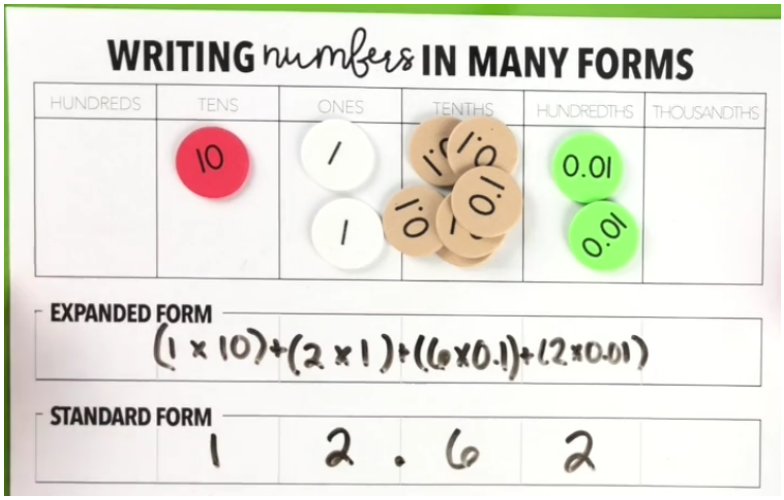
10. **Read and Write Decimals-** Instruct students to apply their knowledge of decimal place value to read and write decimals to the thousandths place in standard form, word form, and expanded form. Students should be taught to recognize that the expanded form of a decimal can be written in decimal form and fraction form. Instruct students to write a decimal given in one form in another form.

a. Complete Lesson 8, Sessions 1-4 (4 days)

b. Possible strategies include but are not limited to:

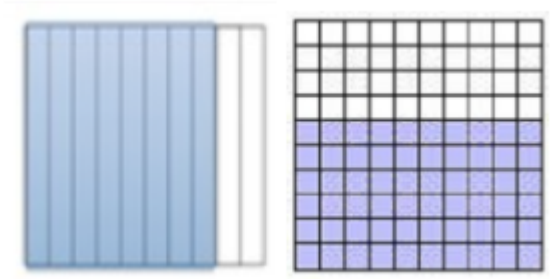
   i. If students need a review, see the place value chart strategy with clay in Lesson 6 (in this unit) for understanding the place value of a decimal.

   ii. Start with concrete, if you don't want to use the clay as an example, you can use place value disks. Renaming place value blocks might be confusing for some students. (From Mix and Math 360°)



i. When reading decimals to students, read them the way you would write them in word form. This allows students to have many opportunities to hear how decimals are said. Instead of saying 65 point 23, say sixty-three and twenty-three hundredths. The more exposure to the words the more likely the students will be to use them.

ii. Students might need a reminder of how fractions and decimals are related so one way to remind them would be to use 10 and 100 grids (see below). This will also help with reading a decimal since they are read like a fraction and writing them in expanded form as a fraction.

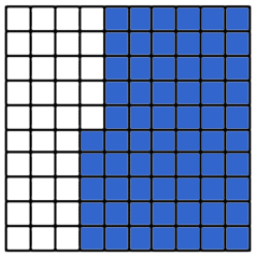


Here is an example:

0.65, 65/100

60/10 + 5/100

You can see the 6 tenths and 5 hundredths



c. Students should be exposed to the following types of problems:

What is 293.61 in expanded form?

Drag and drop a number into each box.

$2 \times \square + 9 \times \square + 3 \times \square + 6 \times \square + 1 \times \square$

1,000	$\frac{1}{1,000}$	10	10,000	$\frac{1}{10}$
1	$\frac{1}{100}$	0	$\frac{1}{10,000}$	100

Mrs. Bell wrote the expanded form of a number, as shown.

$$5 \times 100 + 4 \times 10 + 6 \times 1 + 2 \times \left(\frac{1}{10}\right) + 8 \times \left(\frac{1}{1000}\right)$$

What is the number written in standard form?

Enter your answer in the box.

Which numbers or expressions have the same value as twenty-nine thousandths?

Select the **two** correct answers.

- A. 0.29
- B. 2.9
- C. 0.029
- D. $2 \times \frac{1}{10} + 9 \times \frac{1}{1000}$
- E. $2 \times \frac{1}{10} + 9 \times \frac{1}{100}$
- F. $2 \times \frac{1}{100} + 9 \times \frac{1}{1000}$

d. Lesson Vocabulary: expanded form, Review the following key terms: decimal, hundredths, mixed number, tenths, thousandths

11. **Compare and Round Decimals-** Instruct students to use the decimal place-value understandings they gained in previous lessons to compare and round decimals through thousandths. Students should be taught to use number lines, place-value charts, and fractional representations to compare two decimals and to round decimals to the nearest hundredth, tenth, and whole number.

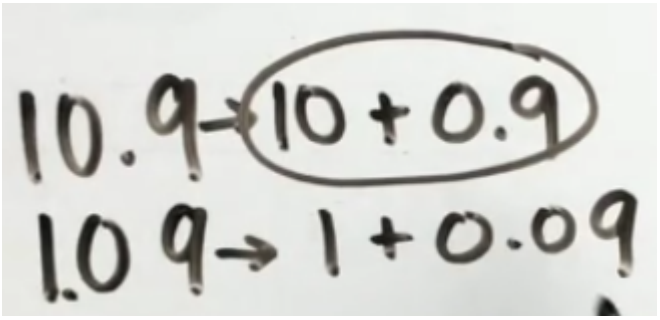
a. Complete Lesson 9, Sessions 1-4 (4 days)

b. A common misconception that is directly related to comparing whole numbers is the idea that the longer the number, the greater the number. With whole numbers, a 5-digit number is always greater that a 1-, 2-, 3-, or 4-digit number. However, with decimals, a number with one decimal place may be greater than a number with two or three decimal places. For example, 0.5 is greater than 0.12, 0.009 or 0.499. One method for comparing decimals is to make all numbers have the same number of digits to the right of the decimal point by adding zeros to the number, such as 0.500, 0.120, 0.009 and 0.499. A second method is to use a place-value chart to place the numerals for comparison.

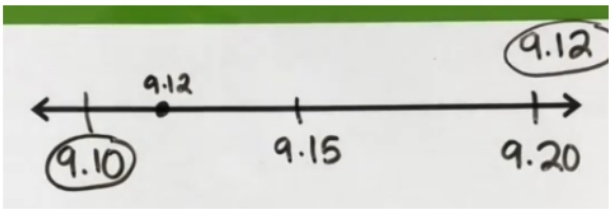
c. Possible strategies include but are not limited to:

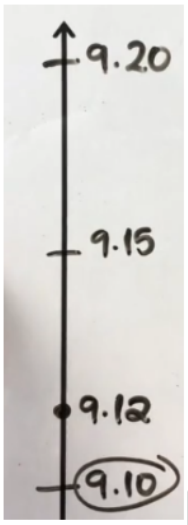
   i. Allow students to solve problems with a context, using real world examples.

   ii. When comparing numbers it is important to have students refer back to the actual values of each digit. Both of these decimals have three digits: 10. 9 and 1.09. When you break them up into expanded form you see that 10 is more than 1 + 0.09 when added together, therefore 10.9 is greater than 1.09. If students still have difficulty, model with base ten blocks. (From Mix and Math 360°)



iii. Instead of looking at decimals in isolation, encourage students to look at numbers as they relate to the numbers around them. It is helpful to students to create a number line and make note of the midpoint decimal to see which decimal it is closest to. Here is an example of rounding 9.12 to the nearest tenth on an open number line (horizontal and vertical versions).

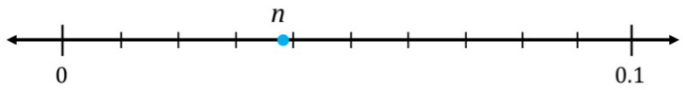




A task you can try with your

students is below:

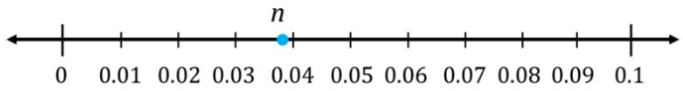
A number n is shown on the number line.



1. The tick marks are evenly spaced. Label them. 2. What is n rounded to the nearest hundredth? 3. What is n rounded to the nearest tenth?

Solution

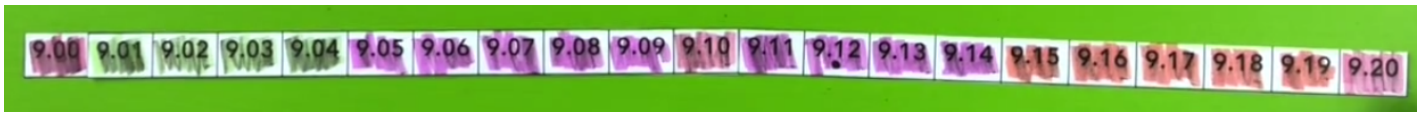
First, label all of the tick marks:



We can see that n is closer to 0.04 than 0.03, so it rounds up to 0.04.

We can also see that n is closer to 0 than to 0.1, so n rounds down to 0.

iv. One more way to show and practice rounding is to use a number path. Students use these in the lower grades, but you can level it up using decimals. Color code the path based on where decimals would round to: (From Mix and Math 360°)



d. Students should be exposed to the following types of problems:

A class took a survey of various Internet Service Providers and recorded the downloading speed o service, as shown in the table.

Internet Speeds

Internet Service Provider	Speed (Mbps)
A	2.532
B	2.435
C	2.564
D	2.439

Drag and drop the speeds and symbols into each empty box to create correct comparisons.

2.435 2.564 > = <

2.439 ☐ ☐ 2.532 ☐ ☐

Part A

Select the **two** statements that are **incorrect**.

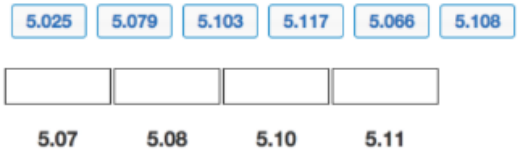
- A. 0.1951 rounds to 0.19
- B. 1.3976 rounds to 1.398
- C. 2.8102 rounds to 2.7
- D. 5.2547 rounds to 5.25
- E. 6.0007 rounds to 6.001

Part B

Select the **two** statements that show a number correctly rounded to the **thousandths** place.

- A. 0.1951 rounds to 0.19
- B. 1.3976 rounds to 1.398
- C. 2.8102 rounds to 2.82
- D. 5.2547 rounds to 5.254
- E. 6.0007 rounds to 6.001
- F. 4.8961 rounds to 4.89

Drag and drop one number into each box. When you are finished, the number inside each box should match the number below the box when rounded to the nearest hundredth.



e. Lesson Vocabulary: inequality, Review the following key terms: compare, greater than symbol (>), less than symbol (<), place value

12. **Add Decimals**- Instruct students to add decimals to hundredths. Students should use visual models such as place-value charts, number lines, and base-ten models; they conceptualize and explain decimal addition. Students should be taught to apply the standard algorithm for addition to decimals but are not expected to achieve fluency. Instruct students to use their rounding and estimation skills to estimate a decimal sum to check whether a result is reasonable.

a. Complete Lesson 10, Sessions 1-3 (3 days)

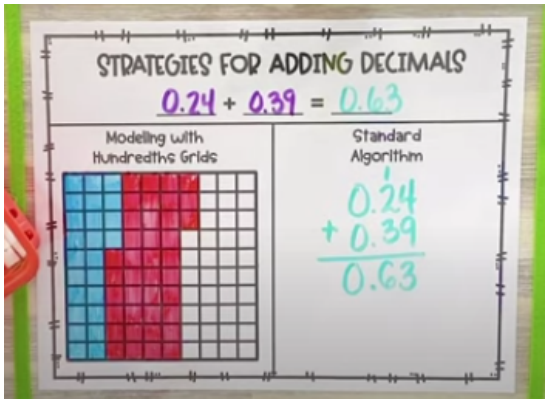
b. Students should be able to express that when they add decimals, they add tenths to tenths and hundredths to hundredths. So, when they are adding in a vertical format (numbers beneath each other), it is important that they write numbers with the same place value beneath each other. This understanding can be reinforced by connecting addition of decimals to their understanding of addition of fractions. Adding fractions with denominators of 10 and 100 is a standard in fourth grade.

c. Possible strategies include but are not limited to:

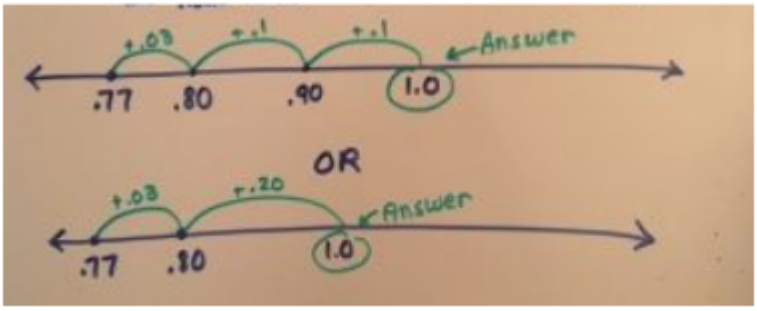
   i. Allow students to solve problems with a context, using real world examples.

   ii. Provide students with a visual model for adding decimals so they can one decimal adding on to

the other..

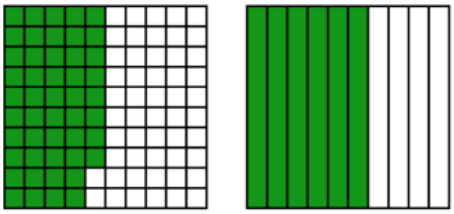


iii. Students should be taught how to add decimals on a number line. Using an open number line is helpful so students can make and label their own moves. For example: .23 + 77 = 1.0

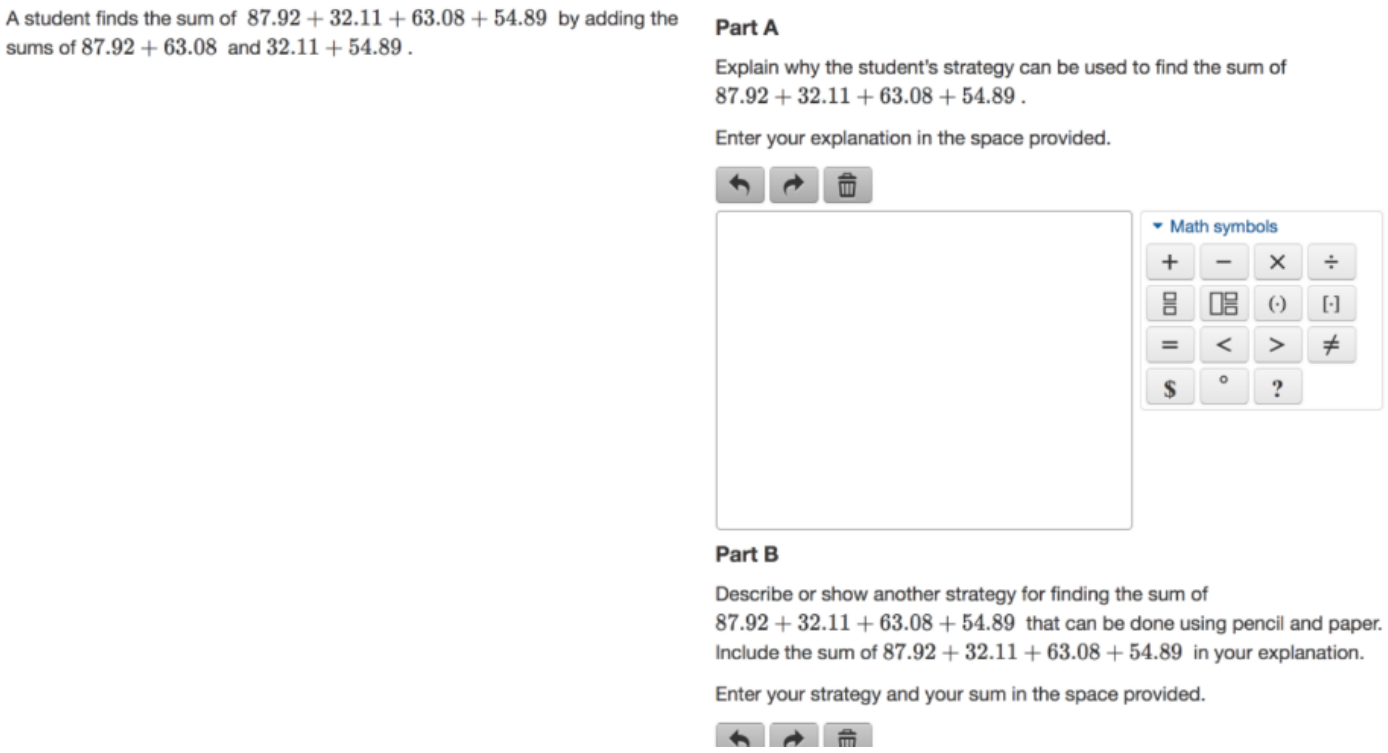


d. Students should be exposed to the following types of problems:

Find the sum of 0.48 and 0.6. You may use the models shown to help find the sum.



- A. 0.42
- B. 0.54
- C. 1.08
- D. 1.80



e. Lesson Vocabulary: There is no new vocabulary. Review the following key terms: decimal, estimate (verb), place value, sum

13. **Subtract Decimals**- Instruct students to use place-value charts, number lines, and base-ten models to subtract decimals to hundredths. Students should also use the relationship between addition and subtraction to explore using the adding on to subtract strategy with decimals. As with decimal addition, students should work with the standard algorithm format to subtract decimals but are not expected to achieve fluency with this method. Instruct students to use their rounding and estimation skills to estimate a decimal difference to check whether a result is reasonable.

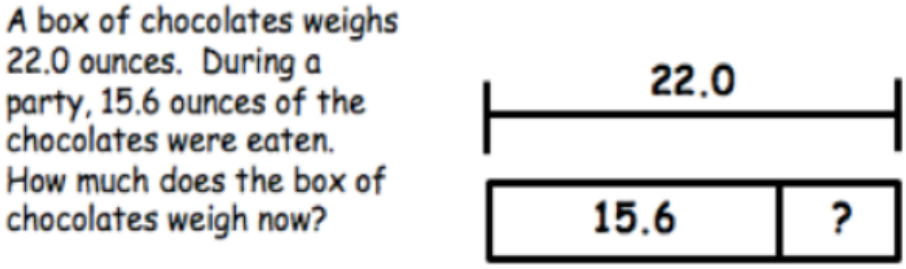
a. Complete Lesson 11, Sessions 1-4 (4 days)

b. Students should be able to express that when they subtract decimals, they subtract tenths to tenths and hundredths to hundredths. So, when they are subtracting in a vertical format (numbers beneath each other), it is important that they write numbers with the same place value beneath each other. This understanding can be reinforced by connecting subtraction of decimals to their understanding of subtractions of fractions. Subtracting fractions with denominators of 10 and 100 is a standard in fourth grade.

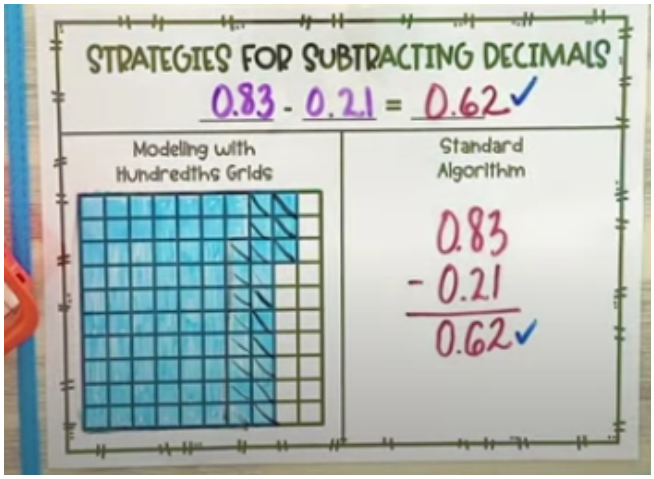
c. Possible strategies include but are not limited to:

   i. Allow students to solve problems with a context, using real world examples.

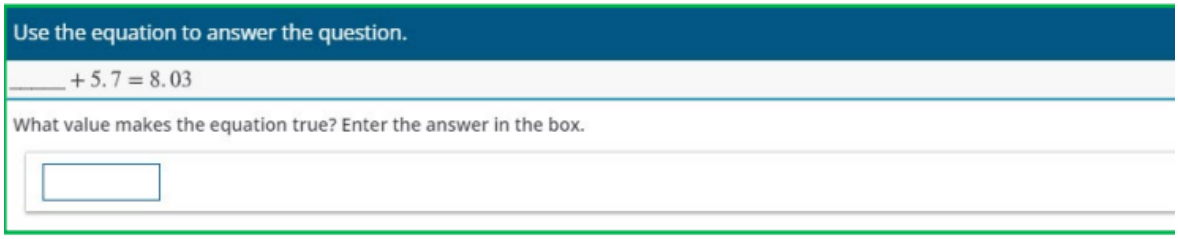
   ii. Students can use bar models to understand what the problem is asking:



iii. Provide students with a visual model for subtracting decimals so they can see how one decimal is being taken away.



d. Students should be exposed to the following type of problem:



e. Lesson Vocabulary: There is no new vocabulary. Review the following key terms: decimal, difference

GENERAL QUESTIONS FOR TEACHER USE

Adapted from Growing Success and materials from Math GAINS and TIPS4RM (Georgia Department of Education)

Reasoning and Proving

• How can we show that this is true for all cases?

• In what cases might our conclusion not hold true?

• How can we verify this answer?

• Explain the reasoning behind your prediction.

• Why does this work?

• What do you think will happen if this pattern continues?

• Show how you know that this statement is true.

• Give an example of when this statement is false.

• Explain why you do not accept the argument as proof.

• How could we check that solution?

• What other situations need to be considered?

Reflecting

• Have you thought about...?

• What do you notice about...?

• What patterns do you see?

• Does this problem/answer make sense to you?

• How does this compare to...?

• What could you start with to help you explore the possibilities?

• How can you verify this answer?

• What evidence of your thinking can you share?

• Is this a reasonable answer, given that...?

Selecting Tools and Computational Strategies

• How did the learning tool you chose contribute to your understanding/solving of the problem? Assist in your communication?

• In what ways would [name a tool] assist in your investigation/solving of this problem?

• What other tools did you consider using? Explain why you chose not to use them.

• Think of a different way to do the calculation that may be more efficient.

• What estimation strategy did you use?

Connections

• What other math have you studied that has some of the same principles, properties, or procedures as this?

• How do these different representations connect to one another?

• When could this mathematical concept or procedure be used in daily life?

• What connection do you see between a problem you did previously and today's problem?

Representing

• What would other representations of this problem demonstrate?

• Explain why you chose this representation.

• How could you represent this idea algebraically? graphically?

• Does this graphical representation of the data bias the viewer? Explain.

• What properties would you have to use to construct a dynamic representation of this situation?

• In what way would a scale model help you solve this problem?

Note: The instructor is encouraged to consult the supplemental resources located under materials to personalize and differentiate instruction for students, as well as address any learning gaps based on formative assessments.

Evidence/Performance Tasks

Formative Assessment:

- Fact Fluency Practice Assessments
- Administer Ready Math Lesson Quizzes at the end of each Lesson
- Administer Comprehension Check (digital)

Summative Assessments:

- Administer Ready Math Mid-Unit Assessments
- Administer Ready Math End of Unit Assessments

Benchmark Assessments:

- iReady Diagnostic
- Fact Fluency Assessment
- Acadience Assessment (As a reference, these assessments are not administered by the classroom teacher)

Alternative Assessments:

- Informal Observation
- Small Group Observation
- Exit Tickets
- Math Journal
- Oral and Written Explanations of Reasoning

Materials

The following are approved resources that teachers can include to further unit related objectives:

- Ready Math Teacher Toolbox Resources
    - Whole Class Instruction
        - Teach: Instruction & Practice, Interactive Tutorials,
        - Assess: Lesson Quizzes & Unit Assessments
    - Small Group Differentiation

        - Prepare: Prerequisite Lessons
        - Reteach: Tools for Instruction
        - Reinforce: Math Center Activities
        - Extend: Enrichment Activities
- Ready Math Workbook
- Ready Math Slides
- Digital Math Tools
- iReady My Path
- Learning Games
- The First 10 Weeks Number Talks
- The Second 10 Weeks Number Talks
- The Third 10 Weeks Number Talks
- The Fourth 10 Weeks Number Talks
- Manipulatives: counters, tens frames, connecting cubes, base 10 blocks, fraction strips,
- White boards
- Number paths
- Hundred charts
- Blank Bar Models
- Grid Paper
- Blank Number Bonds
- CPS District Mathematics Google Drive Folder
- Literature to assist in teaching:
    - *Counting on Frank* by Rod Clements (Volume/Powers of Ten)
    - *Fractions, Decimals, and Percents* by David A. Adler
    - *Perimeter, Area, and Volume: A Monster Book of Dimensions* by David A. Adler

Supplemental Resources:

- Grade 5 NJSLA Math Questions- Organized by Topic
- Acing Math- Card games that support a variety of math skills
- Three Act Task: Volume (Got Cubes)
- Three Act Task: Volume (Packing Sugar)
- Three Act Task: Volume (Overflow)
- Three Act Task: Volume (The Fish Tank)
- Three Act Task: Comparing and Ordering Decimals (Final Lap)
- Three Act Task: Comparing and Ordering Decimals (Chasing Gold)
- Real-World problem examples
- Tasks Aligned with Fifth Grade Standards

Any additional resources that are not included in this list will be presented to and reviewed by the supervisor before being included in lesson plans. This ensures resources are reviewed and vetted for relevance and appropriateness prior to implementation.

Standards

MATH.K-12.1	Make sense of problems and persevere in solving them
MATH.K-12.2	Reason abstractly and quantitatively
MATH.K-12.3	Construct viable arguments and critique the reasoning of others
MATH.K-12.4	Model with mathematics
MATH.K-12.5	Use appropriate tools strategically
MATH.5.NBT.A.1	Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
MATH.K-12.6	Attend to precision
MATH.5.NBT.A.2	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.
MATH.5.NBT.A.3	Read, write, and compare decimals to thousandths.
MATH.K-12.7	Look for and make use of structure
MATH.5.NBT.A.3.a	Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 ×

	(1/1000).
MATH.5.NBT.A.3.b	Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
MATH.K-12.8	Look for and express regularity in repeated reasoning
MATH.5.NBT.A.4	Use place value understanding to round decimals to any place.
MATH.5.NBT.B.5	With accuracy and efficiency, multiply multi-digit whole numbers using the standard algorithm.
MATH.5.NBT.B.6	Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
MATH.5.NBT.B.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.
ELA.L.KL.5.1	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
ELA.L.KL.5.1.A	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases.
ELA.L.VL.5.2	Determine or clarify the meaning of unknown and multiple-meaning academic and domain-specific words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.
MATH.5.M.B.2	Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
MATH.5.M.B.2.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.
MATH.5.M.B.2.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.
MATH.5.M.B.3	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and non-standard units.
MATH.5.M.B.4	Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
MATH.5.M.B.4.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.
MATH.5.M.B.4.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.
MATH.5.M.B.4.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.
ELA.SL.PE.5.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 5 topics and texts, building on others’ ideas and expressing their own clearly.
ELA.SL.PE.5.1.B	Follow agreed-upon rules for discussions and carry out assigned roles.
ELA.SL.PE.5.1.C	Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
TECH.9.4.5.CI	Creativity and Innovation

Suggested Strategies for Modification

Possible accommodations/modification for Fifth Grade

Note: Teachers can find more specific modifications for English learners, learners with special needs,learners reading below grade level, and advanced learners on the Ready Math website.