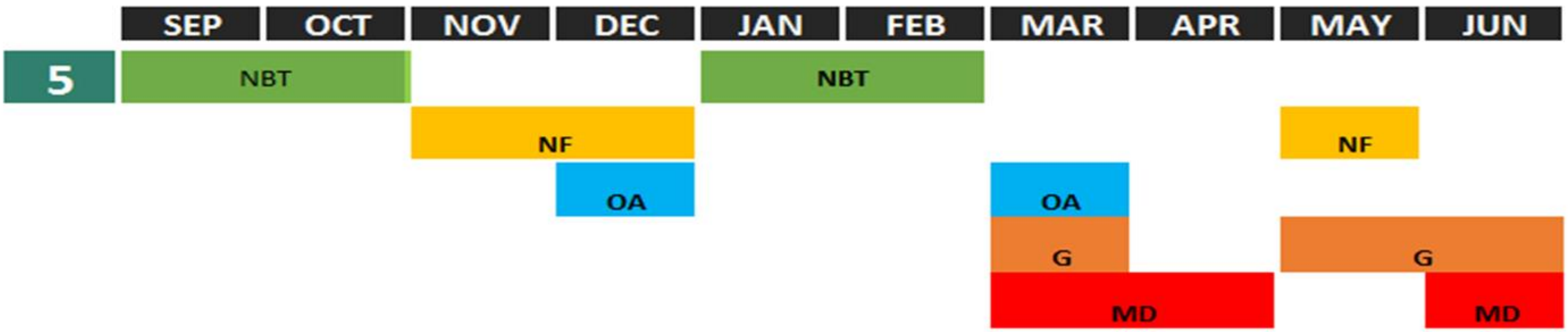
5th Grade Mathematics

Unit 3 Curriculum Map – Math in Focus

Decimals, data, two-dimensional figures and volume

ORANGE PUBLIC SCHOOLS
OFFICE OF CURRICULUM AND INSTRUCTION
OFFICE OF MATHEMATICS

A STORY OF UNITS



Numbers Base Ten: Understand the place value system and perform operations with multi-digit whole numbers and with decimals to hundredths

Numbers and Operations-Fractions: Use equivalent fractions as a strategy to add and subtract fractions and apply and extend previous understandings of multiplication and division to multiply and divide fractions

Operations and Algebraic Thinking: Write and interpret numerical expressions and analyze patterns and relationships

Geometry: Graph points on the coordinate plane to solve real-world and mathematical problems and classify two-dimensional figures into categories based on their properties

Measurment and Data: Convert like measurement units within a given measurement system, represent and interpret data, and understand concepts of volume and relate volume to mulitplication and division

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Unit Overview

Unit 3: Chapters 9,11,13,14
In this Unit Students will be:
• Multiplying and Dividing decimals • Understanding that displaying data in a graph highlights some features of the data • Understanding that triangles and four sided figures have their own special properties. • Finding the volume of rectangular prisms, and relating these volumes to liquid measures.
Essential Questions
➢ How can we apply multiplication and division knowledge using decimals? ➢ How do we use place value to round a decimal? ➢ In what ways can data be organized and displayed? ➢ How can fractional data sets be analyzed using line plots? ➢ How can attributes of a two dimensional figure be used to classify it? ➢ How can shapes be represented and compared using geometric attributes? ➢ How does volume relate to three dimensional figures? ➢ What tools and units are used to measure the attributes of a three dimensional object? ➢ How can you find the volume for a prism that is not a standard shape?
Enduring Understandings
• Chapter 9: Multiplying and Dividing Decimals ✓ Multiplication, Division and Estimation ✓ Metric Conversions ✓ Real World Problems • Chapter 11: Graphs and Probability ✓ Double Bar Graphs-Comparing Data on a Graph ✓ Graphing Equations ✓ Line Plots involving Fractional data ✓ Probability- Combinations ✓ Theoretical and Experimental Probabilities • Chapter 13: Properties of Triangles and Four Sided Figures ✓ Classifying Triangles ✓ Measurement of angles of a triangle ✓ Right, Equilateral and Isosceles Triangles ✓ Triangle Inequalities ✓ Parallelogram, Rhombus, and Trapezoid • Chapter 14: Surface Area and Volume ✓ Solids ✓ Drawings

- ✓ Surface Area
- ✓ Volume of Solid
- ✓ Volume of Rectangular Prism of Liquid

New Jersey Student Learning Standards	
5.NBT.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.

Students extend their understanding of the base-ten system to the relationship between adjacent places, how numbers compare, and how numbers round for decimals to thousandths. This standard calls for students to reason about the magnitude of numbers. Students should work with the idea that the tens place is ten times as much as the ones place, and the ones place is 1/10th the size of the tens place.

In fourth grade, students examined the relationships of the digits in numbers for whole numbers only. This standard extends this understanding to the relationship of decimal fractions. Students use base ten blocks, pictures of base ten blocks, and interactive images of base ten blocks to manipulate and investigate the place value relationships. They use their understanding of unit fractions to compare decimal places and fractional language to describe those comparisons.

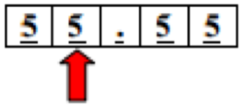
Before considering the relationship of decimal fractions, students express their understanding that in multi-digit whole numbers, a digit in one place represents 10 times what it represents in the place to its right and 1/10 of what it represents in the place to its left.

Example:
The 2 in the number 542 is different from the value of the 2 in 324. The 2 in 542 represents 2 ones or 2, while the 2 in 324 represents 2 tens or 20. Since the 2 in 324 is one place to the left of the 2 in 542 the value of the 2 is 10 times greater. Meanwhile, the 4 in 542 represents 4 tens or 40 and the 4 in 324 represents 4 ones or 4. Since the 4 n 324 is one place to the right of the 4 in 542 the value of the 4 in the number 324 is 1/10th of its value in the number 542.

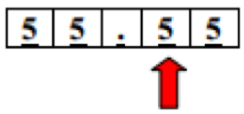
Example:
A student thinks, "I know that in the number 5555, the 5 in the tens place (5555) represents 50 and the 5 in the hundreds place (5555) represents 500. So a 5 in the hundreds place is ten times as much as a 5 in the tens place or a 5 in the tens place is 1/10 of the value of a 5 in the hundreds place. Base on the base-10 number system digits to the left are times as great as digits to the right; likewise, digits to the right are 1/10th of digits to the left. For example, the 8 in 845 has a value of 800 which is ten times as much as the 8 in the number 782. In the same spirit, the 8 in 782 is 1/10th the value of the 8 in 845.

To extend this understanding of place value to their work with decimals, students use a model of one unit; they cut it into 10 equal pieces, shade in, or describe 1/10 of that model using fractional language ("This is 1 out of 10 equal parts. So it is 1/10". I can write this using 1/10 or 0.1"). They repeat the process by finding 1/10 of a 1/10 (e.g., dividing 1/10 into 10 equal parts to arrive at 1/100 or 0.01) and can explain their reasoning, "0.01 is 1/10 of 1/10 thus is 1/100 of the whole unit."

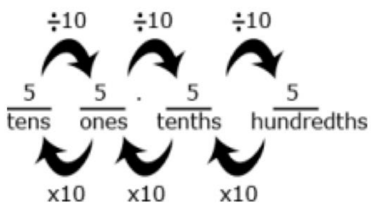
In the number 55.55, each digit is 5, but the value of the digits is different because of the placement.



The 5 that the arrow points to is 1/10 of the 5 to the left and 10 times the 5 to the right. The 5 in the ones place is 1/10 of the 50 and 10 times five tenths.



The 5 that the arrow points to is 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.



5.NBT.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.

New at Grade 5 is the use of whole number exponents to denote powers of 10. Students understand why multiplying by a power of 10 shifts the digits of a whole number or decimal that many places to the left. Example: Multiplying by 10^4 is multiplying by 10 four times. Multiplying by 10 once shifts every digit of the multiplicand one place to the left in the product (the product is ten times as large) because in the base-ten system the value of each place is 10 times the value of the place to its right. So multiplying by 10 four times shifts every digit 4 places to the left.

Patterns in the number of 0s in products of a whole numbers and a power of 10 and the location of the decimal point in products of decimals with powers of 10 can be explained in terms of place value. Because students have developed their understandings of and computations with decimals in terms of multiples rather than powers, connecting the terminology of multiples with that of powers affords connections between understanding of multiplication and exponentiation.

This standard includes multiplying by multiples of 10 and powers of 10, including 10^2 which is 10 x 10=100, and 10^3 which is 10 x 10 x 10=1,000. Students should have experiences working with connecting the pattern of the number of zeros in the product when you multiply by powers of 10. Example: 2.5 x 10^3= 2.5 x (10 x 10 x 10) = 2.5 x 1,000 = 2,500. Students should reason that the exponent above the 10 indicates how many places the decimal point is moving (not just that the decimal point is moving but that you are multiplying or making the number 10 times greater three times) when you multiply by a power of 10. Since we are multiplying by a power of 10 the decimal point moves to the right.

350 ÷ 10^3= 350 ÷ 1,000 = 0.350 = 0.35 350/10 = 35, 35 /10 = 3.5 3.5 /10 =.0.35, or 350 x 1/10, 35

x 1/10, 3.5 x 1/10 this will relate well to subsequent work with operating with fractions. This example shows that when we divide by powers of 10, the exponent above the 10 indicates how many places the decimal point is moving (how many times we are dividing by 10 , the number becomes ten times smaller). Since we are dividing by powers of 10, the decimal point moves to the left.

Students need to be provided with opportunities to explore this concept and come to this understanding; this should not just be taught procedurally.

Example: Students might write:
• 36 x 10 = 36 x 101 = 360
• 36 x 10 x 10 = 36 x 102 = 3600
• 36 x 10 x 10 x 10 = 36 x 103 = 36,000
• 36 x 10 x 10 x 10 x 10 = 36 x 104 = 360,000

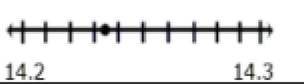
Students might think and/or say:
• I noticed that every time, I multiplied by 10 I added a zero to the end of the number. That makes sense because each digit's value became 10 times larger. To make a digit 10 times larger, I have to move it one place value to the left.
• When I multiplied 36 by 10, the 30 became 300. The 6 became 60 or the 36 became 360. So I had to add a zero at the end to have the 3 represent 3 one-hundreds (instead of 3 tens) and the 6 represents 6 tens (instead of 6 ones).

Students should be able to use the same type of reasoning as above to explain why the following multiplication and division problem by powers of 10 make sense.
• $523 \times 10^3 = 523{,}000$ The place value of 523 is increased by 3 places.
• $5.223 \times 10^2 = 522.3$ The place value of 5.223 is increased by 2 places.
• $52.3 \div 10^1 = 5.23$ The place value of 52.3 is decreased by one place.

5.NBT.4	Use place value understanding to round decimals to any place.

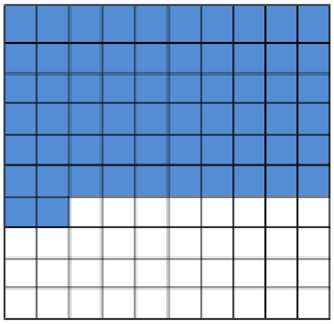
This standard refers to rounding. Students should go beyond simply applying an algorithm or procedure for rounding. The expectation is that students have a deep understanding of place value and number sense and can explain and reason about the answers they get when they round. Students should have numerous experiences using a number line to support their work with rounding.

Example: Round 14.235 to the nearest tenth. Students recognize that the possible answer must be in tenths thus, it is either 14.2 or 14.3. They then identify that 14.235 is closer to 14.2 (14.20) than to 14.3 (14.30).



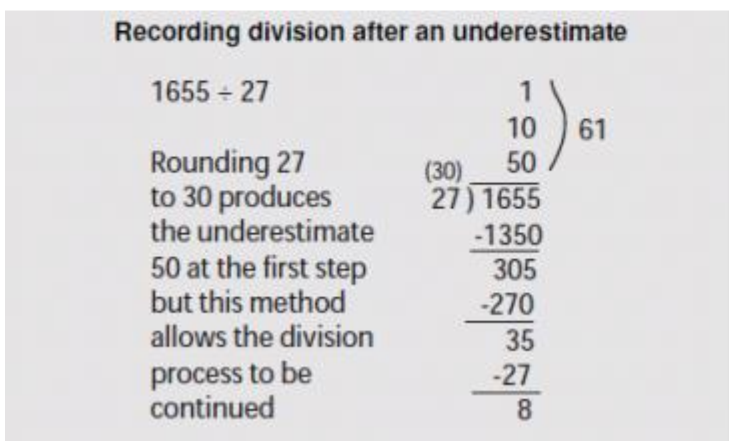
Students should use benchmark numbers to support this work. Benchmarks are convenient numbers for comparing and rounding numbers. 0., 0.5, 1, 1.5 are examples of benchmark numbers.

Example: Which benchmark number is the best estimate of the shaded amount in the model below? Explain your thinking.



5.NBT.5	Fluently multiply multi-digit whole numbers using the standard algorithm.

In fifth grade, students fluently compute products of whole numbers using the standard algorithm. Underlying this algorithm are the properties of operations and the base-ten system. Division strategies in fifth grade involve breaking the dividend apart into like base-ten units and applying the distributive property to find the quotient place by place, starting from the highest place. (Division can also be viewed as finding an unknown factor: the dividend is the product, the divisor is the known factor, and the quotient is the unknown factor.) Students continue their fourth grade work on division, extending it to computation of whole number quotients with dividends of up to four digits and two-digit divisors. Estimation becomes relevant when extending to two-digit divisors. Even if students round appropriately, the resulting estimate may need to be adjusted.



Computation algorithm. A set of predefined steps applicable to a class of problems that gives the correct result in every case when the steps are carried out correctly.

Computation strategy. Purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another.

This standard refers to fluency which means accuracy (correct answer), efficiency (a reasonable amount of steps), and flexibility (using strategies such as the distributive property or breaking numbers apart also using strategies according to the numbers in the problem, 26 x 4 may lend itself to (25 x 4) + 4 where as another problem might lend itself to making an equivalent problem 32 x 4 = 64 x 2)). This standard builds upon students' work with multiplying numbers in third and fourth grade. In fourth grade, students developed understanding of multiplication through using various strategies.

While the standard algorithm is mentioned, alternative strategies are also appropriate to help students develop conceptual understanding. The size of the numbers should NOT exceed a three-digit factor by a two-digit factor.

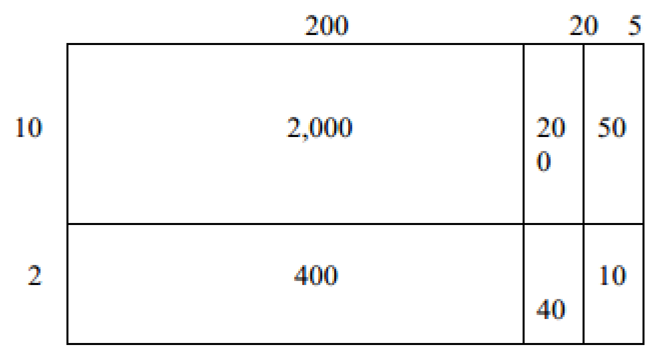
Examples of alternative strategies:

There are 225 dozen cookies in the bakery. How many cookies are there?

Student 1 225 x 12 I broke 12 up into 10 and 2. 225 x 10 = 2,250 225 x 2 = 450 2,250 + 450 = 2,700	Student 2 225x12 I broke up 225 into 200 and 25. 200 x 12 = 2,400 I broke 25 up into 5 x 5, so I had 5 x 5 x12 or 5 x 12 x 5. 5 x12= 60. 60 x 5 = 300 I then added 2,400 and 300 2,400 + 300 = 2,700.	Student 3 I doubled 225 and cut 12 in half to get 450 x 6. I then doubled 450 again and cut 6 in half to get 900 x 3. 900 x 3 = 2,700.

Draw a array model for 225 x 12…. 200 x 10, 200 x 2, 20 x 10, 20 x 2, 5 x 10, 5 x 2

225 x 12



2,000
400
200
40
50
+ 10
2,700

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.

This standard builds on the work from fourth grade where students are introduced to decimals and compare them. In fifth grade, students begin adding, subtracting, multiplying and dividing decimals. This work should focus on concrete models and pictorial representations, rather than relying solely on the algorithm. The use of symbolic notations involves having students record the answers to computations (2.25 x 3= 6.75), but this work should not be done without models or pictures. This standard includes students' reasoning and explanations of how they use models, pictures, and strategies.

Expectations for decimals are limited to thousandths and expectations for factors are limited to hundredths at this grade level so students will multiply tenths with tenths and tenths with hundredths, but they need not multiply hundredths with hundredths.

Addition:

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.

Example: 3.6 + 1.7

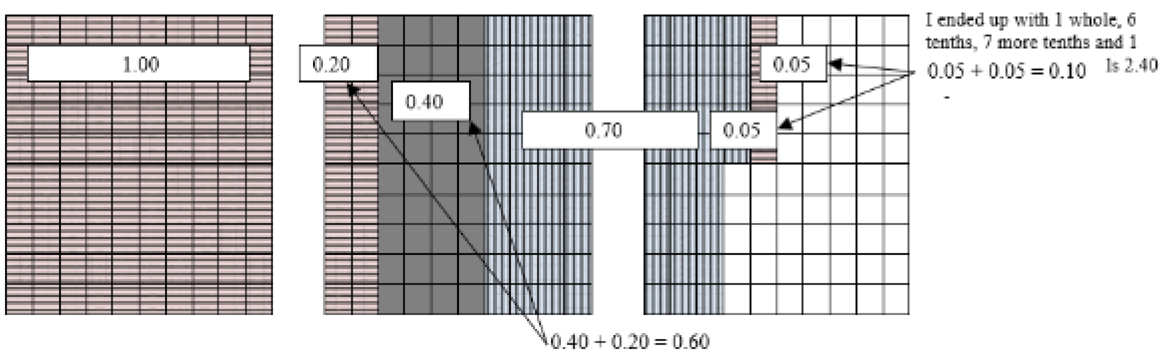
A student might estimate the sum to be larger than 5 because 3.6 is more than 3 ½ and 1.7 is more than 1 ½.

Example: A recipe for a cake requires 1.25 cups of milk, 0.40 cups of oil, and 0.75 cups of water. How much liquid is in the mixing bowl?

Student 1

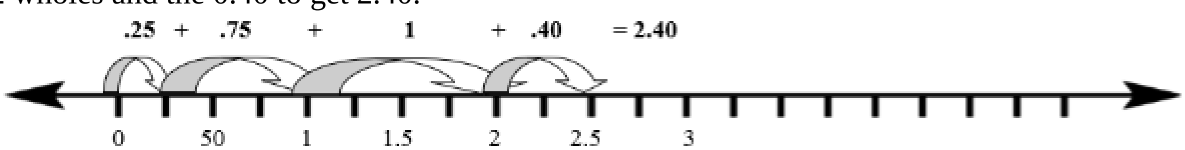
1.25 + 0.40 + 0.75

First, I broke the numbers apart: I broke 1.25 into 1.00 + 0.20 + 0.05 I left 0.40 like it was. I broke 0.75 into 0.70 + 0.05 I combined my two 0.05s to get 0.10. I combined 0.40 and 0.20 to get 0.60. I added the 1 whole from 1.25.



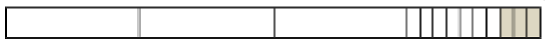
Student 2

I saw that the 0.25 in 1.25 and the 0.75 for water would combine to equal 1 whole. I then added the 2 wholes and the 0.40 to get 2.40.



Subtraction:

Example: 4 - 0.3
3 tenths subtracted from 4 wholes. The wholes must be divided into tenths. (solution is 3 and 7/10 or 3.7)



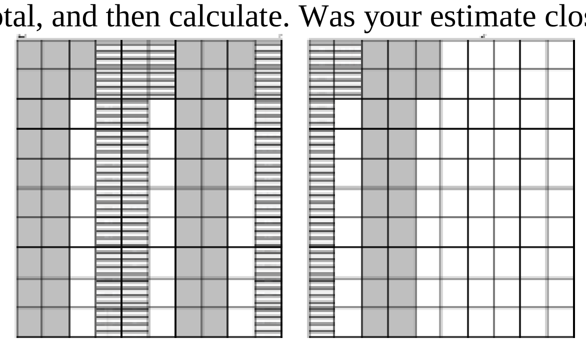
Multiplication:

There are several lines of reasoning that students can use to explain the placement of the decimal point in other products of decimals. Students can think about the product of the smallest base-ten units of each factor. For example, a tenth times a tenth is a hundredth, so 3.2 x 7.1 will have an entry in the hundredth place. Students can also think of the decimals as fractions or as whole numbers divided by 10 or 100. Students can also reason that when they carry out the multiplication without the decimal point, they have multiplied each decimal factor by 10 or 100, so they will need to divide by those numbers in the end to get the correct answer. Also, students can use reasoning about the sizes of numbers to determine the placement of the decimal point. This estimation-based method is not reliable in all cases, however, especially in cases students will encounter in later grades. For example, it is not easy to decide where to place the decimal point in 0.023 x 0.0045 based on estimation. Students can summarize the results of their reasoning such as those above as specific numerical patterns and then as one general overall pattern such as "the number of decimal places in the product is the sum of the number of decimal places in each factor."

• 6 x 2.4

A student might estimate an answer between 12 and 18 since 6 x 2 is 12 and 6 x 3 is 18. Another student might give an estimate of a little less than 15 because s/he figures the answer to be very close, but smaller than 6 x 2 ½ and think of 2 ½ groups of 6 as 12 (2 groups of 6) + 3 (½ of a group of 6).

Example of Multiplication: A gumball costs $0.22. How much do 5 gumballs cost? Estimate the total, and then calculate. Was your estimate close?

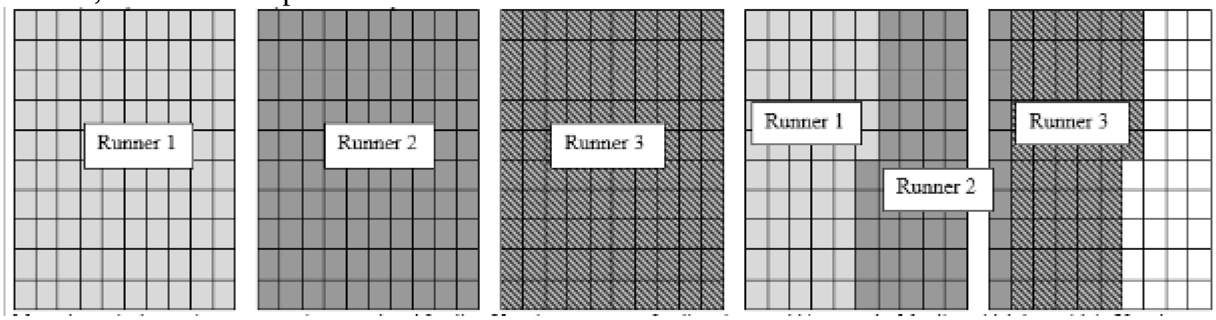


I estimate that the total cost will be a little more than a dollar. I know that 5 20's equal 100 and we have 5 22's. I have 10 whole columns shaded and 10 individual boxes shaded. The 10 columns equal 1 whole. The 10 individual boxes equal 10 hundredths or 1 tenth. My answer is $1.10. My estimate was a little more than a dollar, and my answer was $1.10. I was really close.

Division:

General methods used for computing quotients of whole numbers extend to decimals with the additional issue of placing the decimal point in the quotient. As with decimal multiplication, students can first examine the cases of dividing by 0.1 and 0.01 to see that the quotient becomes 10 times or 100 times as large as the dividend. As with decimal multiplication, students can then proceed to more general cases. Dividing by a decimal less than 1 results in a quotient larger than the dividend and moves the digits of the dividend one place to the left. Students can summarize the results of their reasoning as specific numerical patterns then as one general overall pattern such as "when the decimal point in the divisor is moved to make a whole number, the decimal point in the dividend should be moved the same number of places

Example of Division: A relay race lasts 4.65 miles. The relay team has 3 runners. If each runner goes the same distance, how far does each team member run? Make an estimate, find your actual answer, and then compare them.



My estimate is that each runner runs between 1 and 2 miles. If each runner went 2 miles, that would be a total of 6 miles which is too high. If each runner ran 1 mile, that would be 3 miles, which is too low. I used the 5 grids above to represent the 4.65 miles. I am going to use all of the first 4 grids and 65 of the squares in the 5th grid. I have to divide the 4 whole grids and the 65 squares into 3 equal groups. I labeled each of the first 3 grids for each runner, so I know that each team member ran at least 1 mile. I then have 1 whole grid and 65 squares to divide up. Each column represents one-tenth. If I give 5 columns to each runner, that means that each runner has run 1 whole mile and 5 tenths of a mile. Now, I have 15 squares left to divide up. Each runner gets 5 of those squares. So each runner ran 1 mile, 5 tenths and 5 hundredths of a mile. I can write that as 1.55 miles.
My answer is 1.55 and my estimate was between 1 and 2 miles. I was pretty close.

5.OA.3	Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.

This standard extends the work from Fourth Grade, where students generate numerical patterns when they are given one rule. In Fifth Grade, students are given two rules and generate two numerical patterns. The graphs that are created should be line graphs to represent the pattern. This is a linear function which is why we get the straight lines. The Days are the independent variable, Fish are the dependent variables, and the constant rate is what the rule identifies in the table.

Make a chart (table) to represent the number of fish that Sam and Terri catch.

Days	Sam's Total Number of Fish	Terri's Total Number of Fish
0	0	0
1	2	4
2	4	8
3	6	12
4	8	16
5	10	20

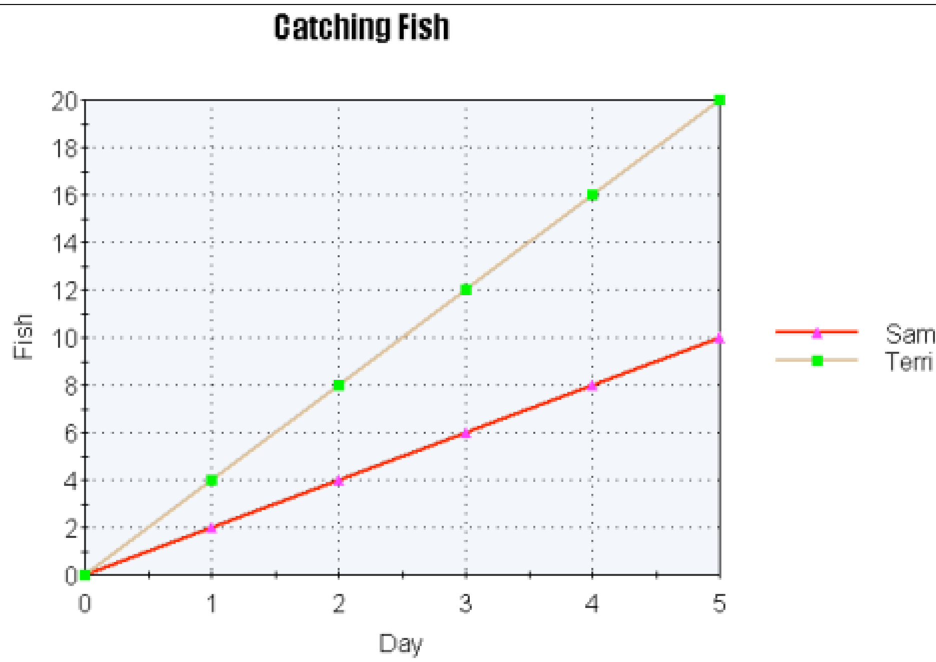
Example:

Describe the pattern: Since Terri catches 4 fish each day, and Sam catches 2 fish, the amount of Terri's fish is always greater. Terri's fish is also always twice as much as Sam's fish. Today, both Sam and Terri have no fish. They both go fishing each day. Sam catches 2 fish each day. Terri catches 4 fish each day. How many fish do they have after each of the five days? Make a graph of the number of fish.

Plot the points on a coordinate plane and make a line graph, and then interpret the graph.

Student:

My graph shows that Terri always has more fish than Sam. Terri's fish increases at a higher rate since she catches 4 fish every day. Sam only catches 2 fish every day, so his number of fish increases at a smaller rate than Terri. Important to note as well that the lines become increasingly further apart. Identify apparent relationships between corresponding terms. Additional relationships: The two lines will never intersect; there will not be a day in which boys have the same total of fish, explain the relationship between the number of days that has passed and the number of fish a boy has (2n or 4n, n being the number of days).



Example:

Use the rule "add 3" to write a sequence of numbers. Starting with a 0, students write 0, 3, 6, 9, 12, . . .

Use the rule "add 6" to write a sequence of numbers. Starting with 0, students write 0, 6, 12, 18, 24, . . .

After comparing these two sequences, the students notice that each term in the second sequence is twice the corresponding terms of the first sequence. One way they justify this is by describing the patterns of the terms. Their justification may include some mathematical notation (See example below). A student may explain that both sequences start with zero and to generate each term of the second sequence he/she added 6, which is twice as much as was added to produce the terms in the first sequence. Students may also use the distributive property to describe the relationship between the two numerical patterns by reasoning that 6 + 6 + 6 = 2 (3 + 3 + 3).

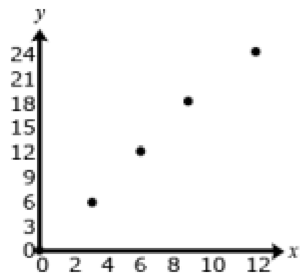
0, $^{+3}$ 3, $^{+3}$ 6, $^{+3}$ 9, $^{+3}$12, . . .

0, $^{+6}$ 6, $^{+6}$ 12, $^{+6}$18, $^{+6}$ 24, . . .

Once students can describe that the second sequence of numbers is twice the corresponding terms of the first sequence, the terms can be written in ordered pairs and then graphed on a coordinate grid. They should recognize that each point on the graph represents two quantities in which the second quantity is twice the first quantity.

Ordered pairs

(0, 0) (3,6) (6,12) (9,18)



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.

This standard call for students to convert measurements within the same system of measurement in the context of multi-step, real-world problems. Both customary and standard measurement systems are included; students worked with both metric and customary units of length in second grade. In third grade, students work with metric units of mass and liquid volume. In fourth grade, students work with both systems and begin conversions within systems in length, mass and volume. Students should explore how the base-ten system supports conversions within the metric system. Example: 100 cm = 1 meter.

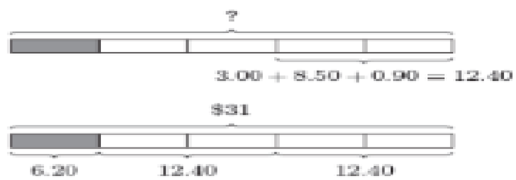
In Grade 5, students extend their abilities from Grade 4 to express measurements in larger or smaller units within a measurement system. This is an excellent opportunity to reinforce notions of place value for whole numbers and decimals, and connection between fractions and decimals (e.g., 2 ½ meters can be expressed as 2.5 meters or 250 centimeters). For example, building on the table from Grade 4, Grade 5 students might complete a table of equivalent measurements in feet and inches. Grade 5 students also learn and use such conversions in solving multi-step, real world problems (see example below).

Feet	Inches
0	0
	1
	2
	3

The main focus of this table is on arriving at the measurements that generate the table.

Multi-Step problem with unit conversion

Kumi spent a fifth of her money on lunch. She then spent half of what remained . She bought a card game for $3, abook for $8.50, and candy for 90 cents. How much money did she have at first?

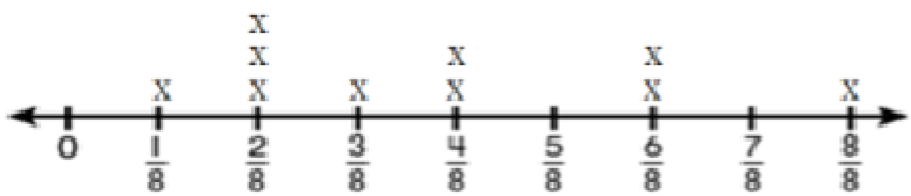


Students can use tape diagrams to represent problems involving conversion of units.
(MP.1)

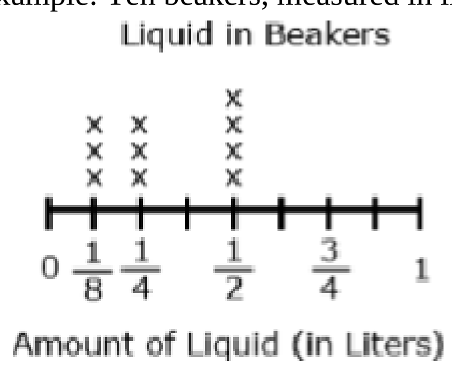
5.MD.2	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.

This standard provides a context for students to work with fractions by measuring objects to one-eighth of a unit. This includes length, mass, and liquid volume. Students are making a line plot of this data and then adding and subtracting fractions based on data in the line plot.

Example: Students measured objects in their desk to the nearest ½, ¼, or 1/8 of an inch then displayed data collected on a line plot. How many object measured ¼? ½? If you put all the objects together end to end what would be the total length of all the objects?



Example: Ten beakers, measured in liters, are filled with a liquid.

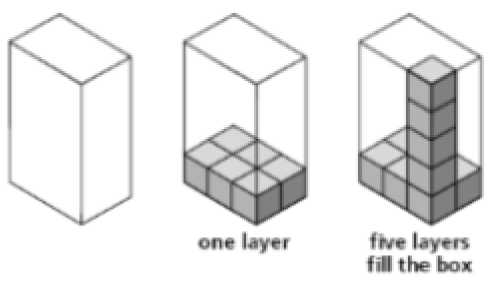


The line plot above shows the amount of liquid in liters in 10 beakers. If the liquid is redistributed equally, how much liquid would each beaker have? (This amount is the mean.)
Students apply their understanding of operations with fractions. They use either addition and/or multiplication to determine the total number of liters in the beakers. Then the sum of the liters is shared evenly among the ten beakers.

5.MD.3	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume. b. A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.
5.MD.4	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.
5.MD.5	Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

5. MD.3, 5.MD.4, and 5. MD.5 These standards represent the first time that students begin exploring the concept of volume. In third grade, students begin working with area and covering spaces. The concept of volume should be extended from area with the idea that students are covering an area (the bottom of cube) with a layer of unit cubes and then adding layers of unit cubes on top of bottom layer (see picture below). Students should have ample experiences with concrete manipulatives before moving to pictorial representations. Students' prior experiences with volume were restricted to liquid volume. As students develop their understanding volume they understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. This cube has a length of 1 unit, a width of 1 unit and a height of 1 unit and is called a cubic unit. This cubic unit is written with an exponent of 3 (e.g., in3, m3). Students connect this notation to their understanding of powers of 10 in our place value system. Models of cubic inches, centimeters, cubic feet, etc. are helpful in developing an image of a cubic unit. Students' estimate how many cubic yards would be needed to fill the classroom or how many cubic centimeters would be needed to fill a pencil box.

(3 x 2) represented by first layer
(3 x 2) x 5 represented by number of 3 x 2 layers
(3 x 2) + (3 x 2) + (3 x 2) + (3 x 2)+ (3 x 2) =
6 + 6 + 6 + 6 + 6 + 6 = 30 6 representing the size/area of one layer



The major emphasis for measurement in Grade 5 is volume. Volume not only introduces a third dimension and thus a significant challenge to students' spatial structuring, but also complexity in the nature of the materials measured. That is, solid units are “packed,” such as cubes in a three-dimensional array, whereas a liquid “fills” three-dimensional space, taking the shape of the container. The unit structure for liquid measurement may be psychologically one dimensional for some students.

"Packing" volume is more difficult than iterating a unit to measure length and measuring area by tiling. Students learn about a unit of volume, such as a cube with a side length of 1 unit, called a unit cube.5.MD.3 They pack cubes (without gaps) into right rectangular prisms and count the cubes to determine the volume or build right rectangular prisms from cubes and see the layers as they build.5.MD.4 They can use the results to compare the volume of right rectangular prisms that have different dimensions. Such experiences enable students to extend their spatial structuring from two to three dimensions. That is, they learn to both mentally decompose and recompose a right rectangular prism built from cubes into layers, each of which is composed of rows and columns. That is, given the prism, they have to be able to decompose it, understanding that it can be partitioned into layers, and each layer partitioned into rows, and each row into cubes. They also have to be able to compose such as structure, multiplicatively, back into higher units. That is, they eventually learn to conceptualize a layer as a unit that itself is composed of units of units—rows, each row composed of individual cubes—and they iterate that structure. Thus, they might predict the number of cubes that will be needed to fill a box given the net of the box.
Another complexity of volume is the connection between "packing" and "filling."

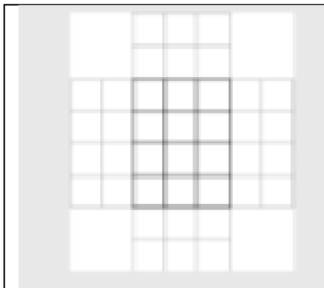
Comparing and discussing the volume-units and what they represent can help students learn a general, complete, and interconnected conceptualization of volume as filling three-dimensional space.

They learn that the height of the prism tells how many layers would fit in the prism. That is, they understand that volume is a derived attribute that, once a length unit is specified, can be computed as the product of three length measurements or as the product of one area and one length measurement.

Then, students can learn the formulas V =l x w x h and V = B x h for right rectangular prisms as efficient methods for computing volume, maintaining the connection between these methods and their previous work with computing the number of unit cubes that pack a right rectangular prism.5.MD.5b They use these competencies to find the volumes of right rectangular prisms with edges whose lengths are whole numbers and solve real-world and mathematical problems involving such prisms.

Students also recognize that volume is additive and they find the total volume of solid figures composed of two right rectangular prisms.5.MD.5c For example, students might design a science station for the ocean floor that is composed of several rooms that are right rectangular prisms and that meet a set criterion specifying the total volume of the station. They draw their station and justify how their design meets the criterion.

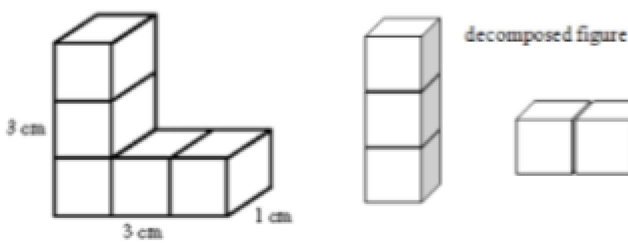
Net for five faces of a right rectangular prism

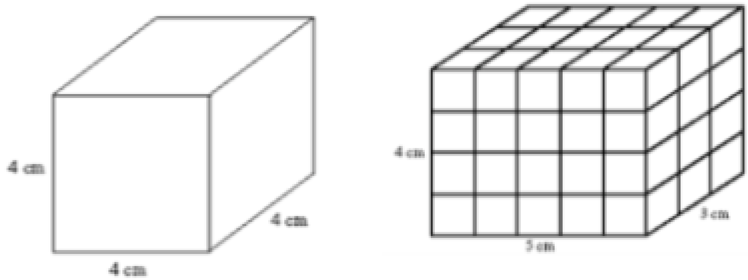


Students are given a net and asked to predict the number of cubes required to fill the container formed by the net. In such tasks, students may initially count single cubes or repeatedly add the number in each layer to find the total number of unit cubes. In folding the net to make the shape, students can see how the side rectangles fit together and determine the number of layers.

5. MD.5a & b These standards involve finding the volume of right rectangular prisms (see picture above).Students should have experiences to describe and reason about why the formula is true. Specifically, that they are covering the bottom of a right rectangular prism (length x width) with multiple layers (height). Therefore, the formula (length x width x height) is an extension of the formula for the area of a rectangle.
5.MD.5c This standard calls for students to extend their work with the area of composite figures into the context of volume. Students should be given concrete experiences of breaking apart (decomposing) 3-dimensional figures into right rectangular prisms in order to find the volume of the entire 3-dimensional figure.

Examples:



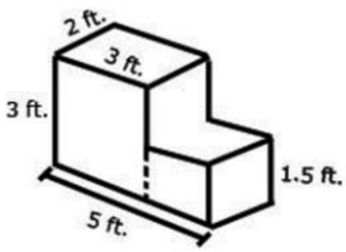


students need multiple opportunities to measure volume by filling rectangular prisms with cubes and looking at the relationship between the total volume and the area of the base. They derive the volume formula (volume equals the area of the base times the height) and explore how this idea would apply to other prisms. Students use the associative property of multiplication and decomposition of numbers using factors to investigate rectangular prisms with a given number of cubic units.

Example: When given 24 cubes, students make as many rectangular prisms as possible with a volume of 24 cubic units. Students build the prisms and record possible dimensions

Length	Width	Height
1	2	12
2	2	6
4	2	3
8	3	1

Example: Students determine the volume of concrete needed to build the steps in the diagram below.

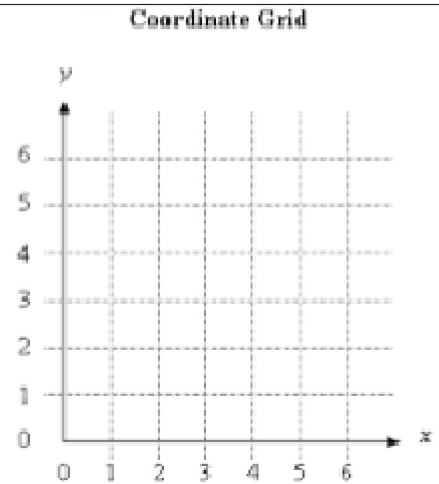


5.G.1	Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).

5.G.2	Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation

5.G.1 and 5.G.2 These standards deal with only the first quadrant (positive numbers) in the coordinate plane. Although students can often "locate a point," these understandings are beyond simple skills. For example, initially, students often fail to distinguish between two different ways of viewing the point (2, 3), say, as instructions: "right 2, up 3"; and as the point defined by being a distance 2 from the y-axis and a distance 3 from the x-axis. In these two descriptions the 2 is first associated with the x-axis, then with the y-axis

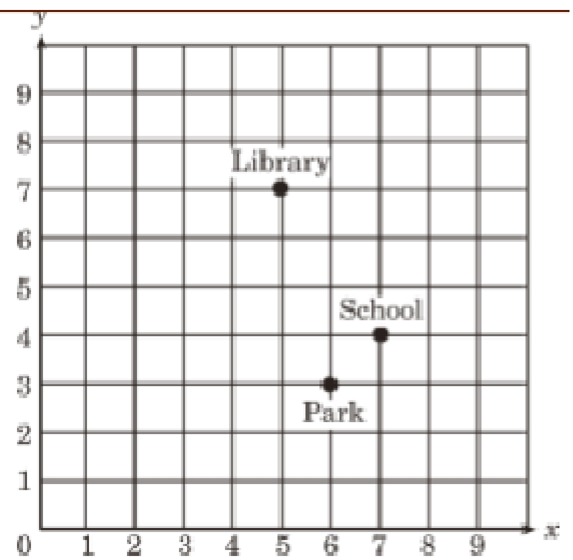
Example: Connect these points in order on the coordinate grid below: (2, 2) (2, 4) (2, 6) (2, 8) (4, 5) (6, 8) (6, 6) (6, 4) and (6, 2).
What letter is formed on the coordinate grid? Solution:" M" is formed



Example: Plot these points on a coordinate grid.
Point A: (2,6)
Point B: (4,6)
Point C: (6,3)
Point D: (2,3)
Connect the points in order. Make sure to connect Point D back to Point A. 1. What geometric figure is formed? What attributes did you use to identify it? 2. What line segments in this figure are parallel? 3. What line segments in this figure are perpendicular?
solutions: trapezoid, line segments AB and DC are parallel, segments AD and DC are perpendicular

Example: Emanuel draws a line segment from (1, 3) to (8, 10). He then draws a line segment from (0, 2) to (7, 9). If he wants to draw another line segment that is parallel to those two segments what points will he use?

This standard references real-world and mathematical problems, including the traveling from one point to another and identifying the coordinates of missing points in geometric figures, such as squares, rectangles, and parallelograms.



Example: Using the coordinate grid, which ordered pair represents the location of the School?

Explain a possible path from the school to the library. Example: Sara has saved $20. She earns $8 for each hour she works. If Sara saves all of her money, how much will she have after working 3 hours? 5 hours? 10 hours? Create a graph that shows the relationship between the hours Sara worked and the amount of money she has saved. What other information do you know from analyzing the graph? Example: Use the graph below to determine how much money Jack makes after working exactly 9 hours. 	
5.G.3	Understand that attributes belonging to a category of two dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.
This standard calls for students to reason about the attributes (properties) of shapes. Student should have experiences discussing the property of shapes and reasoning. Example: Examine whether all quadrilaterals have right angles. Give examples and non-examples. Example: If the opposite sides on a parallelogram are parallel and congruent, then rectangles are parallelograms A sample of questions that might be posed to students include: A parallelogram has 4 sides with both sets of opposite sides parallel. What types of quadrilaterals are parallelograms? Regular polygons have all of their sides and angles congruent. Name or draw some regular polygons. All rectangles have 4 right angles. Squares have 4 right angles so they are also rectangles. True or False? A trapezoid has 2 sides parallel so it must be a parallelogram. True or False? The notion of congruence ("same size and same shape") may be part of classroom conversation but the concepts of congruence and similarity do not appear until middle school.	
5.G.4	Classify two-dimensional figures in a hierarchy based on properties.

This standard builds on what was done in 4th grade. Figures from previous grades**: polygon, rhombus/rhombi, rectangle, square, triangle, quadrilateral, pentagon, hexagon, cube, trapezoid, half/quarter circle, circle, kite**

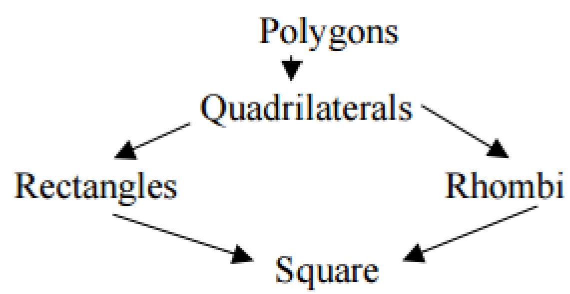
A **kite** is a quadrilateral whose four sides can be grouped into two pairs of equal-length sides that are beside (adjacent to) each other.

Student should be able to reason about the attributes of shapes by examining: What are ways to classify triangles? Why can't trapezoids and kites be classified as parallelograms? Which quadrilaterals have opposite angles congruent and why is this true of certain quadrilaterals? and How many lines of symmetry does a regular polygon have?

Example: Create a Hierarchy Diagram using the following terms:

polygons – a closed plane figure formed from line segments that meet only at their endpoints.
quadrilaterals - a four-sided polygon.
rectangles - a quadrilateral with two pairs of congruent parallel sides and four right angles.
rhombi – a parallelogram with all four sides equal in length.
square – a parallelogram with four congruent sides and four right angles

Possible student solution:



4.MD.1	Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb., oz.; l, ml; hr., min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft. is 12 times as long as 1 in. Express the length of a 4 ft. snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...

The units of measure that have not been addressed in prior years are cups, pints, quarts, gallons, pounds, ounces, kilometers, millimeter, milliliters, and seconds. Students' prior experiences were limited to measuring length, mass (metric and customary systems), liquid volume (metric only), and elapsed time. Students did not convert measurements. Students develop benchmarks and mental images about a meter (e.g., about the height of a tall chair) and a kilometer (e.g., the length of 10 football fields including the end zones, or the distance a person might walk in about 12 minutes), and they also understand that "kilo" means a thousand, so 3000 m is equivalent to 3 km. Expressing larger measurements in smaller units within the metric system is an opportunity to reinforce notions of place value. There are prefixes for multiples of the basic unit (meter or gram), although only a few (kilo-, centi-, and milli-) are in common use. Tables such as the one below are an opportunity to develop or reinforce place value concepts and skills in measurement activities.

Relating units within the metric system is another opportunity to think about place value. For example, students might make a table that shows measurements of the same lengths in centimeters and meters. Relating units within the traditional system provides an opportunity to engage in mathematical practices, especially "look for and make use of structure" and "look for and express regularity in repeated reasoning" For example, students might make a table that shows measurements of the same lengths in feet and inches.

Super- or subordinate unit	Length in terms of basic unit
kilometer	10^3 or 1000 meters
hectometer	10^2 or 100 meters
decameter	10^1 or 10 meters
meter	1 meter
decimeter	10^{-1} or $\frac{1}{10}$ meters
centimeter	10^{-2} or $\frac{1}{100}$ meters
millimeter	10^{-3} or $\frac{1}{1000}$ meters

Note the similarity to the structure of base-ten units and U.S. currency (see illustrations on p. 12 of the Number and Operations in Base Ten Progression).

Centimeter and meter equivalences

cm	m
100	1
200	2
300	3
500	
1000	

Foot and inch equivalences

feet	inches
0	0
1	12
2	24
3	

Students need ample opportunities to become familiar with these new units of measure and explore the patterns and relationships in the conversion tables that they create. Students may use a two-column chart to convert from larger to smaller units and record equivalent measurements. They make statements such as, if one foot is 12 inches, then 3 feet has to be 36 inches because there are 3 groups of 12.

Example: Customary length conversion table

Yards	Feet
1	3
2	6
3	9
n	$n \times 3$

Foundational understandings to help with measure concepts: Understand that larger units can be subdivided into equivalent units (partition). Understand that the same unit can be repeated to determine the measure (iteration). Understand the relationship between the size of a unit and the number of units needed (compensatory principal).

M : Major Content S: Supporting Content A : Additional Content

21st Century Career Ready Practices

CRP1. Act as a responsible and contributing citizen and employee.
CRP2. Apply appropriate academic and technical skills.
CRP3. Attend to personal health and financial well-being.
CRP4. Communicate clearly and effectively and with reason.
CRP5. Consider the environmental, social and economic impacts of decisions.
CRP6. Demonstrate creativity and innovation.
CRP7. Employ valid and reliable research strategies.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Model integrity, ethical leadership and effective management.
CRP10. Plan education and career paths aligned to personal goals.
CRP11. Use technology to enhance productivity.
CRP12. Work productively in teams while using cultural global competence.

MIF Lesson Structure

	LESSON STRUCTURE	RESOURCES	COMMENTS
PRE TEST	**Chapter Opener** Assessing Prior Knowledge *The Pre Test serves as a diagnostic test of readiness of the upcoming chapter*	**Teacher Materials** Quick Check PreTest (Assessm’t Bk) Recall Prior Knowledge **Student Materials** Student Book (Quick Check); Copy of the Pre Test; Recall prior Knowledge	Recall Prior Knowledge (RPK) can take place just before the pre-tests are given and can take 1-2 days to front load prerequisite understanding Quick Check can be done in concert with the RPK and used to repair student misunderstandings and vocabulary prior to the pre-test ; Students write Quick Check answers on a separate sheet of paper Quick Check and the Pre Test can be done in the same block *(See Anecdotal Checklist; Transition Guide)* Recall Prior Knowledge – Quick Check – Pre Test
DIRECT ENGAGEMENT	**Direct Involvement/Engagement** Teach/Learn *Students are directly involved in making sense, themselves, of the concepts – by interacting the tools, manipulatives, each other, and the questions*	**Teacher Edition** 5-minute warm up Teach; Anchor Task **Technology** Digi **Other** Fluency Practice	• The Warm Up activates prior knowledge for each new lesson • Student Books are CLOSED; Big Book is used in Gr. K • Teacher led; Whole group • Students use concrete manipulatives to explore concepts • A few select parts of the task are explicitly shown, but the majority is addressed through the hands-on, constructivist approach and questioning • Teacher facilitates; Students find the solution
GUIDED LEARNING	**Guided Learning and Practice** Guided Learning	**Teacher Edition** Learn **Technology** Digi **Student Book** Guided Learning Pages Hands-on Activity	Students-already in pairs /small, homogenous ability groups; Teacher circulates between groups; Teacher, anecdotally, captures student thinking **Small Group w/Teacher circulating among groups** Revisit Concrete and Model Drawing; Reteach Teacher spends majority of time with struggling learners; some time with on level, and less time with advanced groups Games and Activities can be done at this time

INDEPENDENT PRACTICE	**Independent Practice** *A formal formative assessment*	**Teacher Edition** Let's Practice **Student Book** Let's Practice **Differentiation Options** All: Workbook Extra Support: Reteach On Level: Extra Practice Advanced: Enrichment	**Let's Practice** determines readiness for Workbook and small group work and is used as formative assessment; Students not ready for the Workbook will use Reteach. The Workbook is continued as Independent Practice. Manipulatives **CAN** be used as a communications tool as needed. Completely Independent On level/advance learners should finish all workbook pages.
ADDITIONAL PRACTICE	**Extending the Lesson**	Math Journal Problem of the Lesson Interactivities Games	
	Lesson Wrap Up	Problem of the Lesson Homework (Workbook , Reteach, or Extra Practice)	Workbook or Extra Practice Homework is only assigned when students fully understand the concepts (as additional practice) Reteach Homework (issued to struggling learners) should be checked the next day
POST TEST	**End of Chapter Wrap Up and Post Test**	**Teacher Edition** Chapter Review/Test Put on Your Thinking Cap **Student Workbook** Put on Your Thinking Cap **Assessment Book** Test Prep	Use Chapter Review/Test as "review" for the End of Chapter Test Prep. Put on your Thinking Cap prepares students for novel questions on the Test Prep; Test Prep is graded/scored. The Chapter Review/Test can be completed • Individually (e.g. for homework) then reviewed in class • As a 'mock test' done in class and doesn't count • As a formal, in class review where teacher walks students through the questions Test Prep is completely independent; scored/graded Put on Your Thinking Cap (green border) serve as a capstone problem and are done just before the Test Prep and should be treated as Direct Engagement. By February, students should be doing the Put on Your Thinking Cap problems on their own.

TRANSITION LESSON STRUCTURE (No more than 2 days)

- **Driven by Pre-test results, Transition Guide**
- **Looks different from the typical daily lesson**

Transition Lesson – Day 1 **Objective:**	
CPA Strategy/Materials	**Ability Groupings/Pairs (by Name)**
Task(s)/Text Resources	**Activity/Description**

Pacing Guide

Activity	Common Core Standards	Estimated Time (# of block)	Lesson Notes
Pre-Test 9	5.NBT.1, 5.NBT.4, 5.NBT.5, 5.NBT.6	1/2 block	
Authentic Assessment #9 Minutes & Days	5.NBT.6, 5.MD.1	½ block	
Chapter Opener 9/Recall Prior Knowledge 1	5.NBT.2, 5.NBT.7	1 block	
Multiplying Decimals 9.1	5.NBT.1, 5.NBT.7	2 blocks	As you present these methods for multiplying tenths by a whole number, you may wish to point out the similarities and differences between multiplying whole numbers and decimals. Students should realize that in both procedures, they multiply one place at a time. The main difference is that when multiplying decimals, they need to place the decimal point correctly in the product.
Multiplying by Tens, Hundreds and Thousands 9.2	5.NBT.1, 5.NBT.2, 5.NBT.7	2 blocks	You may wish to provide visuals to show how to move the decimal point to the right when multiplying decimals by 100 and 1,000.
Dividing Decimals 9.3	5.NBT.1, 5.NBT.4, 5.NBT.7	2 blocks	For students with difficulty aligning the digits, have them use a pencil to draw faint vertical lines between the digits of the dividend. This helps them write the digits in the correct column.
Dividing by Ten, Hundreds and Thousands 9.4	5.NBT.1, 5.NBT.2, 5.NBT.7	2 blocks	You may wish to provide visuals to show how to move the decimal point to the left when dividing decimals by 100 and 1,000.
Estimating Decimals 9.5	5.NBT.4, 5.NBT.7	1 block	Comparing estimates and actual sums helps students see the range of answers that may be considered "reasonable". Emphasize, however, that in real-world contexts the goal is to find a quick way to check reasonableness, rather than to find a close estimate.
Converting Metric Units 9.6	4.MD.1	2 blocks	Place a strip of masking tape along the length and width of the

			desk. Then students can mark on the tape where one 30-entimeter length ends and the next begins.
Real-World Problems: Decimals 9.7	5.NBT.4, 5.NBT.7	1 block	Emphasize that when you are requires to give an accurate answer, you round the answer after completing all calculations. However, when you are required to give an estimated answer you round the given numbers before making any calculations.
Chapter 9 Wrap Up/Review		1 block	Reinforce and consolidate chapter skills and concepts
Chapter 9 Test-Review w/TP	4.MD.1, 5.NBT.1, 5.NBT.2, 5.NBT.4, 5.NBT.7	1 block	
Authentic Assessment #10 The Value of Education	5.NBT.7	½ block	
Pre-Test 11 (numbers 6, 9e, and 10 optional)	3.MD.3, 4.MD.1, 5.MD.2, 5.G.1, 6.SP.5	½ block	
Chapter Opener 11/Recall Prior Knowledge 11	OMIT	OMIT	
Making and Interpreting Line Plots 11.1	5.MD.2	1 block	Explain to students the difference between a line plot and a line graph.
Mini Assessment #8 5.MD.2	5.MD.2	½ block	
Review		2 blocks	Review/Reteach concepts that need to be readdressed
Making and Interpreting Double bar Graphs 11.2	OMIT	OMIT	
Graphing an Equation 11.3 *(skip pages 152-153)*	5.G.1, 5.G.2	1 block	
Authentic Assessment #11 Marta's Multiplication Error	5.NBT.2	½ block	
Comparing Data Using Line Graphs 11.4 *(skip pages 158-160)*	5.OA.3	1 block	Students may wonder how they can be sure their ordered pairs form a straight line. Have them notice that for every increase of 1 second, Bottle A will contain 50 more milliliters of water. So each time they move one unit right on the graph, they will need to move up 2 units. The consistency of this pattern ensures that the line will be straight.
Mini Assessment #9 5.OA.3	5.OA.3	½ block	
Review		½ block	Review/Reteach concepts that

			need to be readdressed
Combinations 11.5	OMIT	OMIT	
Theoretical Probability and Experimental Probability 11.6	OMIT	OMIT	
Chapter 11 Wrap Up/Review		1 block	Reinforce and consolidate chapter skills and concepts
Chapter 11 Test-Review w/TP	5.G.1, 5.MD.2, 6, 7.SP.8	1 block	
Pre-Test 13 (numbers 6, 15, 16, and 17 optional)	1.NBT.3, 2.G.2, 3.G.1, 4.MD.7, 4.G.2, 5.G.4, 6.EE.5	1 block	
Chapter Opener 13/Recall Prior Knowledge 13	5.G.3, 5.G.4	1 block	
Classifying triangles 13.1	5.G.3	1 block	Some student may classify triangle DEF as an isosceles triangle. This is *not* incorrect, but it is not a relationship you need students to recognize at this point.
Measures of Angles of a triangle 13.2	OMIT	OMIT	
Right, Isosceles and Equilateral triangles 13.3	5.G.3, 5.G.4	3 blocks	Students may have difficulty visualizing the triangles. Have them draw triangles using a protractor. Then have them identify which sets of angle measures can be angle measures of a right triangle.
Triangle Inequalities 13.4	OMIT	OMIT	
Parallelogram, Rhombus and Trapezoid 13.5	5.G.3, 5.G.4	3 blocks	Have students complete the **Table of Four Sided Figures**. They may want to use it as a reference.
Mini Assessment #10 5.G.3-4	5.G.3, 5.G.4	½ block	
Review		2 blocks	Review/Reteach concepts that need to be readdressed
Chapter 13 Test-Review w/TP	OMIT		
Pre-Test 14	3.MD.2, 4.MD.3, 5.MD.3, 5.NF.6	1/2 block	
Chapter Opener 14/Recall Prior Knowledge 14	5.MD.1	1 block	
Building Solids Using Unit Cubes 14.1	OMIT	1 block	
Drawing Cubes and Rectangular Prisms 14.2	OMIT	1 block	
Prisms and Pyramids 14.3	OMIT	1 block	
Nets and surface Area 14.4	OMIT	1 block	

Understanding and Measuring Volume 14.5	5.MD.3, 5.MD.3.a, 5.MD.3.b, 5.MD.4, 5.MD.5, 5.MD.5.a	2 blocks	You may want to begin this lesson with a review of the "Let's Explore" activity on page 293.
Volume of a rectangular Prism and Liquid 14.6	5.MD.1, 5.MD.3, 5.MD.3.a, 5.MD.3.b, 5.MD.4, 5.MD.5, 5.MD.5.a, 5.MD.5.b	2 blocks	If using water is not practical in your classroom, you may want to replace it with a granular substance such as sand, rice or beans. These substances are less scientifically correct but just as visually effective
Volume of Composite Solids 14.7	5.MD.5.c	1 block	Exercise 1 reinforces students' understanding of rectangular prisms. Have students work in pairs and give each pair 10 snap cubes. Have students follow the instructions in the Student Book. Invite students to present their answers to the class.
Chapter 14 Wrap Up/Review		1 block	Reinforce and consolidate chapter skills and concepts
Chapter 14 Test-Review w/TP	4.MD.1, 5.NF.4.a, 5.MD.3.a,5.MD.4, 5.MD.5.c, 5.MD.5.b, 7.G.6	1 block	
Mini Assessment # 11 5.MD.3-5	5.MD.3, 5.MD.4, 5.MD.5	½ block	
Authentic Assessment #12 Rounding to Tenths and Hundredths (optional)	5.NBT.4	½ block	

Resources for Special Needs and English Language Learners

Chapter 9

Additional Support

For English Language Learners

Select activities that reinforce the chapter vocabulary and the connections among these words, such as having students

- add terms, definitions, and examples to the student-made dictionary
- use models to show how to regroup tenths
- use their own words to explain how multiplying and dividing are different
- discuss the Chapter Wrap Up, encouraging students to use the chapter vocabulary

For Extra Support

Select activities that go back to the appropriate stage of the Concrete-Pictorial-Abstract spectrum, such as having students

- model multiplying and dividing decimals using base-ten models for tenths and hundredths
- draw pictures showing how to multiply and divide decimals
- tell how multiplying and dividing whole numbers is the same as multiplying and dividing decimals and how they are different
- create and solve real-world problems to match decimal computation problems such as those on page 94

See also pages 55 and 63.

If necessary, review:

- Chapter 2 (Whole Number Multiplication and Division)
- Chapter 8 (Decimals)

For Advanced Learners

See suggestions on page 90.

Chapter 11

Additional Support

For English Language Learners

Select activities that reinforce the chapter vocabulary and the connections among these words, such as having students

- add terms, definitions, and examples to their student-made dictionary
- identify different parts of a bar graph, such as its title, vertical and horizontal axes, and labels
- answer yes/no questions about theoretical and experimental probabilities
- discuss the Chapter Wrap Up, encouraging students to use the chapter vocabulary

For Extra Support

Select activities that go back to the appropriate stage of the Concrete-Pictorial-Abstract spectrum, such as having students

- work with manipulatives such as counters and colored cubes to show different possible combinations
- talk about events that are likely, unlikely, or equally likely
- draw pictures to match specific probabilities
- make a map of the classroom, and label the locations of several items on a coordinate grid.

See also page 171.

If necessary, review Chapter 8 (Decimals)

For Advanced Learners

See suggestions on pages 151, 154–155, 171, and 173–174.

Chapter 13

Additional Support

For English Language Learners

Select activities that reinforce the chapter vocabulary and the connections among these words, such as having students

- add terms, definitions, and examples to the student-made dictionary
- identify examples of triangles, trapezoids, rhombuses, and parallelograms in their surroundings
- make and label pictures of different kinds of triangles to use as references during the lesson
- discuss the Chapter Wrap Up, encouraging students to use the chapter vocabulary

For Extra Support

Select activities that go back to the appropriate stage of the Concrete-Pictorial-Abstract spectrum, such as having students

- draw and cut out models of two-dimensional figures to use to identify and describe properties
- review using a protractor to measure angles
- look through books or magazines and identify two-dimensional figures
- tell how equilateral, isosceles, and right triangles are different and how they are the same

See also page 223–224.

If necessary, review:
- Chapter 12 (Angles)

For Advanced Learners

See suggestions on pages 239–240, 247, and 248.

Chapter 14

Additional Support

For English Language Learners

Select activities that reinforce the chapter vocabulary and the connections among these words, such as having students

- add terms, definitions, and examples to the student-made dictionary
- use objects in the shape of rectangular prisms as models for discussing surface area and volume
- find and explain the different meanings of the word *net*
- discuss the Chapter Wrap Up, encouraging students to use the chapter vocabulary

For Extra Support

Select activities that go back to the appropriate stage of the Concrete-Pictorial-Abstract spectrum, such as having students

- build solid figures with snap cubes, and then take them apart one by one, counting each cube
- build solid figures with snap cubes, and then draw the figures on isometric dot paper
- dismantle boxes to form nets, and then reconstruct the boxes
- use measuring cups and water to determine the volume of rectangular containers

See also pages 260, 268, and 272.

For Advanced Learners

See suggestions on pages 271, 274–275, 281–282, 294–295, and 300.

Pacing Calendar

Please complete the pacing calendar based on the suggested pacing.

JANUARY						
Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

FEBRUARY

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28			

MARCH						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

APRIL

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

Unit 3 Math Background

Chapter 9: Multiplying and Dividing Decimals

In Grade 4, students learned to add and subtract one-and two-place decimals. In Chapters 1 and 2 of Grade 5, students learned to multiply and divide whole numbers by tens, hundreds, and thousands, as well as estimate products and quotients.

Chapter 11: Graphs and Probability

In Grade 3, students learned to interpret bar graphs. In Grade 4, students learned to find the average or mean, and write the probability of favorable equally likely outcomes as a fraction.

Chapter 13: Properties of Triangles and Four Sided Figures

In Grade 3, students learned to classify polygons. They also learned to find measures of angles on a line and compare expressions.

Chapter 14: Surface Area and Volume

Students were taught the meaning of the terms: Cylinder, Sphere and Cone. Review the definitions of these terms with students and highlight the differences between the three.

Transition Guide References:

Chapter 9: Multiplying and Dividing Decimals				
Transition Topic: Money and Decimals				
Grade 5 Chapter 9 Pre Test Items	**Grade 5 Chapter 9 Pre-Test Item Objective**	**Additional Support for the Objective: Grade 4 Reteach**	**Additional Support for the Objective: Grade 4 Extra Practice**	**Grade 4 Teacher Edition Support**
Items 3, 16–17	Estimate products and quotients.	Support for this objective is included in Chapter 2.		4A Chapter 2 Lessons 2 and 4
Items 4–9	Multiply by ones, tens, and hundreds mentally.	3A pp. 123–128	Lesson 7.1	4A Chapter 2 Lessons 2 and 3
Items 10-15	Use patterns to divide multiples of 10 and 100.	15 3A pp. 142–144	Lesson 8.1	4A Chapter 2 Lessons 2 and 4
Items 18–19	19 Use a variety of strategies to solve word problems involving all four operations.	Support for this objective is included in Chapter 2.		4B Chapter 8 Lesson 3

PARCC Assessment Evidence/Clarification Statements

NJSLS	Evidence Statement	Clarification	Math Practices
5.NBT.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.	i) Tasks have "thin context"1 or no context. ii) Tasks involve the decimal point in a substantial way (e.g., by involving, for example, a comparison of a tenths digit to a thousandths digit or a tenths digit to a tens digit)	MP.2, MP.7
5.NBT.2-2	Use whole-number exponents to denote powers of 10.		MP.7
5.NBT.4	Use place value understanding to round decimals to any place.	i) Tasks have "thin context" or no context.	MP.2
5.NBT.5-1	Multiply multi-digit whole numbers using the standard algorithm..	i) Tasks do not have a context. ii) Tasks assess accuracy. iii) The given factors are such as to require an efficient/standard algorithm (e.g., 726 × 48). Factors in the task do not suggest any obvious ad hoc or mental strategy (as would be present for example in a case such as 725 × 40). iv) For purposes of assessment, the possibilities are 1-digit x 2-digit, 1-digit x 3digit, 2-digit x 3-digit, or 2-digit x 4-digit	MP.7
5.NBT.7-1	Add two 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.	i) Tasks do not have a context. ii) Only the sum is required; explanations are not assessed here. iii) Prompts may include visual models, but prompts must also present the addends as numbers, and the answer sought is a number, not a picture. iv) Each addend is greater than or equal to 0.01 and less than or equal to 99.99. v) 20% of cases involve a whole number—either the sum is a whole number, or else one of the addends is a whole number presented without a decimal point. (The addends cannot both be whole numbers.)	MP.5
5.NBT.7-2	Subtract two 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.	i) Tasks do not have a context. ii) Only the difference is required; explanations are not assessed here. iii) Prompts may include visual models, but prompts must also present the subtrahend and minuend as numbers, and the answer sought is a number, not a picture. iv) The subtrahend and minuend are each greater than or equal to 0.01 and less than or equal to 99.99. Positive differences only. (Every included subtraction problem is an unknown-addend problem included in 5.NBT.7-1.) v) 20% of cases involve a whole number—either the difference is a whole number, or the subtrahend is a whole number	MP.5, MP. 7

		presented without a decimal point, or the minuend is a whole number presented without a decimal point. (The subtrahend and minuend cannot both be whole numbers.) MP	
5.NBT.7-3	Multiply tenths with tenths or tenths with 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	i) Tasks do not have a context. ii) Only the product is required; explanations are not assessed here. iii) Prompts may include visual models, but prompts must also present the factors as numbers, and the answer sought is a number, not a picture. iv) Each factor is greater than or equal to 0.01 and less than or equal to 99.99. v) The product must not have any non-zero digits beyond the thousandths place. (For example, 1.67 x 0.34 = 0.5678 is excluded because the product has an 8 beyond the thousandths place; cf. 5.NBT.3, and see p. 17 of the Number and Operations in Base Ten Progression document.) vi) Problems are 2-digit x 2-digit or 1-digit by 3- or 4-digit. (For example, 7.8 x 5.3 or 0.3 x 18.24.) vii) 20% of cases involve a whole number—either the product is a whole number, or else one factor is a whole number presented without a decimal point. (Both factors cannot both be whole numbers.)	MP.5, MP.7
5.NBT.7-4	Divide in problems involving tenths and/or 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.	i) Tasks do not have a context. ii) Only the quotient is required; explanations are not assessed here. iii) Prompts may include visual models, but prompts must also present the dividend and divisor as numbers, and the answer sought is a number, not a picture. iv) Divisors are of the form XY, X0, X, X.Y, 0.XY, 0.X, or 0.0X (cf. 5.NBT.6), where X and Y represent non-zero digits. Dividends are of the form XY, X0, X, XYZ.W, XY0.Z, X00.Y, XY.Z, X0.Y, X.YZ, X.Y, X.0Y, 0.XY, or 0.0X, where X, Y, Z, and W represent non-zero digits. v) Quotients are either whole numbers or else decimals terminating at the tenths or hundredths place. (Every included division problem is an unknown-factor problem included in 5.NBT.7-3.) vi) 20% of cases involve a whole number—either the quotient is a whole number, or the dividend is a whole number presented without a decimal point, or the divisor is a whole number presented without a decimal point. (If the quotient is a whole number,	MP.5, MP.7

		then neither the divisor nor the dividend can be a whole number.)	
5.OA.3	Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. For example, given the rule “Add 3” and the starting number 0, and given the rule “Add 6” and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.		MP.3, MP.8
5.MD.1-1	Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m).		MP.5, MP.6
5.MD.1-2	Solve multi-step, real world problems requiring conversion among different-sized standard measurement units within a given measurement system.	i)Multi-step problems must have at least 3 steps. .	MP.1, MP.6
5.MD.2-2	Use operations on fractions for this grade (knowledge and skills articulated in 5.NF) to solve problems involving information 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.	.	MP.5
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.	i) Measures may include those in whole cubic cm or cubic cm.	MP.7
5.MD.4	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.	i) Tasks assess conceptual understanding of volume (see 5.MD.3) as applied to a specific situation—not applying a volume formula.	MP.7
5.MD.5b	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	i) Tasks are with and without contexts. ii) 50% of tasks involve use of $V = l \times w \times h$ and 50% of tasks involve use of $V = B \times h$. iii) Tasks may require students to measure to find edge lengths to the nearest cm, mm or in.	MP.5, MP.7

	problems		
5.MD.5c	Relate 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.	i) Tasks require students to solve a contextual problem by applying the indicated concepts and skills.	MP.2, MP.5
5.G.1	Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and xcoordinate, y-axis and y-coordinate).	i) Tasks assess student understanding of the coordinate plane as a representation scheme, with essential features as articulated in standard 5.G.1. ii) It is appropriate for tasks involving only plotting of points to be aligned to this evidence statement. iii) Coordinates must be whole numbers only.	MP.2, MP.5
5.G.2	Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.		MP.1, MP.5
5.G.3	Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.	i) A trapezoid is defined as “A quadrilateral with at least one pair of parallel sides.”	MP.5, MP.7
5.G.4	Classify two-dimensional figures in a hierarchy based on properties.	i) A trapezoid is defined as “A quadrilateral with at least one pair of parallel sides.”	MP.5, MP.7
4.MD.1	Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two- column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ..		MP.5, MP.8

Connections to the Mathematical Practices

1	**Make sense of problems and persevere in solving them** Mathematically proficient students in fifth grade should solve problems by applying their understanding of operations with whole numbers, decimals, and fractions including mixed numbers. They solve problems related to volume and measurement conversions. Students seek the meaning of a problem and look for efficient ways to represent and solve it. They may check their thinking by asking themselves, “What is the most efficient way to solve the problem?”, “Does this make sense?”, and “Can I solve the problem in a different way?”.
2	**Reason abstractly and quantitatively** In fifth grade, students should recognize that a number represents a specific quantity. They connect quantities to written symbols and create a logical representation of the problem at hand, considering both the appropriate units involved and the meaning of quantities. They extend this understanding from whole numbers to their work with fractions and decimals. Students write simple expressions that record calculations with numbers and represent or round numbers using place value concepts.
3	**Construct viable arguments and critique the reasoning of others** In fifth grade, mathematically proficient students may construct arguments using concrete referents, such as objects, pictures, and drawings. They explain calculations based upon models and properties of operations and rules that generate patterns. They demonstrate and explain the relationship between volume and multiplication. They refine their mathematical communication skills as they participate in mathematical discussions involving questions like “How did you get that?” and “Why is that true?” They explain their thinking to others and respond to others’ thinking.
4	**Model with mathematics** In fifth grade, students experiment with representing problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, making a chart, list, or graph, creating equations, etc. Students need opportunities to connect the different representations and explain the connections. They should be able to use all of these representations as needed. Fifth graders should evaluate their results in the context of the situation and whether the results make sense. They also evaluate the utility of models to determine which models are most useful and efficient to solve problems.
5	**Use appropriate tools strategically** Mathematically proficient fifth graders consider the available tools (including estimation) when solving a mathematical problem and decide when certain tools might be helpful. For instance, they may use unit cubes to fill a rectangular prism and then use a ruler to measure the dimensions. They use graph paper to accurately create graphs and solve problems or make predictions from real world data.

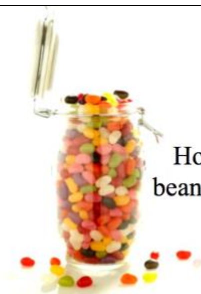
6	**Attend to precision** Fifth graders should continue to refine their mathematical communication skills by using clear and precise language in their discussions with others and in their own reasoning. Students use appropriate terminology when referring to expressions, fractions, geometric figures, and coordinate grids. They are careful about specifying units of measure and state the meaning of the symbols they choose. For instance, when figuring out the volume of a rectangular prism they record their answers in cubic units.
7	**Look for and make use of structure** Mathematically proficient fifth grade students look closely to discover a pattern or structure. For instance, students use properties of operations as strategies to add, subtract, multiply and divide with whole numbers, fractions, and decimals. They examine numerical patterns and relate them to a rule or a graphical representation.
8	**Look for and express regularity in repeated reasoning** Fifth graders should use repeated reasoning to understand algorithms and make generalizations about patterns. Students connect place value and their prior work with operations to understand algorithms to fluently multiply multi-digit numbers and perform all operations with decimals to hundredths. Students explore operations with fractions with visual models and begin to formulate generalizations.

Visual Vocabulary

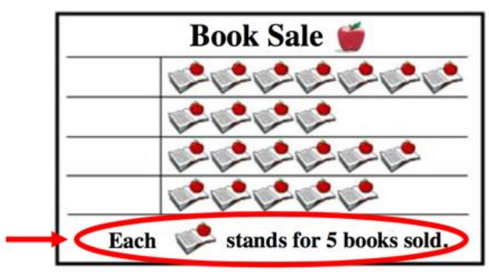
Visual Definition

The terms below are for teacher reference only and are not to be memorized by students. Teachers should first present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or use them with words, models, pictures, or numbers.

CHAPTER 9

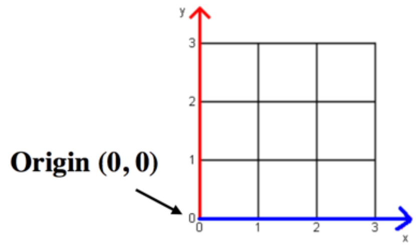
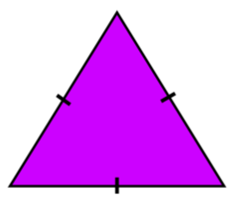
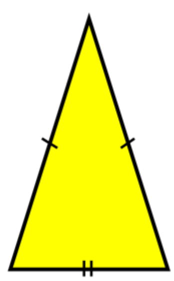
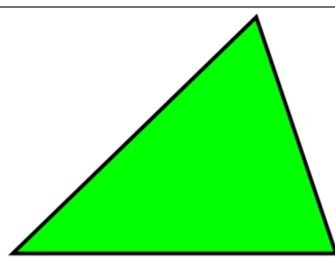
dividend	$7\overline{)56}$	A number that is divided by another number.
divisor	$7\overline{)56}$	The number by which another number is divided.
estimate	 How many jelly beans are in the jar?	To find a number close to an exact amount; an estimate tells *about* how much or *about* how many.

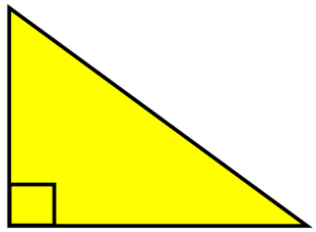
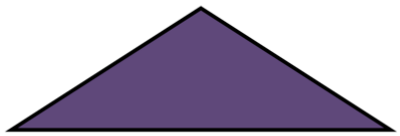
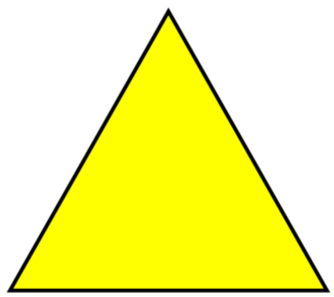
CHAPTER 11

key		A part of a map, graph, or chart that explains what the symbols mean.

CHAPTER 13

ordered pair	$(-5, 2)$ $(x\ ,\ y)$	A pair of numbers that gives the coordinates of a point on a grid in this order (horizontal coordinate, vertical coordinate). Also known as a coordinate pair.

origin		The intersection of the *x*- and *y*-axes in a coordinate plane, described by the ordered pair (0, 0).
***x*-coordinate**	**(7, 2)** ***x*-coordinate**	In an ordered pair, the value that is always written first.
***y*-coordinate**	**(7, 2)** ***y*-coordinate**	In an ordered pair, the value that is always written second.
CHAPTER 14		
equilateral triangle		A triangle whose sides are all the same length.
isosceles triangle		A triangle that has at least two congruent sides.
scalene triangle		A triangle that has no congruent sides.

right triangle		A triangle that has one 90º angle.
obtuse triangle		A triangle that contains one angle with a measure greater than 90º (obtuse angle) and two acute angles.
acute triangle		A triangle with no angle measuring 90º or more.

Potential Student Misconceptions

Chapter 9:

- Lesson 9.1-Some students may incorrectly place the decimal point in the product. Remind students to write the whole number at the bottom right when writing the problems in vertical form and to align the decimal point in the product with the decimal point in the top factor.
- Lesson 9.3- Some students may divide each price in Ex. 24 by 400 or 500, thinking that this is the price per 100 milliliters. Explain that this is the price per milliliter, not per 100 milliliters. In order to find the price per 100 milliliters, students need to multiply the unit price by 100.
- Lesson 9.4-Studentsmay have difficulty with Ex. 15 because they are not dividing 4.165 by 10,100 or 1,000, but instead must find the numbers that were divided by 10,100 and 1,000 to get 4.165.
- Lesson 9.5-Some students may have difficulty deciding if their estimate will be greater than or less than the actual total. Explain that if you round down, the estimate will be less that the actual sum or product; and if you round up, the estimate will be greater than the actual sum or product.
- Lesson 9.6-Themost common error when converting units of measure is using the wrong operation. You may wish to have students tell which operation or operations they need to use for each exercise before they begin.
- Lesson 9.7- For Ex. 4, some students may divide 70.4 by 9. Explain that in order to find a number that is 9 times the other, you must divide this sum by 10. Draw a bar mode to show students why this is true.

Chapter 11:

- Lesson 11.1-Students may forget to number their number lines or include a key. Remind them that the purpose of a graph is to communicate information. Both the labels and the key are important ways to tell people what the graph is about.
- Lesson 11.2- Some students may incorrectly interpret the scale on the vertical axis of the graph when it has unlabeled tic marks on the axis. Explain that each unlabeled value is half way between the value above and the value below it.
- Lesson 11.4- Students may confuse which numbers are represented on each axis. Before they try Ex. 2 to 4,ask them which grid lines they will need to look at to find the answers to each question.

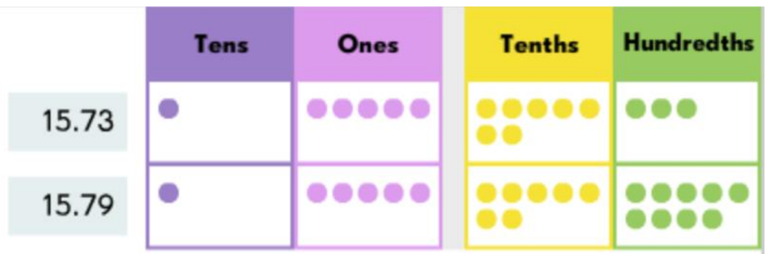
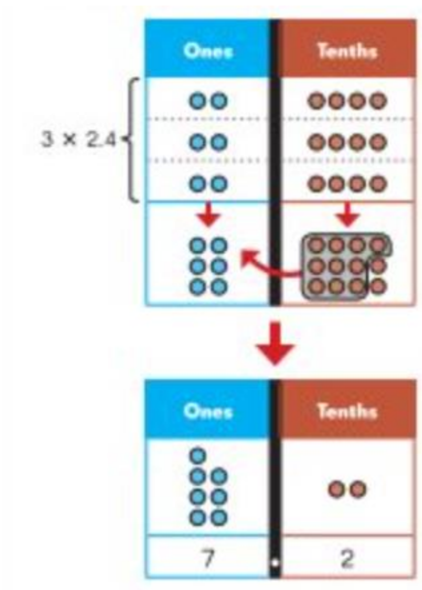
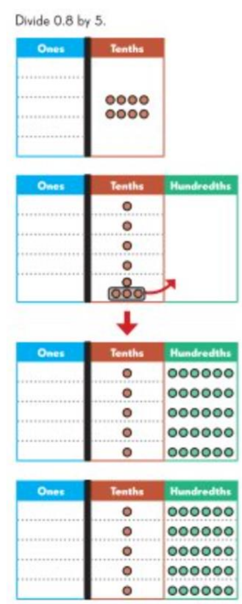
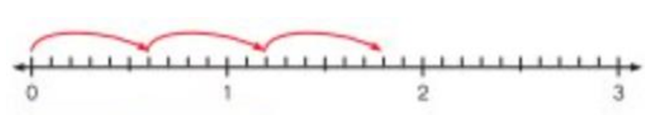
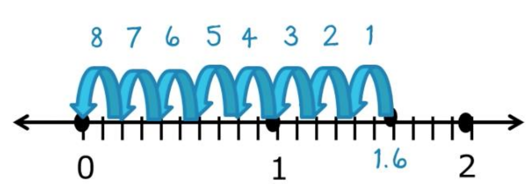
Chapter 13:

- Lesson 13.1- Some students may classify PQR as a right triangle as an obtuse triangle. Remind them that a right triangle can never be obtuse.
- Lesson 13.3-In Ex. 5, students may incorrectly calculate angle QPR as 60 degrees because the sides of triangle PQR all look equal in length. Explain that unless a figure is drawn to scale, students cannot determine the lengths of its sides by the way the figure looks.
- Lesson 13.5-n Ex. 3, students may incorrectly assume that HK bisects angle G, and that since the measure of angle G =80 degrees, the measure of angle y= 40 degrees. Explain that students need to find measure of angle y by using the sum of the angles HGK. Since HG=GK, then the opposite angles have equal measures.

Chapter 14:

- Lesson 14.5-In Ex. 7, students may mislabel linear and cubic units. Explain that the length and width of a surface are two dimensions used to find area. Length, width and height are the three dimensions used to find volume.
- Lesson 14.6-Students may get confused about which units to use for each answer. Suggest that they read each problem first to identify the unit required in the answer.
- Lesson 14.7-Some students may think that the figures have missing dimensions. For example, in Ex. 1 they may want to know how far the top block is from the end of the lower block. Help them see the base as a single long prism.

Multiple Representations Framework

Concrete and Pictorial Representations	
Place Value Chart	  
Number Line	0.6 x 3  1.6 ÷ 0.2 

Assessment Framework

Unit 3 Assessment / Authentic Assessment Framework			
Assessment	**NJSLS**	**Estimated Time**	**Format**
Pre Test 9	5.NBT.1, 5.NBT.4, 5.NBT.5, 5.NBT.6	40 minutes	Individual
Authentic Assessment 9	5.NBT.6, 5.MD.1	25 minutes	Individual
Chapter Test/Review 9	4.MD.1, 5.NBT.2, 5.NBT.4, 5.NBT.7	40 minutes	Individual
Test Prep 9	4.MD.1, 5.NBT.1, 5.NBT.2, 5.NBT.7	40 minutes	Individual
Authentic Assessment 10	5.NBT.7	25 minutes	Individual
Mini Assessment 5.MD.2	5.MD.2	15 minutes	Individual
Authentic Assessment 11	5.NBT.2	25 minutes	Individual
Mini Assessment 5.OA.3	5.OA.3	15 minutes	Individual
Pre Test 11	3.MD.3, 4.MD.1, 5.MD.2, 5.G.1, 6.SP.5	40 minutes	Individual
Chapter Test/Review 11	3.MD.3, 5.MD.2, 5.G.1, 7.SP.8	40 minutes	Individual
Pre Test 13	1.NBT.3, 2.G.2, 3.G.1, 4.MD.7, 4.G.2, 5.G.4, 6.EE.5	40 minutes	Individual
Mini Assessment 5.G.3-4	5.G.3-4	15 minutes	Individual
Chapter Test/Review 13	4.G.2, 5.G.4, 7.G.5	40 minutes	Individual
Pre Test 14	3.MD.2, 4.MD.3, 5.MD.3, 5.NF.6	40 minutes	Individual
Chapter Test/Review 14	4.MD.1, 5.MD.3.a, 5.MD.4, 5.MD.5.b, 5.MD.5.c, 5.NF.4.a, 7.G.6	40 minutes	Individual
Test Prep 14	4.MD.1, 5.MD.3.a, 5.MD.5.b, 6.G.4, 7.G.6	40 minutes	Individual
Mini Assessment 5.MD.3-5	5.MD.3, 5.MD.4, 5.MD.5	30 minutes	Individual
Authentic Assessment 12 (optional)	5.NBT.4	25 minutes	Individual

	PLD	**Genesis Conversion**
Rubric Scoring	PLD 5	100
	PLD 4	89
	PLD 3	79
	PLD 2	69
	PLD 1	59

5th Grade Authentic Assessment #9 –Minutes and Days

Name:_______________________________________

What time was it 2011 minutes after the beginning of January 1, 2011?

Authentic Assessment #9 Scoring Rubric: Minutes and Days

NJSLS.MATH.CONTENT.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.

NJSLS.MATH.CONTENT.5.NBT.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.

Mathematical Practices: 1,2, 6, 7, and 3

SOLUTION:

January 1, 2011 begins at 12:00 AM. To find the time 2011 minutes later will require changing units since time is told in hours and minutes. There are 60 minutes in an hour so to see how many hours there are in 2011 minutes we can perform the division problem 2011÷60. Since 30×60=1800, we can write

$$2011=30\times60+211.$$

Next, 60 goes into 211 three times, with a remainder of 31 so we get

$$2011=30\times60+3\times60+31.$$

Using the distributive property this last expression is equivalent to

$$2011= (30+3)\times60+31.$$

So 2011 minutes is the same as 33 hours and 31 minutes. Now 33 hours is one day and an additional 9 hours so this means that 2011 minutes is one day, nine hours, and thirty-one minutes. So 2011 minutes after the beginning of 2011 it is January 2 and it is 9:31 AM.

Level 5: Distinguished Command	**Level 4: Strong Command**	**Level 3: Moderate Command**	**Level 2: Partial Command**	**Level 1: No Command**
Student correctly answers and clearly constructs and communicates a complete response based on explanations/reasoning using : • Strategies based on place value, the properties of operations, and/or the relationship between multiplication and division • Conversion among different-sized standard measurement units within a given measurement system Response includes an **efficient** and logical progression of steps.	Student answers, clearly constructs, and communicates a complete response containing one minor calculation error based on explanations/reasoning using: • Strategies based on place value, the properties of operations, and/or the relationship between multiplication and division • Conversion among different-sized standard measurement units within a given measurement system Response includes a **logical** progression of steps	Student answers, clearly constructs, and communicates a complete response containing calculation errors or a conceptual error based on explanations/reasoning using: • Strategies based on place value, the properties of operations, and/or the relationship between multiplication and division • Conversion among different-sized standard measurement units within a given measurement system Response includes a **logical but incomplete** progression of steps. Minor calculation errors.	Student answers, clearly constructs, and communicates a complete response containing major calculation and/or conceptual errors based on explanations/reasoning using: • Strategies based on place value, the properties of operations, and/or the relationship between multiplication and division • Conversion among different-sized standard measurement units within a given measurement system Response includes an **incomplete or Illogical** progression of steps.	The student shows no work or justification.

5th Grade Authentic Assessment #10 - The Value of Education

Name:____

The Value of Education

Name	Level of Education	Weekly Income
Miley	High School Drop Out	$440.50
Niko	High School Graduate	$650.35
Taylor	2-Year College Graduate	$771.25
Pinky	4-Year College Graduate	$1,099.20

a. How much more does Niko earn than Miley in one week?

b. If Taylor and Miley both work for 2 weeks, how much more will Taylor earn?

c. How much money will Pinky earn in a month? About how long will Miley have to work to earn the same amount?

Authentic Assessment #10 Scoring Rubric: The Value of Education

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.

Mathematical Practice: 1, 6

SOLUTION:

a. Niko makes \$650.35 per week and Miley makes \$440.50 per week. We know that

$$650-440=210$$

and

$$210.35-0.50=210+0.35-0.50=210-0.15=209.85$$

Niko makes \$209.85 more per week than Miley.

b. Taylor makes \$771.25 per week and makes twice that much in two weeks.

$$2\times771.25=2(700+70+1+0.25)=1400+140+2+0.50$$

Taylor makes \$1542.50 in two weeks.

Miley makes \$440.50 per week and so will make \$881 in two weeks. Since

$$1542.50-881=742.50-81=741.50-80=701.50-40=661.50$$

We know that Taylor will make \$661.50 more than Miley in two weeks.

c. There are four weeks in a month. Pinky makes \$1099.20 in a week so will make

$$4\times1099.20=4\times1100-4\times0.80=4400-3.20=4396.80$$

Pinky will make \$4396.80 in a month. We can divide this by how much Miley makes in one week to find out how many weeks she will have to work.

$$4396.8\div440.5\approx4400\div440=10$$

Miley will have to work about 10 weeks, or two and a half months, to earn the same amount that Pinky will make in one month.

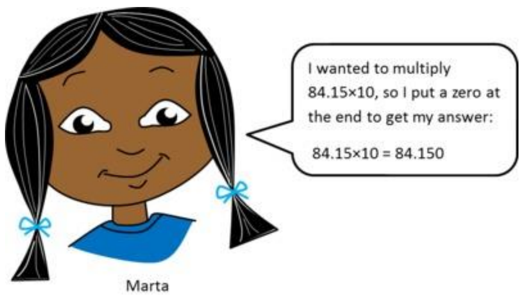
Level 5: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command	Level 1: No Command
No Errors Clearly constructs and communicates a complete response based on explanations/reasoning using: • Properties of Operations • Properties of Place Value • The Relationship between Addition and Subtraction Response includes an **efficient** and logical progression of steps.	**Error in One Part** Clearly constructs and communicates a complete response based on explanations/ reasoning using: • Properties of Operations • Properties of Place Value • The Relationship between Addition and Subtraction Response includes a logical progression of steps	**Error in Two Parts** Constructs and communicates a complete response based on explanations /reasoning using: • Properties of Operations • Properties of Place Value • The Relationship between Addition and Subtraction Response includes a logical but incomplete progression of steps. Minor calculation errors	**Error in Three Parts** Constructs and communicates an incomplete response based on explanations /reasoning using the: • Properties of Operations • Properties of Place Value • The Relationship between Addition and Subtraction Response includes an incomplete or Illogical progression of steps.	The student shows no work or justification

5th Grade Authentic Assessment #11 – Marta's Multiplication Error

Name:____

Martha's Multiplication Error

Marta made an error while finding the product
84.15×10.



In your own words, explain Marta's misunderstanding. Please explain what she should do to get the correct answer and include the correct answer in your response.

Authentic Assessment #11 Scoring Rubric: Marta's Multiplication Error

5.NBT.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.

Mathematical Practices: 2,3, and 7

SOLUTION:

Marta is mistakenly trying to continue a pattern dealing with multiplying whole numbers by powers of 10: the product will have the same digits as the whole number followed by the same number of 0s as the power of 10. Marta tried to place a 0 after 84.15 in her problem to continue this pattern, but placing a 0 in the thousandths place did not change the value of 84.15. Instead, Marta can shift the decimal one place to the right so that each digit occupies ten times its original place. Her correct answer is 841.5. Another way of finding the product of 84.15 and 10 is to rewrite 84.15 in expanded notation and use the distributive property:

$(80+4+0.1+0.05)\times10 = (80\times10)+(4\times10)+(0.1\times10)+(0.05\times10)$

$=800+40+1+0.5$

$=841.5$

Using expanded notation also highlights that the place value of each digit needs to be multiplied by a factor of 10. It should be noted that the digit 8 in the original expression represented 8 tens, but will be 8 hundreds in our product. In Marta's solution, the 8 still only represents 8 tens and the magnitude of the number has not changed.

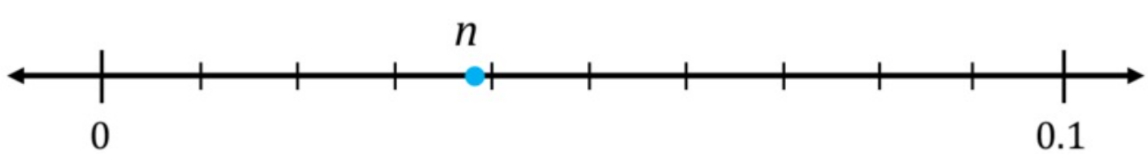
Level 5: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command	Level 1: No Command
Student gives all 3 correct answers. Clearly constructs and communicates a complete response based on explanations/ reasoning using: • Place value • Patterns in the placement of a decimal point when multiplying or dividing by a power of ten • Patterns in the number of zeros when multiplying or dividing by a power of ten Response includes an **efficient** and logical progression of steps.	**Student gives all 3 correct answers.** Clearly constructs and communicates a complete response based on explanations/ reasoning. • Place value • Patterns in the placement of a decimal point when multiplying or dividing by a power of ten. • Patterns in the number of zeros when multiplying or dividing by a power of ten Response includes a **logical** progression of steps	**Student gives all 2 correct answers.** Constructs and communicates a complete response based on explanations/ reasoning. • Place value • Patterns in the placement of a decimal point when multiplying or dividing by a power of ten. • Patterns in the number of zeros when multiplying or dividing by a power of ten Response includes a **logical but incomplete** progression of steps. Minor calculation errors.	**Student gives 1 correct answers.** Constructs and communicates an incomplete response based on explanations/ reasoning. • Place value • Patterns in the placement of a decimal point when multiplying or dividing by a power of ten. • Patterns in the number of zeros when multiplying or dividing by a power of ten Response includes an **incomplete or Illogical** progression of steps.	**Student does not give any correct answers.** The student shows no work or justification.

5th Grade Authentic Assessment #12 – Rounding to Tenths and Hundredths

Name:____

Rounding to Tenths and Hundredths

A number *n* is shown on the number line.



a. The tick marks are evenly spaced. Label them.

b. What is *n* rounded to the nearest hundredth?

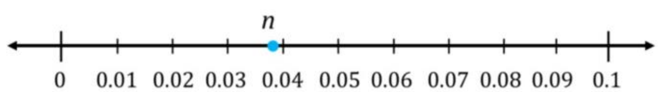
c. What is *n* rounded to the nearest tenth?

Authentic Assessment #12 Rubric: Rounding to Tenths and Hundredths

5.NBT. 4: Use place value understanding to round decimals to any place.

Mathematical Practice: 2

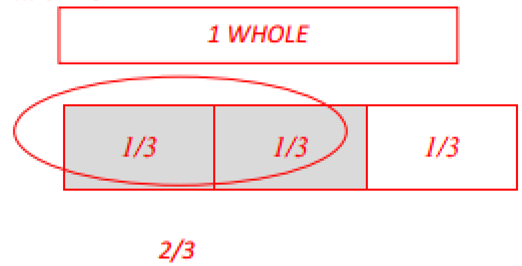
SOLUTION:

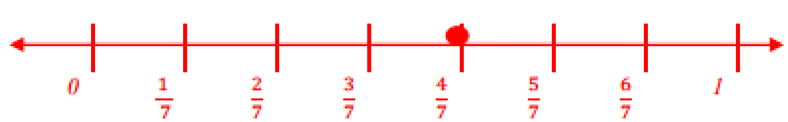


a.

b. We can see that *n* is closer to 0.04 than 0.03, so it rounds up to 0.04.
c. We can also see that *n* is closer to 0 than to 0.1, so *n* rounds down to 0.

Level 5: Distinguished Command	**Level 4: Strong Command**	**Level 3: Moderate Command**	**Level 2: Partial Command**	**Level 1: No Command**
Clearly constructs and communicates a complete response based on explanations/reasoning using : • Place Value • Position on the number line Response includes an **efficient** and logical progression of steps. All parts correct	Clearly constructs and communicates a complete response based on explanations/reasoning using: • Place Value • Position on the number line Response includes a **logical** progression of steps. Minor error in labeling of the number line.	Constructs and communicates a complete response based on explanations/reasoning using: • Place Value • Position on the number line Response includes a **logical but incomplete** progression of steps. One part incorrect.	Constructs and communicates an incomplete response based on explanations/reasoning using: • Place Value • Position on the number line Response includes an **incomplete or Illogical** progression of steps. Two parts incorrect.	The student shows no work or justification.

Grade level	*Standard*	*Revised Standard*
3	3.OA.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5 × 7.	3.OA.1 Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. For example, describe and/or represent a context in which a total number of objects can be expressed as 5 × 7.
3	3.OA.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.	3.OA.2 Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. For example, describe and/or represent a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.
3	3.NF.1 Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b	3.NF.1 Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b. *Ex. b = 3* 
3	3.NF.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line. b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize	3.NF.2 Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line. b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.

	that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.	*Ex. a = 4; b = 7* 
3	3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).	3.MD.6 Measure areas by counting unit squares (square cm, square m, square in, square ft, and non-standard units).
4	4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two - column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36),	4.MD.1 Know relative sizes of measurement units within one system of units including km, m, cm, mm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...
5	5.MD.5b. Apply the formulas V = l × w × h and V = b × 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	5.MD.5b Apply the formulas V = l × w × h and V = B × 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
5	5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.	5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and non-standard units.