MATH NEWS

Volume 3 | 5th Grade – Unit 3 | 2nd Nine Weeks

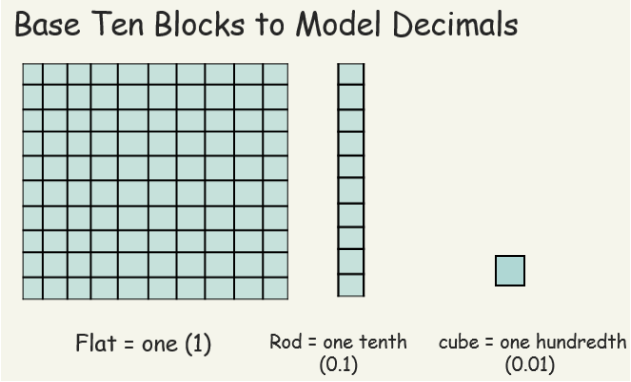
Unit 3: Multiplying and Dividing with Decimals

UNIT 3 GOALS:

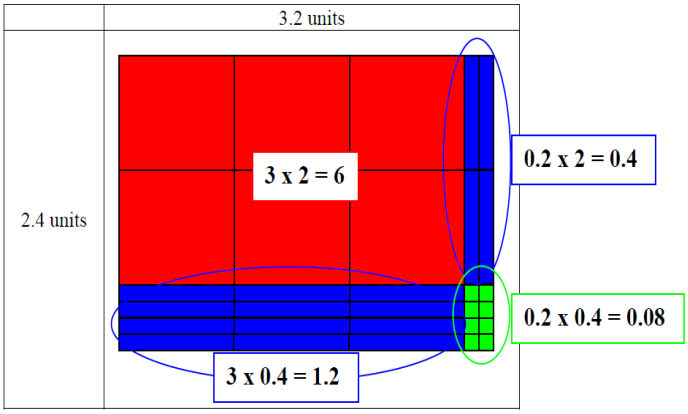
- Model multiplication and division of decimals using concrete and pictorial models.
- Apply place value strategies when estimating to find products and quotients.
- Multiply and divide decimals with fluency.
- Use whole numbers and decimals to solve multi-step word problems.
- Use whole number exponents to denote powers of 10.

Using Base-Ten Blocks to Model Decimals

Students will "build" decimal values and model multiplication and division using base-ten blocks. Students will also use pictorial models of base-ten blocks (decimal grids) to model multiplication and division of decimals.



To illustrate the product of **3.2 x 2.4** you will need to combine blocks in a rectangular array.



$6 + 1.2 + 0.4 + 0.08 = 7.68$

3.2 x 2.4 = 7.68

Multi-Digit Whole Number and Decimal Operations

Students will solve multiplication and division of decimal word problems to hundredths, using *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.

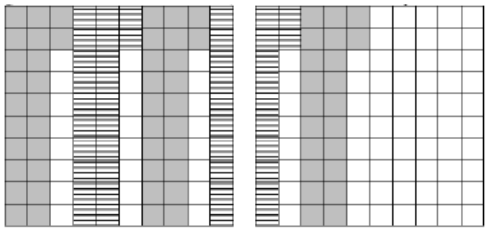
Before students are asked to give exact answers, they should estimate answers based on their understanding of operations and the value of the numbers.

Example:

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 five 20's equal 100 and we have five 22's.

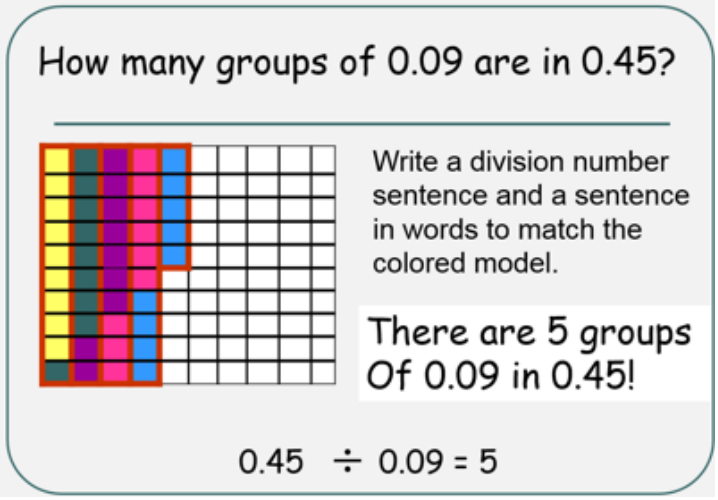
Model the problem on decimal grids:



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.

Modeling division of decimals on a decimal grid:



Students will use the traditional multiplication algorithm to solve multiplication of decimal problems. Before multiplying, students should estimate the answer in order to know where to place the decimal in the product.

Example: 9.8 x 7.5 =
The students may think 9.8 is close to 10 and know 10 x 7.5 is 75. The product should be close to 75.

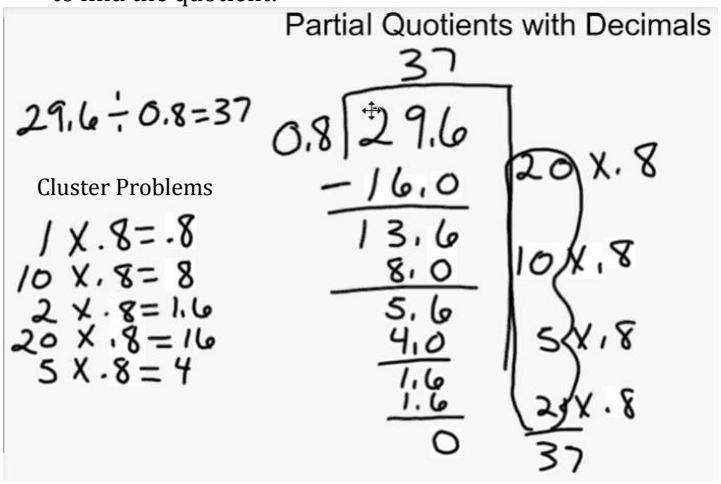
$$\begin{array}{r} 9.8 \\ \times\ 7.5 \\ \hline 490 \\ 6860 \\ \hline 7350 \end{array}$$

Since the estimated product is 75, the decimal point should go between the ones and tenth places.
73.50 Or 73.5 is the product.

Students will use partial quotients to divide with decimals values.

Example: 29.6 ÷ 0.8 =

- First students estimate the quotient for the given problem. *A student might think 29.6 ÷ 0.8 = is about the same as 30 ÷ 1 so the quotient will be about 30. It will be more than 30 but less than 40.*
- Next, students create a set of "Cluster Problems" or "Think Bubble" using facts related to the divisor while keeping the dividend in mind.
- Students use the problems in the cluster to subtract out "friendly chunks" from the dividend.
- Finally, students combine all of the groups of divisor used to find the quotient.



29.6 ÷ 0.8 = 37

Scan the codes here for videos on multiplying and dividing with decimals.

Powers of Ten

Students will explain patterns in the number of zeros of the product when multiplying a number by powers of 10. Students will also 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.

In the example below students should reason that the exponent (10^3) the 3 indicates the number of times you will multiply by 10. Students should "discover" in this particular situation when multiplying by a power of 10 the decimal point moves to the right. Students should also discover that multiplying by 10^3 is same as multiplying by 1,000.

Examples:

$2.5 \times 10^3 = 2{,}500$	$2.5 \times (10 \times 10 \times 10) = 2{,}500$	$2.5 \times 1{,}000 = 2{,}500$

In the example below students should reason that the exponent (10^3) the 3 indicates the number of times you will divide by 10. Students should "discover" in this particular situation when dividing by a power of 10 the decimal point moves to the left. Students should also discover that dividing by 10^3 is same as dividing by 1,000.

$350 \div 10^3 = 0.350$	$350 \div (10 \times 10 \times 10) = 0.350$	$350 \div 1{,}000 = 0.35$

This will relate well to subsequent work with operating with fractions. Students will eventually see the relationship between dividing by 10^2 and dividing by 1/100.

$350 \div 10^2 = 3.5$	$350 \div (10 \times 10) = 3.5$
OR	
$350 \times 1/100 = 3.5$	$350 \div 100 = 3.5$

Students relate this understanding to converting metric measurements.
Convert 3 meters to centimeters. (1 meter = 100 centimeters) 100 is the same as 10^2.

$$\begin{aligned} & 3\text{m} \times 10^2 \\ &= 3 \times 10 \times 10 \\ &= 3 \times 100 \\ &= 300 \text{ cm} \end{aligned}$$