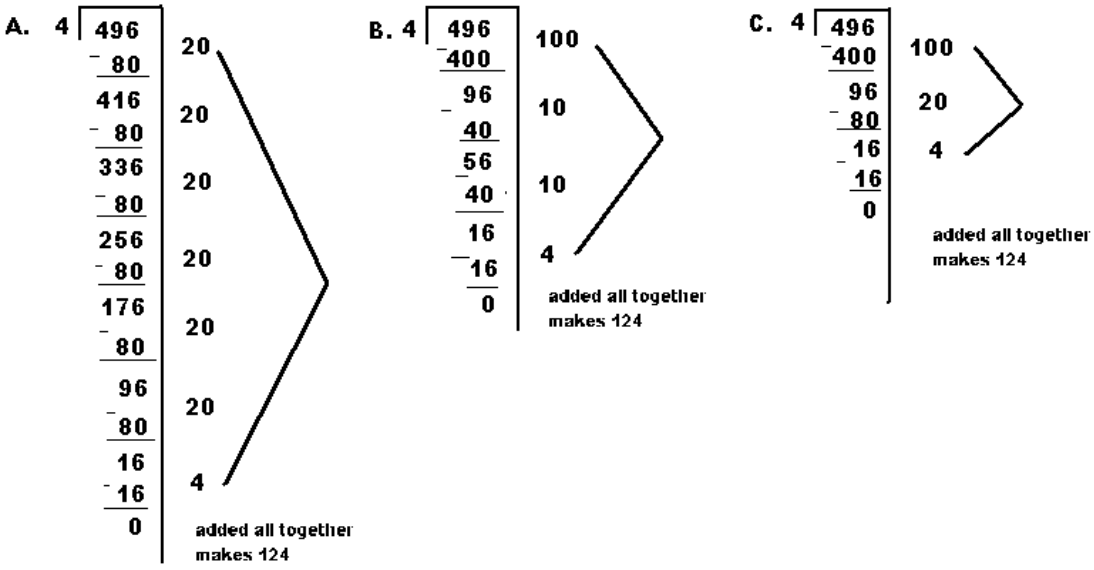
Division
Strategy Notebook
4th Grade
MCC4.NBT.6

This strategy notebook is designed to be a reference for teachers when they are teaching the strategy standards in whole group. STUDENTS DO NOT HAVE TO MASTER ALL THESE STRATEGIES. THESE ARE JUST EXAMPLES OF WAYS FOR STUDENTS TO BUILD NUMBER SENSE. THE STRATEGIES THAT SAY "IMPORTANT" ARE THE ONES THAT STUDENTS NEED TO UNDERSTAND.

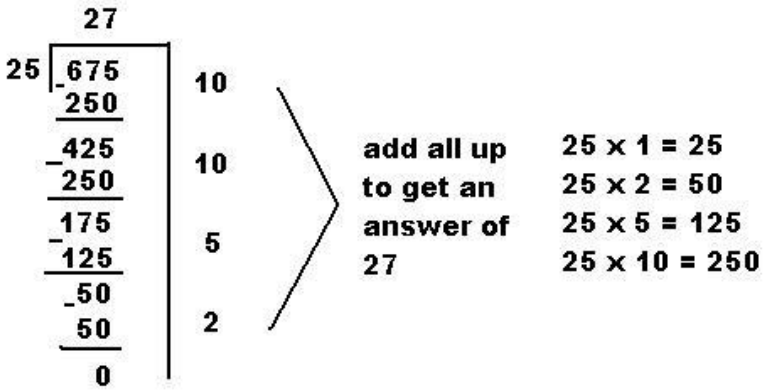
Partial Quotients Strategy (Important)

The "partial quotients" strategy uses place value and allows students to build on multiplication facts with friendly numbers.

Look at the problem 496 ÷ 4. There are three examples of a student's approach to solving 496 ÷ 4. We could say that example C is more efficient than the other two but it is important to point out how the student is thinking/building on understanding. The students can multiply 4 x 20 over and over again or use higher multiples of ten efficiently; they all reach the same solution. The "partial quotient" way will work with any division problem.



Look at the next problem 675 ÷ 25. Notice, to the right, how the student wrote down facts that were easy for him/her and those were the only facts he/she used. This is a good way to introduce students to this strategy. After a while, students will gain enough number sense that they will realize there may be other multiplication facts to use that might be more efficient.



Here are some problems you can use that support "Partial Quotients."

96 ÷ 4	348 ÷ 6	420 ÷ 3	500 ÷ 6	124 ÷ 4
77 ÷ 5	256 ÷ 4	852 ÷ 3	496 ÷ 8	348 ÷ 6

Place Value Strategy

Students can use this place value strategy to make division easier to understand.

The problem is 872 ÷ 6. Using the "Place Value" strategy, we will break up 872 into its place value parts. Then you will need to find out how many 6's are in 800, how many 6's are in 270, and how many 6's are in 32.

$6\overline{)872}$

$$
\begin{array}{r}
100 + 40 + 5 \quad \text{145 R2} \\
6\overline{)800 + 70 + 2} \\
-600 \\
\hline
200 + 70 \\
270 \\
-240 \\
\hline
30 \quad +2 \\
32 \\
-30 \\
\hline
2
\end{array}
$$

Distributive Property Strategy

In this strategy you break up the dividend into chunks that will be easier to work with. See example below:

$6\overline{)872}$

$$
\begin{array}{l}
6 \div (600 + 272) \\
6 \div (600 + 240 + 32) \\
6 \div (600 + 240 + 30 + 2)
\end{array}
$$

$$
\begin{array}{c}
100 + 40 + 5 + R2 \\
145\ R2
\end{array}
$$

For more explanation, watch the video called Explaining Strategies to use with division based on place value and properties in the professional development section of Q1 4th grade curriculum map.

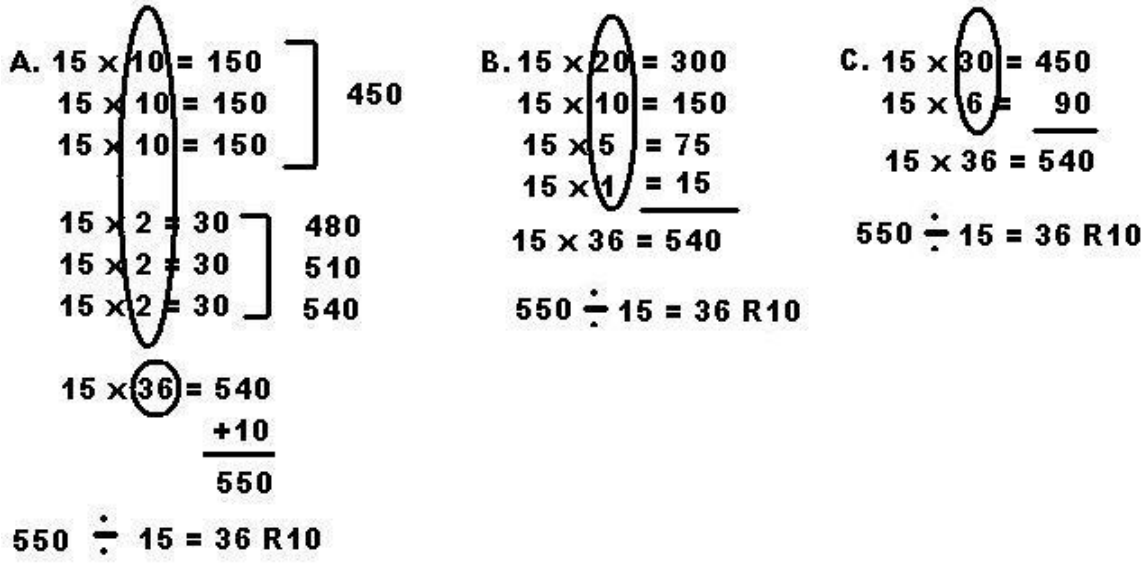
Multiplying Up Strategy (Important part is area model…scroll down)

This strategy builds on students' strength in multiplication. Students realize they can multiply up to reach the dividend. This becomes easier as they become more confident in their understanding of multiplication and its relationship to division. This is a lot like partial quotients, just written differently.

Initially students will want to use smaller factors and multiples. This will result in more steps. You then would need to discuss choosing efficient factors.

Below are some different ways students used this strategy. Notice how the student is building up to the dividend through multiplication in each example. Example C is the most efficient, but the others still get the same answer.

The problem is: 550 ÷ 15



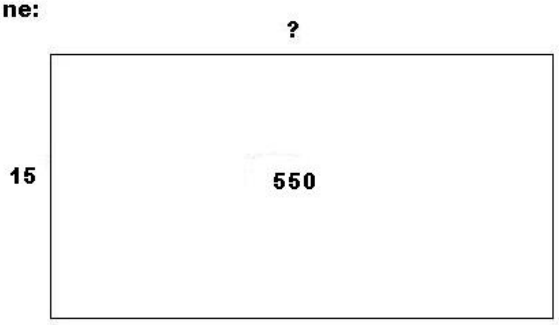
Here are some problems you can use that support "Multiplying Up."

79 ÷ 5	72 ÷ 4	99 ÷ 6	453 ÷ 3	999 ÷ 4
500 ÷ 4	215 ÷ 4	960 ÷ 3	484 ÷ 4	536 ÷ 6

An open array model can be used to model the student's strategy of multiplying up and show the relationship between multiplication and division. CCGPS states that the student should "illustrate and explain the calculation by using equations, rectangular arrays, and/or area models".

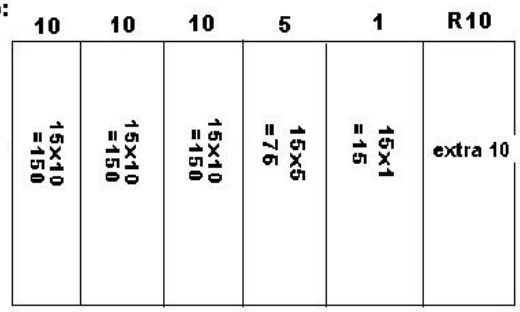
550 ÷ 15

Step One:



I know that one side is 15 and the middle is 550. I need to know what the other side will be. This will be my quotient.

Step Two:



I am going to break the middle up into chunks using some easy multiplication facts. I will chunk it until I get to 550. My quotient will be 10 + 10 + 10 + 5 + 1. The extra is the remainder.

Proportional Reasoning Strategy

Division of whole numbers can also be represented as a fraction with the whole divided into a specific number of parts. For example, if I have 16 candies to be shared among 8 children, 16 would be my whole (numerator) and 8 would be the number of parts the whole will be divided into, or the denominator. Students can explore "proportional reasoning" using equivalent fractions. Knowing that the divisor and dividend 16/8 share common factors, students can simplify the quantity to any of the following equivalent fractions: 8/4, 4/2, 2/1. This is an excellent way to help students understand that you can divide the dividend and the divisor by the same amount to create a simpler problem. If the dividend and divisor share common factors, then the problem can be simplified.

550 ÷ 15	**Both 550 and 15 share the common factor of 5. Let's simplify each number by dividing by 5.**
550 ÷ 15 **÷ 5 ÷ 5** **110 ÷ 3**	**As we divide each number by 5, the problem becomes 110 ÷3. This problem is much simpler now with a one digit divisor. We cannot simplify 3 any more.**
$\frac{550}{15} = \frac{110}{3} = 36\frac{2}{3}$	**If we turn our remainder into a fraction our original problem of 550 ÷ 15 would have an answer of 36 10/15. Our new problem, 110 ÷ 3, has an answer of 36 2/3. The fraction 10/15 can reduce to 2/3, so they are equivalent.**
	It may be helpful to think of this sequence of division problems as equivalent fractions.

- This strategy helps to teach MCC4. OA.3 (interpret remainders as fractional amounts). In GPS we did not teach how remainders can be seen as fractions.
- This strategy also works well if both the divisor and the dividend are even numbers. This allows the student to simplify each number by dividing it by 2 until it can not be simplified anymore. The problem will then be much easier to solve.

Here are some problems you can use that support "Proportional Reasoning Strategy."

200 ÷ 8	1000 ÷ 8	96 ÷ 4	144 ÷ 6	184 ÷ 8