Warm-Up

CST/CAHSEE: 4th Grade CST	Review: 4th Grade CST
$6\overline{)267}$ A 43 B 43 R3 C 44 D 44 R3 Solve 3 different ways.	At school, there are 704 desks to place into 22 classrooms. If the same number of desks is placed in each classroom, how many desks will be in each room? A 32 B 34 C 42 D 44 Create 3 other possible distracters for this problem.

Current: 5th Grade CST	Other: 4th Grade CST
What is the answer to this division problem? $12\overline{)246}$ A 2.05 B 2.5 C 20.5 B 25 How could you mitigate errors if students have the decimal placed incorrectly?	Justin solved the problem below. Which expression could be used to check his answer? $3\overline{)1364}$ 454 R2 A $(454 \times 3) + 2$ B $(454 \times 3) + 2$ C $(454 \times 3) \times 2$ D $(454 + 2) \times 3$ Why might students choose the other distracters?

Today's Objective/Standards: Use of Fractional Decomposition to Divide Whole Numbers and Decimals

Fractional Decomposition to Divide Whole Numbers and Decimals

4NS 3.2 Demonstrate an understanding of and the ability to use standard algorithms for dividing a multi digit number.

4NS 3.4 Solve problems involving division of multiple digit numbers by one-digit numbers.

5NS 2.2 Demonstrate proficiency with division, including division with positive decimals and long division with multi-digit divisors.

6NS 2.3 Solve addition, subtraction, multiplication and division problems, including those arising in concrete situations, that use positive and negative integers and combinations of these operations.

To be taught after "divvy up" and Partial Quotients.

Introduction:
"We are going to use your knowledge of basic facts with decomposition to solve division problems."

What are three ways you can write the expression '369 divided by 3?"

$$3\overline{)369} \qquad\qquad 369 \div 3 \qquad\qquad \frac{369}{3}$$

The Fraction bar is another way of expressing division. It tells us to divide the Numerator by the denominator.

I am going to decompose $\dfrac{369}{3}$ in a way so that I can use my basic math facts to simplify, or divide this expression.

$$\frac{369}{3}$$
$$= \frac{300}{3} + \frac{60}{3} + \frac{9}{3}$$
$$= 100 + 20 + 3$$
$$= 123$$

$$\begin{array}{r} 123 \\ 3\overline{)369} \\ -\ 3 \\ \hline 069 \\ -\ 6 \\ \hline 09 \\ -\ 9 \\ \hline 0 \end{array}$$

$$\begin{array}{r} 1\ 2\ 3 \\ 3\overline{)\ 3\ 6\ 9} \\ -3\ 0\ 0 \quad 100 \\ \hline 6\ 9 \\ -\ 3\ 0 \quad 10 \\ \hline 3\ 9 \\ -\ 3\ 0 \quad 10 \\ \hline 9 \\ -\ 9 \quad 3 \\ \hline 0 \end{array}$$

Then I am going to solve using two other methods to check. First I am going to break the numerator up by place value to see if there are improper fractions I can easily simplify in my head. "369 divided by 3 equals 300 divided by 3 plus 60 divided by 3 plus 9 divided by 3." I can simplify these fractions in my head. *Show decomposition of the fraction on the board as you explain.*

Example 2 $\dfrac{264}{6}$

What is the dividend? (264) What is the divisor? (6)
I am going to decompose this fraction into smaller fractions that are simple to solve in my head. Question –"Why do you think I decomposed the fraction this way? (*It is broken up by basic facts*) Is this the only way I could have decomposed the fraction? (*no*)

$$\begin{aligned}
\frac{264}{6} &\\
&= \frac{240}{6} + \frac{24}{6}\\
&= 40 + 4\\
&= 44
\end{aligned}$$

What is the quotient?
44

Example 3 $\dfrac{704}{22}$

Model Think Aloud – When I look at this fraction – the decomposition of the numerator isn't as obvious to me as it was in the previous problems. So I think I will break out obvious multiples of 22. What are possible multiples of 22? I know that 220 is divisible by 22 so I will pull out as many 220's as I can. (Narrate as you record this example: 220 +220=440, so I can pull out another 220 which adds up to 660…)

$$\begin{aligned}
\frac{704}{22} &\\
&= \frac{220}{22} + \frac{220}{22} + \frac{220}{22} + \frac{44}{22}\\
&= 10 + 10 + 10 + 2\\
&= 32
\end{aligned}$$

Use Choral Response as you simplify the decomposed fraction – "What is 220 divided by 22? (10)

"You Try"
(with a partner)

$1362 \div 3$

$$\begin{aligned}
\frac{1362}{3} &\\
&= \frac{1200}{3} + \frac{162}{3}\\
&= 400 + \frac{150}{3} + \frac{12}{3}\\
&= 400 + 50 + 4\\
&= 454
\end{aligned}$$

Or

$$\begin{aligned}
\frac{1362}{3} &\\
&= \frac{1000}{3} + \frac{300}{3} + \frac{60}{3} + \frac{2}{3}\\
&= \frac{900}{3} + \frac{100}{3} + 100 + 20 + \frac{2}{3}\\
&= 300 + 120 + \frac{102}{3}\\
&= 420 + \frac{90}{3} + \frac{12}{3}\\
&= 420 + 30 + 4\\
&= 454
\end{aligned}$$

Check with your neighbors and see if they decomposed the same way as you, or differently. Describe how you decomposed your fraction and why.

Would this method work with problems where there might be a remainder or a quotient with decimals? When solving division problems, sometimes you need to find a quotient that has decimals. Other times you may want to solve with a remainder. Can you think of a time when you are dividing something up and you would want a remainder rather than a decimal? (*ie when you cannot divide up the item into smaller pieces – such as people being put into cars. This is a good time to discuss word problems and division on a multiple choice test.*)

Here is an example of fractional decomposition solved as a decimal and again with remainder.

Model

$$\frac{246}{12}$$
$$= \frac{240}{12} + \frac{6}{12}$$
$$= \frac{120}{12} + \frac{120}{12} + \frac{6}{12}$$
$$= 10 + 10 + \frac{1}{2}$$
$$= 20 + .5$$
$$= 20.5$$

With a decimal

OR

$$\frac{246}{12}$$
$$= \frac{240}{12} + \frac{6}{12}$$
$$= \frac{120}{12} + \frac{120}{12} + \frac{6}{12}$$
$$= 10 + 10 + \frac{6}{12}$$
$$= 20 + \frac{6}{12}$$
$$= 20\ R6$$

With a remainder

Decimal – The fraction was decomposed into 3 fractions that could be easily simplified in my head. 120 divided by 12 equals 10. 10 + 10 = 20. 6 divided by 12 can be simplified to $\frac{1}{2}$ which is a benchmark fraction that I know is equal to .5.

If I was dividing up 246 children into groups of 12, would I want to solve it as a decimal? (no.) I would use the remainder of 6 to let me know that I had 20 groups of 12 children and one additional group of 6 (the remainder.)

You Try: $267 \div 6$

$$\frac{267}{6}$$

$$= \frac{240}{6} + \frac{27}{6}$$

$$= 40 + \frac{24}{6} + \frac{3}{6}$$

$$= 40 + 4 + .5$$

$$= 44.5$$

With a decimal

OR

$$\frac{267}{6}$$

$$= \frac{240}{6} + \frac{27}{6}$$

$$= 40 + \frac{24}{6} + \frac{3}{6}$$

$$= 40 + 4 + \frac{3}{6}$$

$$= 44 \, R \, 3$$

With a remainder

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