Putting the Pieces Together

Division with Base 10

Let’s try it….

Model the following problems using base ten blocks or quick pics, to model an area model and a fair share.

$168 \div 14$

$126 \div 6$

Let’s try it….

Model the following problem using partial quotients

$$168 \div 14$$

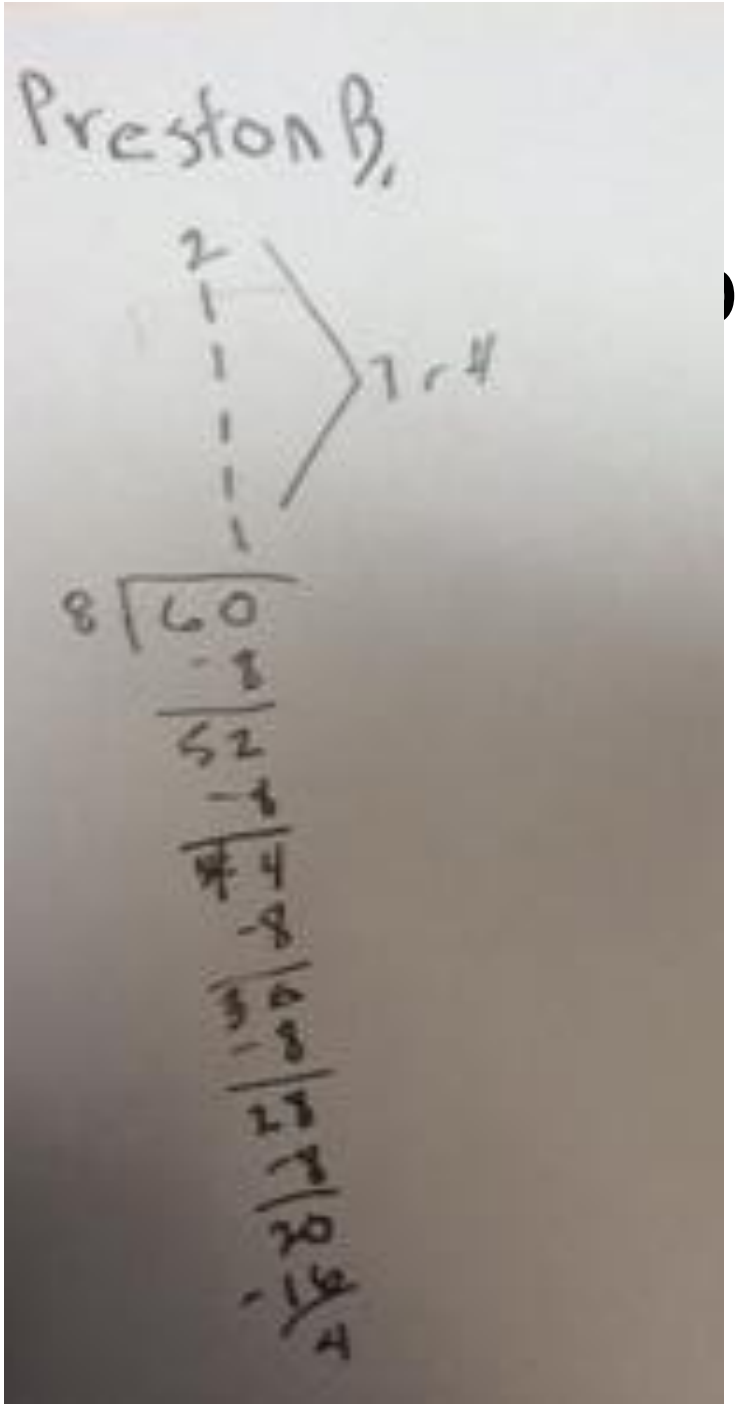
Partial Quotient Strategy

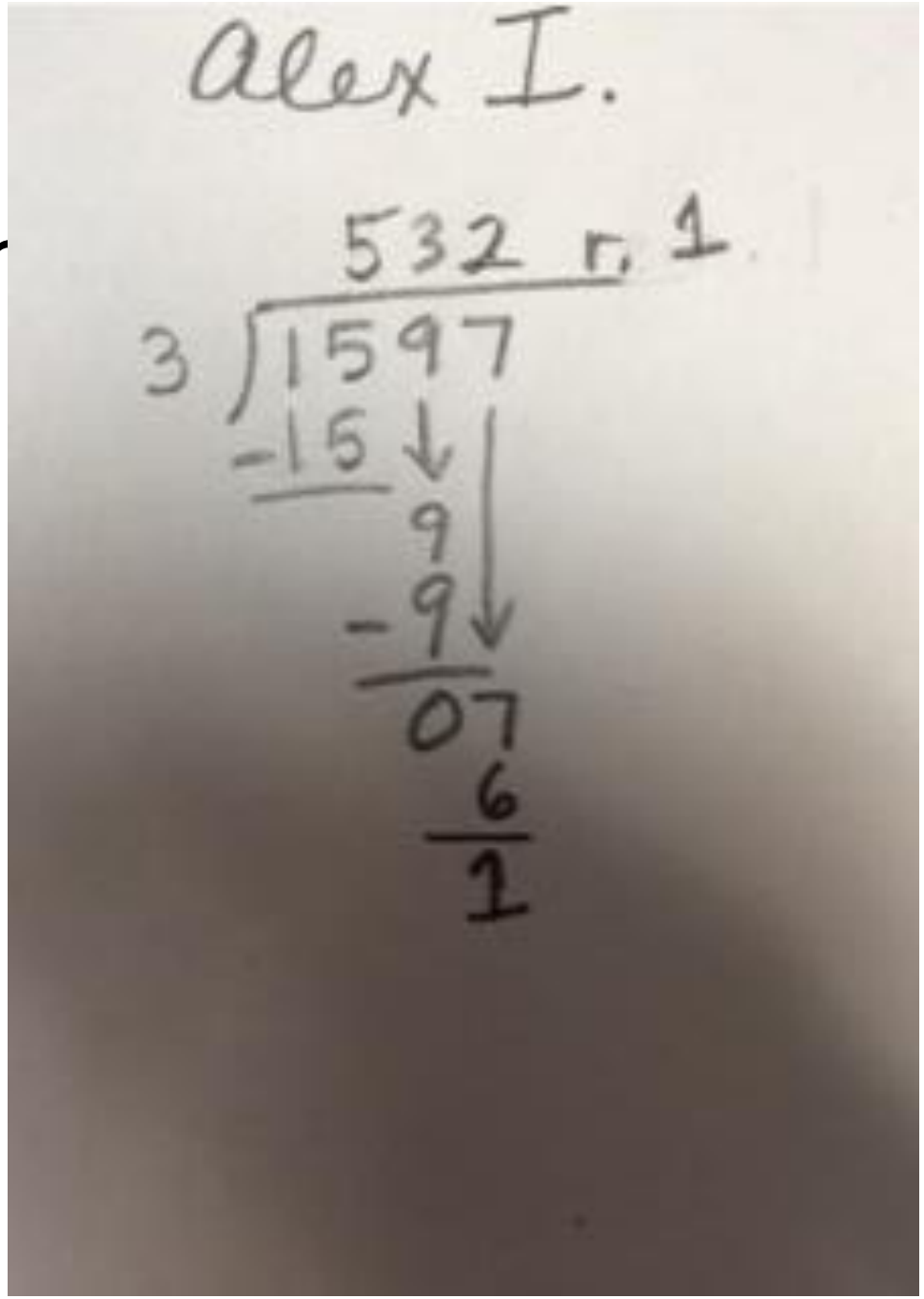
Framework

Focus, Coherence, and Rigor

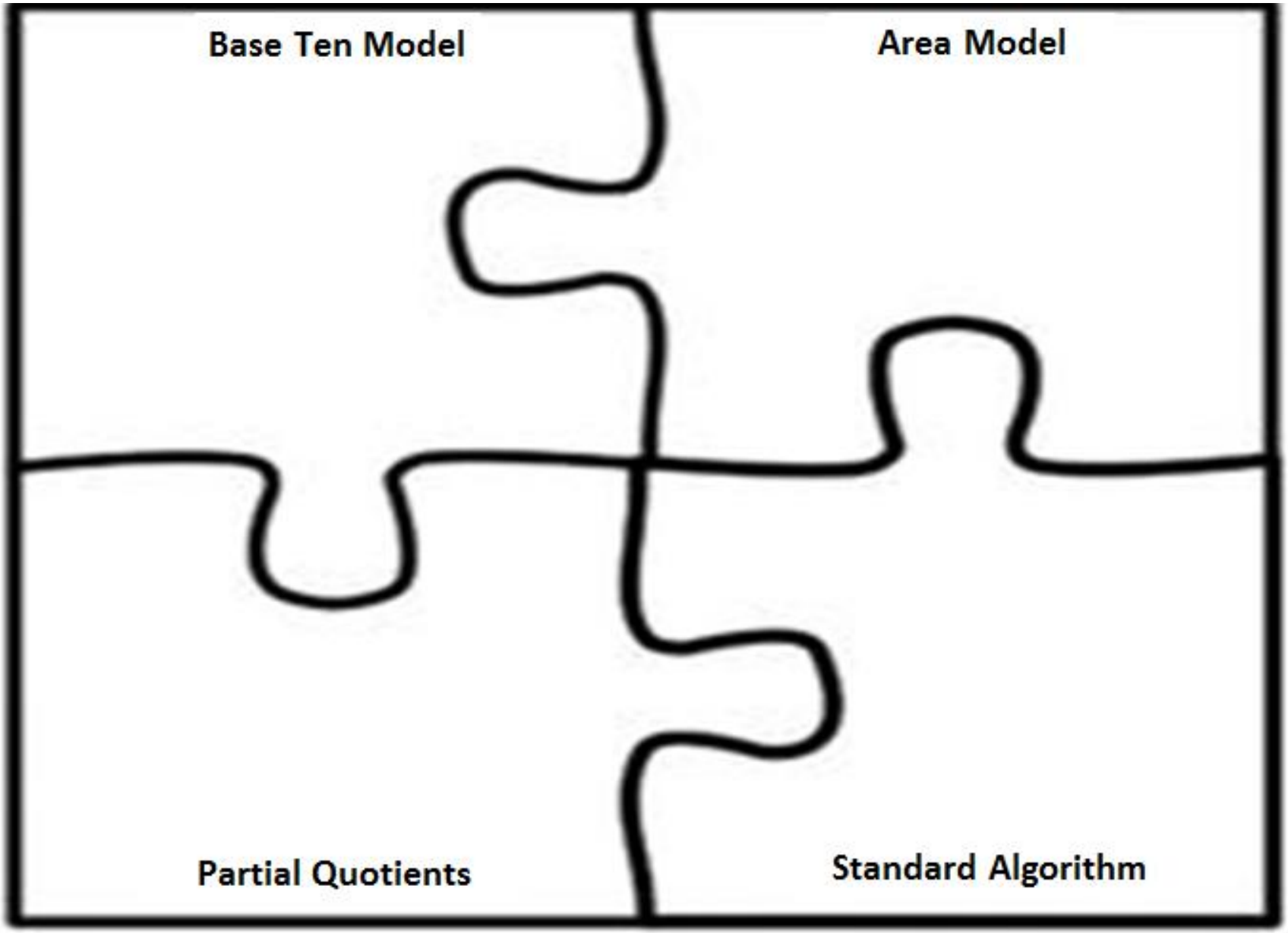
In grade three, division was introduced conceptually as the inverse of multiplication. In grade four, students continued using place-value strategies, properties of operations, the relationship between multiplication and division, area models, and rectangular arrays to solve problems with one-digit divisors and develop and explain written methods. This work was extended in grade five to include two-digit divisors and all operations with decimals to hundredths. In grade six, fluency with the algorithms for division is reached (**6.NS.2**).

Grade-six students fluently divide using the standard algorithm (**6.NS.2**). Students should examine several methods for recording division of multi-digit numbers and focus on a variation of the standard algorithm that is efficient and makes sense to them. They can compare variations to understand how the same step can be written differently but still have the same place-value meaning. All such discussions should include place-value terms. Students should see examples of standard algorithm division that can be easily connected to place-value meanings.


Preston B.
7 r 4
8 | 60
-8
52
-48
44
-40
40
-40
0


Alex I.
532 r. 1
3 | 1597
-15
9
-9
07
6
1

228 ÷ 19


Base Ten Model
Area Model
Partial Quotients
Standard Algorithm

5th grade Framework

In grade five, students use various strategies to extend division to include quotients of whole numbers with up to four-digit dividends and two-digit divisors, and they illustrate and explain calculations by using equations, rectangular arrays, and/or area models (**5.NBT.6▲**). When the two-digit divisor is a familiar number, students might use strategies based on place-value understanding.

Example 2: Find the quotient $9984 \div 64$. **5.NBT.6▲**

An area model for division is shown below. As the student uses the area model, he or she keeps track of how much of the 9984 is left to divide.

Area model:

	64
100	6400
50	3200
5	320
1	64

Recording:

$$
\begin{array}{r|l}
64 & 9984 \\
\hline
 & -6400 \quad (100\times64) \\
\hline
 & 3584 \\
 & -3200 \quad (50\times64) \\
\hline
 & 384 \\
 & -320 \quad (5\times64) \\
\hline
 & 64 \\
 & -64 \quad (1\times64) \\
\hline
 & 0
\end{array}
$$

Therefore the quotient is $100 + 50 + 5 + 1 = 156$.

6th grade Framework

Focus, Coherence, and Rigor

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Example: Scaffold Division **6.NS.2**

Scaffold division is a variation of the standard algorithm in which partial quotients are written to the right of the division steps rather than above them.

To find the quotient $3440 \div 16$, students can begin by asking, "How many groups of 16 are in 3440?" This is a measurement interpretation of division and can form the basis of the standard algorithm. Students estimate that there are at least 200 groups of 16, since $2 \times 16 = 32$, and therefore $200 \times 16 = 3200$. They would then ask, "How many groups of 16 are in the remaining 240?" Clearly, there are at least 10. The next remainder is then $80 = 240 - 160$, and we see that there are 5 more groups of 16 in this remaining 80. The quotient in this strategy is then found to be $200 + 10 + 5 = 215$.

Divisor	Dividend	Quotient
16	3440 –3200	200
	240 –160	10
	80 –80	5
	0	**215**
	Remainder	**Quotient**

Connection to SMPs

- **SMP.4 Model with mathematics.**
- **SMP.5 Use appropriate tools strategically.**
- **SMP.8 Look for and express regularity in repeated reasoning.**

Base ten models
Area models
Quick pics
Equations

Putting the Pieces Together