MA.4.NSO.2.4

Overarching Standard: ***MA*.4.NSO.2** *Build an understanding of operations with multi-digit numbers including decimals.*

Benchmark of Focus

MA.4.NSO.2.4: Divide a whole number up to four digits by a one-digit whole number with procedural reliability. Represent remainders as fractional parts of the divisor.

Benchmark Clarifications

Clarification 1: Instruction focuses on helping a student choose a method they can use reliably.

Clarification 2: Instruction includes the use of models based on place value, properties of operations or the relationship between multiplication and division.

Related Benchmark/Horizontal Alignment

- MA.4.AR.1.1
- MA.4.M.1.2
- MA.4.M.2.1
- MA.4.GR.2.1/2.2

Vertical Alignment

Previous Benchmarks	Next Benchmarks
MA.3.NSO.2.4	MA.5.NSO.2.2

Terms from the K-12 Glossary

- Dividend
- Divisor
- Expression
- Equation
- Quotient

Purpose and Instructional Strategies

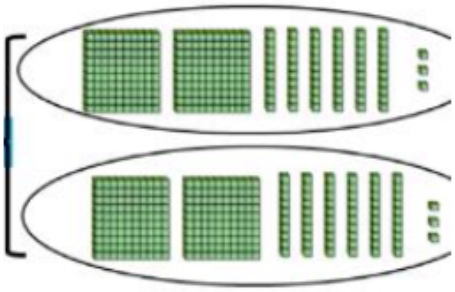
The purpose of this benchmark is for students to choose a reliable method for dividing 4 digit numbers by 1 digit numbers. It builds on the understanding developed during exploration (MA.3.NSO.2.2) and on automaticity (MA.4.NSO.2.1), and prepares for procedural fluency (MA.5.NSO.2.2).

- This benchmark connects to previous work with division within 144. Before achieving procedural reliability, it may be useful for students to engage in additional exploratory work dividing multi-digit numbers by single-digit numbers. Students should use multiple methods (K12.MTR.2.1) such as area models or models of base-ten blocks to connect understanding to a method they will use with procedural reliability and ultimately leading to a standard algorithm.

- When students are using their preferred method they should be able to explain their thinking, connecting it to place value understanding and the relationship between division and repeated subtraction.

Base-Ten Blocks

$526 \div 2 = 263$



Dividend = Total

Divisor = the number of groups

Quotient = the amount in 1 group

Long Division Algorithm

$$\begin{array}{r} 108 \\ 4\overline{)\,432} \\ -\,4 \\ \hline 03 \\ -\,0 \\ \hline 32 \\ -\,32 \\ \hline 0 \end{array}$$

Area Model

$348 \div 4$

$60 + 20 + 7 = 87$

4	240	80	28

$348 \div 4 = (240 \div 4) + (80 \div 4) + (28 \div 4)$
$= 60 + 20 + 7$
$= 87$

Partial Quotient Division

4	248	
	-120	30
	128	
	-120	30
	8	
	-8	2
	0	62

$248 \div 4$

$248 \div 4 = (120 \div 4) + (120 \div 4) + (8 \div 4)$
$= 30 + 30 + 2$
$= 62$

Common Misconceptions or Errors

- Many students are taught an algorithm for division and then tend to look at the digits within the number as single digits instead of thinking about the place value of each digit or thinking about the number as a whole. When asked if their solution is reasonable, students do not understand what is reasonable because they are unable to estimate since they do not see the number in its entirety, but rather, as individual digits. Students must have a solid understanding about place value and the properties of operations to make sense of division.

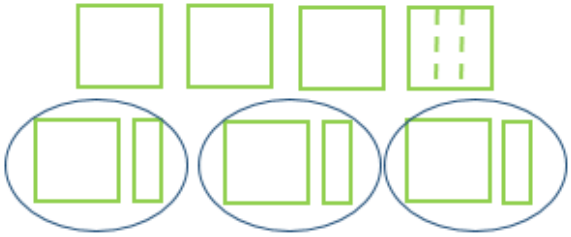
- Some students may not understand that the remainder represents a fraction with the divisor as the denominator. For example, $7 \div 3 = 2r1$ means that $7 \div 3 = 2\ \frac{1}{3}$. Students should have experience with equal sharing division problems that involve remainders (MA.4.AR.1.1).

Strategies to Support Tiered Instruction

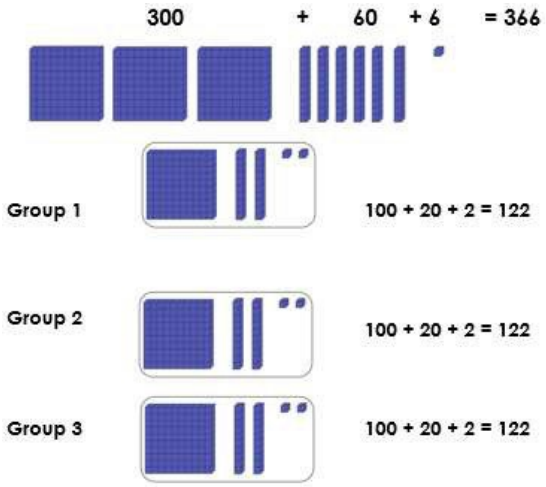
- Instruction includes connecting place value with the partial products model. Students should not view the digits as individual numbers but connect individual digits with the value of that number.
  - Example: 366 is 300 + 60 + 6.

$$\begin{array}{r} 122 \\ 3\overline{)\,366} \\ -\,300 \quad 3 \times 100 = 300 \\ \hline 66 \\ -\,60 \quad 3 \times 20 = 60 \\ \hline 6 \\ -\,6 \quad 3 \times 2 = 6 \\ \hline 0 \end{array}$$

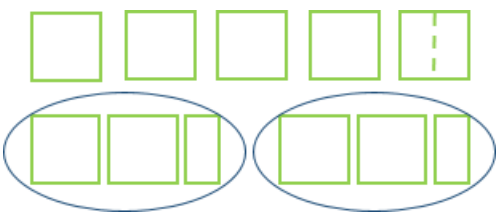
- Instruction includes problems involving division with a remainder. Students use models to understand what the remainder is. The remainder can be written as a whole number or a fraction.
    - For example, Karly, Juan, and Li share 4 cookies equally. How many cookies can each person eat? Karly, Juan, and Li each can eat one whole cookie but then must split the 4th cookie into thirds so that they can each eat $1\frac{1}{3}$ cookies. The remainder1 in this division problem represents the fraction $\frac{1}{3}$.



- Instruction connects place value to dividing whole numbers equally. Students build the number with base ten blocks and then physically divide the number into equal groups.
    - For example, when solving 366 ÷ 3, students should build the number 366 and then physically move the blocks into 3 equal groups. This will help solidify the understanding from thinking of the digit as a "3" and now thinking about it as 300.



- Instruction includes the opportunity to use models to understand what the remainder is. The remainder can be written as a whole number or a fraction. Students physically cut or break apart paper to show what is happening in problems involving remainders.
    - For example, using the problem: Frank and Lisa share five brownies. How many brownies can they each eat? Students should model the problem with five pieces of paper, each representing one brownie. Students should start by labeling each brownie. Frank and Lisa each have two brownies with one brownie left over. Then, students physically cut the last brownie into two equal parts so that each person is able to eat 2 ½ brownies. Relate this to an equation 5 ÷ 2 = 2 ½.



Questions to ask students:

- **Ask a student that is using the standard algorithm how their strategy connects to place value. (Example: 128 ÷ 5)**
  - Sample answer that indicates understanding: I must decompose the 100 into 10 tens so that I can put 2 tens into each of the 5 groups equally. There will be 2 tens and 8 ones left. I must decompose the 2 tens into 20 ones to add to the 8 ones for a total of 28 ones. I can place 5 ones equally into each of the 5 groups. There will be 3 ones left over.
  - Sample answer that indicates an incomplete understanding or misconception: First I divide, then I multiply, next I subtract, and drop down the next digit. I repeat the steps as needed.

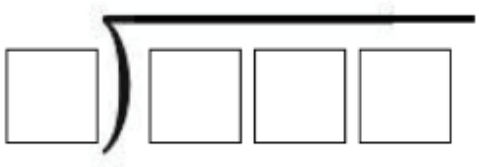
- **Referring to partial quotients: Why is it easier to subtract larger multiples of the divisor rather than just continuously subtracting the divisor itself?**

  Sample answer that indicates understanding: *If you subtract larger multiples, you will arrive at the quotient quicker. Example: 72 ÷ 6… I could subtract 10 groups of 6 or 60. Then I would subtract 2 groups of 6 or 12. The quotient of 72 ÷ 6 is 12 because that's how many groups of 6 I subtracted.*

Instructional Tasks

Instructional Task 1

Using only the number tiles 2, 3, 4, 5, 6or 7, fill in the blanks in the division situation to find a quotient as close to 100 as possible.



Instructional Task 2

Sam and Sally were given $117 after they helped deliver groceries for a month. In order to split the money equally, Sam divides 117 by 2 and gets 58 with a remainder of 1. Explain how they should use this result to determine their equal shares in dollars and cents.

Instructional Items

Instructional Item 1

What is 1,545 divided by 5?

Instructional Item 2

What is 311 divided by 7? (Express the remainder as a fraction)

Achievement Level Descriptors

Benchmark	Context	Assessment Limits
MA.4.NSO.2.4 Divide a whole number up to four digits by a one-digit whole number with procedural reliability. Represent remainders as fractional parts of the divisor. Clarification 1: Instruction focuses on helping a student choose a method they can use reliably. Clarification 2: Instruction includes the use of models based on place value, properties of operations or the relationship between multiplication and division. **Also Assesses** MA.4.NSO.2.1 Recall multiplication facts with factors up to 12 and related division facts with automaticity.	Mathematical	Items may include whole number quotients.

ALD 2	ALD 3	ALD 4	ALD 5
divides a whole number up to three digits by a one-digit whole number without a remainder. recalls multiplication facts with factors up to 5 and related division facts.	divides a whole number up to three digits by a one-digit whole number; represents remainders as whole numbers or fractional parts of the divisor. recalls multiplication facts with factors up to 10 and related division facts.	divides a whole number up to four digits by a one-digit whole number with procedural reliability; represents remainders as fractional parts of the divisor. recalls multiplication facts with factors up to 12 and related division facts with automaticity.	identifies an error and divides a whole number up to four digits by a one-digit whole number; represents remainders as fractional parts of the divisor.

Additional Resources:
CPALMS Resources

Khan Academy: Intro to Remainders https://goo.gl/udhZ2B

Resources/Tasks to Support Your Child at Home:

Using a spinner, dice or cards create or pose different division problems with 1-digit divisors for your child to model using base ten blocks or a quick picture. Then encourage them to also use an area model. Make connections between the two models by asking, "How are the strategies similar? How are they different?" Extend to have your child use partial quotients by subtracting larger multiples of the divisor.

Khan Academy: Division with Area Models https://goo.gl/fpFuLR

Khan Academy: Division Using Place Value https://goo.gl/ve85qJ