MA.5.NSO.2.2

Overarching Standard: MA.5.NSO.2 *Add, subtract, multiply and divide multi-digit numbers.*

Benchmark of Focus

MA.5.NSO.2.2	Divide multi-digit whole numbers, up to five digits by two digits, including using a standard algorithm with procedural fluency. Represent remainders asfractions.

Example: The quotient 27 ÷ 7 gives 3 with remainder 6 which can be expressed as $3\frac{6}{7}$

Benchmark Clarifications:
Clarification 1: Within this benchmark, the expectation is not to use simplest form for fractions.

Related Benchmark/Horizontal Alignment

- MA.5.FR.2.4
- MA.5.AR.1.1/1.3
- MA.5.M.1.1
- MA.5.GR.3.3

Vertical Alignment

Previous Benchmarks
- MA.4.NSO.2.4

Next Benchmarks
- MA.6.NSO.2.1

Terms from the K-12 Glossary
- Equation
- Expression
- Whole Number

Purpose and Instructional Strategies
The purpose of this benchmark is for students to demonstrate procedural fluency while dividing multi-digit whole numbers with up to 5-digit dividends and 2-digit divisors. To demonstrate procedural fluency, students may choose the standard algorithm that works best for them and demonstrates their procedural fluency. A standard algorithm is a method that is efficient and accurate (MTR.3.1). In Grade 4, students had experience dividing four-digit by one-digit numbers using a method of their choice with procedural reliability (MA.4.NSO.2.4). In Grade 6, students will multiply and divide multi-digit numbers including decimals with fluency (MA.6.NSO.2.1).
- When students use a standard algorithm, they should be able to justify why it works conceptually. Teachers can expect students to demonstrate how their algorithm works, forexample, by comparing it to another method for division. (MTR.6.1)

- In this benchmark, students are to represent remainders as fractions. In the benchmark example, the quotient of 27 ÷ 7 is represented as $3\frac{6}{7}$ Students should gain understanding that this quotient means that there are 3 full groups of 7 in 27, and the remainder of 6 represents $\frac{6}{7}$ of another group. Students are not expected to have mastery of converting between forms (fraction, decimal, percentage) until grade 6 but students should start to gain familiarity that fractions and decimals are numbers and can be equivalent (i.e., aremainder of ½ is the same as 0.5). Writing remainders as fractions or decimals is acceptable. Similarly, students should be able to understand that a remainder of zero means that whole groups have been filled without any of the dividend remaining. (MTR.5.1, MTR.7.1)
- Along with using a standard algorithm, students should estimate reasonable solutionsbefore solving. Estimation helps students anticipate possible answers and evaluate whether their solutions make sense after solving.
- This benchmark supports students as they solve multi-step real-world problems involving combinations of operations with whole numbers (MA.5.AR.1.1). In a real-world problem,students should interpret remainders depending on its context.

Common Misconceptions or Errors

Students can make computational errors while using standard algorithms when they cannot reason why their algorithms work. In addition, they can struggle to determine where or why that computational mistake occurred because they did not estimate reasonable values for intermediate outcomes as well as for the final outcome. During instruction, teachers should expect students to justify their work while using their chosenalgorithms and engage in error analysis activities to connect their understanding to the algorithm.

Strategies to Support Tiered Instruction

- Instruction includes estimating reasonable values for quotients when dividing by two-digit divisors.
  - For example, students make reasonable estimates for the quotient of 496 ÷ 24. Before using an algorithm, students can estimate the quotient to make sure that they are using the algorithm correctly and the answer is reasonable. Students can use multiples of 24 and their understanding of multiplication and division to estimate the quotient. Students may want their estimate to be as close to 496 as possible. So, knowing that 24 × 2 = 48, they can state that 24 × 20 = 480. A reasonable estimate for the quotient would be 20 because 480 is close to 496."
  - For example, students make reasonable estimates for the quotient of 94 ÷ 13. Explicit instruction could include stating, "Before using an algorithm, we will estimate the quotient to make sure that we are using the algorithm correctly and our answer is reasonable. The divisor of 13 is close to 10 and the dividend of 94 is

close to 90. So, we can use 90 ÷ 10 = 9 to estimate that our quotient should be close to 9."

- Instruction includes explaining and justifying mathematical reasoning while using a division algorithm to divide by two-digit divisors. Instruction also includes determining if an algorithm was used correctly by analyzing any errors made and reviewing the reasonableness of solutions.
  - For example, the teacher connects place value with the partial quotients model to determine 496 ÷ 24. Students should not just view the digits as individual numbers but connect individual digits with the value of that number (e.g., 496 is 400 + 90 + 6). Instruction includes stating, "In this problem we are finding how many groups of 24 are in 496. We will subtract groups of 24 until we cannot subtract any more groups. The total number of groups that we can subtract is the quotient. We can subtract 10 groups of 24 two times, so the quotient is 20. We have a remainder of 16. The quotient is represented as $20\frac{16}{24}$ because we have 20 full groups of 24 in 496 and the remainder of 16 represents $\frac{16}{24}$ of another group.

```
        2 0
    ________
24 | 4 9 6
   - 2 4 0     10 groups of 24
   -------
     2 5 6
   - 2 4 0     10 groups of 24
   -------
       1 6
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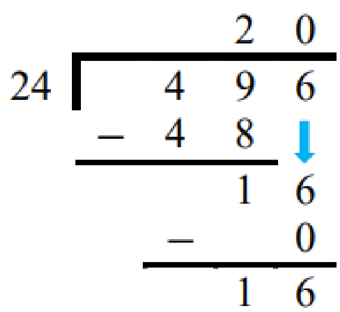
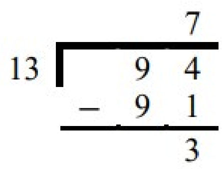
  - For example, connect place value with the partial quotients model to determine 94 ÷ 13. Students should not just view the digits as individual numbers but connect individual digits with the value of that number (e.g., 94 is 90 + 4). Instruction includes stating, "In this problem we are finding how many groups of 13 are in 94. We will subtract groups of 13 until we cannot subtract any more groups. The total number of groups that we can subtract is the quotient. We can subtract 7 groups of 13, so the quotient is 7. We have a remainder of 3. The quotient is represented as $7\frac{3}{13}$ because we have 7 full groups of 13 in 94 and the remainder of 3 represents $\frac{3}{13}$ of another group."

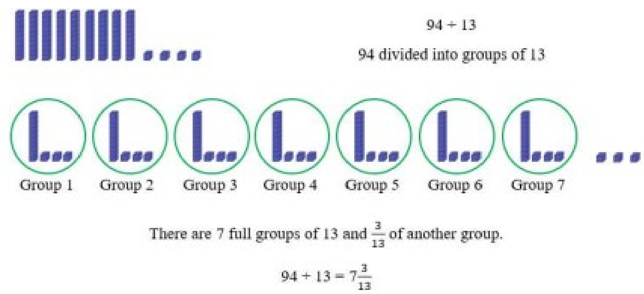
```
          7
     ______
13 |   9 4
   -   2 6     2 groups of 13
   -------
       6 8
   -   2 6     2 groups of 13
   -------
       4 2
   -   2 6     2 groups of 13
   -------
       1 6
   -   1 3     1 group of 13
   -------
         3
```

- For example, students use an algorithm to solve 496 ÷ 24 and explain their thinking using place value understanding. Instruction includes stating, "In this problem we are finding how many groups of 24 are in 496. We will begin by dividing our largest place value first. Recognizing that the 4 represents 400, if your divide 400 by 24 the result will be less than 100, so the quotient won't have any whole hundreds. Remember that 496 is the same as 49 *tens* 6 *ones*, so we will see how many groups of 24 are in 49 *tens*. We can also think of this as × 24 = 49 *tens*. There are 20 groups of 24 in 49 *tens*, that's 2 times 10 groups, so we can place a 2 in the tens place of the quotient. Next, we will subtract 49 *tens* − 48 *tens* (20 groups of 24 equal 48 *tens*) to find a difference of 1 *ten*. We can combine this 1 *ten* with the 6 *ones* remaining in 496. We now have 16 *ones* remaining from our original dividend of 496, this is not enough to make a group of 24. We have a remainder of 16. The quotient is represented $20\frac{16}{24}$ because we have 20 full groups of 24 in 496 and the remainder of 16 represents $\frac{16}{24}$ of another group. Our quotient of $20\frac{16}{24}$ is close to our estimate of 20, this helps us determine that our answer is reasonable.

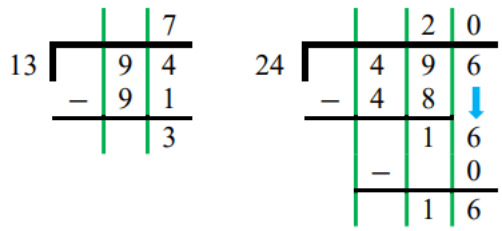


- For example, students use an algorithm to solve 94 ÷ 13 and explain their thinking using base ten blocks and place value understanding. Instruction includes stating, "In this problem we are finding how many groups of 13 are in 94. We will begin by dividing our largest place value first. How many groups of 13 are in 9 *tens*? Recognizing that the 9 represents 90, if you divide 90 by 13 the result will be less than 10, so the quotient won't have any whole tens. Remember that 94 is the same as 9 *tens* 4 *ones* and 94 *ones*, so we will see how many groups of 13 are in 94 *ones*. We can also think of this as × 13 = 94. There are 7 groups of 13 in 94 *ones*. Next, we will subtract to find our remainder of 3. Our quotient is represented as $7\frac{3}{13}$ because we have 7 full groups of 13 in 94 and the remainder of 3 represents $\frac{3}{13}$ of another group. Our quotient of $7\frac{3}{13}$ is close to our estimate of 9, this helps us determine that our answer is reasonable."





- Instruction includes the use of place value columns to support place value understanding when using a division algorithm.
    - Example:



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. As a fraction the remainder is $\frac{3}{5}$ of another group.
    - 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.
- Ask students if there is another way to solve the division problem.
    - Could solve it using repeated subtraction or using an unknown factor multiplication problem.
    - Additionally, students may use a less efficient algorithm such as partial quotients. This could indicate that they understand division, but do not yet understand the standard algorithm. Students needs support with connecting the algorithms they do know to the standard algorithm.
- Ask students to explain how they know their answer is reasonable.
    - Students should have an estimation strategy they can employ to develop an approximation of the solution.

Instructional Tasks

Instructional Task 1

The Magnolia Outreach organization is donating 6,924 pounds rice to families in need. Theypour all the rice into 15-pound containers.

Part A. How many containers will they fill if they use all the rice?

Part B. Will Magnolia Outreach be able to fill all the containers completely? If not, will the partially filled container be more or less than half-full? Explain how you know.

Instructional Items

Instructional Item 1

What is the quotient of 498 ÷ 72?

Benchmark	Context	Assessment Limits
MA.5.NSO.2.2 Divide multi-digit whole numbers, up to five digits by two digits, including using a standard algorithm with procedural fluency. Represent remainders as fractions. Example: The quotient 27 ÷ 7 is 3 with remainder 6 which can be expressed as $3\frac{6}{7}$. Clarification 1: Within this benchmark, the expectation is not to use simplest form for fractions.	Mathematical	Items containing a divisor with one digit must have a dividend with five digits. Items may include whole number quotients.

ALD 2	ALD 3	ALD 4	ALD 5
N/A	divides multi-digit whole numbers, up to five digits by one digit, with remainders and represents remainders as fractions.	divides multi-digit whole numbers, up to five digits by two digits, including using a standard algorithm with procedural fluency, and represents remainders as fractions.	identifies an error and divides multi-digit whole numbers, up to five digits by two digits, including using a standard algorithm and represents remainders as fractions with procedural fluency.

Additional Resources:

CPALMS

Khan Academy

Resources/Tasks to Support Your Child at Home:

Whole Number Division Games