

MA.4.NSO.2.5

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

Benchmark of Focus

MA.4.NSO.2.5: Explore the multiplication and division of multi-digit whole numbers using estimation, rounding and place value.

Example: The product of 215 and 460 can be estimated as being between 80,000 and 125,000 because it is bigger than 200×400 but smaller than 250×500 .

Example: The quotient of 1,380 and 27 can be estimated as 50 because 27 is close to 30 and 1,380 is close to 1,500. 1,500 divided by 30 is the same as 150 *tens* divided by 3 *tens* which is 5 *tens*, or 50.

Benchmark Clarifications

Clarification 1: Instruction focuses on previous understanding of multiplication with multiples of 10 and 100, and seeing division as a missing factor problem.

Clarification 2: Estimating quotients builds the foundation for division using a standard algorithm.

Clarification 3: When estimating the division of whole numbers, dividends are limited to up to four digits and divisors are limited to up to two digits.

Related Benchmark/Horizontal Alignment

- MA.4.NSO.1.1/1.2/1.3/1.4
- 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

MA.3.NSO.1.4
MA.3.NSO.2.2

Next Benchmarks

MA.5.NSO.2.4

Terms from the K-12 Glossary

- expression
- equation
- factor

Purpose and Instructional Strategies

The purpose of this benchmark is to give students authentic opportunities to estimate in multiplication and division. This work builds on students rounding to the nearest 10 or 100 without performing operations (MA.3.NSO.1.4).

- When students find exact solutions of multiplication and division problems, they should use mental math and computation strategies to estimate to determine if their solution is reasonable (MTR.6.1).
- Estimation is often about getting useful answers that need not be exact.
- Students need to be able to explain their reasoning.

Common Misconceptions or Errors

- Some students may not understand how an approximate answer can be useful.
- Students may obsess over whether they got the same estimate as someone else. This can be resolved when the teacher explains that both estimates are useful and acceptable.

Strategies to Support Tiered Instruction

- Instruction includes relating estimation strategies to real world situations.
 - For example, an art teacher has 10 classes with the following numbers of students, 21, 25, 18, 27, 23, 27, 30, 28, 30, 26. He wants to buy 12 pencils for each student. Discuss with students why a suitable estimate could be $12 \times 10 \times 30$.

Questions to ask students:

- **What is a reasonable estimate for quotient of this division problem?**
 - Sample answer that indicates understanding: *Before I divide, I look at the number and estimate. In the problem $463 \div 6$ I know that $420 \div 6$ is 70 and $480 \div 6$ is 80. My answer should be somewhere between 70 and 80.*
- **Ask students to explain how they know their answer is reasonable.**
 - Sample answer that indicates understanding: Students should have an estimation strategy they can employ to develop an approximation of the solution.

Instructional Tasks

Instructional Task 1

Mrs. Diaz bought 50 packages of crayons to give to her art class. Each package contains 8 individual crayons. She wants to give an equal number of crayons to each of the 22 students in the class.

Part A. One student estimated that each student in Mrs. Diaz' class would get 10 crayons.

Do you think this is a good estimate? Why or why not?

Part B. Use estimation to determine about how many crayons each student will get. Write your answer below and explain your reasoning.

Instructional Items

Instructional Item 1

Marianela bought 33 packages of pink erasers and 25 packages of glow-in-the-dark erasers for the school store. Packages of pink erasers cost \$12 each and packages of glow-in-the-dark erasers cost \$19 each. Marianela says she spent about \$850, is her answer reasonable? Explain.

- a. Yes, because $(30 \times \$10) + (25 \times \$20) = \$800$.
- b. Yes, because $(30 \times 25) + (\$10 \times \$20) = \$950$.
- c. No, because $(30 \times 30) + (\$10 \times \$20) = \$1,100$.
- d. No, because $(30 + 30) \times (\$10 \times \$20) = \$1,200$.

Achievement Level Descriptors

Benchmark		Context	Assessment Limits
MA.4.NSO.2.5 Explore the multiplication and division of multi-digit whole numbers using estimation, rounding and place value. Example: The product of 215 and 460 can be estimated as being between 80,000 and 125,000 because it is bigger than 200×400 but smaller than 250×500 . Example: The quotient of 1,380 and 27 can be estimated as 50 because 27 is close to 30 and 1,380 is close to 1,500. 1,500 divided by 30 is the same as 150 tens divided by 3 tens which is 5 tens, or 50. Clarification 1: Instruction focuses on previous understanding of multiplication with multiples of 10 and 100 and seeing division as a missing factor problem. Clarification 2: Estimating quotients builds the foundation for division using a standard algorithm. Clarification 3: When estimating the division of whole numbers, dividends are limited to up to four digits and divisors are limited to up to two digits.		Both	N/A
ALD 2	ALD 3	ALD 4	ALD 5
multiplies multi-digit whole numbers by factors of 10 and 100. recalls multiplication facts with factors up to 5 and related division facts.	estimates products and quotients of multi-digit whole numbers with factors and divisors that are multiples of 10 and 100.	explores the multiplication and division of multi-digit whole numbers using estimation, rounding, and place value.	multiplies and divides multi-digit whole numbers using estimation, rounding, and place value.

Additional Resources:

[CPALMS Resources](#)

[Learn Zillion Video- Divide 4-digit dividends by 2-digit divisors by estimating](#)

Resources/Tasks to Support Your Child at Home:

Video: Estimate the Quotients Using Multiples <https://goo.gl/KGTY14>

[Estimating Multi-Digit Division](#)