# 06. Investigations in Measurement; Decimal Multiplication and Division 

Content Area: Math<br>Course(s):<br>Time Period: Length: Status:<br>Full Year<br>5 weeks<br>Published

## General Overview, Course Description or Course Philosophy

In Grade 5, instructional time should focus on three critical areas:

1. Developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions)
2. Extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations
3. Developing understanding of volume

In this unit, students will understand that place values understandings are applied to multiplying and dividing decimals by powers of 10 , use whole number methods are extended to multiply and divide decimals, use patterns in powers of 10 to convert measurements, and line plots are used to organize and analyze measurement data.

## OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Students will understand that:

- Place value understandings are applied to multiplying and dividing decimals by powers of 10 .
- Whole number methods are extended to multiply and divide decimals.
- Patterns in powers of 10 are used to convert measurements in metric units.
- Line plots are used to organize and analyze measurement data.


## Essential Questions

- How does understanding place values assist in multiplying and dividing decimals by powers of 10 ? How does this understanding affect the placement of the decimal point?
- How are whole number methods extended to multiply and divide decimals?
- How do patterns in powers of 10 aid in converting measurements between metric units? What role do place values play in these conversions?
- How are line plots utilized to organize and analyze measurement data effectively?
- In what practical scenarios are decimal operations crucial? How do these operations apply to everyday situations, such as finance, measurements, or scientific calculations?
- What strategies or algorithms are effective in multiplying and dividing decimals by powers of 10 ?
- How do shifts in decimal places correspond to powers of 10 in multiplication and division of decimals? What patterns emerge from these operations?


## STUDENT LEARNING TARGETS

## Refer to the 'Declarative Knowledge' and 'Procedural Knowledge sections.

## Declarative Knowledge

Students will know:

- Estimation is one strategy used to place the decimal point when multiplying and dividing decimals.
- When a decimal is multiplied by a power of 10 , the decimal point moved to the right, shifting digits to the left; when a decimal is divided by 10 , the decimal point moves to the left, shifting digits to the right.
- The number of places that the decimal points moves matches the exponent in the power of 10 ; zeros may need to be attached to the end of a number or inserted to the right of the decimal point to indicate the correct placement of the decimal point.
- When the decimal point moves n places to the right, the digit is multiplied by 10 n times, or multiplied by 10 n ; when the decimal point moves n places to the left, the digit is multiplied by $1 / 10 \mathrm{n}$ times or divided by 10 n times; this is the same as multiplying by $1 / 10 \mathrm{n}$ or dividing by 10 n
- Finding the average of a set of numbers is one way to "even out" a set of measurements (adding all the data values and dividing by the number of measurements).
- The additive nature of volume is used to find the volume of complex and irregular objects and figures.
- When an object is submerged in a calibrated container of water, it displaces a volume of water equal to the volume of the object that can be measured; one cubic centimeter of water is equivalent to one milliliter of water.
- As an equivalent fraction expresses the same value with a different numerator and denominator, an equivalent problem produces the same quotient using a different dividend and divisor.


## Procedural Knowledge

[^0]- Use a calculator to multiply and divide decimals by powers of ten to describe and explain patterns in the placement of the decimal point.
- Apply an understanding of multiplication and division by powers of 10 to convert measurements in metric units.
- Create line plots to display measurement data in fractions of a unit.
- Use operations with fractions to solve problems based on information presented through line plots.
- Use information presented in line plots to solve problems about redistributing measurement data.
- Use displacement to measure the volumes of objects.
- Use estimation and number sense to predict the relative size of decimal products and quotients.
- Use two strategies for solving decimal multiplication problems.
- Solve a multi-step number story using decimals and explain the reasonableness of the product; revise their work
- Create equivalent problems to help solve division problems involving decimal dividends and divisors.
- Collect reaction-time data and create a line plot; compute with decimals to identify typical reaction times; estimate totals.


## CONTENT AREA STANDARDS

| MA.5.MD.A. 1 | Convert among different-sized standard measurement units within a given measurement <br> system (e.g., convert 5 cm to 0.05 m$)$, and use these conversions in solving multi-step, real <br> world problems. |
| :--- | :--- |
| MA.5.MD.B. 2 | Make a line plot to display a data set of measurements in fractions of a unit $(1 / 2,1 / 4,1 / 8)$. <br> Use operations on fractions for this grade to solve problems involving information <br> presented in line plots. |
| Recognize volume as an attribute of solid figures and understand concepts of volume |  |
| measurement. |  |


| MA.5.NF.A. 2 | Solve word problems involving addition and subtraction of fractions referring to the same <br> whole, including cases of unlike denominators, e.g., by using visual fraction models or <br> equations to represent the problem. Use benchmark fractions and number sense of <br> fractions to estimate mentally and assess the reasonableness of answers. |
| :--- | :--- |
| MA.5.NBT.A. 2 | Explain patterns in the number of zeros of the product when multiplying a number by <br> powers of 10, and explain patterns in the placement of the decimal point when a decimal <br> is multiplied or divided by a power of 10. Use whole-number exponents to denote powers <br> of 10. |
| Mead, write, and compare decimals to thousandths. |  |
| MA.5.NBT.A. 3 E |  |

## INTERDISCIPLINARY CONNECTIONS

## Math and Science: Metric Conversions Lab

- Conduct a lab experiment where students measure various objects using metric units. Apply patterns in powers of 10 to convert these measurements, then create line plots to analyze and compare the data collected.


## RELATED STANDARDS (Technology, 21st Century Life \& Careers, ELA Companion Standards are Required)

## CS.K-12.2.d

CS.K-12.7.a
WRK.K-12.P. 4
WRK.K-12.P. 5
WRK.K-12.P. 8

TECH.K-12.P. 4
TECH.K-12.P. 5
TECH.K-12.P. 8

Evaluate and select technological tools that can be used to collaborate on a project. Select, organize, and interpret large data sets from multiple sources to support a claim. Demonstrate creativity and innovation.

Utilize critical thinking to make sense of problems and persevere in solving them.
Use technology to enhance productivity increase collaboration and communicate effectively.

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## RESOURCES (Instructional, Supplemental, Intervention Materials)

## Core Instructional Materials

- Everyday Math Unit 6 Resources (Math Masters, Student Journal Volume 2) / ConnectED
- Calendar Math

Supplemental Materials:

- Illustrative Math Tasks
- IXL
- Games
- Exponent Ball (Lesson 6-2, 6-7): Multiplying and dividing decimals by powers of 10
- Decimal Top-It: Addition or Subtraction (Lesson 6-4): Adding or subtracting decimals
- Decimal Top-It: Decimal Subtraction Variation (Lesson 6-6): Comparing and subtracting decimals
- Prism Pile-Up (Lesson 6-6): Finding volumes of rectangular prisms
- Doggone Decimal (Lesson 6-8): Estimating decimals products
- Decimal Domination (Lesson 6-9): Predicting decimal products and multiplying decimals
- Spend and Save (Lesson 6-11): Adding and subtracting decimals
- Division Top-It: Larger Numbers (Lesson 6-11): Dividing multi-digit whole numbers
- Fraction/Whole Number Top-It (Lesson 6-13): Multiplying whole numbers and fractions
- Manipulatives
- Base 10-blocks (flats, longs, cubes)
- Number card sets 1-4, 0-9, 1-9, 1-10
- 6-sided dice
- Counters
- Meterstick
- Tape measure
- Unifix cubes
- Stopwatch

Intervention Materials:

- Number Worlds
- Touch Math Now


## EVIDENCE OF LEARNING

Refer to the 'Formative, Summative, and Benchmark Assessments' sections.

## Formative Assessments

- Journal Pages
- Homelinks
- Math Boxes
- Observations
- Classwork
- Homework Assignments
- Do Now Questions
- Exit Tickets
- Self Assessment Questions


## Summative Assessments

- Check Points
- Unit 6 Assessment
- Graded Assignments
- Project-based assessments


## Benchmark Assessments

- IXL Screener / Diagnostic Snapshot BOY
- Trimester 1 Benchmark Assessment
- IXL Diagnostic Snapshot MOY
- Trimester 2 Benchmark Assessment
- IXL Diagnostic Snapshot EOY
- Trimester 3 Benchmark Assessment


## ACCOMMODATIONS \& MODIFICATIONS FOR SUBGROUPS

See link to Accommodations \& Modifications document in course folder.


[^0]:    Students will be able to:

