MATH Literacy

Toolkit

Decimal Place Value Toolkit

SNIPPETS FROM THE LESSON

ProActiveEd

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State Standards

☑ TEKS 4.2A-H

☑ TEKS 4.3G

NCTM Process Standards

Problem Solving	Build new mathematical knowledge through problem solving. Solve problems that arise in mathematics and in other contexts. Apply and adapt a variety of appropriate strategies to solve problems. Monitor and reflect on the process of mathematical problem solving.
Reasoning and Proof	Make and investigate mathematical conjectures. Select and use various types of reasoning and methods of proof.
Communication	Organize and consolidate student mathematical thinking in written and verbal communication. Communicate mathematical thinking clearly to peers, teachers, and others. Use the language of mathematics to express mathematical ideas precisely
Connections	Recognize and use connections among mathematical ideas. Understand how mathematical ideas interconnect and build on one another to produce a coherent whole. Recognize and apply mathematics in contexts outside of mathematics.
Representations	Create and use representations to organize, record, and communicate mathematical ideas. Select, apply, and translate among mathematical representations to solve problems. Use representations to model and interpret physical, social, and mathematical phenomena.

Learning Objectives

Student explore the concept of decimal place by recognizing that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left. Students explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Student use whole number exponents to denote powers of 10; read, write, and compare decimals to thousandths; and use place value understanding to round decimals to any place.

Toolkit Materials

Concrete Representations

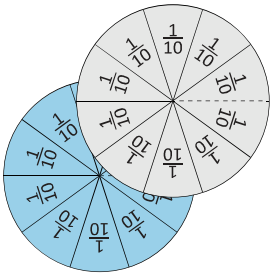
- ☑ See blackline masters section below

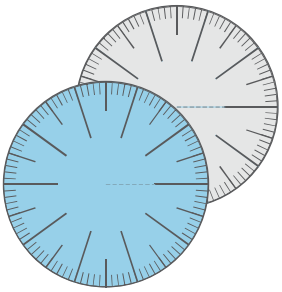
Blackline Masters

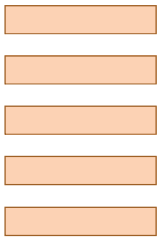
- ☑ Blue Tenth Fraction Circle
- ☑ White Tenth Fraction Circle
- ☑ Blue Hundredths Fraction Circle
- ☑ White Hundredths Fraction Circle
- ☑ Fraction Bars
- ☑ "Build It. Draw It. Find It. Write It." Mat

Not Included

- ❒ Scissors







Build It							
Draw It							
Find It							
Write It							
	Hundreds	Tens	Ones	.	Tenths	Hundreths	Thousandths

Literacy Guide

	Academic Discourse	Engage in conversations about the big ideas
	Conceptual Understanding	Explore the math using hands-on materials
	Informational Text	Read and write about concepts and problem solving strategies
	S.T.E.A.M. Connections	Investigate science, technology, engineering and art topics using the math
	Technical Writing	Present and write about the S.T.E.A.M. Connections

Recommended Intervention Toolkit

Introduction to Decimals Toolkit

Recommended Acceleration Toolkit

Adding and Subtracting Decimals Toolkit

Teacher Tips

Anchor 1: Academic Discourse

- ☑ Use games like a scavenger hunt to help students see the mathematics in the universe that surrounds them.
- ☑ Connect prior learning to make real-world connections to the learning goal.
- ☑ Reduce the barrier of academic vocabulary by focusing on big ideas and real world representations.

Anchor 2: Conceptual Understanding

- ☑ Use concrete realia or virtual manipulatives to represent the learning objective.
- ☑ Use hand-on manipulatives and student created pictures before transitioning to abstract concepts and standard algorithms.
- ☑ Use laboratory procedures that follow a constructivist approach to investigate the topic and learn key concepts.
- ☑ Communicate learning experiences through academic dialogue
- ☑ Write expository pieces to demonstrate conceptual understanding of the learning topic.

Anchor 3: Informational Text

- ☑ Use informational text to investigate the topic and learn key terms.
- ☑ Use reading strategies like previewing, chunking, annotating, and text dependent questioning to help students process the density text.
- ☑ Encourage reading and English teachers to utilize informational text about mathematics in their classroom settings.
- ☑ Communicate learning experiences through academic dialogue
- ☑ Write expository pieces to analyze the concepts and strategies presented in the text.

Anchor 4: S.T.E.A.M. Connections

- ☑ Use research, context clues, and access student schema to comprehend the given scenario
- ☑ Investigate invented strategies and standard algorithms to determine potential successes and failures.
- ☑ Design a prototype that satisfies the criteria outlined in the project before creating the final product.
- ☑ Collaborate with others to share strategies, critique reasoning, and justify methods.

Anchor 5: Technical Writing

- ☑ Write paragraphs that summarize the S.T.E.A.M. scenario. Be sure to include the criteria and scoring guide.
- ☑ Write paragraphs that describes the steps that will be used to address the scenario. Be careful to use numbers with a description of the role those numbers play in those steps.
- ☑ Write paragraphs that incorporates the steps used to address the scenario into actual calculations that include graphs, charts, diagrams and other representations as deemed appropriate
- ☑ Write paragraphs that investigate alternative problem solving strategies as a means for verifying the accuracy and validity of solutions
- ☑ Write paragraphs that reflect on strengths, misconceptions, and potential future applications of the concepts that were addressed and the strategies that were used.

Math Conversations

SETUP THE GAME

We use math to describe the world around us. There are so many opportunities every single day for us to observe, discuss, and interact with parts of a whole. You are going to go on a hunt for items that can be described as parts in a whole.

PLAY THE GAME

Gather sets of 10 related (or similar) objects. Identify a relationship between each set of 10 objects. You might refer to their colors, sizes, shapes, textures, etc. Go ahead and get creative with your part to whole descriptions! Complete the table below with your findings.

Items (What **10 items** did you collect?)	Part to whole relationship (What are you describing?)	Fraction (Write the part/whole as a fraction)	Number Name (Write the fraction in words)
10 crayons	3 crayons out of the 10 crayons are purple.	3/10	three tenths

Math Conversations Wrap-up Questions

- Look at the fraction column. What do all of the fractions have in common?

When you look at the far right column of the table you filled in, you see the number names of each fraction that you wrote. These numbers can be expressed as fractions, but they can also be expressed as **decimals**. A **decimal** is a fraction that has a **base-10** number as its denominator.

What's Old?

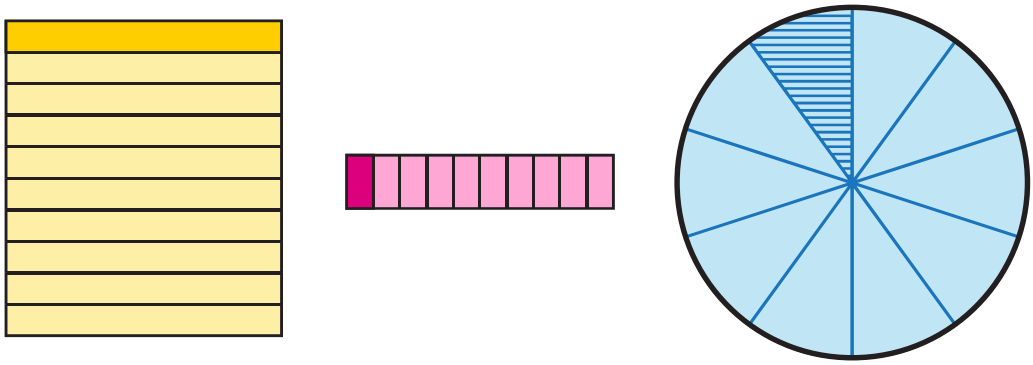
You already know a lot about fractions. You know that fractions are numbers. You know that fractions are used to represent **parts of a whole**. You know that the "bottom number" of a fraction is called the **denominator** and it represents the number of parts that make the whole. You know that the "top number" of a fraction is called the **numerator** and it represents the number of parts used. You know that there are several ways to represent a fraction, or a part/whole relationship.

one-tenth

$$\frac{1}{10}$$

⇦ **Numerator**

⇦ **denominator**



What's New?

Today, you are going to learn about ANOTHER way to represent a part/whole relationship. In the above example, you are reminded that one tenth means that the whole is broken into ten equal parts and one of the parts is used. One tenth can be written as a fraction $\frac{1}{10}$. One tenth can also be written as a **decimal**. A decimal is another way to express a part of a whole. Today you will learn about decimals- What do they mean? How do we write them? How do we compare them? How do we round them? You will explore these concepts to deepen your understanding of decimals.

Math Explorations

Let's explore part/ whole relationships by using circles, grids, and bars to represent each whole.

Explore 1

Set up- 1

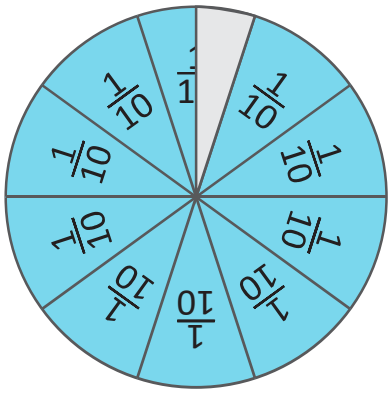
In the "Try It" section, you reviewed fractions by building and using a fraction wheel.
Get out your tenths fraction wheel that you used in the "Try It" section

Build It- 1

1. Spin your fraction wheel until 4 pieces are shaded.
   How many tenths are shaded blue? _____
2. Four tenths are shaded blue. How do you write four tenths as a fraction? _____
   Four out of ten parts are shaded. This is represented in fraction form as 4/10.
3. Now spin your circle until nine pieces are shaded.
   How many tenths are shaded blue? _____
4. Nine tenths are shaded blue. How do you write nine tenths as a fraction? _____
   Nine out of ten parts are shaded. This is represented in fraction form as 9/10.

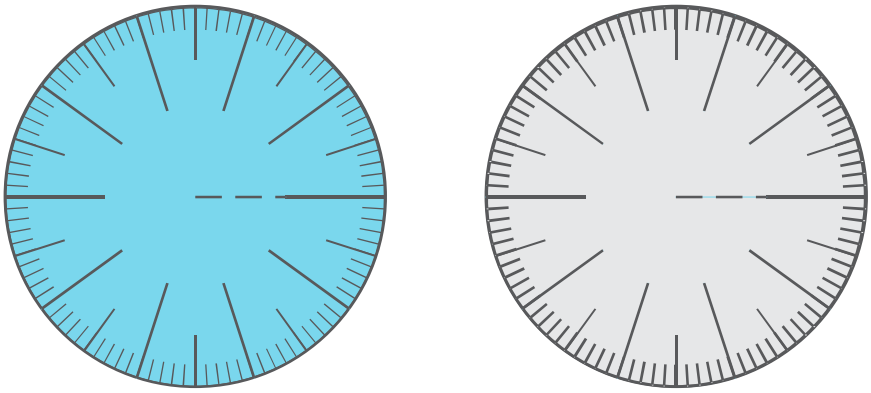
Set up- 2

5. What if you wanted more than 9/10 shaded, but still not the whole circle? Spin your tenths fraction wheel until you have almost all of it shaded. How can we represent this amount?

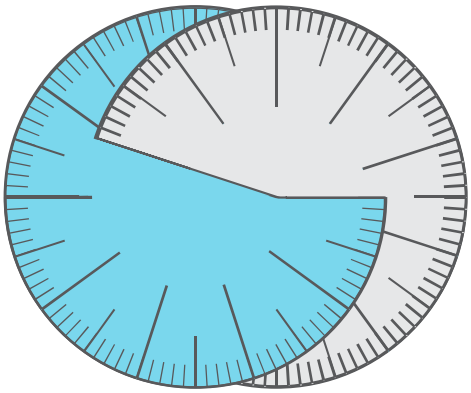


6. Since it's not quite 10 full pieces, but it's more than 9 pieces, we need to divide the circle into smaller pieces to be able to get an accurate number.

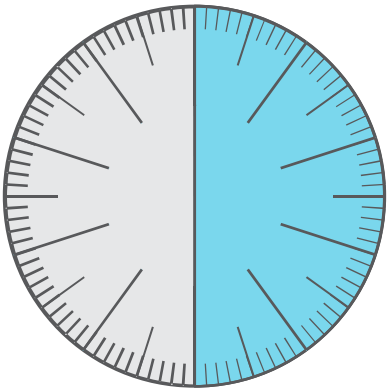
7. You should have two circles divided into 100 pieces. Cut out your white hundredths circle and cut out your blue hundredths circle.



8. Cut along the dotted line on the white circle and the light blue circle.
9. Slide the circles into each other by fitting the two circles together along the slits. Now as you spin the circles, different amounts of blue will show.



10. The shaded part will represent different amounts.



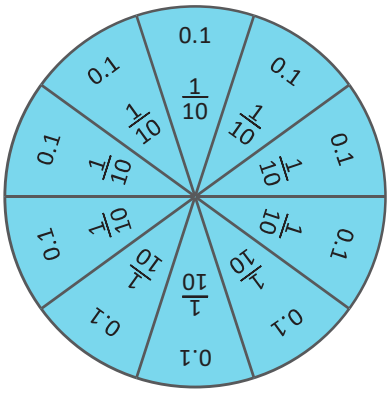
Build It- 2

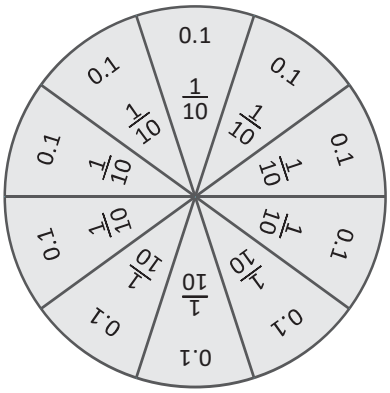
11. Spin your hundredths wheel until there are only 5 parts not shaded.
    How many parts are shaded? _____
12. 95 out of 100 parts are shaded, which is ninety-five hundredths.
    How do we write this number as a fraction?
13. Spin your circle until 42 pieces out of 100 are shaded.
14. The amount shaded is forty-two hundredths. How do you write this as a fraction?

Explore 2

As briefly mentioned above, there is another way to write fractions. When we divide a whole into a base 10 number (such as 10, 100, 1000), we can write the fraction amount as a **decimal**. The word **decimal** means based on 10.

1. Pull apart your tenths circles.
2. They are already labeled one tenth in fraction form. Now, let's label each part one tenth in decimal form. Above the fraction on each part, write 0.1





Think back to what you know about whole numbers. Each digit in a number has a value that depends on its place in that number. This is called **place value**. You already know that each place is 10x bigger than the place to its right. The same is true with numbers less than one.

The **decimal point** separates whole numbers from fractions. The whole numbers are to the left of the decimal point and the fractions are to the right of the decimal point.

Reading & Writing Instructions

Identify the Craft and Structure

- Find and highlight definitions for decimal, decimal point, and place value.
- Write your own definitions in the margins.
- Share your definitions with a partner.
- Read the passage and stop at every word you don't know. Place a dot above the words and keep reading.
- Compare your dotted words with a partner and try to figure out what they mean.
- Write your meanings in the margin
- Reread the passage using your definitions.

Find the Key Ideas and Details

- What is the text about?
- What is the relationship between fractions and decimals?
- What are the place values to the right of the decimal point?

Integrate Your Knowledge and Ideas

- Provide an example of a comparison of two decimals to the thousandths place.
- Explain patterns in how the decimal point moves when a number is multiplied or divided by a power of 10.

Write: Letter to Your Parent or Guardian

Write a letter to your parents telling them about decimals.

- What are decimals?
- Explain the place values to the right of the decimal point.
- How are decimals related to fractions?
- How can you compare two decimals?
- What happens to the decimal point when a number is multiplied or divided by a power of 10?

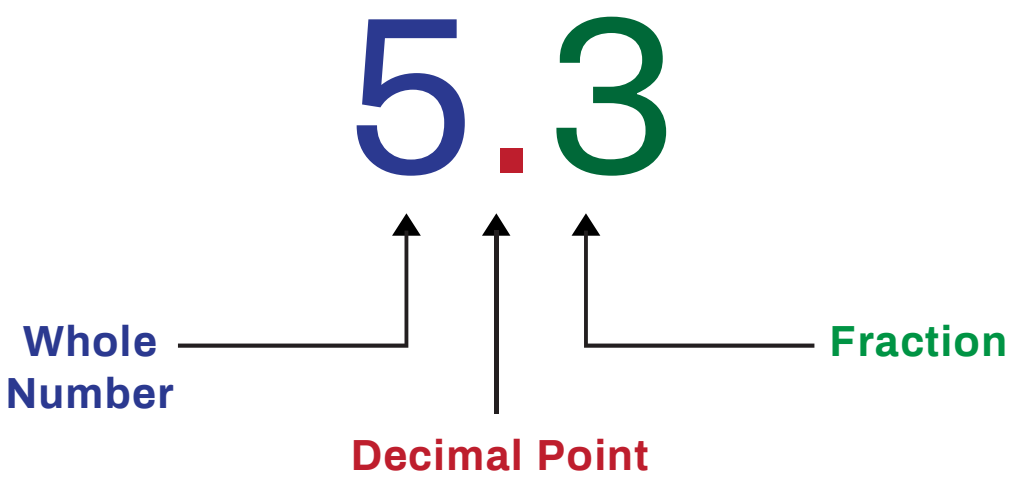
Diving Into Decimals

What are Decimals?

In the Explore section, you did a lot of work with part to whole relationships. You used wheels, grids, and rulers to show how a whole can be divided into equal parts to represent a number less than one.

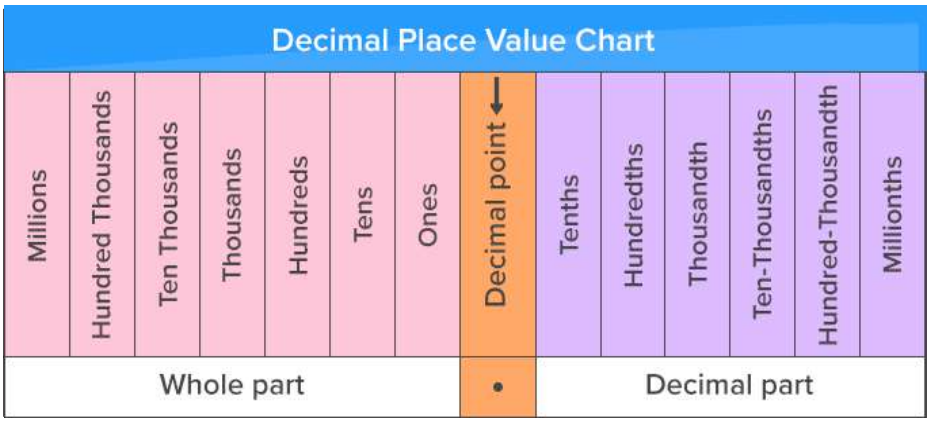
Decimals are a way to express these part to whole relationships. The prefix “deci” means 10. Decimals are a base 10 system, which means that the whole gets divided into powers of 10 (such as 10, 100, 1000, etc).

Decimals contain a decimal point which looks like a period and is used to separate the whole number on the left from the fraction on the right.



Place Value

Since decimals are a base 10 system, each place value is a power of 10. You already know the place values of whole numbers: ones, tens, hundreds, thousands, etc. Remember, the fraction portion of the number is to the right of the decimal point. A fraction is a number that is less than one. When a whole number is divided into pieces using a base 10 system, the fewest number of pieces that it can be divided into is ten. Therefore, the first place to the right of the decimal point is tenths. The next power of 10 is 100, so the next place value is hundredths. The next power of 10 is 1000, so the next place value is thousandths.



Reading and Writing Decimals

When we read decimals aloud, we use place value. The decimal is read as “and”. For instance, how would you say 67.539?

67.539 is sixty-seven and five-hundred thirty-nine thousandths.

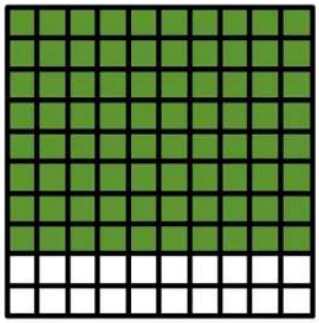
You can also expand decimals into expanded form. Let’s look at 67.539 again.
6 x 10 + 7 x 1 + 5 x (1/10) + 3 x (1/100) + 9 x (1/1000)

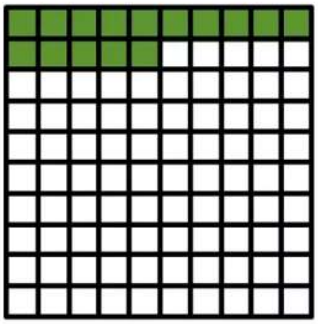
Comparing Decimals

When comparing decimals, you can use visuals like fraction wheels and grids to see which is larger or smaller. For instance, when comparing the decimals 0.8 and 0.15, you can shade in a grid for both. You can then look at both grids to determine which grid has more area shaded in and that is the larger decimal.

$0.8 \quad \square \quad 0.15$

$\frac{80}{100} \quad \square \quad \frac{15}{100}$





Racing Robots

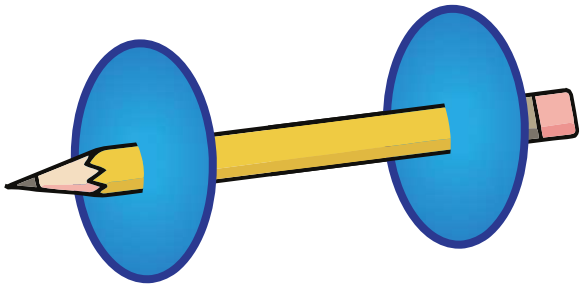
A servo motor is a motor commonly used in robots. This type of motor allows each part of the robot to move at its own precise and accurate measurement.

Your task is to develop a robot that will be able to maneuver through a course. Your robot will be built using a pencil as the body and a fraction wheel on each end. You will use your fraction circles as wheels to get your robot through the maze. Each wheel is allowed to make its own movements. Follow the criteria below to design a maze and program your robot to get through the maze. When you write your program, make sure to include each step in detail describing the movement of the wheels.

CRITERIA

Your fraction/decimal wheels must make the following movements (in no particular order) at least once throughout the course.

- 5.9 left wheel rotation
- 1.25 right wheel rotation
- 3.7 left wheel rotation
- 2.45 right wheel rotation



MAZE Sketch - Draw a detailed sketch of your maze

Program	
Left Wheel	**Right Wheel**

S.T.E.A.M. Presentation

Write a five paragraph essay describing the maze that you created, the program that you developed, and a descriptive explanation on how to maneuver your robot through the maze. This will serve as an instruction manual for the robot and maze. Remember to describe the decimal turns that the wheels are required to make. How did you determine where to include those decimals and how did you plan your maze accordingly?

Paragraph 1: Summary

Use complete sentences to restate the project in your own words, identifying important information in the project. Use numbers with units in your description of any quantities.

Paragraph 2: Strategy

Use complete sentences and academic vocabulary to write the steps you would take to solve the problem. Do not use any numbers or computations in your description.

Paragraph 3: Solution

Use complete sentences, an organized presentation of mathematical computations (e.g. graphs, tables, equations, etc.), and your strategy to demonstrate the solution to the problem.

Paragraph 4: Justification

Use complete sentences and flexible problem solving strategies to construct viable arguments that demonstrate the accuracy of your solution.

Paragraph 5: Reflection

Use complete sentences and academic vocabulary to reflect on what you did well, what you did not do well, and what will you do differently next time to fix any errors.