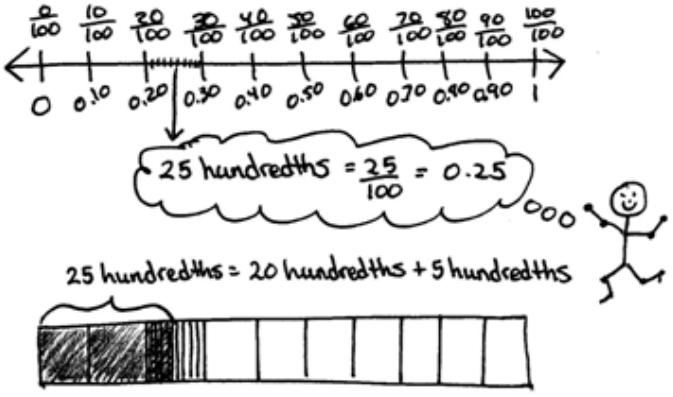
Topic B

Tenths and Hundredths

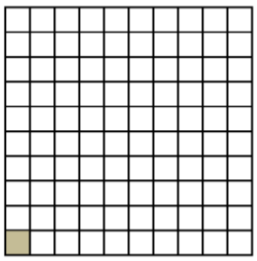
4.NF.5, 4.NF.6, 4.NBT.1, 4.NF.1, 4.NF.7, 4.MD.1

Focus Standards:	4.NF.5	Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* (Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.)
	4.NF.6	Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*
Instructional Days:	5	
Coherence -Links from:	G3–M2	Place Value and Problem Solving with Units of Measure
	G3–M5	Fractions as Numbers on the Number Line
-Links to:	G5–M1	Place Value and Decimal Fractions

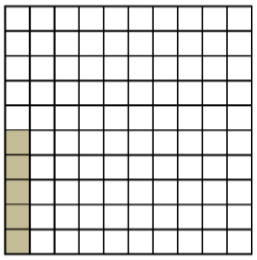
In Topic B, students decompose tenths into 10 equal parts to create hundredths. In Lesson 4, they once again use metric measurement as a basis for exploration. Using a meter stick, they locate 1 tenth meter and then locate 1 hundredth meter. They identify 1 centimeter as $\frac{1}{100}$ meter and count $\frac{1}{100}, \frac{2}{100}, \frac{3}{100}$, up to $\frac{10}{100}$, and, at the concrete level, realize the equivalence of $\frac{10}{100}$ meter and $\frac{1}{10}$ meter. They represent $\frac{1}{100}$ meter as 0.01 meter, counting up to $\frac{25}{100}$ or 0.25, both in fraction and decimal form. They then model the meter with a tape diagram and partition it into tenths, as they did in Lesson 1. Students locate 25 centimeters and see that it is equal to 25 hundredths by counting up, $\frac{10}{100}, \frac{20}{100}, \frac{21}{100}, \frac{22}{100}, \frac{23}{100}, \frac{24}{100}, \frac{25}{100}$. They represent this as $\frac{20}{100} + \frac{5}{100} = \frac{25}{100}$ and, using decimal notation, write 0.25. A number bond shows the decomposition of 0.25 into the fractional parts of $\frac{2}{10}$ and $\frac{5}{100}$.



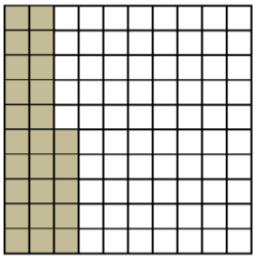
In Lesson 5, students relate hundredths to the area model (pictured below), to a tape diagram, and to place value disks. They see and represent the equivalence of tenths and hundredths pictorially and numerically.



1 hundredth = $\frac{1}{100}$ = 0.01

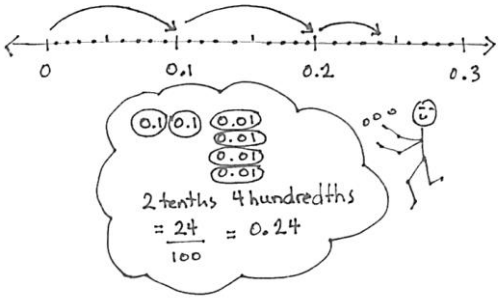


5 hundredths = $\frac{5}{100}$ = 0.05

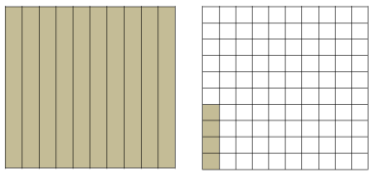


25 hundredths = $\frac{25}{100}$ = 0.25

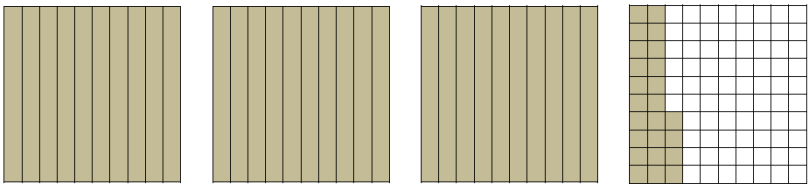
Students count up from $\frac{1}{100}$ with place value disks just as they did with centimeters in Lesson 4. This time, the 10 hundredths are traded for 1 tenth, and the equivalence is expressed as $\frac{1}{10} = \frac{10}{100}$ = 0.1 = 0.10 (**4.NF.5**, **4.NF.6**). The equivalence of tenths and hundredths is also realized through multiplication and division (e.g., $\frac{1}{10} = \frac{1 \times 10}{10 \times 10} = \frac{10}{100}$ and $\frac{10}{100} = \frac{10 \div 10}{100 \div 10} = \frac{1}{10}$), establishing that 1 tenth is 10 times as much as 1 hundredth. They see, too, that 16 hundredths is 1 tenth and 6 hundredths, and that 25 hundredths is 2 tenths and 5 hundredths.



In Lesson 6, students draw representations of three-digit decimal numbers (with ones, tenths, and hundredths) with the area model.

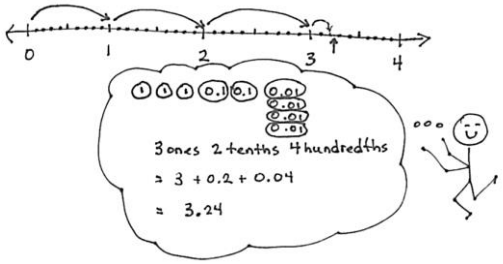


1 one 4 hundredths = $1\frac{4}{100}$ = 1.04



3 ones 24 hundredths = $3\frac{24}{100}$ = 3.24

Students also further extend their use of the number line to show the ones, tenths, and hundredths as lengths. Lesson 6 concludes with students coming to understand that tenths and hundredths each hold a special place within a decimal number, establishing that 3.80 and 3.08 are different and distinguishable values.



In Lesson 7, decimal numbers to hundredths are modeled with disks and written on the place value chart, where each digit's value is analyzed. The value of the total number is represented in both fraction and decimal expanded form as pictured below.

Hundreds	Tens	Ones	•	Tenths	Hundredths
3	7	8		7	3

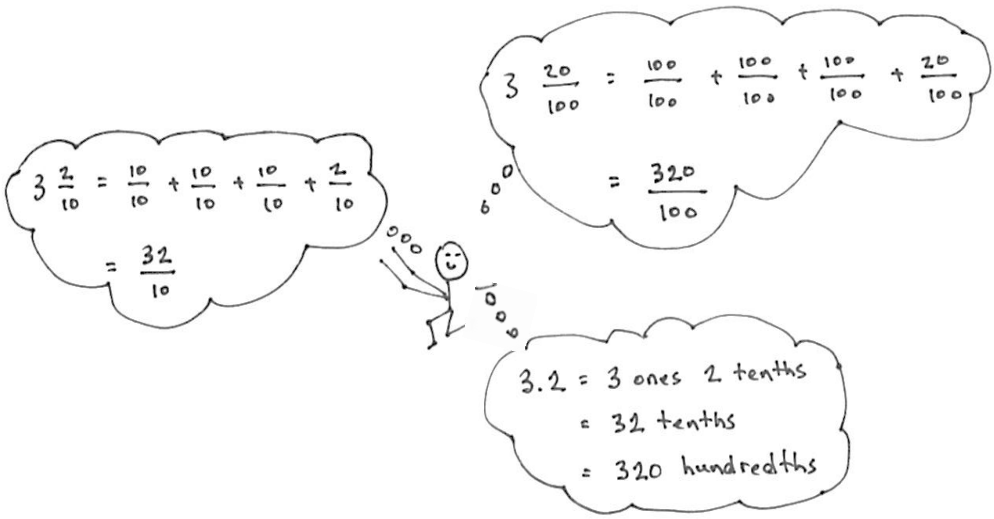
3 hundreds 7 tens 8 ones . 7 tenths 3 hundredths

$$(3 \times 100) + (7 \times 10) + (8 \times 1) + \left(7 \times \frac{1}{10}\right) + \left(3 \times \frac{1}{100}\right) = 378\frac{73}{100}$$

$$(3 \times 100) + (7 \times 10) + (8 \times 1) + (7 \times 0.1) + (3 \times 0.01) = 378.73$$

In the Debrief, students discuss the symmetry of the place value chart around 1, seeing the ones place as the "mirror" for tens and tenths and hundreds and hundredths, thereby avoiding the misconception of the *oneths* place or the decimal point itself as the point of symmetry. This understanding helps students recognize that, even as we move to the decimal side of the place value chart, a column continues to represent a unit 10 times as large as that of the column to its right.

In Lesson 8, students use what they know about fractions to represent decimal numbers in terms of different units. For example, 3.2 might be modeled as 3 ones 2 tenths, 32 tenths, or 320 hundredths. Students show these renamings in unit form, fraction form, and decimal form.



A Teaching Sequence Toward Mastery of Tenths and Hundredths	
Objective 1:	**Use meters to model the decomposition of one whole into hundredths. Represent and count hundredths. (Lesson 4)**
Objective 2:	**Model the equivalence of tenths and hundredths using the area model and place value disks. (Lesson 5)**
Objective 3:	**Use the area model and number line to represent mixed numbers with units of ones, tenths, and hundredths in fraction and decimal forms. (Lesson 6)**
Objective 4:	**Model mixed numbers with units of hundreds, tens, ones, tenths, and hundredths in expanded form and on the place value chart. (Lesson 7)**
Objective 5:	**Use understanding of fraction equivalence to investigate decimal numbers on the place value chart expressed in different units. (Lesson 8)**