Topic A

# Exploration of Tenths

**4.NF.6,** 4.NBT.1, 4.MD.1

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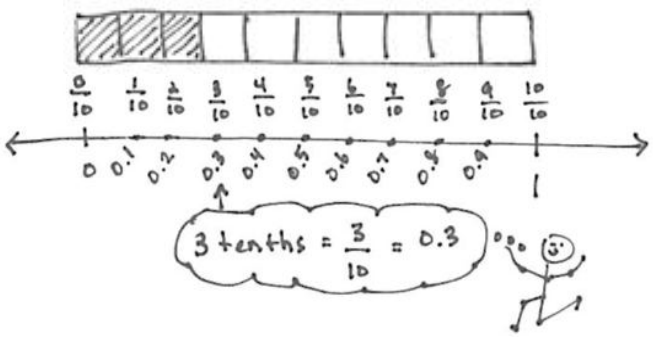
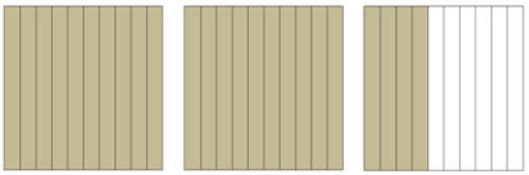
| **Focus Standard:** | | 4.NF.6 | Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram*. |
| **Instructional Days:** | | 3 | |
| **Coherence** | **-Links from:** | G3–M2 | Place Value 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 |

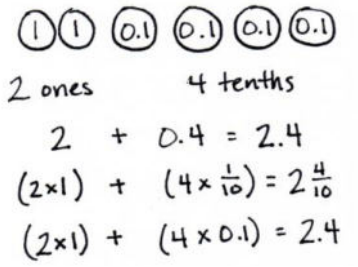
In Topic A, students use their understanding of fractions to explore tenths. In Lesson 1, students use metric measurement and see tenths in relation to one whole in the context of 1 kilogram, 1 meter, and 1 centimeter. Using bags of rice, each weighing $\frac{1}{10}$ kilogram, students see that the weight of 10 bags is equal to 1 kilogram. Through further exploration and observation of a digital scale, students learn that $\frac{1}{10}$ kilogram can also be expressed as 0.1 kilogram, that $\frac{2}{10}$ kilogram can be expressed as 0.2 kilogram, and that all expressions of tenths in fraction form (up to one whole) can be expressed in decimal form as well. Students then use their knowledge of pairs of 10 to determine how many more tenths are needed to bring a given number of tenths up to one whole. To bring together this metric measurement experience through a more abstract representation, tenths are represented on the number line and with tape diagrams as pictured below. Students express tenths as decimal fractions, are introduced to decimal notation, and write statements of equivalence in unit, fraction, and decimal forms (e.g., 3 tenths = $\frac{3}{10}$ = 0.3) (**4.NF.6**). Finally, meters and centimeters are decomposed into 10 equal parts in a manner similar to that in which 1 kilogram was decomposed.



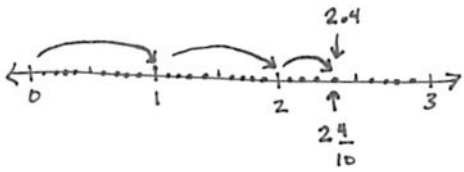
In Lesson 2, students return to the use of metric measurement, this time to investigate decimal fractions greater than 1. They use a centimeter ruler to draw lines that measure, for example, $2\frac{4}{10}$ or $6\frac{8}{10}$ centimeters, and recognize that those numbers can also be expressed in unit form as 24 tenths centimeters or 68 tenths centimeters. Students represent decimal numbers using the area model and see that numbers containing ones and fractions (i.e., mixed numbers) can also be expressed using decimal notation (e.g., 2.4 or 6.8); they also write more sophisticated statements of equivalence (e.g., $2\frac{4}{10} = 2 + \frac{4}{10}$ and 2.4 = 2 + 0.4) (**4.NF.6**).




In Lesson 3, students work with place value disks and the number line to represent and identify decimal numbers with tenths as a unit. To explore the place value of each unit in a decimal number with tenths, students use place value disks to rename groups of 10 tenths as ones. Next, students learn to record the value of each digit of a mixed number in fraction expanded form, followed by decimal expanded form (e.g., 2 ones 4 tenths = $2\frac{4}{10} = (2 \times 1) + (4 \times \frac{1}{10})$ and 2.4 = (2 × 1) + (4 × 0.1)). Finally, students model the value of decimal fractions within a mixed number by plotting decimal numbers on the number line.








| A Teaching Sequence Toward Mastery of Exploration of Tenths | |
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| **Objective 1:** | **Use metric measurement to model the decomposition of one whole into tenths. (Lesson 1)** |
| **Objective 2:** | **Use metric measurement and area models to represent tenths as fractions greater than 1 and decimal numbers. (Lesson 2)** |
| **Objective 3:** | **Represent mixed numbers with units of tens, ones, and tenths with place value disks, on the number line, and in expanded form. (Lesson 3)** |