**Multiplication and Division of Fractions and Decimal Fractions**

In this 38-day module, students learn to multiply fractions and decimal fractions and start work with fraction division. Students will begin by measuring fractional parts on a number line as a concrete way of understanding fractional parts of a whole, and eventually move to more abstract fraction operations.

4 ÷ 3, shown as a traditional algorithm division problem:

```
<table>
<thead>
<tr>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>
```

Check: 3 \times 1 \frac{1}{3} = 1\frac{1}{3} + 1\frac{1}{3} + 1\frac{1}{3} = 3 + \frac{3}{3} = 4

Each bag of arts weighs 1\frac{1}{3} kilograms.

**What Came Before this Module:** We learned to add and subtract fractions with unlike denominators, moving from concrete to abstract examples.

**What Comes After this Module:** In Module 5, we will work with the area and volume of two- and three-dimensional figures.

**New Terms in this Module:**
- **Decimal divisor:** the number that divides the whole and that has units of tenths, hundredths, thousandths, e.g. 1/100
- **Simplify:** using the largest fractional unit possible to express an equivalent fraction, e.g. 4/6 simplifies to 2/3, with the denominator 3 being a larger fractional unit than 6

**Familiar Terms with Some Definitions:**
- **Denominator**
- **Decimal Fraction**
- **Equation**
- **Equivalent Fraction**
- **Factors:** numbers that are multiplied to obtain a product
- **Line Plot**
- **Mixed Number**
- **Numerator**
- **Tape Diagram**
- **Unit**: one segment of a partitioned tape diagram
- **Unknown:** the missing factor or quantity in multiplication or division
- **Whole Unit:** any unit that is partitioned into smaller, equally sized fractional units

**Key Common Core Standards:**
- **Write and interpret numerical expressions.**
- **Perform operations with multi-digit whole numbers and with decimals to hundredths.**
- **Apply and extend previous understandings of multiplication and division to multiply and divide fractions.**
- **Convert like measurement units within a given measurement system.**
- **Represent and interpret data.**
Various types of number lines:

- A ruler number line
- A circular number line (the clock)
- A vertical number line

The clock - a circular number line!

A Story of Units has several key mathematical “models” that will be used throughout a student’s elementary years.

The number line is a powerful, flexible model that students can use in many ways. In this particular module, students begin to understand the idea of fractions as division by marking a ruler or line plot with $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{1}{8}$ increments.

The number line is used beginning in Kindergarten in A Story of Units, and will continue to appear in various forms through 5th grade. It is used to develop a deeper understanding of whole number units, fraction units, measurement units, decimals, and negative numbers. Often, the mathematical concepts in an ASOU module move from concrete to more abstract, and the number line is an important concrete conceptual step for students of all ages.

**Sample Problem from Module 4:**
*(Example taken from Lesson 5)*

Forty students shared 5 pizzas equally. How much pizza did each student receive?

What fraction of the pizza did each student receive?

Note the use of a tape diagram as well as the drawing showing division of a whole number into fractional parts: