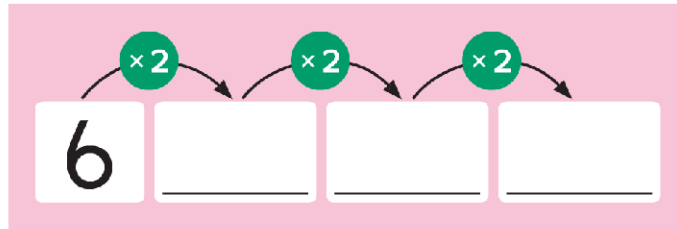


Operations and Algebraic Thinking

This module continues the development of multiplication number facts, starting with the eights facts. This set of facts uses the doubling strategy that helped establish the twos and fours facts in Module 3. Pictorial representations are used to introduce the strategy. Arrow diagrams reinforce the work to show that the answers to questions such as $6 \times 8 = \underline{\quad}$ can be determined by a series of doubles.



This thinking will help to extend the work beyond the set of facts. The module also explores estimation strategies and patterns related to multiplying by 8.

The module also develops thinking associated with two other sets of multiplication facts, the ones and zeros facts. Both of these are relatively easy to establish and represent important properties that are used throughout mathematics. The lessons help establish the general rules that need to be associated with each of the properties, that is, the *identity property* which states that ‘the product of a number n and 1 is n ’, for example $n \times 1 = n$. Less formally, multiplying a number by 1 results in a product that is the original number. The module demonstrates this property using everyday examples.

The *zero property* of multiplication states that ‘the product of a number n and 0 is 0’, for example $n \times 0 = 0$. Like the identity property, the zero property is established using everyday examples, such as 4 plates of muffins with 0 muffins on each plate.

Number and Operations – Fractions

The latter section of the module focuses on extending the idea of fractions to examples greater than 1. This is established carefully starting with representing fractions by folding strips of paper to show halves, fourths, and then eighths. The strips show how a fraction such as $\frac{5}{8}$ can be interpreted by counting one-eighths. This same thinking is used to represent fractions on a number line. Students interpret fractions as a series of jumps. Each jump is a unit fraction long.

Using the number line and strips, students count unit fractions such as $\frac{1}{4}$ or $\frac{1}{8}$ beyond 1 to introduce improper fractions. Students are then asked to show specific improper fractions, first with the number line model and then explore how these new fractions can be represented with the area model.



For professional learning on this content, select the following videos from the resources tab at top right of screen.

CIMF *An Introduction to Teaching Multiplication Number Facts*

CMS2 *Teaching the Doubling Strategy for Multiplication Number Facts ($\times 2$, $\times 4$ and $\times 8$)*

DTF1 *Naming Fractions*

DTF2 *Interpreting Fractions*

DEF1 *An Introduction to Equivalent Fractions*

DAF1 *Adding and Subtracting Common Fractions: Same Denominators*

DFM1 *An Introduction to Fraction Models*

DFM3 *Analyzing the Area Model of Fractions*

DFM4 *Analyzing the Length Model of Fractions*

DFM5 *Analyzing the Number Line Model of Fractions*