3 **Module 9**

Core Focus

- Subtraction: Making estimates and standard algorithm
- Subtraction: Compensation strategy
- Common fractions: Comparisons

Subtraction

- Students explore subtracting two- and three-digit numbers using the standard subtraction algorithm.

- In the standard subtraction algorithm, what was called borrowing is now called **regrouping**.
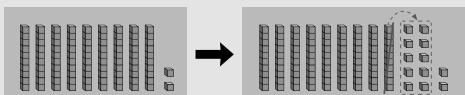

9.3 **Subtraction: Using the standard algorithm with two-digit numbers (decomposing tens)**

Step In Dorothy has $92 and buys this game.

How much money will she have left over?
How could you calculate it using base-10 blocks?

I would show 92 using 9 tens blocks and 2 ones blocks. Then I would have to regroup 1 tens block as 10 ones blocks so that I have 8 tens and 12 ones.

Using the standard subtraction algorithm is like using base-10 blocks.
You need to regroup when the top digit in a place-value column is less than the bottom digit in the same column.

In this example, 92 is regrouped as 80 +12, so 80 – 30 and 12 – 8 can be subtracted more easily.

- Because students have had many experiences with composing and decomposing to make numbers easier to add or subtract, they should find the standard subtraction algorithm makes sense and easy to work with.

9.5 **Subtraction: Using the standard algorithm with three-digit numbers (decomposing hundreds)**
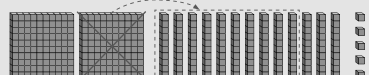
Step In A gardener had 235 seedlings to plant.
In the first garden bed, he planted 72 seedlings.
How many seedlings does he have left to plant?

How could you calculate it using base-10 blocks?

I would show 235 using 2 hundreds blocks, 3 tens, and 5 ones. Then I would take away the number of seedlings he has planted.

I can take 2 ones from 5 ones but I need to regroup 1 hundreds block as 10 tens blocks so that I have 13 tens.

In this lesson, students use the standard subtraction algorithm to subtract three-digit numbers.

Ideas for Home

- Ask your child to regroup the same quantity of money in different ways. E.g. $1.38 is 1 hundred (dollar), 3 tens (dimes), and 8 ones (pennies), which can be regrouped as 13 tens and 8 ones, or 12 tens and 18 ones, or 11 tens and 28 ones.

- When practicing the algorithm, ask your child to use place-value language while subtracting. E.g. for 457 - 228, 457 can be regrouped as 44 hundreds, 4 tens and 17 ones.

Glossary

▸ The **standard subtraction algorithm** is the familiar paper-and-pencil procedure most adults learned for subtracting multi-digit numbers.

▸ **Regrouping** is when numbers are regrouped as new place values to combine the quantities.

Fractions

- Students explore **equivalent fractions** and compare fractions to determine which is greater. The fraction chart (see below) helps to find equivalent fractions and compare fractions of different sizes.

> **9.8** **Common fractions: Comparing unit fractions (length model)**
>
> **Step In** Each strip is one whole. What fraction of each strip has been shaded?
>
> Which strip shows the greatest fraction shaded?
> Which strip shows the least fraction shaded?
>
> **When you write $\frac{1}{3}$, what does the 3 tell you?**
> When you write $\frac{1}{5}$, what does the 5 tell you?
> Why is $\frac{1}{5}$ less than $\frac{1}{3}$?
>
> Which fraction is greater in each pair? How do you know?
>
> $\frac{1}{8}$ or $\frac{1}{12}$ $\frac{1}{20}$ or $\frac{1}{50}$
>
> It takes 8 one-eighths to fill one whole and 12 one-twelfths to fill one whole. So eighths are bigger than twelfths.
>
> $\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{6}$ $\frac{1}{7}$ $\frac{1}{8}$

These length models in a fraction chart show that $\frac{1}{4}$ is equivalent to $\frac{2}{8}$; and $\frac{2}{6}$ is greater than $\frac{2}{8}$.

- Students visualize fractions on a number line. The same point on a number line can be labeled with different fraction names, which are equivalent fractions.

- They use number lines to compare fractions with the same denominator, which shows how many equal-sized parts divide the distance from 0 to 1.

> **9.10** **Common fractions: Making comparisons with the same denominator (number line)**
>
> **Step In** On these number lines, the distance from 0 to 1 is one whole.
>
> **What do the marks between 0 and 1 on this number line show? How do you know?**
>
> 0   1   2
>
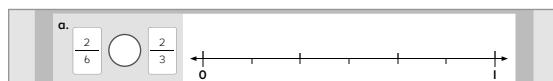> How can you figure out which mark shows six-fourths?

- Students use a number line to order fractions from least to greatest. Comparing unit fractions is an effective way to get a sense for the size of a fraction.

> **Step In** Order these fractions from greatest to least. $\frac{1}{8}$ $\frac{1}{4}$ $\frac{1}{6}$ $\frac{1}{2}$ $\frac{1}{3}$
>
> How did you decide the order?
>
> I looked at the denominator. The greater the denominator the smaller the size of the unit fraction.

- When students can visualize where $\frac{1}{4}$ and $\frac{1}{8}$ are on a number line, it is obvious that $\frac{1}{8}$ is less than $\frac{1}{4}$, even though 8 is greater than 4 in whole numbers.

- To compare fractions with different denominators, the number line can be divided to represent both denominators. E.g. thirds (above the line) and sixths (below it).

> a.
> $\frac{2}{6}$ ◯ $\frac{2}{3}$
> 0   1

Ideas for Home

- Notice how a ruler is like a number line. One inch is divided into $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ and $\frac{1}{16}$. Practice counting by unit fractions. Notice the equivalent fractions. E.g. $\frac{4}{16}$ is equivalent to $\frac{1}{4}$.

Glossary

▸ **Equivalent fractions** are fractions described in different ways, but are the same distance on the number line. $\frac{3}{6}$ is equivalent to $\frac{1}{2}$.