Section Overview

Rational Numbers   *Lesson 2-1*

Why? Students must know how to work with rational numbers in order to solve one- and two-step equations.

Write $\frac{2}{3}$ as a decimal.

$$\frac{2}{3}$$

```
   0.666
3)2.0000
  −18
    20
   −18
    20
   −18
    20
```

> The pattern repeats.
> This is a repeating decimal.

$\frac{2}{3}$ is equivalent to $0.\overline{6}$.

Write -0.32 as a fraction.

$$-0.32$$

$$-0.32 = -\frac{32}{100}$$

2 is in the hundredths place, so write hundredths as the denominator.

$$= -\frac{32 \div 4}{100 \div 4}$$

Simplify by dividing by the **greatest common divisor**.

$$= -\frac{8}{25}$$

Comparing and Ordering Rational Numbers   *Lesson 2-2*

Why? Many quantities and measurements are expressed with rational numbers.

> A **rational number** is a number that can be expressed as a *ratio* (fraction) in the form $\frac{n}{d}$, where n and d are integers and $d \neq 0$.
> **Examples:**
> $$5 = \frac{5}{1} \quad \frac{3}{4} \quad 1.59 = 1\frac{59}{100} = \frac{159}{100}$$

Comparing Two Fractions with Different Denominators

Compare $\frac{5}{8}$ and $\frac{2}{3}$.

$$\frac{5}{8} = \frac{5 \cdot 3}{8 \cdot 3} = \frac{15}{24} \qquad \frac{2}{3} = \frac{2 \cdot 8}{3 \cdot 8} = \frac{16}{24}$$

> Write the fractions as **fractions with a common denominator.** Then compare the numerators.

$$\frac{15}{24} < \frac{16}{24}, \text{ so } \frac{5}{8} < \frac{2}{3}.$$

Comparing Decimals

Compare 0.387 and 0.39.

0.387

0.390

So, $0.387 < 0.39$.

> Write the **decimals with the same number of decimal places.** Compare each place from left to right.

Section Overview

Operations with Rational Numbers

Why? To evaluate expressions, we need to be able to operate with rational numbers.

Addition

$$\frac{3}{8} + \frac{7}{8}$$

$$= \frac{3 + 7}{8}$$

$$= \frac{10}{8}$$

$$= \frac{5}{4}$$

$$= 1\frac{1}{4}$$

Add numerators and keep the common denominator.

Subtraction

$$12.7 - 5.34$$

$$\begin{array}{r} 12.70 \\ -\ 5.34 \\ \hline 7.36 \end{array}$$

Line up the decimal points. Use **zeros** as placeholders.

Multiplication

$$1\frac{3}{8}\left(-\frac{2}{3}\right)$$

$$= \frac{11}{8}\left(-\frac{2}{3}\right)$$

$$= \frac{(11)(-2)}{(8)(3)}$$

$$= \frac{-22}{24}$$

$$= -\frac{11}{12}$$

Write the mixed number $1\frac{3}{8}$ as an improper fraction, $\frac{11}{8}$.

Division

$$\frac{8}{9} \div \frac{2}{3}$$

$$= \frac{8}{9} \cdot \frac{3}{2}$$

$$= \frac{24}{18}$$

$$= \frac{4}{3}$$

$$= 1\frac{1}{3}$$

To divide by $\frac{2}{3}$, multiply by its reciprocal, $\frac{3}{2}$.

Adding and Subtracting with Unlike Denominators

Why? Students must know how to add and subtract fractions with unlike denominators in order to solve problems involving recipes and other measurement applications.

To add or subtract fractions with unlike denominators, first find a common denominator, and then add the numerators.

Addition

$$\frac{3}{4} + \frac{4}{5}$$

$$= \frac{3}{4}\left(\frac{5}{5}\right) + \frac{4}{5}\left(\frac{4}{4}\right)$$

$$= \frac{15}{20} + \frac{16}{20}$$

$$= \frac{15 + 16}{20}$$

$$= \frac{31}{20} = 1\frac{11}{20}$$

Find a common denominator by multiplying the denominators.

Subtraction

$$2\frac{3}{8} - 1\frac{1}{12}$$

$$= \frac{19}{8} - \frac{13}{12}$$

8: 8, 16, **24**

12: 12, **24**

$$= \frac{19}{8}\left(\frac{3}{3}\right) - \frac{13}{12}\left(\frac{2}{2}\right)$$

$$= \frac{57}{24} - \frac{26}{24}$$

$$= \frac{31}{24} = 1\frac{7}{24}$$

Find a common denominator by listing the multiples of each denominator and choosing the LCD.