Chapter 1

Basic Math

CHAPTER OUTLINE

LEARNING OUTCOMES

Upon completion of the chapter, the student will be able to:

1-1 Perform calculations with fractions.

1-2 Perform calculations with decimals.

1-3 Convert quantities.

1-4 Calculate percentages.

1-5 Calculate unknown quantities using ratio-proportion.

KEY TERMS

addend
complex fraction
cross-multiplication
decimal
denominator
dividend
divisor
fraction
improper fraction
mixed number
numerator
proper fraction
quotient
subtrahend

Case Consideration … Death by Decimal

On an exam, a nursing student correctly calculated a quantity to be 62.5 mg, but recorded the answer as 6.25 mg. The student exclaimed, "I can't believe the instructor marked the entire question wrong! I did all of the math right; I just put the decimal point in the wrong place. What's the big deal? It probably won't make a difference in medication administration; it's only a fraction off. I should have at least received partial credit!"

1. Where is the error in the student's reasoning?
2. How can this error be avoided?

INTRODUCTION

Nurses perform basic math without a calculator. Even when a calculator is used to perform dosage calculations, checking the accuracy of calculations requires the ability to perform basic math without a calculator. This is sometimes referred to as "mental math." As a nurse, mental math is performed on a daily basis. In this and other chapters, color is used to enhance mathematical operations by matching the color of the text font with the corresponding numbers in an equation.

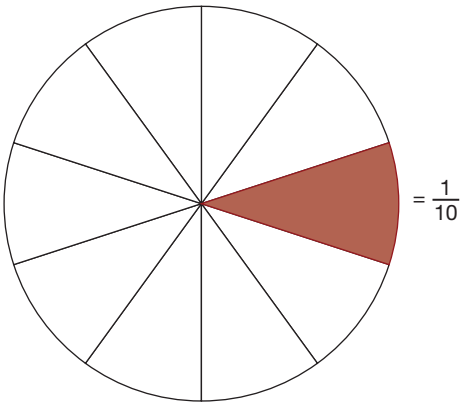

FIGURE 1-1 The shaded part of the circle, which is one (1) part, reflects the numerator and the total number of parts (10) is the denominator. Therefore $\frac{1}{10}$ means 1 of 10 equal parts.

1-1 Calculating with Fractions

Fractions are used when calculating dosages, converting metric to household measurement, and when critically evaluating the relationship of one quantity to another quantity. A **fraction** represents a portion of a whole (**Figure 1-1**). It is written as two quantities: a **numerator** (part[s] of a whole) and a **denominator** (the whole). The denominator represents the number of equal parts that make up a whole. Because a fraction is the division of a whole quantity, it is written using a division sign, with the numerator as the first number and the denominator as the second number.

$$\frac{\text{numerator}}{\text{denominator}} \leftarrow \text{division sign}$$

The horizontal line above the denominator is a division sign that indicates the numerator is divided by the denominator.

Types of Fractions

There are various types of fractions:

- **Proper fraction**—Numerator is less than the denominator, so the value is less than 1 (e.g., $\frac{3}{5}$).
- **Improper fraction**—Numerator is greater than the denominator, so the value is greater than 1 (e.g., $\frac{5}{3}$), or the numerator is the same as the denominator, so the value is equivalent to 1 (e.g., $\frac{5}{5}$).
- **Mixed number**—Whole number and fraction (e.g., $1\frac{3}{5}$).
- **Complex fraction**—A fraction in which the numerator and/or the denominator is a fraction (e.g., $\frac{\frac{1}{2}}{1\frac{1}{4}}$, $\frac{\frac{3}{5}}{2}$, or $\frac{1}{\frac{2}{3}}$). Calculations with complex fractions are included in Appendix A.

LEARNING ACTIVITY 1-1 Refer to the following fractions and answer the questions that follow:

$$\frac{3}{5}, \quad \frac{9}{8}, \quad 2\frac{1}{2}$$

1. Identify the improper fraction(s). _____
2. Identify the fraction(s) that are greater than one (1). _____
3. Identify the proper fraction(s). _____

Creating Equivalent Fractions

Performing calculations with fractions requires the ability to:

- *Convert fractions to equivalent fractions with common denominators.* Converting fractions to equivalent fractions with common denominators most often involves enlarging the fraction. This is done by multiplying both the numerator and denominator by the same number. Select a number that will produce the common denominator. For example, to convert $\frac{2}{3}$ to twelfths (12ths), multiply both the numerator and denominator by 4: $\frac{2(\times 4)}{3(\times 4)} = \frac{8}{12}$. This skill is necessary for addition and subtraction of fractions.
- *Convert mixed numbers to improper fractions.* To convert mixed numbers to improper fractions, multiply the denominator by the whole number and add the numerator and place that number over the existing denominator. For example, to convert $4\frac{4}{5}$ to an improper fraction, $\frac{(5\times 4)+4}{5} = \frac{24}{5}$.
- *Reduce fractions to lowest terms and convert improper fractions to mixed numbers.* To reduce fractions to lowest terms, find the largest number that will divide evenly into both the numerator and denominator. For example, to reduce $\frac{24}{18}$ to lowest terms, divide the largest number (6) that goes evenly into both the numerator and denominator: $\frac{24(\div 6)}{18(\div 6)} = \frac{4}{3} = 1\frac{1}{3}$.

Comparing Fractions by Size

Why it is important to know if the value of one fraction is equivalent to (=), less than (<), or greater than (>) the value of another fraction?

- Estimating the correct answer is an important step in dosage calculation.
- Estimating involves comparing values.
- Comparing reduces accidental over or under dosage.

When the numerator and the denominator are the same, the value equals one (1).

Example: Six (6) slices of a pizza cut into 6 equal parts is considered $\frac{6}{6}$ (or 1) pizza (**Figure 1-2**).

$$\frac{6}{6} = 1$$

When the denominators are both the same, the fraction with the smaller numerator has the lesser value.

FIGURE 1-2 $\frac{6}{6}$ of a pizza equals 1 whole pizza.

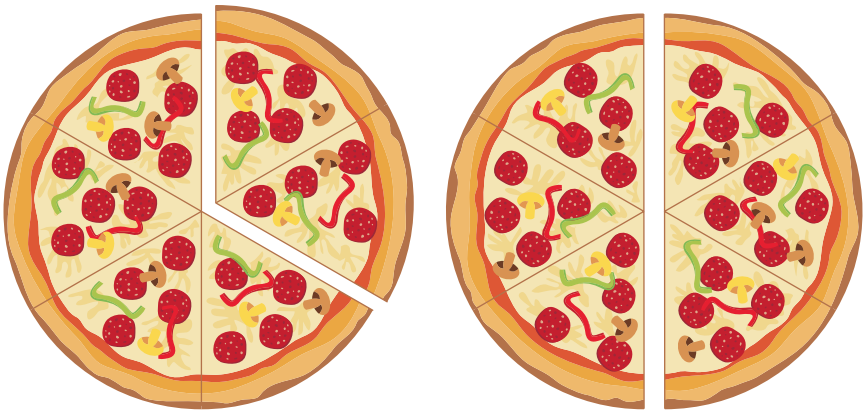

FIGURE 1-3 When the slices are the same size (i.e. the denominators are the same) 2 slices is less than 3 slices.

Example: Two slices, or $\frac{2}{6}$ of a pizza, are less than 3 slices, or $\frac{3}{6}$ of a pizza of the same size (**Figure 1-3**).

$$\frac{2}{6} \text{ is less than } \frac{3}{6} \text{ because the denominators are the same and 2 is less than 3.}$$

When the numerators are the same, the fraction with the smaller denominator has the greater value.

Example: If one pizza is sliced into 5 equal parts, and the other same-sized pizza is sliced into 10 equal parts, each of the 10 slices will be smaller than the slices from the pizza cut into 5 pieces. So, 4 slices from the pizza cut into 5 pieces, or $\frac{4}{5}$ of a pizza, is a larger quantity than slices from the pizza cut into 10 pieces, or $\frac{4}{10}$ of a pizza.

$\frac{4}{5}$ is greater than $\frac{4}{10}$ because the numerators are the same, and the denominator, 5, is less than 10 (**Figure 1-4**).

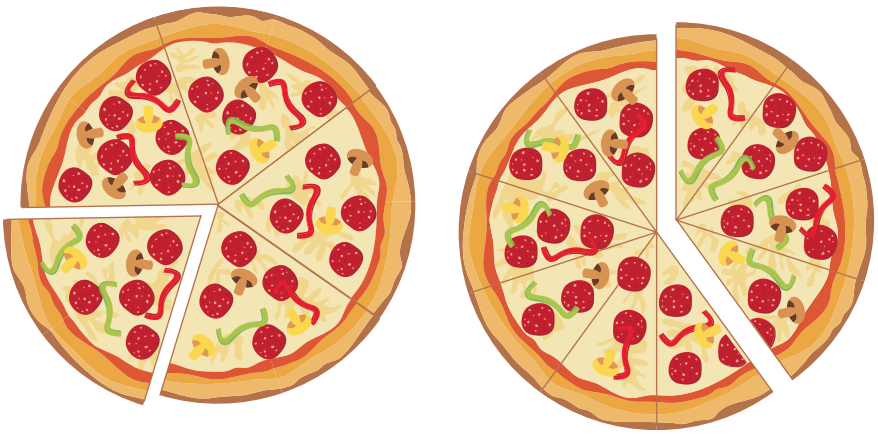

FIGURE 1-4 The fraction with the smaller denominator, $\frac{4}{5}$ (of a pizza), is a larger quantity than $\frac{4}{10}$ (of a pizza), a fraction with the same numerator, but larger denominator.

When the numerators and denominators are different, to compare the fractions, do the following:

- Convert the fractions to equivalent fractions with a common denominator, and then compare the numerators.
- To find a common denominator, multiply the numerator and denominator of the first fraction by the denominator of the other fraction.
- Next, multiply the numerator and denominator of the other fraction by the denominator of the first fraction as demonstrated in the following examples.

Example 1: Determine if the first fraction is less than, greater than, or equal to the second fraction.

$$\frac{5}{6} \ ? \ \frac{3}{5}$$

Find a common denominator:

- Multiply the numerator and denominator of the first fraction by 5 (the denominator of the second fraction).

$$\frac{5(\times 5)}{6(\times 5)} = \frac{25}{30}$$

- Multiply the numerator and denominator of the second fraction by 6 (the denominator of the first fraction).

$$\frac{3(\times 6)}{5(\times 6)} = \frac{18}{30}$$

Compare the numerators of the resulting fractions, $\frac{25}{30}$? $\frac{18}{30}$. Because the numerator of the first fraction, $\frac{25}{30}$, is larger than the numerator of the second fraction, $\frac{18}{30}$, the first fraction has greater value:

$$\frac{25}{30} \text{ is larger than } \frac{18}{30}$$

$$\text{Therefore, } \frac{5}{6} \text{ is larger than } \frac{3}{5}.$$

Example 2: The patient had $\frac{3}{5}$ of breakfast and $\frac{2}{3}$ of lunch. Did the patient eat more for breakfast or lunch?

$$\frac{3}{5} \ ? \ \frac{2}{3}$$

$$\frac{3(\times 3)}{5(\times 3)} \ ? \ \frac{2(\times 5)}{3(\times 5)}$$

$$\frac{9}{15} \text{ is less than } \frac{10}{15}$$

$$\text{Therefore, } \frac{3}{5} \text{ is less than } \frac{2}{3}.$$

So, the patient ate more for lunch.

Example 3: The patient walked $\frac{2}{3}$ of the hall in the morning, and then $\frac{3}{4}$ of the hall in the evening. Did the patient walk farther in the morning or evening?

$$\frac{2}{3} \,?\, \frac{3}{4}$$

$$\frac{2(\times 4)}{3(\times 4)} \,?\, \frac{3(\times 3)}{4(\times 3)}$$

$$\frac{8}{12} \text{ is less than } \frac{9}{12}$$

$$\text{Therefore, } \frac{2}{3} \text{ is less than } \frac{3}{4}.$$

So, the patient walked farther in the evening.

If the denominators are large, find the least common denominator (LCD) by dividing the numerator and denominator of each fraction by a number that will yield the smallest denominator that is the same in both fractions.

Example: Determine if the first fraction is less than or greater than the second fraction.

$$\frac{30}{80} \,?\, \frac{29}{40}$$

$$\frac{30(\div 2)}{80(\div 2)} \,?\, \frac{29}{40}$$

$$\frac{15}{40} \text{ is less than } \frac{29}{40}$$

$$\text{Therefore, } \frac{30}{80} \text{ is less than } \frac{29}{40}.$$

LEARNING ACTIVITY 1-2 Determine if the first fraction is less than, greater than, or equal to the second fraction.

1. $\frac{2}{3}$? $\frac{2}{5}$ _____
2. $\frac{5}{8}$? $\frac{7}{8}$ _____
3. $\frac{4}{7}$? $\frac{2}{3}$ _____

Calculations Using Fractions

Healthcare professionals must acquire proficiency with addition, subtraction, multiplication, and division of fractions. Addition and subtraction of fractions require common denominators, whereas common denominators are not needed for multiplication and division.

Addition of Fractions

Fractions are added by following these steps:

- Convert **addends** (numbers that are added together) to fractions with common denominators, if needed.
- Add the numerators, but maintain the common denominator.
- **Reduce, if necessary.**

Adding fractions *with* common denominators. When common denominators exist, skip step 1 and simply add the numerators and maintain the common denominator (e.g., $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$). Because $\frac{3}{5}$ is not reducible, step 3, reducing to lowest terms is also eliminated.

Adding fractions *without* common denominators. To add $\frac{1}{5} + \frac{4}{15}$, begin with step 1:

- Determine a common denominator (15) and convert $\frac{1}{5}$ to 15ths by multiplying both the numerator and denominator by 3:

$$\frac{1(\times 3)}{5(\times 3)} = \frac{3}{15}$$

- Add the numerators and maintain the common denominator, $\frac{3}{15} + \frac{4}{15} = \frac{7}{15}$, a fraction that is already in lowest terms.

Adding mixed numbers. Adding mixed numbers can be accomplished by converting the mixed numbers to improper fractions or by keeping the mixed numbers intact.

Adding Mixed Numbers Converted to Improper Fractions	Adding Intact Mixed Numbers
1. Reduce fractions, if desired. 2. Convert mixed number addends to improper fractions. 3. Convert fractions to equivalent fractions with common denominators. 4. Add the numerators, but maintain the common denominator. 5. **Reduce, if necessary.** Example: $2\frac{2}{8} + 3\frac{2}{3} =$ _____ $2\frac{1}{4} + 3\frac{2}{3} =$ $\frac{9(\times 3)}{4(\times 3)} + \frac{11(\times 4)}{3(\times 4)} =$ $\frac{27}{12} + \frac{44}{12} =$ $\frac{71}{12} = \mathbf{5\frac{11}{12}}$	1. Reduce fractions, if desired. 2. Convert addends to mixed numbers with common denominators. 3. Add the whole numbers; add the numerators; maintain the common denominator. 4. **Reduce, if necessary.** Example: $2\frac{2}{8} + 3\frac{2}{3} =$ _____ $2\frac{1}{4} + 3\frac{2}{3} =$ $2\frac{1(\times 3)}{4(\times 3)} + 3\frac{2(\times 4)}{3(\times 4)} =$ $2\frac{3}{12} + 3\frac{8}{12} =$ $5\frac{11}{12} = \mathbf{5\frac{11}{12}}$

LEARNING ACTIVITY 1-3 Add the fractions.

1. $\frac{2}{7} + \frac{1}{3} =$ _____
2. $\frac{5}{16} + \frac{1}{4} + \frac{1}{2} =$ _____
3. $2\frac{1}{3} + 3\frac{1}{2} =$ _____

Subtraction of Fractions

Subtracting proper fractions. To subtract fractions, follow these steps:

1. Convert **subtrahends** (numbers involved in subtraction) to fractions with common denominators.
2. Subtract the numerators, but maintain the common denominator.
3. **Reduce, if necessary.**

Example: $\frac{1}{2} - \frac{1}{3} =$

$$\frac{1}{2} - \frac{1}{3} = \frac{1(\times 3)}{2(\times 3)} - \frac{1(\times 2)}{3(\times 2)} = \frac{3}{6} - \frac{2}{6} = \mathbf{\frac{1}{6}}$$

Subtracting mixed numbers. As with addition, subtracting mixed numbers can be accomplished by converting the mixed numbers to improper fractions or by keeping the mixed number intact.

Keeping the mixed number intact may require borrowing from the whole number in order to enlarge the first fraction. To borrow from the whole number, reduce the whole number by 1, convert 1 to a fraction with the needed denominator, and then add this fraction to the existing fraction. For example, to solve $4\frac{1}{8} - 2\frac{3}{8}$, borrow 1 from 4 (making it 3), convert 1 to $\frac{8}{8}$, and then add $\frac{8}{8}$ to $\frac{1}{8}$ (making $\frac{9}{8}$), for a total of $3\frac{9}{8}$. Now the problem can be solved: $3\frac{9}{8} - 2\frac{3}{8} = 1\frac{6}{8}$, which reduces to $1\frac{3}{4}$.

Subtracting Mixed Numbers Converted to Improper Fractions

1. Convert mixed numbers to improper fractions.
2. Convert subtrahends to fractions with common denominators.
3. Subtract the numerators, but maintain the common denominator.
4. **Reduce, if necessary.**

Example: $3\frac{1}{4} - 1\frac{3}{8} =$

$$\frac{13}{4} - \frac{11}{8} =$$
$$\frac{26}{8} - \frac{11}{8} =$$
$$\frac{15}{8} =$$
$$\mathbf{1\frac{7}{8}}$$

Subtracting Intact Mixed Numbers

1. Convert subtrahends to fractions with common denominators.
2. Borrow from the whole number to make an improper fraction, if needed.
3. Subtract the whole number, subtract the numerators, but maintain the common denominator.
4. **Reduce, if necessary.**

Example: $3\frac{1}{4} - 1\frac{3}{8}$

$$\begin{array}{r} 3\frac{1\times 2}{4\times 2} = 3\frac{2}{8} \\ -\,1\frac{3}{8} \\ \hline \end{array}$$

Because $\frac{3}{8}$ cannot be subtracted from $\frac{2}{8}$, convert $3\frac{2}{8}$ to $2\frac{10}{8}$: Borrow $\frac{8}{8}$(1) from 3 and reduce to 2; add $\frac{8}{8}$ to $\frac{2}{8}$, which results in $2\frac{10}{8}$.

$$\begin{array}{r} 2\frac{10}{8} \\ -\,1\frac{3}{8} \\ \hline \mathbf{1\frac{7}{8}} \end{array}$$

LEARNING ACTIVITY 1-4 Subtract the fractions.

1. $\frac{5}{6} - \frac{1}{4} =$ _____
2. $2\frac{3}{5} - 1\frac{1}{4} =$ _____
3. $6\frac{1}{3} - 2\frac{3}{5} =$ _____

Multiplication of Fractions

Converting mixed numbers is required for multiplication and division of fractions, whereas it is optional for addition and subtraction. Steps for multiplying fractions include:

1. Convert the whole or mixed number(s) to improper fractions, if necessary.
2. Reduce to lowest terms (cancel terms). NOTE: This step is optional, but recommended.
3. Multiply the numerators.
4. Multiply the denominators.
5. **Reduce, if necessary.**

Example 1: $2\frac{3}{5} \times 1\frac{1}{4}$

$$2\frac{3}{5} \times 1\frac{1}{4} = \frac{13}{5} \times \frac{5}{4} = \frac{13}{\cancel{5}_1} \times \frac{\cancel{5}^1}{4} = \frac{13 \times 1}{1 \times 4} = \frac{13}{4} = \mathbf{3\frac{1}{4}}$$

Example 2: $\frac{100}{400} \times \frac{1}{5}$

$$\frac{100}{400} \times \frac{1}{5} = \frac{\cancel{100}^1}{\cancel{400}_4} \times \frac{1}{5} = \frac{1 \times 1}{4 \times 5} = \mathbf{\frac{1}{20}}$$

Example 3: $5 \times \frac{2}{3}$

$$5 \times \frac{2}{3} = \frac{5}{1} \times \frac{2}{3} = \frac{5 \times 2}{1 \times 3} = \frac{10}{3} = \mathbf{3\frac{1}{3}}$$

LEARNING ACTIVITY 1-5 Multiply the fractions.

1. $\frac{1}{3} \times \frac{1}{4} =$ _____
2. $3 \times \frac{9}{10} =$ _____
3. $2\frac{3}{5} \times 1\frac{1}{4} =$ _____

Division of Fractions

The first fraction or number in the equation is referred to as the **dividend** (i.e., the fraction or number being divided). The second number or fraction in the equation—the number the dividend is being divided by—is called the **divisor**. The result of the division is the **quotient**. The steps in the division of fractions include:

1. Convert dividend and/or divisor to improper fractions, if necessary.
2. Invert the divisor by placing the denominator over the numerator.

3. Cancel terms (optional, if needed).
4. Multiply the inverted divisor by the dividend.
5. **Reduce, if necessary.**

Example 1: $\frac{3}{4} \div \frac{1}{2}$

$$\frac{3}{4} \div \frac{1}{2} = \frac{3}{\cancel{4}_2} \times \frac{\cancel{2}^1}{1} = \frac{3}{2} \times \frac{1}{1} = \frac{3}{2} = \mathbf{1\frac{1}{2}}$$

Example 2: $3\frac{1}{2} \div 1\frac{4}{5}$

$$3\frac{1}{2} \div 1\frac{4}{5} = \frac{7}{2} \div \frac{9}{5} = \frac{7}{2} \times \frac{5}{9} = \frac{35}{18} = \mathbf{1\frac{17}{18}}$$

LEARNING ACTIVITY 1-6 Determine the quotient.

1. $\frac{5}{9} \div \frac{3}{4} =$ _____
2. $\frac{8}{16} \div \frac{1}{3} =$ _____
3. $1\frac{1}{2} \div 2\frac{1}{4} =$ _____

Clinical CLUE

Most dosage calculations are performed using *fractions,* but most amounts to administer are *decimal* quantities.

1-2 Calculating with Decimals

Dosage quantities less than one (1) are written using decimals. The metric system, the system of measurement used in dosage calculations, is a decimal system. Patient deaths have occurred due to misplaced or poorly written decimal points:

> In 2002, a cancer patient received a 10-fold overdose of the blood thinner, warfarin, which resulted in an eventually fatal cerebral hemorrhage. A common term for this is "death by decimal," which involves a patient getting 10 times or one-tenth what the doctor prescribed. (*Quality Digest*, 2008)

Therefore, nurses must understand the value of each decimal place, and how to calculate accurately with decimals. **Decimals** are fractions with a denominator that is a multiple of 10. The most common decimal places used in health care are:

- $0.1 = \frac{1}{10}$ (one-ten*th*)
- $0.01 = \frac{1}{100}$ (one-hundred*th*)
- $0.001 = \frac{1}{1{,}000}$ (one-thousand*th*)

The decimal point separates a whole number from the fraction. The whole number is placed to the left of the decimal point, and the fraction (quantity ending in *th*) is placed to the right of the decimal point (**Figure 1-5**).

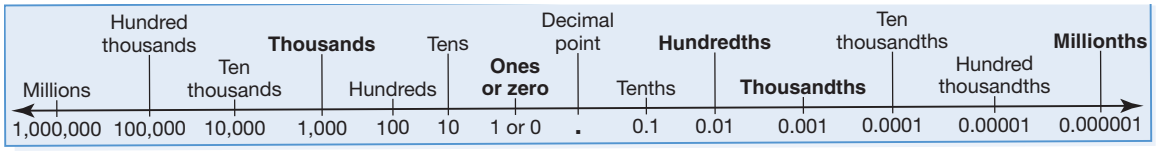

FIGURE 1-5 Number line with with whole numbers to the left of the decimal point and decimal fractions to the right of the decimal point.

WARNING!

Avoid "Death by Decimal" Medication Errors!

To prevent medication errors, The Institute for Safe Medication Practices (ISMP, 2012) recommends:

- Placing a leading zero (0) in front of a "naked" decimal point, one that has no whole number preceding it, for example:
  - Write 0.2 not .2
- Omitting a trailing zero after a decimal point, for example:
  - Write 3.5 not 3.50
  - Write 1 not 1.0

Including a leading zero emphasizes the decimal point and minimizes the potential for overdose due to an overlooked or missed decimal point. Omitting a trailing zero also decreases the potential for giving the patient 10 times the ordered dose or more.

Adding Decimals

1. Align the decimals.
2. Annex zeros to make the numbers the same length after the decimal.
3. **Add the numbers.**

Example: 0.24 + 3.46 + 12.345 =

$$\begin{array}{r} 0.240 \\ 3.460 \\ +\ 12.345 \\ \hline \mathbf{16.045} \end{array}$$

LEARNING ACTIVITY 1-7 Add the numbers.

1. 5 + 2.1 + 0.225 = _____
2. 2.5 + 3.49 + 4.01 = _____
3. 0.001 + 7.25 + 500 = _____

Subtracting Decimals

1. Align the decimals.
2. Annex zeros to make the number the same length after the decimal.
3. **Subtract numbers.**

Example: 5.67 – 1.422 =

$$\begin{array}{r} 5.670 \\ -\ 1.422 \\ \hline 4.248 \end{array}$$

LEARNING ACTIVITY 1-8 Subtract the numbers.

1. 2.67 – 0.125 = _____
2. 3.012 – 1.954 = _____
3. 14 – 1.025 = _____

Multiplying Decimals

1. Multiply the numbers together.
2. Count the number of decimal places.
3. Move the decimal point by that many spaces to the left.

Example: 12.5 × 0.45 =

$$\begin{array}{r} 12.5 \\ \times\ 0.45 \\ \hline 625 \\ 500 \\ 0 \\ \hline 5.625 \end{array}$$

1 decimal place
2 decimal places

Because 1 decimal place + 2 decimal places = 3 decimal places, move the decimal point 3 places to the left.

LEARNING ACTIVITY 1-9 Multiply the decimals.

1. 25 × 0.33 = _____
2. 6.2 × 1.04 = _____
3. 0.85 × 1.009 = _____

Multiplying Decimals by the Power of 10

When multiplying decimals by numbers that are powers (multiples) of 10, move the decimal as many places to the right as there are zeros in the multiplier.

Examples:

$$0.5 \times 10 = 5 \qquad 0.5 \times 100 = 50 \qquad 0.5 \times 1{,}000 = 500$$

LEARNING ACTIVITY 1-10 Determine the product by moving the decimal as many places to the right as there are zeros in the multiplier.

1. $0.003 \times 10 =$ _____
2. $2.5 \times 10 =$ _____
3. $0.75 \times 1{,}000 =$ _____

Dividing Decimals

1. Move the decimal point of the divisor as many places as necessary to make a whole number.
2. Move the decimal point of the dividend to the right by the same number of places.
3. Place the new decimal point above the dividend in the quotient.

Example: $54 \div 0.2 =$

```
0.2)54
02.)540.
 →   →
    270.
  2)540.
    4
    14
    14
     00
```

LEARNING ACTIVITY 1-11 Determine the quotient using long division.

1. $100 \div 2.5 =$ _____
2. $75 \div 0.05 =$ _____
3. $9.5 \div 5 =$ _____

Dividing Decimals by the Power of 10

When dividing decimals by numbers that are powers (multiples) of 10, move the decimal as many places to the left as there are zeros in the divisor.

Examples:

$$0.5 \div 10 = 0.05 \qquad 0.5 \div 100 = 0.005 \qquad 0.5 \div 1{,}000 = 0.0005 \qquad 1{,}500 \div 1{,}000 = 1.5$$

LEARNING ACTIVITY 1-12 Determine the quotient by moving the decimal as many places to the left as there are zeros in the divisor.

1. 0.003 ÷ 10 = _____
2. 2.5 ÷10 = _____
3. 0.75 ÷ 1,000 = _____

Rounding Decimals

Typically, for dosage calculation, the nurse will round decimals to the nearest tenth or hundredth. If rounding to tenths, the end value will be tenths; if rounding to hundredths, the end value will be hundredths. To round:

- Evaluate the digit one decimal place to the right of the desired end value (one decimal place to the right of tenths or one decimal place to the right of hundredths).
- Increase the digit in the end value by 1 if the digit to the right of the end value is 5 or higher, and delete all digits to the right of the end value. For example, 1.25 rounded to the nearest tenth becomes 1.3.
- Leave the digit in your end value unchanged if the digit to the right of the end value is 4 (four) or less, and delete all digits to the right of the end value. For example 1.24 rounded to the nearest tenth becomes 1.2.

Rounding RULE

To round, evaluate *only one* digit to the right of the level to be rounded to. For example, if rounding to the whole number, 6.45 is rounded to 6, not 7, because only the numeral 4 is evaluated. *Do not* perform successive rounding, i.e., round 6.45 to 7 by rounding 4 up to 5 and then 6 up to 7.

LEARNING ACTIVITY 1-13 Round the decimal number as indicated.

1. 2.68 to the nearest tenth _____
2. 0.322 to the nearest hundredth _____
3. 0.446 to the nearest hundredth _____

1-3 Converting Quantities

Fractions and decimals are expressions of relationships of quantities. For example, the fraction $\frac{1}{2}$ expresses 1 of 2 equal parts. Because a decimal is a fraction with a denominator that is a multiple of 10, a decimal also expresses a relationship between quantities. Other expressions of quantity relationships include percent and ratio. Ratios are fractions with the numerator written to the left of the denominator and separated by a colon (:). Percent means "per hundred," referring to a quantity expressed in hundredths. Healthcare professionals must be able to interpret and convert quantities expressed as fractions, decimals, percentages, and ratios.

Converting Fractions

- Fraction to decimal: Divide the numerator by the denominator:

$$\frac{1}{2} = 1 \div 2 = \mathbf{0.5}$$

- Fraction to ratio: Write the fraction side by side using a colon as the division sign:

$$\frac{1}{2} = 1:2$$

- Fraction to percentage:
  - Convert the fraction to a decimal (by dividing the numerator by the denominator).
  - Convert the decimal to a percentage by moving the decimal point to the right two places, and then add a percent sign:

$$\frac{1}{2} = 1 \div 2 = 0.5 = 50\%$$

Converting Decimals

- Decimal to fraction:
  1. The denominator is written as the decimal place value.
  2. The numerator is the decimal number without the decimal point.
  3. **Reduce, if necessary.**

$$0.02 = \frac{2}{100} = \frac{\mathbf{1}}{\mathbf{50}}$$

- Decimal to ratio: Convert the decimal to a fraction, then convert to a ratio:

$$0.02 = \frac{2}{100} = \frac{\mathbf{1}}{\mathbf{50}} = 1:50$$

- Decimal to percentage: Move the decimal point to the right two places; add a percent sign:

$$0.02 = 2\%$$

Converting Ratios

- Ratio to fraction: Write first quantity, numerator, over the second quantity, denominator:

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

- Ratio to decimal: First quantity, numerator, divided by second quantity, denominator:

$$3:4 = 3 \div 4 = 0.75$$

- Ratio to percentage:
  - Convert the ratio to a decimal (by dividing the numerator by the denominator).
  - Convert the decimal to a percentage by moving the decimal point to the right by two places, and then add a percent sign:

$$3:4 = 3 \div 4 = \mathbf{0.75} = 75\%$$

Converting Percentages

- Percentage to fraction: Eliminate the percent sign; convert the quantity to a numerator and place it over a denominator of 100; reduce the fraction:

$$95\% = \frac{95}{100} = \frac{\mathbf{19}}{\mathbf{20}}$$

- Percentage to decimal: Eliminate the percent sign; move the decimal point to the *left* two places:

$$95\% = 0.95$$

- Percentage to ratio: Convert the percent to a fraction; **reduce**; write the fraction as a ratio:

$$95\% = \frac{95}{100} = \frac{\mathbf{19}}{\mathbf{20}} = 19:20$$

LEARNING ACTIVITY 1-14 Convert the quantity to its equivalent as indicated.

1. 1.5 = _____ (percentage) _____ (ratio)
2. ½ = _____ (decimal) _____ (percentage)
3. 1:5 = _____ (percentage) _____ (fraction)

1-4 Calculating Percentages

Calculating the Percentage of a Whole Quantity

Nurses may need to calculate percentages of quantities. To answer the question, "What is 6% of 120?":

- First translate the words to math:
  - *What* means x (the unknown)
  - *Is* means = (equals)
  - *Of* means × (multiplied by)
  - $x = 6\% \times 120$
- Next, convert the percentage to decimal, write the equation, and solve:
  - $6\% = \frac{6}{100} = 0.06$
  - $x = 0.06 \times 120$
  - $x = 7.2$

Calculating the Percentage of a Partial Quantity

Nurses will also be required to calculate percentages of partial quantities. For example, the nurse may answer the question, "If the patient ate 300 calories at breakfast, what percentage of a 2,000-calorie diet was consumed?" For the nurse to determine that 300 *is what* percentage *of* 2,000:

- First, translate the words to math:
  - *What* means x (the unknown)
  - *Is* means = (equals)
  - *Of* means × (multiplied by)
- Next, write the equation and solve:
  - $300 = x \times 2{,}000$
  - $300 = 2{,}000\,x$

    To solve for x, divide both sides of the equation by the quantity in front of x.
  - $\frac{300}{2{,}000} = \frac{\cancel{2{,}000}\,x}{\cancel{2{,}000}}$
  - $0.15 = x$
  - $x = 15\%$ (by converting the decimal to percent)
- Simple method:
  - Create a fraction.
  - Convert to a decimal.
  - **Convert to a percent.**

Example: 300 *is what* percentage [or portion] *of* 2,000?

$$\frac{300}{2{,}000}$$

$$300 \div 2{,}000 = 0.15$$

$$\mathbf{0.15 = 15\%}$$

1-5 Calculating Unknown Quantities Using Ratio-Proportion

Unknown quantities can be determined by equating equivalent fractions or ratios. This process is used to calculate the amount of medication to administer. Nurses should become proficient in using ratio-proportion to determine an unknown quantity.

Cross-Multiplication to Determine if Fractions Are Equivalent

Equivalent fractions will have equivalent products when cross-multiplied. **Cross-multiplication** is the product of the numerator of the first fraction and the denominator of the second fraction equal to the product of the numerator of the second fraction and the denominator of the first fraction. Equivalent cross products mean that the fractions are equivalent.

Example:

Cross-multiply $\frac{3}{5} = \frac{6}{10}$

Cross-multiply $3 \times 10 = 5 \times 6$

producing $30 = 30$

Multiplying Extremes and Means to Determine if Ratios Are Equivalent

Fractions can be written as linear ratios, in which case the numerator of the first fraction and the denominator of the second fraction are called the *extremes* (outer quantities), while the denominator of the first fraction and the numerator of the second fraction are called the *means* (inner quantities). The ratios are equivalent if the product of extremes equals the product of the means. Multiplication of extremes and means to determine if ratios are equivalent is similar to cross-multiplication of fractions.

Clinical CLUE

The colon (:) in a linear ratio is read as "to," and the double colon (::)—used to compare two ratios to determine if they are proportionate (equivalent)—is read as "as." The ratio-proportion, 1:2 :: 4:8, is interpreted, "1 is to 2 as 4 is to 8." An equal sign (=) can take the place of a double colon (::).

Example: Determine if the following ratios are equivalent:

$$3:5 = 6:10$$

The product of the extremes (the outer numbers) equals the product of the means (the inner numbers).

$$3 \times 10 = 5 \times 6$$
$$30 = 30$$

Finding the Value of *x* in a Proportion

To find the value of x in a proportion, set up the equation and perform the calculation until x stands alone.

Example: Solve for x to create two proportionately equivalent fractions: $\frac{3}{5} = \frac{x}{10}$

$$\frac{3}{5} = \frac{x}{10}$$

- Cross-multiply:

$$5 \times x = 3 \times 10$$
$$5x = 30$$

- Divide each side of the equation by 5:

$$\frac{\cancel{5}\,x}{\cancel{5}} = \frac{30}{5}$$

- Solve for x:

$$\boldsymbol{x = 6}$$

Finding *x* When a Fraction Is Multiplied By a Whole Number

- Convert the whole number to an improper fraction using 1 as the denominator.
- **Perform the calculation.**

Example: $\frac{4}{9} \times 2 = x$

$$\frac{4}{9} \times 2 = x$$

$$\frac{4}{9} \times \frac{2}{1} = x$$

$$\mathbf{\frac{8}{9} = x}$$

LEARNING ACTIVITY 1-15 Determine the value of *x*.

1. $\frac{250}{500} = \frac{x}{2}$ _____
2. $250:750 = x:3$ _____
3. $\frac{5}{20} = \frac{1}{x}$ _____

Death by Decimal … Case Closure

If the decimal point is in the wrong place, the dose is incorrect by a power of 10. How well the mathematical steps are followed does not matter to the patient if the dose administered is wrong. If the nurse correctly calculates a dose of 62.5 mg, but administers 6.25 mg, a serious under-dosing of medication will occur. In the event that the medication is ordered to treat a life-threatening situation, under-dosing will lead to ineffective (or no) treatment. This type of error has resulted in the death of patients. A nurse can prevent decimal point errors by:

- Memorizing the steps for performing decimal calculations outlined in this chapter.
- Following the ISMP guidelines to use leading zeros before naked decimal points and avoid trailing zeros when recording quantities.
- Practicing calculations (practice promotes fluency and every nurse should strive to become fluent in math).
- When in doubt, double-checking calculations with another nurse.

Chapter Summary

Learning Outcomes	Points to Remember
1-1 Perform calculations with fractions: a. Types of Fractions b. Creating Equivalent Fractions c. Comparing Fractions	*Proper fraction*: Numerator is less than denominator $\frac{3}{5}$ *Mixed*: Whole number and fraction $1\frac{3}{5}$ *Improper*: Numerator is greater than denominator $\frac{5}{3}$ or numerator is the same as the denominator $\frac{5}{5}$ *Enlarging fractions:* Multiply the numerator and denominator by the same number: $\frac{2(\times 4)}{3(\times 4)} = \frac{8}{12}$ *Comparing fractions*: If denominators are the same, the smaller the numerator, the lesser the value: $\frac{2}{4}$ is less than $\frac{3}{4}$ If the numerators are the same, the smaller the denominator, the greater the value: $\frac{4}{5}$ is greater than $\frac{4}{10}$
d. Calculating with Fractions 1. Addition	*Adding proper fractions:* $\frac{1}{3} + \frac{2}{6} = \frac{2}{6} + \frac{2}{6} = \frac{4}{6} = \mathbf{\frac{2}{3}}$ *Adding mixed numbers by:* • Converting addends to improper fractions: $2\frac{2}{8} + 3\frac{2}{3} = 2\frac{1}{4} + 3\frac{2}{3} = \frac{9}{4} + \frac{11}{3} = \frac{27}{12} + \frac{44}{12} = \frac{71}{12} = \mathbf{5\frac{11}{12}}$ • Keeping the mixed number(s) intact: $2\frac{2}{8} + 3\frac{2}{3} = 2\frac{1}{4} + 3\frac{2}{3} = 2\frac{3}{12} + 3\frac{8}{12} = \mathbf{5\frac{11}{12}}$
2. Subtraction	*Subtracting proper fractions*: $\frac{5}{8} - \frac{1}{4} = \frac{5}{8} - \frac{2}{8} = \mathbf{\frac{3}{8}}$ *Subtracting mixed numbers by*: • Converting subtrahends to improper fractions: $3\frac{1}{4} - 1\frac{3}{8} = \frac{13}{4} - \frac{11}{8} = \frac{26}{8} - \frac{11}{8} = \frac{15}{8} = \mathbf{1\frac{7}{8}}$ • Keeping the mixed number intact and borrowing from the whole number: $3\frac{1}{4} - 1\frac{3}{8} = 3\frac{2}{8} - 1\frac{3}{8} = 2\frac{10}{8} - 1\frac{3}{8} = \mathbf{1\frac{7}{8}}$

3. Multiplication	$\frac{100}{400} \times \frac{1}{5} = \frac{\cancel{100}^{1}}{\cancel{400}_{4}} \times \frac{1}{5} = \frac{1 \times 1}{4 \times 5} = \mathbf{\frac{1}{20}}$ *Multiplying a whole number by a fraction:* $5 \times \frac{2}{3} = \frac{5}{1} \times \frac{2}{3} = \frac{10}{3} = \mathbf{3\frac{1}{3}}$ *Multiplying mixed numbers:* $2\frac{3}{5} \times 1\frac{1}{4} = \frac{13}{5} \times \frac{5}{4} = \frac{13}{\cancel{5}_{1}} \times \frac{\cancel{5}^{1}}{4} = \frac{13}{4} = \mathbf{3\frac{1}{4}}$
4. Division	*Dividend*—the fraction being divided *Divisor*—the fraction the dividend is being *divided by* *Quotient*—the result of the division *Dividing proper fractions*: $\frac{3}{4} \div \frac{1}{2} = \frac{3}{\cancel{4}_{2}} \times \frac{\cancel{2}^{1}}{1} = \frac{3}{2} \times \frac{1}{1} = \frac{3}{2} = \mathbf{1\frac{1}{2}}$ *Dividing mixed numbers*: $3\frac{1}{2} \div \frac{4}{5} = \frac{7}{2} \div \frac{4}{5} = \frac{7}{2} \times \frac{5}{4} = \frac{35}{8} = \mathbf{4\frac{3}{8}}$
1-2 Perform calculations with decimals: a. Addition	0.24 + 3.46 + 12.345 = 0.240 3.460 +12.345 16.045
b. Subtraction	5.67 – 1.422 = 5.670 – 1.422 4.248

c. Multiplication	$12.5 \times 0.45 =$ 12.5 1 decimal place × 0.45 2 decimal places 6 2 5 5 0 0 0 5.625. ← Because 1 decimal place + 2 decimal places = 3 decimal places, move the decimal point 3 places to the left. *Multiplying decimals by the power of 10*: Move the decimal as many places to the right as there are zeros in the multiplier. $0.5 \times 10 = 5, \quad 0.5 \times 100 = 50, \quad 0.5 \times 1,000 = 5,000$
d. Division	0.2)54 02.)540. **270.** 2)540. 4 14 14 000
e. Rounding	Round 0.569411 • Tenths: 0.6 • Hundredths: 0.57
1-3 Convert quantities: a. Fractions	• Fraction to ratio: $\frac{1}{2} = 1:2$ • Fraction to decimal: $\frac{1}{2} = 1 \div 2 = 0.5$ • Fraction to percent: $\frac{1}{2} = 1 \div 2 = 0.5 = 50\%$
b. Decimals	• Decimal to fraction: $0.02 = \frac{2}{100} = \frac{1}{50}$ • Decimal to ratio: $0.02 = \frac{2}{100} = \frac{1}{50} = 1:50$ • Decimal to percent: $0.02 = 2\%$

c. Ratios	• Ratio to fraction: $75:100 = \frac{75}{100} = \frac{3}{4}$ • Ratio to decimal: $75:100 = 75 \div 100 = 0.75$ • Ratio to percent: $75:100 = 75 \div 100 = 0.75 = 75\%$
d. Percentages	• Percent to fraction: $25\% = \frac{25}{100} = \frac{1}{4}$ • Percent to ratio: $25\% = \frac{25}{100} = \frac{1}{4} = 1:4$ • Percent to decimal: $25\% = 0.25$
1-4 Calculate percentages	What is 6% of 120? • $6\% = \frac{6}{100} = 0.06$ • $x = 0.06 \times 120$ • $x = 7.2$ 300 is what percentage of 2,000? • $300 = x \times 2,000$ • $\frac{300}{2,000} = \frac{x \times \cancel{2,000}}{\cancel{2,000}}$ • $0.15 = x$ • $x = 15\%$ (by converting the decimal to percent)
1-5 Calculate quantities using ratio-proportion	$\frac{3}{5} = \frac{6}{10}$ cross-multiply $3 \times 10 = 5 \times 6$ producing $30 = 30$ As a ratio equation: $3:5 = 6:10$ Multiply the extremes: $3 \times 10 = 30$ Multiply the means: $5 \times 6 = 30$ producing $30 = 30$ Finding the value of x in a proportion: $\frac{3}{5} = \frac{x}{10}$ Cross-multiply $3 \times 10 = 5 \times x$ $30 = 5x$ $\frac{30}{5} = \frac{5x}{5}$ $\mathbf{6} = \boldsymbol{x}$

Homework

For exercises 1–3, circle the correct answer. (LO 1-1)

1. Identify the fraction(s) greater than 1 $\frac{3}{16}, \frac{5}{4}, \frac{3}{3}$
2. Identify the fraction(s) equal to 1 $\frac{27}{25}, \frac{3}{4}, \frac{9}{9}$
3. Identify the fraction(s) less than 1 $\frac{24}{25}, \frac{4}{4}, \frac{12}{9}$

For exercises 4–7, match the fractions with the corresponding type. (LO 1-1)

4. $\frac{7}{5}$ _____
5. $2\frac{9}{16}$ _____
6. $\frac{4}{4}$ _____
7. $\frac{6}{7}$ _____

A. Improper fraction
B. Proper fraction
C. Mixed number

For exercises 8–25, perform the calculations with fractions and reduce to lowest terms. (LO 1-1)

8. $\frac{3}{4} + \frac{5}{16} =$ _____
9. $\frac{3}{7} + \frac{2}{3} =$ _____
10. $2\frac{5}{6} + \frac{1}{8} =$ _____
11. $7\frac{2}{3} + 2\frac{11}{12} + \frac{3}{4} =$ _____
12. $\frac{5}{9} - \frac{3}{6} =$ _____
13. $\frac{2}{3} - \frac{5}{24} =$ _____
14. $15\frac{12}{14} - 3\frac{1}{7} =$ _____
15. $32\frac{1}{3} - 4\frac{3}{4} =$ _____
16. $\frac{2}{5} \times \frac{7}{8} =$ _____
17. $6\frac{1}{2} \times 2\frac{1}{3} =$ _____
18. $25 \times \frac{2}{5} =$ _____
19. $\frac{4}{7} \div \frac{2}{9} =$ _____
20. $5 \div \frac{3}{8} =$ _____
21. $\frac{1}{4} \div 9 =$ _____
22. $5\frac{1}{2} \div 3\frac{1}{3} =$ _____
23. $2\frac{5}{9} \div \frac{1}{4} =$ _____
24. $\frac{3}{4} \div 1\frac{1}{2} =$ _____
25. $\frac{100}{1} \times \frac{25}{1} \times 1\frac{1}{2} =$ _____

For exercises 26–35, solve the decimal equations and round to the hundredth, when necessary. (LO 1-2)

26. $3.84 + 0.1 + 10.25 =$ _____
27. $7 + 9.1 + 0.003 =$ _____
28. $10 - 6.3 =$ _____
29. $7.5 - 0.205 =$ _____
30. $3.5 \times 2 =$ _____
31. $1.5 \times 8.95 =$ _____
32. $4.75 \times 100 =$ _____
33. $0.5 \times 1000 =$ _____
34. $125 \div 2.5 =$ _____
35. $5.75 \div 0.25 =$ _____

For exercises 36–41, convert the quantity as indicated. Convert fractions and ratios to lowest terms. Round decimals to the hundredths, if necessary. Round percentages to the whole number. (LO 1-3)

36. $\frac{3}{25} =$ _____ (decimal)
    $=$ _____ (ratio)
37. $0.45 =$ _____ (fraction)
    $=$ _____ (percent)
38. $\frac{8}{12} =$ _____ (ratio)
    $=$ _____ (decimal)
39. $4:5 =$ _____ (decimal)
    $=$ _____ (percent)
40. $1:5 =$ _____ (percent)
    $=$ _____ (fraction)
41. $\frac{21}{50} =$ _____ (percent)
    $=$ _____ (decimal)

For exercises 42–45, solve the word problems, rounding percentages to the whole number. (LO 1-4)

42. What is 8% of 50? _____
43. What is 10.5% of 1,200? _____
44. 40 is what percent of 90? _____
45. 500 is what percent of 1,700? _____

For exercises 46–50, solve for x using ratio-proportion. (LO 1-5)

46. $\frac{5}{15} = \frac{x}{21}$ _____
47. $2:3 = x:12$ _____
48. $\frac{1{,}000}{250} = \frac{25}{x}$ _____
49. $\frac{100}{5} = \frac{250}{x}$ _____
50. $\frac{80}{20} = \frac{65}{x}$ _____

NCLEX®-Style Review Questions

For questions 1–6, select the best response.

1. A newborn weighs 3,751 grams at birth and 3,352 grams just prior to discharge from the hospital 2 days later. Knowing that newborns may lose 5–10% of their body weight in the first few days of life, the nurse correctly calculates that this newborn's weight loss is:
   a. less than 5%.
   b. within the 5–10% range.
   c. more than 10%.
   d. not able to be determined from the information given.

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2. A patient is ordered to maintain a fluid restriction of 1,500 milliliters per day. If the patient has an intravenous solution running continuously at 30 milliliters per hour, how much fluid can the patient have by mouth per day?
   a. 120 milliliters
   b. 720 milliliters
   c. 780 milliliters
   d. 1,470 milliliters
3. A patient is ordered to take one tablet of "baby aspirin" per day. Each tablet contains 81 milligrams of aspirin. If a regular adult tablet contains 325 milligrams of aspirin, what portion of an adult aspirin tablet does this "baby aspirin" tablet represent?
   a. $\frac{1}{4}$
   b. $\frac{1}{3}$
   c. $\frac{3}{8}$
   d. $\frac{1}{2}$
4. A patient's total caloric intake should consist of 15% protein. If the patient consumes 1,800 calories a day, how many calories should be from protein?
   a. 120
   b. 240
   c. 270
   d. 360
5. A patient consumes 2,000 calories; 1,100 calories were from carbohydrates. What percent of calories were from carbohydrates?
   a. 45%
   b. 55%
   c. 60%
   d. 65%
6. The nurse receives an order to prepare a ¼-strength feeding solution. Which other quantities also represent ¼? Select all that apply.
   a. 25%
   b. 0.75
   c. 4:1
   d. 1:4
   e. $\frac{100}{25}$
   f. 75%
   g. 0.25

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Chapter 1 ANSWER KEY

Learning Activity 1-1

1. $\frac{9}{8}$
2. $\frac{9}{8}, 2\frac{1}{2}$
3. $\frac{3}{5}$

Learning Activity 1-2

1. Greater than
2. Less than
3. Less than

Learning Activity 1-3

1. $\frac{13}{21}$
2. $\frac{17}{16} = 1\frac{1}{16}$
3. $5\frac{5}{6}$

Learning Activity 1-4

1. $\frac{7}{12}$
2. $1\frac{7}{20}$
3. $3\frac{11}{15}$

Learning Activity 1-5

1. $\frac{1}{12}$
2. $2\frac{7}{10}$
3. $3\frac{1}{4}$

Learning Activity 1-6

1. $\frac{20}{27}$
2. $1\frac{1}{2}$
3. $\frac{2}{3}$

Learning Activity 1-7

1. 7.325
2. 10
3. 507.251

Learning Activity 1-8

1. 2.545
2. 1.058
3. 12.975

Learning Activity 1-9

1. 8.25
2. 6.448
3. 0.85765

Learning Activity 1-10

1. 0.03
2. 25
3. 750

Learning Activity 1-11

1. 40
2. 1,500
3. 1.9

Learning Activity 1-12

1. 0.0003
2. 0.25
3. 0.00075

Learning Activity 1-13

1. 2.7
2. 0.32
3. 0.45

Learning Activity 1-14

1. 150%, 3:2
2. 0.5, 50%
3. 20%, $\frac{1}{5}$

Learning Activity 1-15

1. 1
2. 1
3. 4

Homework

1. $\frac{5}{4}$
2. $\frac{9}{9}$
3. $\frac{24}{25}$
4. A
5. C
6. A
7. B
8. $1\frac{1}{16}$
9. $1\frac{2}{21}$
10. $2\frac{23}{24}$
11. $11\frac{1}{3}$
12. $\frac{1}{18}$
13. $\frac{11}{24}$
14. $12\frac{5}{7}$
15. $27\frac{7}{12}$
16. $\frac{7}{20}$
17. $15\frac{1}{6}$
18. 10
19. $2\frac{4}{7}$
20. $13\frac{1}{3}$
21. $\frac{1}{36}$
22. $1\frac{13}{20}$
23. $10\frac{2}{9}$
24. $\frac{1}{2}$
25. 3,750
26. 14.19
27. 16.103
28. 3.7
29. 7.295
30. 7
31. 13.425
32. 475
33. 500
34. 50
35. 23
36. 0.12, 3:25
37. $\frac{9}{20}$, 45%
38. 2:3, 67%
39. 0.8, 80%
40. 20%, $\frac{1}{5}$
41. 42%, 0.42
42. 4
43. 126
44. 44%
45. 29%
46. 7
47. 8
48. 6.25
49. 12.5
50. 16.25

NCLEX-Style Review Questions

1. c
   Rationale: The weight loss is 399 grams (3,751 grams – 3,352 grams). The percent weight loss is $\frac{399}{3{,}751} = 0.106 = 10.6\%$ weight loss
2. b
   Rationale: 30 milliliters per hour × 24 hours per day = 720 milliliters of IV fluid per day; 1,500 milliliters total intake – 720 milliliters IV fluid = 780 milliliters remaining for oral intake.
3. a
   Rationale: Each baby aspirin tablet is $\frac{81}{325}$ of an adult tablet. $\frac{81}{325} = 0.249 = 24.9\% = 25\% = \frac{1}{4}$
4. c
   Rationale: 15% of 1,800 calories = 0.15 × 1,800 = 270 calories
5. b
   Rationale: 1,100 carbohydrate calories out of 2,000 total calories $= \frac{1{,}100}{2{,}000} = 0.55 = 55\%$
6. a, d, g
   Rationale: $\frac{1}{4} = 1:4 = 1 \div 4 = 0.25 = 25\%$