Chapter 6

A Review of Arithmetic

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Lesson 6.1

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Objective

- Demonstrate proficiency performing mathematic problems that involve the addition, subtraction, multiplication, and division of fractions.

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Common Fractions

- Numerator is the number above the line
- Denominator is the number below the line
- The larger the denominator number, the smaller the portion is
- 1/8 of a pie is smaller than 1/2 of a pie

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Types of Common Fractions

- Proper: numerator smaller than denominator
  - 1/2, 2/3
- Improper: numerator larger than denominator
  - 2/1, 3/2
- Mixed: a whole number and a fraction
  - 2 1/2, 3 2/3
- Equivalent: fractions that have the same value
  - 1/3 and 2/6

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Audience Response Question 1

- Which is the largest fraction?
  - A. 1/150
  - B. 3/7
  - C. 12/25
  - D. 75/199

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Working with Fractions

- Reduce the fraction to the lowest terms
  - Use a common number found in both the numerator and denominator. Divide the numerator and the denominator by the number that will divide into both evenly

$$\frac{25}{125} \div \frac{25}{25} = \frac{1}{5}$$

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Finding the Lowest Common Denominator

- If both numerator and denominator are even numbers, 2 may be a common denominator
- If the numerator and denominator end with 0 or 5, 5 may be a common denominator
- If the numerator divides evenly into the denominator, this will be the smallest term

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Adding Common Fractions

- If the denominators are the same, add the numerators and reduce

$$1/4 + 2/4 + 3/4 = \frac{1 + 2 + 3}{4} \text{ or } 6 = 1\ 2/4 = 1\ 1/2$$

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Adding Common Fractions (cont.)

- When denominators are not alike, change the fractions to equivalent fractions by finding the lowest common denominator

$$\frac{2}{5} + \frac{3}{10} + \frac{1}{2} = \frac{4}{10} + \frac{3}{10} + \frac{5}{10} = \frac{12}{10} = 1\ 2/10 = 1\ 1/5$$

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Adding Mixed Numbers

- Add the fractions first; then add the whole numbers 2 3/4 + 2 1/2 + 3 3/8 __

$\frac{3}{4} = \frac{6}{8}$ $\frac{1}{2} = \frac{4}{8}$ $\frac{3}{8} = \frac{3}{8}$

$\frac{6 + 4 + 3}{8} = \frac{13}{8} = 1\ 5/8$

Now add whole numbers 2 + 1 + 3 = 7

Join 7 + 1 5/8 = 8 5/8

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Audience Response Question 2

- A nurse spends 1/2 hour midway through the shift documenting care provided, and another 3/4 of an hour documenting care later in the shift. How much total time does the nurse spend documenting?
  - 1/2 + 3/4 = ?

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Subtracting Fractions

- If the denominators are different, change the fractions into equivalent fractions

$$\frac{1}{4} - \frac{3}{16} = \frac{4}{16} - \frac{3}{16} = \frac{1}{16}$$

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Subtracting Fractions (cont.)

- If the denominators are different, change the fractions to equivalent fractions 2 5/8 – 1 1/4

$\frac{1}{4} = \frac{2}{8}$ subtract fractions first $\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$

2 – 1 = 1, join with $\frac{3}{8}$ = 1 3/8

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Multiplying Two Fractions

- Multiply the numerators, multiply the denominators $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

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Multiplying Mixed Numbers

- Change the mixed numbers to an improper fraction

$$3\ \frac{1}{2} \times 2\ \frac{1}{5} = \frac{7}{2} \times \frac{11}{5} = \frac{77}{10} = 7\ 7/10$$

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Dividing Fractions

- Change the division sign to a multiplication sign
- Invert (turn upside down) the number after the division sign
- Multiply the numerators and the denominators

$$4 \div \frac{1}{2} = 4 \times \frac{2}{1} = \frac{8}{1} = 8$$

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Dividing with a Mixed Number

- Change mixed number to an improper fraction
- Change division sign to a multiplication sign
- Invert the number after the division sign
- Multiply the numerator and the denominator

$$4\ \frac{1}{2} \div \frac{3}{4} = \frac{9}{2} \div \frac{3}{4} = \frac{9}{2} \times \frac{4}{3} = \frac{36}{6} = \frac{6}{1} = 6$$

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Objectives

- Demonstrate proficiency performing mathematic problems that involve the addition, subtraction, multiplication, and division of decimals.
- Convert decimals to fractions and fractions to decimals.

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Decimal Places

- Numbers to the left of the decimal point are whole numbers
- Numbers to the right of the decimal point are fractions (parts) of the whole number
- 0.1 = one tenth = 1/10
- 0.01 = one hundredth = 1/100
- (1/10 or 0.1 is larger)

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Decimal Safety

- A zero written after the decimal ends may not be recognized and very large doses could be administered
- 1.000 g could be confused with 1000 g
- Instead write 1 g
- “No trailing zeroes to the right of decimal points”
- Place a 0 in front of the decimal point if there is no other whole number involved

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Changing Decimals to Common Fractions

- Remove the decimal point
- Place the appropriate denominator under the number
- Reduce to lowest terms
- 0.2 = 2/10 = 1/5
- (ten is used as the denominator since the decimal is described using the term “tenth”)
- 0.25 = 25/100 = 1/4

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Changing Common Fractions to Decimals

- Divide the numerator of the fraction by the denominator
- 1/4 means 1 ÷ 4 = 0.25
- 2/3 means 2 ÷ 3 = 0.67

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Lesson 6.2

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Objective

- Convert percents to fractions, percents to decimals, decimal fractions to percents, and common fractions to percents.

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Percents

- *Percent* means per 100
- Changing percents to fractions
  - 25% = 25/100 = 1/4
- Changing percents to decimal fractions
  - 5% = 0.05 24% = 0.24

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Objective

- Demonstrate proficiency with converting ratios to percentages and percentages to ratios, with simplifying ratios, and with the use of the proportion method for solving problems.

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Ratios

- A ratio is the relationship one quantity bears to another
- Changing ratio to percent
  - 6:1 = 6/1 × 100 = 600%
- Changing percent to ratio
  - Simplifying ratios
  - 25:100 = 1:4 or 25/100 = 1/4

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Proportion

- Proportion shows how two equal ratios are related
- $1 : 2 = 2 : x$
- Multiply the two means (inner numbers) together. That equals the product of the extremes
- $x = 4$

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Objectives

- Memorize the basic equivalents of the household and metric systems.
- Demonstrate proficiency performing conversion-of-medication problems with the use of the household and metric systems.

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Household Measurements

- Least accurate system of measurement
- 1 cup = 8 ounces
- 1 tablespoon = 3 teaspoons
- 1 teaspoon = approximately 5 mL

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Metric System Length

- Meter is standard unit of measure for length
- 1 meter is about the same length as a yard
- 1 centimeter is 1/100 of a meter
  - The cervix dilates 10 centimeters for delivery
- 1 inch is approximately 2.54 centimeters
- 1 millimeter is 1/1000 of a meter
- 1000 mm = 1 meter

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Metric System Volume

- Liter is standard unit of measure for volume
- A liter is approximately a quart
- 1 milliliter is 1/1000 of a liter
- 1000 mL = 1 liter
  - Most IV fluids are available in 1 liter bags
  - A common volume for an injection is 1 mL

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Metric System Weight

- Gram is standard unit of measure for weight
- A gram weighs approximately the same as a paper clip or a pea
- Many medications measured in milligrams
- 1 microgram = 1/1,000,000 gram
- 1 milligram is 1/1000 gram
- 1000 mg = 1 gram
- 1 kg = 2.2 pounds (You'll like your weight better in kg!)

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Example

- A patient is to receive 1 g of ampicillin. The bottle states that each tablet contains 0.5 g.

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Converting Pounds and Kilograms

- To convert weight in kilograms to pounds, multiply pound weight by 2.2
  - 25 kg × 2.2 = 55 lbs
- To convert weight in pounds to kilograms, divide pound weight by 2.2
  - 140 lbs ÷ 2.2 = 63.6 kg

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Calculating Dose Ranges for mg/kg/day

- Confirms that prescribed medication dose is within acceptable dosage range.

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Other Units of Measure

- Units: standardized quantity of measurements, frequently used for insulin, heparin, and penicillin
- Milliequivalents usually measure potassium
- Best to have a second health care provider independently confirm correct dose measurements with heparin, insulin, and potassium

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Audience Response Question 3

- A patient with diabetes is scheduled to receive 15 units of Regular insulin in the morning before breakfast. The patient is also covered by a sliding scale (below) for insulin she will receive in addition to the scheduled dose if blood glucose levels are elevated. The patient has a blood glucose level of 224 this morning. How many units of insulin should be administered this morning?
  - Glucose 151 to 200 Give 3 units Regular
  - Glucose 201 to 250 Give 6 units Regular
  - Glucose 251 to 300 Give 9 units Regular
  - Glucose 301 to 350 Give 12 units Regular

A. 15 units
B. 18 units
C. 21 units
D. 27 units

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Objective

- Use formulas to calculate intravenous fluid and medicine administration rates.

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IV Fluids

- Health care provider prescribes a specific type and volume of solution to be infused over a specific time span
- Administration sets can be calibrated to deliver a specific amount of solution
- Macrodrip sets: 10, 15 and 20 drops per mL
- Microdrip sets: 60 (small) drops per mL
  - Drops per mL is the drop factor

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Calculating Flow Rate mL/hour

- Divide the total volume of fluid by the total number of hours the infusion is to run

$$\frac{\text{Number of mL}}{\text{Number of hours}} = \text{mL/hr}$$

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Calculating Rates of Infusion for Other than 1 Hour

- Use dimensional analysis to allow conversion from one unit to another. Start with what's available, then proceed to what is ordered and determine what will be calculated
  - 50 mL to infuse at 20 min = ___ mL/hr

50 mL/20 min = 2.5 mL

Multiply by 60 min/hour = 150 mL/hr

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Audience Response Question 4

- An IV of 100 mL D_5W is to run over 30 minutes. At what rate does the nurse set the infusion pump?
  - A. 100 mL/hr
  - B. 50 mL/hr
  - C. 200 mL/hr
  - D. 50 gtt/min

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Drops per Minute (gtt/min)

- Formula to determine the drops per minute

$$\frac{\text{Total volume to infuse} \times \text{drop factor}}{\text{Time in minutes}} = \text{gtt/min}$$

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Objective

- Demonstrate proficiency performing conversions between the centigrade and Fahrenheit systems of temperature measurement.

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Fahrenheit and Centigrade (Celsius) Temperatures

- Formula for converting Fahrenheit to centigrade temperature
  - (Fahrenheit – 32) × 5/9 = centigrade
- Formula for converting centigrade temperature to Fahrenheit temperature
  - (centigrade × 9/5) + 32 = Fahrenheit

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Audience Response Question 5

- The nurse measures a patient's tympanic temperature to be 38.7º C. The patient then asks what the temperature is in Fahrenheit. How does the nurse respond?
  - A. 99.6º F
  - B. 102.3º F
  - C. 101.7º F
  - D. 100.7º F

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