

Medical Math



CHAPTER OBJECTIVES

After careful study of this chapter, you should be able to:

- 1. Give examples of how health care professionals use basic math skills, p. 70.
- 2. Correctly perform operations with whole numbers, fractions, decimals, percentages, ratios, angles, and degrees, p. 71.
- 3. Compare the three main systems of measurement: metric, apothecary, and household, p. 73.
- 4. Convert between systems of measurement, p. 73.
- 5. Convert measurements within the metric system, p. 73.
- 6. Convert between Fahrenheit and Celsius temperatures and between regular time and military time, p. 74.

KEY TERMS

angle
apothecary (ă-POTH-ĕ-
kar-ē) system
Celsius (SEL-sē-ŭs) scale
degree
denominator

dose equation Fahrenheit (FAR-ĕn-hīt) scale fraction household system least common denominator metric system numerator percentage place value ratio reciprocal rounding whole number

A lthough the math used varies among different health care professions, most need an understanding of basic math skills to perform their duties. Although calculators are generally available in most health care settings, they are not a substitute for basic math skills. A health care worker who makes an error keying in numbers on a calculator might not catch this error without good math skills.

It's necessary for health care workers to become familiar with the ways in which numbers are expressed, including whole numbers, fractions, decimals,

percentages, ratios, angles, and degrees. Health care professionals also need to know the basic calculations used to convert measurements from one measurement system to another and within the metric system. Although the metric system is the most common system of measurement used in health care, providers also need a basic understanding of the apothecary and household systems.

The two common scales used to measure temperature are Fahrenheit and Celsius. Formulas allow a temperature to be converted from one to the other. Likewise, regular time can be converted to military time to avoid confusion between a.m. and p.m. times.

Basic math skills in these areas are critical both to success in the health care professional's career and to patient safety.

BUILD YOUR UNDERSTANDING

Objective 1: Give examples of how health care professionals use basic math skills.

Crossword

Complete this crossword puzzle using clues across and down to familiarize yourself with the terminology of basic math skills and its uses in health care.



Across

- 2. This is based on a number's placement to the right of a decimal (2 words)
- 3. These heath care professionals use math to collect and analyze patient data and record vital signs
- 9. These heath care professionals use math to handle patient billing, insurance claims, budgets, and staff scheduling
- 11. Overwhelming feeling of frustration and dread when faced with math problems (2 words)
- 14. This term refers to an amount "out of 100"
- 15. Doing this to numbers allows them to be expressed as an approximate value
- 16. This type of health care technician uses math to perform tests and record results

Down

- 1. Part of the fraction that represents the group
- 3. Part of the fraction that represents the parts
- Counting numbers, which can be positive or negative, but do not include a fraction or decimal (2 words)
- 5. Measured amount of medication given at specific intervals of time
- 6. Statement saying that what is on the left equals what is on the right
- 7. This shows the relationship of one number to another
- 8. Number that expresses part of a whole
- 10. Units of measurement that represent a 360th part of a circle
- 12. This type of health care technician uses math to calculate doses
- 13. Space that exists between two different lines or planes

Objective 2: Correctly perform operations with whole numbers, fractions, decimals, percentages, ratios, angles, and degrees. Complete the Table

Fill in the missing blanks in this table of basic math problems. Show your work in the space provided.

Problem	Work	Answer
Adding whole numbers		
53 + 6,432 + 887 =		
4,999 + 1,003,456 + 2 =		
Subtracting whole numbers		
1,001 - 45 =		
5,473 - 2,862 =		
Multiplying whole numbers		
39 × 56 =		
725 × 3,870 =		
Dividing whole numbers		
3,333 ÷ 11 =		
840 ÷ 24 =		

(continued)

Problem	Work	Answer	
Multiplying fractions			
$4/5 \times 7/9 =$			
6/13 × 15/18 =			
Dividing fractions			
$4/9 \div 3/5 =$			
$1/2 \div 13/15 =$			
Adding/subtracting fractions			
2/5 + 3/5 =			
3/8 + 5/7 =			
Adding/subtracting decimals			
549.387 + 23.76 =			
549.387 - 23.76 =			
Multiplying decimals			
45.6 × 73.45 =			
999.2 × 3.753 =			
Dividing decimals			
$14.7 \div 0.4 =$			
23.1 ÷ 0.6 =			
Rounding			
246.555 to the nearest whole =			
246.555 to the nearest hundred =			
Percentages			
9 × 33% =			
14 × 175% =			
Ratios			
A 1:2 salt solution has what percentage of salt?			
A 2:3 salt solution has what percentage of salt?			
Angles and degrees			
A 90° angle is what percentage of a circle?			
A 45° angle is what percentage of a circle?			

Objective 3: Compare the three main systems of measurement: metric, apothecary, and household.

Jumble

After answering the questions below about systems of measurement, use the circled letters to form the answer to this jumble (punctuation [e.g., hyphens, apostrophes, etc.] counts as a character).

Clue: When the health care professional was in a sweat because she could not remember how to convert a measurement for a patient, she suffered from ...? "_____"

- 1. The _ _ _ _ _ _ system is a system of measurement used in the United States and throughout the world based on multiples of 10.
- 2. In the metric system, the meter is the basic unit of ______.
- 3. In the metric system, the gram is the basic unit of _ _ _ _ _ _ _.
- 4. In the metric system, the liter is the basic unit of _ _ _ _ _ _ _.
- 5. _____, such as *kilo-* and *milli-*, used in the metric system show a fraction or multiple of the base.
- 6. The ______ system is an older measurement system that measures weight and volume using grains and minims.
- 7. Two liquid measurements in the apothecary system include the quart and the $_{\bigcirc}$ ____.
- 8. Two weight measurements in the apothecary system include the grain and the _ _ _ _ _ .
- 10. Health care professionals must be able to instruct patients on the proper household measurements for medications that have orders written in the metric system; for example, 5 mL is equal to 1 _____.

Objectives 4 and 5: Convert between systems of measurement, and convert measurements within the metric system. True or False?

After reviewing the sections, "Converting within the Metric System" and "Converting Between Systems of Measurement," read the statements below and circle T if they are true or F if they are false.

1.	Т	F	Within the metric system, it would never be necessary to convert measurements to a different metric unit.
2.	Т	F	To change grams to milligrams, multiply the number of grams by 1,000, and to change milligrams to grams, divide the number of milligrams by 1,000.
3.	Т	F	To change milligrams to micrograms, multiply the milligrams by 100, and to change micrograms to milligrams, divide the micrograms by 100.
4.	Т	F	To change liters to milliliters, multiply the liters by 1,000,000, and to change milliliters to liters, divide the milliliters by 1,000,000.
5.	Т	F	When converting apothecary to metric, to change grains to grams, divide the number of grains by 15, as in 30 gr \div 15 = 2 g.
6.	Т	F	When converting apothecary to metric, if the number of grains is less than 1, convert the grains to millimeters.

		1	
7.	Т	F	When converting household to metric, to change fluid ounce to milliliters, multiply the number of ounces by 30, as in 4 oz \times 30 = 120 mL.
8.	Т	F	When converting household to metric, to change pounds to kilograms, divide the pounds by 22.2
9.	Т	F	When converting metric to household, to change milliliters to fluid ounces, divide the number of mL by 30, as in 150 mL \div 30 = 5 oz.
10.	Т	F	When using ratios to convert or calculate doses, the proportion, or relationship between the ratios, should be the same to allow health care professionals to calculate the amount of medication they need to administer.

Objective 6: Convert between Fahrenheit and Celsius temperatures and between regular time and military time.

Short Answer

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PART III WORKPLACE SKILLS

After reading the sections, "Conversion of Temperature" and "Time Conversion" in Chapter 12, answer the following questions and be as specific as you can.

1. Compare and contrast the Fahrenheit and Celsius temperature scales.

2. Write the formulas for converting Celsius to Fahrenheit and Fahrenheit to Celsius.

3. Explain how to convert an a.m. time to military time (do not forget to include midnight).

4. Explain how to convert a p.m. time to military time (do not forget to include noon).

EXPAND YOUR KNOWLEDGE

Essay Question

After reading *Coping with Math Anxiety* (http://www.mathacademy.com/pr/minitext/anxiety), choose one math myth listed there that you formerly believed and write a brief essay describing why it's actually a myth and what this means for you. Do you suffer from math anxiety? How could math anxiety jeopardize patients?