

Contextualized Curriculum

for Adult Learners in Math and Literacy

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Making Sure It's Enough

Print:   

How home care aides use their knowledge of calculating with fractions, decimals and percents to help their clients with their daily activities

Industry Sector: [Healthcare](#)

Content Area: [Mathematics](#)

Core Topic: [Decimals, fractions and percents](#)

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Common Core State Standards

Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
4. Model with mathematics.
6. Attend to precision.

High School—Number & Quantity: Quantities

N-Q.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

N-Q.2: Define appropriate quantities for the purpose of descriptive modeling.

N-Q.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Adult Basic Education Standards

Number Sense

N-1: Represent and use numbers in a variety of equivalent forms in contextual situations.

N-2: Understand meanings of operations and how they relate to one another.

N-3: Compute fluently and make reasonable estimates.

Patterns, Functions and Algebra

P-2: Articulate and represent number and data relationships using words, tables, graphs, rules, and equations.

P-3: Recognize and use algebraic symbols to model mathematical and contextual situations.

P-4: Analyze change in various contexts.

Geometry and Measurement

G-4: Understand measurable attributes of objects and the units, systems, and processes of measurement and apply appropriate techniques, tools, and formulas to determine measurements.

Industry Overview

Healthcare in America

From neonatal nurses to radiology technologists, medical coders to medical office assistants, health educators to home care aides, the healthcare industry provides a vast and diverse array of services to individuals at every stage of life. Providing [nearly 17 million jobs](#) and accounting for an estimated [\\$18 billion of the U.S. GDP in 2009](#), healthcare is the nation's largest industry. In Massachusetts, in particular, healthcare accounts for more than 15% of employment (compared with 12% nationally), accounting for approximately [one in six jobs](#). With an aging baby boomer population that is living longer, there is greater demand for more and higher quality preventative and long-term healthcare across the United States. [With eight of the 30 fastest growing occupations](#), healthcare is predicted to be one of the [fastest growing industries](#) both nationwide and in Massachusetts between now and 2020.

Careers in Healthcare

The healthcare industry includes a vast array of jobs related to planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development. This industry includes five career pathways:

- therapeutic services, which includes professionals who work directly with patients to improve their health by providing direct care and treatment for patients (for example, a nurse or a physical therapist assistant);
- diagnostic services, which includes professionals who plan and conduct tests to detect and diagnose diseases and injuries, and use test results to plan treatment (for example, a radiologic technologist or a sonographer, who perform diagnostic imaging examinations, such as X-rays or ultrasounds);
- health informatics, which includes professionals who compile and manage health information and records (for example, a medical records and health information technician, who organizes and manages patient databases; higher-level positions, such as administrators of healthcare facilities or departments, are also included in this pathway);
- support services, which includes professionals who provide assistance to other medical professionals, allowing them to do their jobs in diagnosing and treating patients or supporting therapies (for example, food service workers and nutritionists ensure that patients' meals are healthy and meet dietary guidelines); and
- biotechnology research and development, which include careers that involve bioscience research; while many of these professions require doctoral or medical degrees, some entry-level opportunities in the field require only an associate degree (for example, food and agricultural science technicians).

Mathematics and Communication Skills Needed in Healthcare

The growing complexity of the healthcare industry, including changing technologies, requires workers to continuously upgrade their skills. In addition to technical skills specific to their job, mathematics and literacy skills are crucial for success in all occupations across the healthcare industry.

Communication: First and foremost, no matter the job, good healthcare practitioners are committed to giving patients the best care available and keeping abreast of health research and developments in the field. All workers need to be able to read medical journals and understand medical terminology and vocabulary, as well as read and write literate emails to co-workers/supervisors. Many healthcare jobs also require the ability to read and interpret charts and access and interpret electronic medical records in order to provide quality care.

Many health careers, especially—but not exclusively—those in therapeutic services—involve interacting with patients and their families, in some cases working with people who may be sick, disabled, or dying. Even support staff in a medical office or hospital require effective oral communication skills as well as compassionate interpersonal skills such as the ability to listen and talk to patients to assess needs. Effective communication with colleagues as well as patients is crucial. Healthcare is increasingly a group activity, in which a patient's recovery depends on how well all members of a healthcare team perform specific function, and how well they communicate and collaborate with one another.

Mathematics: From reading charts to interpreting data to measuring and administering correct medicine, basic mathematics skills are essential for providing quality care across most healthcare occupations. Nurses, for example, use mathematics for calculations in all areas of their duties. They use mathematics to calculate dosages, caloric requirements for individual patients, calibrate equipment, and interpret lab results. Charts and patient data are often presented as decimals or percentages, and a nurse must be able to convert between the two, thus requiring competency in understanding and using ratios, proportions and percentages.

Much of modern medicine is based on statistics, and all workers in the industry should have a basic understanding of how statistics are used to influence medical trends. Nurses, for example, need to be aware of the statistics behind prescribing medications and possible side effects or complications. They might use statistics to counsel patients on diagnoses or prognoses, or in gathering patient histories.

Career Opportunities in Healthcare with Education from Community Colleges

Massachusetts Community Colleges play a crucial role in preparing students for careers in health sciences across all sectors of the industry—therapeutic services, diagnostic services, informatics, and support services. All 15 community colleges offer pathways to nursing careers, the largest occupation in the healthcare industry. Additionally, Massachusetts Community Colleges offers associate degree and certificate programs that prepare students to enter occupations across all sectors of the industry, for example:

- *Therapeutic services:* registered nurse, practical nurse, nursing assistant, certified nurse's aide, massage therapist, fitness trainer and instructor, dental hygienist, dental assistant, [pharmacy technician](#), physical therapist assistant, occupation therapy assistant, respiratory assistant, medical assistant
- *Diagnostic services:* radiologic technologist and technician, radiographer, surgical technologist, sonographer, phlebotomist, paramedic, polysomnographic technologist and technician, medical and clinical laboratory technician, magnetic resonance imaging technologist, nuclear medicine technologist, veterinary technologist
- *Informatics:* Medical record and health information technician, medical coder, medical interpreter, medical biller, medical transcriptionist, health educator

Recent Career Opportunities in Massachusetts

The following is a sample of healthcare job listings in Massachusetts that require an associate's degree or certificate:

- Registered Nurse (RN), AmeriCare At Home, Boston, MA [\[show\]](#)
- Medical Technologist, Emerson Hospital, Concord, MA [\[show\]](#)
- Ultrasound Technologist, Brockton, MA [\[show\]](#)
- Licensed Practical Nurse, Hologic, East Watertown, MA [\[show\]](#)

Employment Outlook for Healthcare

America's aging population is now nearing or entering retirement (opening new jobs), and will continue to require more services and the increased use of innovative medical technology for

diagnosis and treatment. As a result, healthcare is one of the fastest growing industries both nationwide and in Massachusetts, where growth is [even higher than nationally](#). For example, in 2010, Baystate Health of Springfield, which employs more than 10,000 across its Western Massachusetts system, said that it would likely need to hire about 15,000 people between 2010 and 2020 to replace retiring workers and meet increased demand.

One important factor in the healthcare industry is the financial pressure on hospitals to focus on efficiency and profitability, which results in discharging patients as soon as possible. These financial pressures, along with increased healthcare coverage under federal law, will likely result in a growth in out-patient services in the healthcare industry, such as [rehabilitation](#) clinics, long-term care facilities, and home care programs. As a result, occupations experiencing the largest growth include home care aides, physical and occupation therapist assistants, dental hygienists, and medical assistants.

Emerging careers in Health/Information Technology (HIT): Estimates based on data from the Bureau of Labor Statistics (BLS), Department of Education, and independent studies indicate a shortfall of approximately 51,000 qualified Health IT (HIT) workers who will be required over the next five years to meet the needs of hospitals and [physicians](#) as they move to adopting an electronic healthcare system, facilitated by the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009. The HITECH Act is a key component of healthcare reform. The Act encompasses interoperable electronic health records (EHRs) including computerized systems to order tests and medications, and support systems to aid clinical decision making and the development of a national health information network to permit the secure exchange of electronic health information among providers. The Congressional Budget Office estimates that the incentive mechanisms in the HITECH Act will increase HIT adoption rates from 45 percent to about 70 percent for hospitals and from 65 percent to approximately 90 percent for [physicians](#). To support job growth in this emerging career field and ensure the adoption of EHRs, new types of workers are needed to facilitate information exchange across healthcare providers and public health authorities, and assist in redesigning workflows within healthcare settings to maximize the quality and efficiency [benefits](#) of EHRs, while maintaining privacy and security of health information and records. To that end, the Department of Health and Human Services has embarked on an initiative to build the HIT workforce with community colleges as the primary training ground for these new workers: (1) Practice workflow and information management redesign specialists; (2) Clinician/practitioner consultants; (3) Implementation support specialists; (4) Implementation managers; (5) Technical/software support staff; and (6) Trainers. The average hourly earnings for community college program graduates are expected to be in the target range of between \$12.46/hour to \$20.25/hour.

Resources:

Healthcare Employment Outlook:

- [Massachusetts Career Information System](#): Massachusetts-specific information on careers which can be used to look at different industries, occupations within those industries, and the skills and education needed to work in these jobs
- [WorkKeys Occupational Profiles](#)
- [Bureau of Labor Statistics](#)

Healthcare Career Information:

- [Top 5 Reasons to Work in the Healthcare Field, About.com](#)
- [Break Into a Healthcare Career, About.com](#)
- [Healthcare Initiatives, US Department of Labor](#)
- [Six Healthcare Careers that are Booming, Yahoo! Education](#)
- [Career Clusters in Health Sciences, National Association of State Directors of Career Technical Education Consortium](#)
- [Explore Health Careers, American Dental Education Association](#)

Massachusetts Healthcare Job Listings:

- [Massachusetts Healthcare Jobs, Jobs.net](#)
- [Healthcare Jobsite, Beyond.com](#)

Workplace Scenario (8th Grade Level)

This scenario is based on the work of a home care aide. For more information, view [this video](#).

You are a home care aide. You work in the home of a [chronically ill](#) elderly [client](#), Mavis. You spend about 20 hours each week with Mavis. You give her companionship and assistance with daily activities. For example, you help her with bathing and grooming, housecleaning, and making sure that she is eating well.

You also monitor Mavis' health. This includes taking her [vital signs](#), such as blood pressure, temperature, or pulse rate. It also involves keeping track of her appearance (such as whether she is perspiring or seems to have little color). You monitor how much she is eating and drinking. You also measure output (both her urine and bowel movements). You usually help Mavis get to doctor's appointments because you are with her all morning on weekdays. You record all of this health information in a notebook. You keep the notebook on Mavis' kitchen table. You encourage the other aides who care for Mavis to do the same.

Helping Mavis eat healthfully is a primary concern for you. Food used to be a source of joy in her life. A former pastry chef, she used to host monthly dinners for her extended family. Many of her guests would drive from across the state for delicious dinners and of course her desserts. After her four children grew up and moved out of the house, Mavis still liked to cook every night for herself and her husband. But when her husband passed away 10 years ago, Mavis gradually stopped cooking. As she grew older, her appetite declined and she lost interest in food. Sometimes she would not eat at all until late afternoon. Recently Mavis has lost a lot of [weight](#). Her doctor would like her to gain some [weight](#) to protect her against [osteoporosis](#) and other health conditions that can arise due to [malnutrition](#). Eating well would also help keep her energy up. Mavis is [diabetic](#). This means that she has to keep her sugar intake in check. She also needs to monitor her blood sugar levels, and track her carbohydrate intake so she can take insulin accordingly.

Mavis does not have a lot of money. You try to help her stretch her food as far as possible. You often make meals that you or another aide can warm up for Mavis when she is hungry. You rely on Mavis' collection of recipes to guide your cooking. However, since you were born and raised in Haiti, you are not very familiar with the English system of measurement. You need to carefully follow Mavis' recipes and measure ingredients exactly in order to make the food to Mavis' taste. In addition, most of the recipes make so much food, it would simply go to waste in Mavis' home. Therefore, you cut down recipes, often by half or more.

In addition to helping Mavis follow her doctor-prescribed nutritional requirements and keeping within her food budget, you are hoping to help Mavis take an interest in and find joy in food and eating again. You think perhaps inviting a friend or two over for lunch or trying out new recipes you will meet this goal.

Workplace Scenario (High School Level)

This scenario is based on the work of a home care aide. For more information, view [this video](#).

You are a home care aide, working in the home of a [chronically ill](#) elderly [client](#), Mavis. You spend about 20 hours each week with Mavis, giving her companionship and assistance with daily activities such as bathing and grooming, housecleaning, and making sure that she is eating well. You also monitor Mavis' health—taking her [vital signs](#), such as blood pressure, temperature, or pulse rate, keeping track of her appearance (such as whether she is perspiring or seems to have little color), how much she is eating and drinking, and output (both her urine and bowel movements). You usually help Mavis get to doctor's appointments because you are with her all morning on weekdays. You record all of this health information in a notebook that you keep on Mavis' kitchen table and encourage the other aides who care for Mavis to do the same.

Helping Mavis eat healthfully is a primary concern for you. Food used to be a source of joy in her life. A former pastry chef, she used to host monthly dinners for her extended family, many of whom would

drive from across the state for delicious dinners and of course her desserts. After her four children grew up and moved out of the house, Mavis still liked to cook every night for herself and her husband. But when her husband passed away 10 years ago, Mavis gradually stopped cooking. As she grew older, her appetite declined and she lost interest in food, sometimes not eating at all until late afternoon. Recently Mavis has lost a lot of [weight](#), and her doctor would like her to gain some [weight](#) to protect her against [osteoporosis](#) and other health conditions that can arise due to [malnutrition](#), as well as keep her energy up. Mavis is also [diabetic](#), so while her doctor wants her to consume more calories, she also has to keep her sugar intake in check, monitor her blood sugar levels, and track her carbohydrate intake so she can take insulin accordingly.

Mavis does not have a lot of money, so you try to help her stretch her food as far as possible. You often make meals that you or another aide can warm up for Mavis when she is hungry, relying on Mavis' collection of recipes to guide your cooking. However, since you were born and raised in Haiti, you are not very familiar with the English system of measurement; you need to carefully follow Mavis' recipes and measure ingredients exactly in order to make the food to Mavis' taste. In addition, most of the recipes make so much food, it would simply go to waste in Mavis' home. Therefore, you cut down recipes, often by half or more.

In addition to helping Mavis follow her doctor-prescribed nutritional requirements and keeping within her food budget, you are hoping to help Mavis take an interest in and find joy in food and eating again, perhaps by inviting a friend or two over for lunch or trying out new recipes.

Core instructional context

Understanding fractions, decimals, and percents, and being able to calculate, compare, and convert them are foundational concepts for understanding algebra. In addition, the numbers that we deal with in our daily lives are rarely whole numbers—dealing with money, measuring ingredients in a recipe, dividing things evenly between children, mixing formula for a baby—all of these tasks require using parts of a whole. Similarly, in the workplace, the numbers that people are dealing with are rarely whole numbers—whether they are dealing with money, medication dosages, lengths of fabric to make clothing, or the time it takes to complete a particular task.

A home care aide cares for clients (often elderly or disabled individuals) in their homes. An HCA may help the [client](#) bathe, dress, and groom, as well as prepare meals and change the bed linens. (HCAs may also remind clients to take medications prescribed by their physician, but cannot administer the medications.) It is important to know that this is one of the fastest growing occupations across the United States—according to the U.S. Department of Labor, employment opportunities are expected to grow almost 70% nationally between 2010 and 2020. However, the pay in this occupation is quite low, and without further education, there are not opportunities for advancement.

While the exact math knowledge required of home care aides—and people in related professions, such as certified Nursing Assistants—varies from job to job, fundamental mathematical knowledge and practices, including a strong working understanding of fractions, decimals, and percents are essential for being able to provide quality health care. For example:

- A home care aide might help a [client](#) on a fixed income pay her bills, and would need to understand and use decimals and percent to help her understand her credit card bill or balance her checkbook.
- A health professional who is helping to administer medication might need to convert fractions and decimals to percentages in order to reduce or increase dosages and explain medication instructions accurately and easily to their patient.
- Nurses frequently administer solutions with concentration expressed as a percent. For example, a nurse would need an understanding of decimals and percent to know that an intravenous solution that is 5% dextrose has a higher concentration of dextrose than a solution that is 0.8% dextrose.

Worked Example

Use the following nutrition label for a box of raisins to answer questions about the nutritional content of raisins.



1) One serving size of raisins is a half of a cup. How many different ways can you show $\frac{1}{2}$?

Answer: Half can be written...

As a fraction:	$\frac{1}{2}$
As a decimal:	0.5
As a percentage:	50%
As a chart:	

2) Use fractions, decimals, and percents to find food and nutrient amounts.

- If one serving of raisins is $\frac{1}{2}$ cup, how many cups is two servings?
 - Answer: $2 \times \frac{1}{2} = \frac{2}{2} = 1$ cup of raisins
- If one serving of raisins has 4.9 grams of fiber, how much fiber does two servings have?
 - Answer: $2 \times 4.9 = 9.8$ g fiber
- If one serving of raisins provides 10% of the recommended daily intake (RDI) of Iron, what percentage of the RDI of iron does two servings provide?
 - Answer: $2 \times 10\% = 20\%$.
 - You could also convert the percentage to a decimal first:
 $10\% = \frac{10}{100} = 0.1$
 $2 \times 0.1 = 0.2 = \frac{20}{100} = 20\%$

Being able to manipulate fractions, decimals, and percentages sets the stage for solving more complex multiple-step problems, which require algebraic thinking to set up and solve equations.

3) According to this food label, how many grams of fiber are in $\frac{3}{4}$ cups of raisins?

There are multiple ways to find the answer to this question. One method is to complete the following steps:

- Step 1: Figure out how many servings there are in $\frac{3}{4}$ cup of raisins
- Step 2: Multiply the number of servings by the amount of fiber in one serving

Step 1: Set up an equation to solve for the unknown variable, x servings of raisins:

$$\frac{3}{4} \text{ cups} = x \text{ servings} \times \frac{1}{2} \text{ cup}$$

Solving the equation

To solve the equation, isolate the x.

To isolate x, divide both sides of the equation by $\frac{1}{2}$.

$$\left(\frac{3}{4} \div \frac{1}{2}\right) = x \text{ servings} \times \left(\frac{1}{2} \div \frac{1}{2}\right)$$

To divide fractions,

- Turn the second fraction (the one you want to divide by) upside-down to become a reciprocal
- Multiply the first fraction by that reciprocal
- Simplify the fraction

So the first side of the equation, $\left(\frac{3}{4} \div \frac{1}{2}\right)$ becomes $\frac{3}{4} \times \frac{2}{1} = \frac{6}{4}$
 $\frac{6}{4}$ can be simplified as $1\frac{1}{2}$

The other side of the equation, $\left(\frac{1}{2} \div \frac{1}{2}\right)$ becomes $\frac{1}{2} \times \frac{2}{1} = \frac{2}{2} = 1$

The equation can now be written as:

$$1\frac{1}{2} = x \text{ servings}$$

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

Therefore: $\frac{3}{4}$ cups = $1\frac{1}{2}$ servings of $\frac{1}{2}$ cup of raisins

****Note:** You can also follow these exact same steps, but first convert all the fractions to decimals, to make calculations easier:

$$0.75 = x \text{ servings} \times 0.5 \text{ cups}$$

$$0.75 / 0.5 = 0.5 x / 0.5$$

$$1.5 = x$$

Step 2: If $\frac{3}{4}$ cup is equal to $1\frac{1}{2}$ servings of raisins, then to find the amount of fiber, multiply:

of servings \times amount of fiber in one serving

$$1\frac{1}{2} \text{ servings} \times 4.9 \text{ g fiber} = \text{total fiber}$$

To work with fractions and decimals together, you need to convert one of them.

Convert $1\frac{1}{2}$ to a decimal:

$$1.5 \times 4.9 = 7.35 \text{ g fiber}$$

Contextualized learning activities

Introduction to the Scenario

Have students read the scenario. Many of the key responsibilities of a home care aide include helping in daily activities such as meal planning, grocery shopping, housekeeping, and managing a personal schedule. Ask students to [brainstorm](#) ways that math is used to help with such daily activities. In particular, ask students if they can identify any ways that fractions, decimals, and/or percentages might be used.

Optional Extension: Have students individually write down everything they did that morning—between the time they woke up and the time they ate lunch. Have students share their description with a partner and then work together to list ways that they used math in general—and fractions, decimals, and percentages, in particular—during that time block. Have students be as explicit as possible and write down particular numbers they worked with (for example, measuring $\frac{1}{2}$ cup of coffee grounds, paying \$2.15 for the bus, buying a shirt marked 30% off of 19.99, and so on).

Food Labels for Thought

Provide an example of a nutrition label from a packaged food. Discuss the information that is included on a food label, including serving size, calories, and nutrients. Ask students to point out examples of fractions, decimals, and percentages on the label, and discuss why the amounts are presented that way. Choose an amount given on the label—such as “serving size = $\frac{1}{2}$ cup” and ask students work in pairs to write or draw or otherwise present as many different ways of expressing that amount as they can (for example: 0.5 cup, drawing a cup and filling it halfway, $\frac{2}{4}$ cup, 50%, etc.). If necessary, spend time with the class exploring why these amounts are equivalent and how they can find other equivalent amounts.

Have students work individually or in pairs to complete the food label contextualized problem.

Making Breakfast Count

Gather or download food labels from several different breakfast foods (cereals, breads, fruits, eggs, juices, etc.) or have students use the [USDA National Nutrient Database](#) to search for label for foods of their own choice. Have students work in small groups to create three different breakfast menus for Mavis based on combination of these foods that meets the following requirements:

- Between 300 and 500 calories
- No more than 30 grams sugar
- No more than 400 mg of sodium

Have each group present their menus to each other. Have students share the methods they used to keep track of the different criteria (trial and error, creating a spreadsheet, focusing on one criterion at a time). Then ask the class to choose which breakfasts would be the best options for Mavis, based on nutritional content as well as [subjective](#) qualities, such as variety and how appealing they sound.

Optional Jigsaw Adaptation: Assign different groups specific nutritional criteria: (for example, one group focuses on creating a low-sodium meal, while other groups focus on low-sugar, calories, variety of ingredients, and ease of preparation). Do a jigsaw so that new groups are formed that include at least one representative of each original group. Have team members share the menu plans from their original group and see how the meals measure up to the other criteria (for example, does the low-sodium plan exceed the sugar limit?). Have new groups modify their meal plans to meet all the criteria.

Adapting Recipes

Have students bring in recipes from magazines, cookbooks, and online. Have students work in groups to choose a recipe and identify how many people it serves. Have students modify the recipe for Mavis—i.e. if the recipe serves 4–6 people, they could halve the recipe, so it provides 2–3 servings (which will leave her with some leftovers but not so much that it will go to waste). Then have students modify it for serving it at a party—say for a group of 8–12 people or more.

Contextualized Problems

1. Reading Food Label

Mavis' doctor has suggested that she should eat breakfast every day. You would like to find something that's easy for Mavis to prepare herself in the morning before you arrive. She suggests a bowl of cereal. Here's the nutrition label for her favorite cereal:



- Find the serving size on this food label. The serving size is an amount of food—such as one cup of milk or two slices of bread—that the nutrition information on the food label applies to. What is the serving size of this cereal according to the label?

- Answer: $\frac{3}{4}$ cup

How many cups equal two serving sizes of this cereal?

- Answer: $1\frac{1}{2}$ cups

- How many cups is half a serving of this cereal?

- Answer: $\frac{3}{8}$

- How many servings of this cereal is $\frac{1}{4}$ cup?

- Answer: $\frac{1}{3}$ of a serving

- How could you express the serving size of this cereal as a decimal?

- Answer: 0.75 cups

- Put these amounts of cereal in order, from smallest to largest: 1 cup, 1 serving, 0.65 cups, 0.5 servings

- Answer: 0.5 servings, 0.65 cups, 1 serving, 1 cup

2. Counting Carbs

As a [diabetic](#), Mavis's doctor wants her to keep track of the amount of carbohydrates she eats, so she knows how much insulin to inject. It's especially important for her to plan her meals in advance, since she usually injects insulin before her meals, based on what she is going to eat.

- Find the amount of total carbohydrates on the cereal food label for one serving. The amount of carbs is listed in grams (g).
 - Answer: 21.65 g
- How many grams of carbohydrates are there in two servings of this cereal? 3 servings? ½ serving?
 - Answers:
 2 servings = 43.3 g
 3 servings = 64.95 g
 ½ serving = 10.825 g
- How many carb grams are there in 1.5 cups of this cereal? Write out the steps you need to complete to find the answer.
 - Answer: 43.3 g Carbohydrates

3. How Much Salt?

Mavis also suffers from hypertension. Her doctor would like her to restrict her sodium intake to 1500mg per day to ease her hypertension. As you can see on the cereal label, some nutrients, such as carbohydrates, are measured in grams. Other nutrients, like sodium, are measured in milligrams.

A milligram is one-thousandth (1/1000) of a gram.

1 gram = 1,000 milligrams

1 milligram = .001 grams

A kilogram is 1000 times the amount of a gram.

1 gram = .001 kilograms

1 kilogram = 1,000 grams

kilogram = 1,000,000 milligrams

- If Mavis ate one serving of cereal, how many milligrams of sodium would she consume?
 - Answer: 190.12 mg
- How could you express the amount of sodium in one serving of cereal in grams, instead of milligrams?
 - 0.19012
 - 1.9012
 - 19.012
 - 1901.2
 - 19012
 - Answer: a. 0.19012 g
- If all Mavis ate was cereal all day long, how many servings could she eat and stay under her doctor's requirement of 1500 mg of sodium?
 - A little bit less than 10 servings
 - A little bit less than 8 servings
 - A little bit more than 2 servings
 - 15 servings
 - Answer: b. A little bit less than 8 servings
 Mavis could eat 7.9 servings of cereal (which is almost 6 cups!)
- Put the following numbers in order from smallest to largest:
 - 200 mg
 - 2/1000 kg
 - 200 g
 - 20 kg

- e. 2/10 mg
- f. 0.02g

◦ Answer: e, f, a, b, c, d

4. Body Mass Index (BMI)

Body Mass Index is a number calculated from a person's weight and height. When used with other data, it can be used as a screen for health factors based on weight.

The standard weight status categories associated with BMI ranges for adults are shown in the following table:

BMI	<u>Weight</u> Status
Below 18.5	Underweight
18.5–24.9	Normal
25.0–29.9	Overweight
30.0 and Above	Obese

In the elderly it is often better to have a BMI between 25 and 27; a slightly higher BMI may, for example, help protect you from osteoporosis.

The formula for calculating BMI is: weight (kg) ÷ height² (m)

The medical field—whether you're in a hospital, clinic, rehab, or home setting—is built on the metric system. Some conversions you will need to know to calculate BMI:

Weight conversion: weight in pounds (lb.) ÷ 2.2 = weight in kilograms (kg)

Height conversion: (height in inches [in.] × 2.54) ÷ 100 = height in meters (m)

So, you can find the BMI for someone who is 5 foot 8 inches and 196 pounds by completing the following steps:

Height: 5 foot 8 inches = (5 × 12) + 8 = 68 in.

Height conversion: (68 in. × 2.54) ÷ 100 = 1.73 m

Weight conversion: 196 lb. ÷ 2.2 = 89 kg

BMI = 89 kg ÷ (1.73 m × 1.73 m) = 29.7

- Mavis is 5'1" and 99 pounds. Use the formula to figure out her current BMI.
 - Answer: BMI = 18.7
- Mavis' doctor would like her BMI to be at least 25. How could you create a formula/equation to find out how much she would have to weight have a BMI of 25?
 - Answer: 25 = x ÷ (1.55 m × 1.55 m)

Contextualized test items

Mavis is healthy enough to do mild exercise, but chooses to stay home and be sedentary most of the day. Her doctor would like her to start a short walking program to help her manage her diabetes and hypertension. You also think it will boost Mavis' mood to get some fresh air and exercise.

There is a local track close to Mavis' house. Once around the track is 200 meters. On her first day out, Mavis walked around the track 2½ times.

1. How many meters did Mavis walk if she walked around the track $2\frac{1}{2}$ times?

- a. 2.5 m
- b. **500 m**
- c. $400\frac{1}{2}$ m
- d. 250 m

2. There are 1,000 meters in 1 kilometer. If Mavis walked $2\frac{1}{2}$ times around the 200 meter track, how many kilometers did she walk?

- a. **0.5 km**
- b. 50 km
- c. 500 km
- d. 0.25 km

Use this food label for a can of refried beans to answer Questions 3–5.



3. If Mavis ate $\frac{1}{4}$ cup of beans with her lunch, approximately how many calories did she eat?

- a. **About 60 calories**
- b. About 120 calories
- c. About 240 calories
- d. About 360 calories

4. If Mavis needs to limit her Carbohydrates to 20 grams for lunch, approximately how many servings of beans can she eat?

- a. $\frac{1}{4}$ servings
- b. **$\frac{1}{2}$ serving**
- c. 1 serving
- d. 2 servings

5. There are 4 calories per Carbohydrate gram. Mavis' doctor recommends she eat 50% of her calories from Carbohydrates. If she eats 1800 calories per day, how many Carbohydrate grams is that?

- a. 3,600 g
- b. 900 g
- c. 450 g
- d. **225 g**

Contextualized project

Meal Planning Jigsaw

Provide students with Mavis' weekly budget and nutritional requirements:

- \$100 a week to spend on food
- Should eat at least 1500 calories per day, ideally between 1600 and 1800
- Limit of 1500mg of sodium per day
- Should eat 30-40 grams of fiber per day

Have students work in small groups to plan a different day's menu and shopping list for that day. Have enough groups so that there are 5 days of food planned, with the assumption that she'll eat leftovers the other days. Jigsaw so that new groups have representatives for each day's menu. Have each new group use an online grocery store (such as freshdirect.com) to create a shopping list for the entire week, staying within the budget. Have groups present their menus and shopping lists to the class. Have groups share the methods they used to keep track of the different criteria (trial and error, creating a spreadsheet, focusing on one criterion at a time).

Additional or extension activities, multimedia, readings and/or resources

Extension activities:

Have students track their own nutritional intake for a day: looking at food labels to determine the serving size amount that they actually eat, and calculating and comparing the amount of nutrients in each food.

One of the tasks of home care aides, as well as nursing assistants and nurses, is to measure patients' [vital signs](#), such as blood pressure, temperature, and pulse rate. The pulse rate is determined by the number of pressure waves at a specific point on the body—most commonly on the inside of the wrist—over a one-minute period. For healthcare providers who work with their patients on a daily basis, such as someone working in a home or nursing home setting, they don't need to palpate for a full minute each time they measure the pulse; instead, they may count the pulses for 15-20 seconds and then determine the rate per minute. Pulse rates provide an opportunity to introduce to concepts of rates to your students—have them take their own pulse for a full minute and then for 15-20 seconds and compare the two rates.

Readings:

- [Description of home care aide occupation](#)
- [Description of home care aide's scope of practice: What Home Health Aides Can Do—and What They Can't](#)
- [Medical Dosage Calculations For Dummies](#) by Richard Snyder and Barry Schoenborn—see Chapter 1, "Brushing Up on Your Math and Entering the Healthcare Field"
- [Dosage Calculations Tutorial](#)

Resources:

- [Nutrient database](#)
- [Fundamentals of Mathematics for Nursing—a self-instructional booklet](#)

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Massachusetts Community Colleges and Workforce Development Transformation Agenda (MCCWDTA) is 100% funded by a \$20 million grant from the U.S. Department of Labor, Employment & Training Administration TAACCT. Grant Agreement #TC-22505-11-60-A-25.

This workforce solution was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The solution was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership. This solution is copyrighted by the institution that created it. Internal use, by an organization and/or personal use by an individual for non-commercial purposes, is permissible. All other uses require the prior authorization of the copyright owner. Massachusetts Community Colleges are equal opportunity employers. Adaptive equipment available upon request for persons with disabilities.