Using Household Measure in Pharmacy Calculations

Objectives

- Identify units of household measure and convert between them.
- Solve medication problems by using household measure and the metric system.
- Convert body weight between kilograms and pounds.
- Determine pediatric doses using dosing tables.
- Calculate the amount of medication to be dispensed.
- Calculate temperature conversions between Celsius and Fahrenheit.

5.1 HOUSEHOLD MEASURE

Household measure is a system of measure used in homes, particularly in kitchens, in the United States. The units of household measure for volume include teaspoonful, tablespoonful, cup, pint, quart, and gallon. The units of household measure for weight are pounds and ounces. Table 5.1 lists the household measure equivalents and their abbreviations. The apothecary and avoirdupois measurements will be presented in Chapter 10.

Chapter

Measuring volume using the household measure is less accurate than using other systems because the measuring utensils can vary in size. Nevertheless, household volume measure may be used in community pharmacy practice when dispensing drugs that will be administered in the patient's home because patients may not

Table 5.1 Household Measure Equivalents

VolumeWeight3 teaspoonsful (tsp)= 1 tablespoonful (tbsp)1 pound (lb) = 16 ounces (oz)2 tablespoonsful (tbsp)= 1 fluid ounce (fl oz)8 fluid ounces (fl oz)= 1 cup2 cups= 1 pint (pt)2 pints (pt)= 1 quart (qt)4 quarts (qt)= 1 gallon (gal)

household measure a system of measure used in homes, particularly in kitchens, in the United States; units of measure for volume include teaspoonful, tablespoonful, cup, pint, quart, and gallon; units for weight are pound and ounce

Safety Note To avoid misreading

c for c or 0, do not

abbreviate cup.

Remember

apothecary pound (fb) = 12 oz ($\frac{3}{2}$) household pound (fb) = 16 oz have other measuring devices at home. Labels instructing patients on how to take a medication often use household measure units for this reason.

It is important to note that the fluid ounce is the same in household and in apothecary (pharmacy) volume measure. However, the ounces used to signify weight are different. There are 12 oz in an apothecary pound, while there are 16 oz in a household pound. The household pound is the more commonly used equivalence.

Converting Household Volume Measures

Like all systems, units of household volume measure can be converted to larger or smaller units. The following examples will demonstrate this type of conversion.

Example 5.1.1 How many tablespoonsful are in 2 cups of medication?

Begin the solution by noting the appropriate equivalences indicated in Table 5.1.

2 tbsp = 1 fl oz1 cup = 8 fl oz

Using these equivalences, the solution can be determined in two ways.

Solution 1: Using the ratio-proportion method, first determine the number of fluid ounces in 2 cups.

$$\frac{x \text{ fl oz}}{2 \text{ cups}} = \frac{8 \text{ fl oz}}{1 \text{ cup}}$$
$$\frac{(2 \text{ cups}) x \text{ fl oz}}{2 \text{ cups}} = \frac{(2 \text{ cups}) 8 \text{ fl oz}}{1 \text{ cup}}$$

$$x \text{ fl oz} = 16 \text{ fl oz}$$

Second, determine the number of tablespoonsful in 16 fl oz.

$$\frac{x \text{ tbsp}}{16 \text{ fl oz}} = \frac{2 \text{ tbsp}}{1 \text{ fl oz}}$$
$$\frac{(16 \text{ fl oz}) x \text{ tbsp}}{16 \text{ fl oz}} = \frac{(16 \text{ fl oz}) 2 \text{ tbsp}}{1 \text{ fl oz}}$$

$$x \text{ tbsp} = 32 \text{ tbsp}$$

Solution 2: Using the dimensional analysis method,

$$2 \text{ cups} \times \frac{8 \text{ fl oz}}{1 \text{ cup}} \times \frac{2 \text{ tbsp}}{1 \text{ fl oz}} = 32 \text{ tbsp}$$

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Example 5.1.2 How many 1 tsp doses are in 3 cups of liquid medication?

Begin the solution by noting the appropriate equivalences indicated in Table 5.1.

$$3 \text{ tsp} = 1 \text{ tbsp}$$

 $2 \text{ tbsp} = 1 \text{ fl oz}$
 $8 \text{ fl oz} = 1 \text{ cup}$

Using these equivalences, the solution can be determined in two ways.

Solution 1: Using the ratio-proportion method, first determine the number of fluid ounces in 3 cups.

$$\frac{x \text{ fl oz}}{3 \text{ cups}} = \frac{8 \text{ fl oz}}{1 \text{ cup}}$$
$$\frac{(3 \text{ cups}) x \text{ fl oz}}{3 \text{ cups}} = \frac{(3 \text{ cups}) 8 \text{ fl oz}}{1 \text{ cup}}$$
$$x \text{ fl oz} = 24 \text{ fl oz}$$

Second, determine the number of tablespoonsful in 24 fl oz.

$$\frac{x \text{ tbsp}}{24 \text{ fl oz}} = \frac{2 \text{ tbsp}}{1 \text{ fl oz}}$$
$$\frac{(24 \text{ fl oz}) x \text{ tbsp}}{24 \text{ fl oz}} = \frac{(24 \text{ fl oz}) 2 \text{ tbsp}}{1 \text{ fl oz}}$$

$$x \text{ tbsp} = 48 \text{ tbsp}$$

Third, determine the number of teaspoonsful in 48 tbsp.

$$\frac{x \operatorname{tsp}}{48 \operatorname{tbsp}} = \frac{3 \operatorname{tsp}}{1 \operatorname{tbsp}}$$
$$\frac{(48 \operatorname{tbsp}) x \operatorname{tsp}}{48 \operatorname{tbsp}} = \frac{(48 \operatorname{tbsp}) 3 \operatorname{tsp}}{1 \operatorname{tbsp}}$$

$$x \operatorname{tsp} = 144 \operatorname{tsp}$$

Solution 2: Using the dimensional analysis method,

$$3 \text{ cups} \times \frac{8 \text{ fl oz}}{1 \text{ cup}} \times \frac{2 \text{ tbsp}}{1 \text{ fl oz}} \times \frac{3 \text{ tsp}}{1 \text{ tbsp}} = 144 \text{ tsp}$$

Example 5.1.3 How many 1 fl oz doses are in 3 pt of liquid medication?

Begin the solution by noting the appropriate equivalences indicated in Table 5.1.

$$8 fl oz = 1 cup$$
$$2 cups = 1 pt$$
$$2 pt = 1 qt$$

Using these equivalences, the solution can be determined in two ways.

Solution 1: Using the ratio-proportion method, first determine the number of cups in 3 pt.

$$\frac{x \text{ cup}}{3 \text{ pt}} = \frac{2 \text{ cups}}{1 \text{ pt}}$$

 $x \operatorname{cup} = 6 \operatorname{cups}$

Second, determine the number of fluid ounces in 6 cups.

 $\frac{x \text{ fl oz}}{6 \text{ cups}} = \frac{8 \text{ fl oz}}{1 \text{ cup}}$ x fl oz = 48 fl oz

Solution 2: Using the dimensional analysis method,

 $3 \text{ pt} \times \frac{2 \text{ cups}}{1 \text{ pt}} \times \frac{8 \text{ fl oz}}{1 \text{ cup}} = 48 \text{ fl oz}$

Example 5.1.4 How many 1 fl oz doses are in 2 qt of liquid medication?

Begin the solution by noting the appropriate equivalences indicated in Table 5.1.

8 fl oz = 1 cup2 cups = 1 pt2 pt = 1 qt

Using these equivalences, the solution can be determined in two ways.

Solution 1: Using the ratio-proportion method, first determine the number of pints in 2 qt.

$$\frac{x \text{ pt}}{2 \text{ qt}} = \frac{2 \text{ pt}}{1 \text{ qt}}$$
$$x \text{ pt} = 4 \text{ pt}$$

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Second, determine the number of cups in 4 pt.

$$\frac{x \operatorname{cup}}{4 \operatorname{pt}} = \frac{2 \operatorname{cups}}{1 \operatorname{pt}}$$
$$x \operatorname{cup} = 8 \operatorname{cups}$$

Third, determine the number of fluid ounces in 8 cups.

$$\frac{x \text{ fl oz}}{8 \text{ cups}} = \frac{8 \text{ fl oz}}{1 \text{ cup}}$$
$$x \text{ fl oz} = 64 \text{ fl oz}$$

Solution 2: Using the dimensional analysis method,

$$2 \text{ qt} \times \frac{2 \text{ pt}}{1 \text{ qt}} \times \frac{2 \text{ cups}}{1 \text{ pt}} \times \frac{8 \text{ fl oz}}{1 \text{ cup}} = 64 \text{ fl oz}$$

Converting between Household Measure and the Metric System

Because of the inaccuracy of the measuring tools used in the household measure, it is often preferable to convert all quantities into the metric system. This may seem like additional work for some problems, but using the metric system will serve you better than relying on the household system, which is declining in use. Prescriptions that are interpreted and entered into a computer as part of the patient's record will need to be converted to the metric system. Typically, such computer programs are set up to accept measurements using milliliters and grams.

Although some references list exact values for conversions between the household measure and the metric system, the equivalents shown in Table 5.2 are generally accepted for use for these conversions in daily pharmacy practice. All of these conversion values should be committed to memory.

Volume Weight 1 tsp = 5 mL 1 oz = 30 g** 1 tbsp = 15 mL 1 lb = 454 g** 1 fl oz = 30 mL* 2.2 lb 1 kg 1 cup = 240 mL 1 lb = 1 kg

Table 5.2 Household Measure and Metric System Conversion Values

1 pt

1 qt

= 480 mL* = 960 mL

1 gallon = 3840 mL

*There are actually 29.57 mL in 1 fl oz, but 30 mL is usually used. When packaging a pint, companies will typically include 473 mL, rather than the full 480 mL.

**There are actually 28.34952 g in an avoirdupois ounce; however, we often round up to 30 g. It is common practice to use 454 g as the equivalent for a pound (28.35 g \times 16 oz/lb = 453.6 g/lb, rounded to 454 g/lb).

The following examples show some typical conversion problems the pharmacy technician must be able to solve.

Example 5.1.5 You are to dispense 300 mL of a liquid preparation. If the dose is 2 tsp, how many doses will the whole preparation contain?

Remember 1 tsp = 5 mL Begin solving this problem by converting to a common unit of measure using the conversion values in Table 5.2.

1 dose = 2 tsp = 2 \times 5 mL = 10 mL

Using these converted measurements, the solution can be determined in two ways.

Solution 1: Using the ratio-proportion method and the metric system,

$$\frac{x \text{ doses}}{300 \text{ mL}} = \frac{1 \text{ dose}}{10 \text{ mL}}$$
$$\frac{(300 \text{ mL}) x \text{ doses}}{300 \text{ mL}} = \frac{(300 \text{ mL}) 1 \text{ dose}}{10 \text{ mL}}$$

x doses = 30 doses

Solution 2: Using the dimensional analysis method,

$$300 \text{ mL} \times \frac{1 \text{ dose}}{10 \text{ mL}} = 30 \text{ doses}$$

Example 5.1.6

A patient is to purchase a 12 fl oz bottle of antacid. The patient is to take 15 mL before each meal and at bedtime. How many doses does the bottle contain?

Begin solving this problem by converting to a common unit of measure using the conversion values in Table 5.2.

1 fl oz = 30 mL, so 0.5 fl oz = 15 mL, and 12 fl oz = 360 mL

Using these converted measurements, the solution can be determined in three ways.

Solution 1: Using the ratio-proportion method and the metric system,

$$\frac{x \text{ doses}}{360 \text{ mL}} = \frac{1 \text{ dose}}{15 \text{ mL}}$$

x dose = 24 doses

Solution 2: Using the dimension analysis method and the metric system,

$$360 \text{ mL} \times \frac{1 \text{ dose}}{15 \text{ mL}} = 24 \text{ doses}$$

Remember

1 fl oz = 30 mL

Solution 3: Using the dimensional analysis method and the household system,

12 fl oz
$$\times \frac{1 \text{ dose}}{0.5 \text{ fl oz}} = 24 \text{ doses}$$

Example 5.1.7 How many 2 tbsp doses are in 480 mL?

Using the conversion values in Table 5.2, 1 tbsp = 15 mL. Since 1 dose equals 2 tbsp,

 $1 \text{ dose} = 2 \text{ tbsp} = 2 \times 15 \text{ mL} = 30 \text{ mL}$

Using these converted measurements, this problem can be solved in two ways.

Solution 1: Using the ratio-proportion method,

$$\frac{x \text{ doses}}{480 \text{ mL}} = \frac{1 \text{ dose}}{30 \text{ mL}}$$

$$x \text{ dose} = 16 \text{ doses}$$

Solution 2: Using the dimensional analysis method,

480 mL
$$\times \frac{1 \text{ dose}}{30 \text{ mL}} = 16 \text{ doses}$$

Example 5.1.8 Theophylline elixir contains 80 mg/15 mL. A dose is 2 tbsp. How many milligrams are in 1 dose of the theophylline elixir?

Using the conversion values in Table 5.2,

 $1 \text{ dose} = 2 \text{ tbsp} = 2 \times 15 \text{ mL} = 30 \text{ mL}$

This problem can be solved in two ways.

Solution 1: Using the ratio-proportion method,

 $\frac{x \text{ mg}}{30 \text{ mL}} = \frac{80 \text{ mg}}{15 \text{ mL}}$

$$x \text{ mg} = 160 \text{ mg}$$

Solution 2: Using the dimensional analysis method,

$$30 \text{ mL} \times \frac{80 \text{ mg}}{15 \text{ mL}} = 160 \text{ mg}$$

Like volumes, weights can be converted between household measure and metric measure. The most common conversions are between the household measurements of pounds and ounces and the metric kilograms and grams. These conversions were presented in Table 5.2.

Example 5.1.9 A physician has written a prescription for a 1.5 oz tube of ointment. How many grams is this?

Since 1 oz equals 30 g, this problem can be solved in two ways.

Solution 1: Using the ratio-proportion method,

Remember

30 g = 1 oz 454 g = 1 lb

$$\frac{x \text{ g}}{1.5 \text{ oz}} = \frac{30 \text{ g}}{1 \text{ oz}}$$

$$x g = 45 g$$

Solution 2: Using the dimensional analysis method,

$$1.5 \text{ oz} \times \frac{30 \text{ g}}{1 \text{ oz}} = 45 \text{ g}$$

Example 5.1.10 You have a 1 lb jar of ointment available. You are instructed to use this stock to fill smaller jars with 20 g of ointment each. How many jars can you fill?

Since 1 lb equals 454 g, this problem can be solved in two ways.

Solution 1: Using the ratio-proportion method,

$$\frac{x \text{ jars}}{454 \text{ g}} = \frac{1 \text{ jar}}{20 \text{ g}}$$

x jar = 22.7 jars, or 22 full jars

Solution 2: Using the dimensional analysis method,

$$454 \text{ g} \times \frac{1 \text{ jar}}{20 \text{ g}} = 22.7 \text{ jars, or } 22 \text{ full jars}$$

In both solutions, there is 0.7 jar of ointment remaining. You can figure out how many grams of ointment are leftover with the following calculation.

20 g/jar \times 0.7 jar leftover ointment = 14 g leftover ointment

Converting Body Weight

As discussed in the previous chapter, drugs are sometimes dosed based on the weight of the patient. Increasingly, drug manufacturers are providing a recommended dose based on a specific dose in milligrams per kilogram of the patient's weight. Because most drugs are dosed on the basis of kilograms, if a patient's weight is documented in pounds, the weight will have to be converted to kilograms before calculating the appropriate dose.

Example 5.1.11 A patient weighs 134 lb. What is this patient's weight in kilograms?

Remember 2.2 lb = 1 kg

Since 1 kg equals 2.2 lb, this problem can be solved in two ways. *Solution 1:* Using the ratio-proportion method,

$$\frac{x \text{ kg}}{134 \text{ lb}} = \frac{1 \text{ kg}}{2.2 \text{ lb}}$$

x kg = 60.909 kg, rounded to 60.9 kg

Solution 2: Using the dimensional analysis method,

134 lb $\times \frac{1 \text{ kg}}{2.2 \text{ lb}}$ = 60.909 kg, rounded to 60.9 kg

Example 5.1.12 A patient weighs 76 lb. What is this patient's weight in kilograms?

Since 1 kg equals 2.2 lb, this problem can be solved in two ways.

Solution 1: Using the ratio-proportion method,

$$\frac{x \text{ kg}}{76 \text{ lb}} = \frac{1 \text{ kg}}{2.2 \text{ lb}}$$

x kg = 34.545 kg, rounded to 34.5 kg

Solution 2: Using the dimensional analysis method,

76 lb
$$\times \frac{1 \text{ kg}}{2.2 \text{ lb}}$$
 = 34.545 kg, rounded to 34.5 kg

Although it is important to understand the conversion using both the ratioproportion and the dimensional analysis methods, a shorthand method for converting a patient's weight from pounds to kilograms is to divide the amount by 2.2 lb/kg. Similarly, you can convert a patient's weight from kilograms to pounds by multiplying it by 2.2 lb/kg.

Example 5.1.13 A patient weighs 58 kg. What is this patient's weight in pounds?

$$58 \text{ kg} \times 2.2 \text{ lb/kg} = 127.6 \text{ lb}$$

Check this answer by converting the answer from pounds back to kilograms.

$$127.6 \text{ lb} \times 1 \text{ kg}/2.2 \text{ lb} = 58 \text{ kg}$$

Example 5.1.14 A patient in the neonatal ICU weighs 1250 g. How many pounds is this?

First, convert the grams to kilograms.

1250 g = 1.25 kg

Second, convert kilograms to pounds.

pt

mL

$$1.25 \text{ kg} \times 2.2 \text{ lb/kg} = 2.75 \text{ lb}$$

Check the answer by converting the answer from pounds back to kilograms.

$$2.75 \text{ lb} \times 1 \text{ kg}/2.2 \text{ lb} = 1.25 \text{ kg}$$

Problem Set 5.1 _____

✓ Self-check your problem set work at www.emcp.com. 19. 120 mL = _____ fl oz 20. $\frac{1}{2}$ gal = _____ mL 21. 2 L = _____ pt 22. Convert the following commonly used volumes to milliliters. a. 3 tbsp = _____ mL b. 1 fl oz = _____ mL c. 2 fl oz = mLd. 3 fl oz = _____ mL e. 4 fl oz = _____ mL f. 5 fl oz = ____ mL g. 6 fl oz = _____ mL h. 7 fl oz = _____ mL i. 8 fl oz = _____ mL j. 12 fl oz = _____ mL k. 16 fl oz = _____ mL

Convert the following weights between household measure and the metric system.



Convert the given volumes within the household measure system.

1.	8 cups =	pt
2.	3 pt =	fl oz
3.	1 pt =	tbsp
4.	3 qt =	fl oz
5.	28 tsp =	fl oz
6.	1 pt =	qt
7.	6 cups =	tsp

Convert the given volumes between the household measure and metric systems.

8.	80 mL =	tbsp
		 -

- 9. 6 fl oz = _____ mL
- 10. 90 mL = _____ fl oz
- 12. 53 mL = _____ tsp

11. 800 mL =

- 13. 35 mL = _____ tsp
- 14. 10 L = _____ gal
- 14. 10 L = _____ gal
- 16. 15 mL = tsp

15. 4 tbsp = _____

- 17. 720 mL = _____ pt
- 18. 30 tsp = _____ mL

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- 27. 30 g = _____ lb
- 28. 0.8 oz = _____ g

Convert the following patient weights from pounds to kilograms.

29. 3.5 lb

- 30. 14 lb
- 31. 42 lb
- 32. 97 lb
- 33. 112 lb
- 34. 165 lb
- 35. 178 lb
- 36. 247 lb

Applications

In solving these problems, convert all quantities into the metric system even when the problem could be solved using only the household measure.

- 37. How many 1 tsp doses are in 2 pt, 6 fl oz?
- 38. How many 2 tsp doses are in 3 cups?
- 39. How many 1 tbsp doses are in 12 bottles containing 16 fl oz each?

- 40. How many 5 mL doses are in a 5 fl oz bottle?
- 41. How many 3 tsp doses are in 1 pt?
- 42. A dose of 1.5 fl oz is to be given three times daily. How many milliliters will be given in one day?
- 43. How many 1¹/₂ tsp doses are in an 8 fl oz bottle of cough syrup?
- 44. How many 1 tsp doses are in an 8 fl oz bottle of cough syrup?
- 45. A medication has 15 mg/mL. How many milligrams are given each day if the patient takes 1 tbsp tid?
- 46. A patient uses 1.5 fl oz of medication tid. How many milliliters are needed to give two doses?
- 47. How many 1 tsp doses are in two bottles containing 400 mL each?
- 48. If a medication is prescribed as 2 tsp/68 kg/day for an adult patient, how many doses would you get in a 300 mL bottle for a patient who weighs 180 lb?
- 49. A medication is prescribed as 1 tsp/20 kg/day for a pediatric patient. How many doses will a 4 fl oz bottle provide for a 52 lb patient?
- 50. A laxative medication is prescribed as 2 tbsp/50 kg. How long will a 12 fl oz bottle last for a patient who weighs 172 lb?

5.2 ORAL DOSES

It is important that pharmacy technicians be able to perform calculations involving oral dosing of medications. Oral medications are prescribed over other dose forms whenever possible and appropriate because oral medications typically are safe and cost-effective. Most prescriptions taken orally come in tablet or capsule form, but liquid forms are also common. Liquid medications are used most commonly by children and by adults with a disease that impairs the swallowing reflex. For all dosing calculations, accuracy of conversions from metric to the household system, dosing amounts, and dispensing amounts need to be checked for safety as well as billing purposes.

Determining Pediatric Doses Using Dosing Tables

Not all drugs that are safe and effective for adult use are appropriate for the pediatric population. In the past, formulas using the child's weight or age were used to reduce the normal adult dose to a smaller amount appropriate for the child patient. Today, prescribers are reluctant to use a medication for a child unless the pharmaceutical

Age	Dose
0–3 mo	40 mg
4–11 mo	80 mg
1–2 yr	120 mg
2–3 yr	160 mg
4–5 yr	240 mg
6–8 yr	320 mg
9–10 yr	400 mg
11 yr to adult	480 mg
adult	325–650 mg q4–6h or 1000 mg 3–4 times daily
adult maximum	4000 mg daily

Table 5.3Acetaminophen Dosing

manufacturer indicates the proper dose. A manufacturer will provide specific ageand/or weight-related prescribing guidelines for pediatric-appropriate doses of a medication as soon as its safety and effectiveness for the pediatric population have been established. These guidelines are provided in dosing tables as a dose range that is a function of the patient's weight and/or age. When a recommended dose is not provided, often the reason is that the Food and Drug Administration has not approved the particular drug for use in children. The dosing tables are satisfactory for many purposes, but when a more accurate calculation is needed, either the weight-based dosing method or the body surface area (BSA) dosing method, which were discussed in Chapter 4, must be used.

dosing table

a table providing dose recommendations based on the age and/or the weight of the patient; often used for determining the safe dose for a pediatric patient A typical **dosing table** includes an age range and/or a weight range with corresponding doses. Dosing tables are used for both oral liquids and solid dose forms, but oral liquids are easier for young patients to take and thus are more common.

Dosing tables often appear on over-the-counter (OTC) packaging for products used for children older than two years of age. For medications used for children under age two, the instruction "Consult your physician" appears. The table for children under age two is available to healthcare providers in pharmacies and physicians' offices. Physicians often instruct parents to purchase OTC medications for small children, so appropriate dosing instructions must be provided for these patients. Dosing may need to be translated from metric units to household measure units. The dosing tables in Tables 5.3, 5.4, and 5.5 will be used to complete the following examples.

Age	Weight	Dose
6–11 mo	12–17 lb	50 mg
12–23 mo	18–23 lb	75 mg
2–3 yr	24–35 lb	100 mg
4–5 yr	36–47 lb	150 mg
6–8 yr	48–59 lb	200 mg
9–10 yr	60–71 lb	250 mg
11 yr	72–95 lb	300 mg

Table 5.4 Ibuprofen Dosing

Table 5.5Pseudoephedrine Dosing

Age	Dose per Day
<2 yr	4 mg q6h
2–5 yr	15 mg q6h
6–12 yr	30 mg q6h
12 yr to adult	30–60 mg q6h

Example 5.2.1 A 12-month-old child weighing 22 lb is to receive one dose of acetaminophen. According to the dosing information in Table 5.3, what is an appropriate dose?

Since the acetaminophen dosing is by age, not weight, use dosing for one to two years. The appropriate dose would be 120 mg.

Example 5.2.2 A parent wants to give her 15-month-old child who weighs 21 lb an appropriate dose of OTC ibuprofen. The package provides the dosing information in Table 5.4. What is the appropriate dose?

The dose can be determined by either age or weight, and for this child, the dosing would be the same. The appropriate dose would be 75 mg.

Dispensing Liquid Medications

Many oral liquid medications are actually solids, suspended in a liquid. These suspensions are often indicated by the number of milligrams per milliliter. For example, amoxicillin is available as a 125 mg/5 mL oral liquid. In other words, 5 mL of the liquid contains 125 mg of amoxicillin.

Oral liquid medications are most often dosed by teaspoonsful, tablespoonsful, fluid ounces, or now, in the metric system, milliliters. Being able to convert accurately between household measure and the metric measure system is a necessary skill for the pharmacy technician. When calculating volumes of oral medication, it is best to convert everything into the same units. The preferred method is to use the metric system. Patient instructions will usually indicate teaspoonsful if the amount is an even half or full teaspoon. However, the instructions should indicate milliliters if the dose is not easily measured using the household system. An oral syringe, as shown in Figure 5.1 is helpful to patients dosing oral liquids using the metric or household systems.

Usually, an oral liquid medication's written prescription includes a specific volume to be given at each dose, as well as the total volume to be dispensed. It is important to have a working knowledge of the volumes of oral liquid medications that are commonly prescribed. Most frequently, the dosage amount is between 2 mL and 60 mL, or roughly ½ tsp to 2 fl oz. Oral doses are often verified in the pharmacy by means of reference and established protocols.



Figure 5.1

Oral Syringe This oral syringe is marked with both household and metric units of measure. **Example 5.2.3** The pharmacy receives a prescription for 100 mg of amoxicillin to be taken three times daily for 10 days. The pharmacy has a 150 mL bottle of 125 mg/5 mL amoxicillin. How many milliliters of the suspension will be dispensed, and what will the patient's dosing instructions on the label say?

Determine what quantity of suspension contains 100 mg amoxicillin. This can be solved in two ways.

Solution 1: Using the ratio-proportion method,

$$\frac{x \text{ mL}}{100 \text{ mg}} = \frac{5 \text{ mL}}{125 \text{ mg}}$$
$$x \text{ mL} = 4 \text{ mL}$$

Solution 2: Using the dimensional analysis method,

$$100 \text{ mg} \times \frac{5 \text{ mL}}{125 \text{ mg}} = 4 \text{ mL}$$

Using the amount determined for a single dose, determine the total amount of suspension to be dispensed for 10 days.

$$4 \text{ mL} \times 3 \text{ doses/day} \times 10 \text{ days} = 120 \text{ mL}$$

The patient's instructions will say, "Take 4 mL three times daily for 10 days." The patient will need a dosing syringe to dispense the required amount of medication.

Example 5.2.4 If a 12 fl oz bottle of mouthwash contains 0.75 g of the active ingredient, how many milligrams will be in a 1 tbsp dose?

Begin the problem by converting all of the household measure units to metric units.

$$12 \text{ fl oz} = 360 \text{ mL}$$

1 tbsp = 15 mL

Also, convert 0.75 g to 750 mg.

Using these converted values, this problem can be solved in two ways.

Solution 1: Using the ratio-proportion method,

$$\frac{x \text{ mg}}{15 \text{ mL}} = \frac{750 \text{ mg}}{360 \text{ mL}}$$
$$x \text{ mg} = 31.25 \text{ mg}$$

Solution 2: Using the dimensional analysis method,

$$15 \text{ mL} \times \frac{750 \text{ mg}}{360 \text{ mL}} = 31.25 \text{ mg}$$

Example 5.2.5 The pharmacy receives a prescription for amoxicillin suspension 1 g bid. The pharmacy has a supply of amoxicillin 250 mg/5 mL. How many milliliters are in one dose? What will the patient's dosing instructions on the bottle label say?

First determine how many milligrams are needed for one dose.

$$1 g = 1000 mg$$

Then determine what quantity of suspension contains 1000 mg.

Solution 1: Using the ratio-proportion method,

$$\frac{x \text{ mL}}{1000 \text{ mg}} = \frac{5 \text{ mL}}{250 \text{ mg}}$$

$$x \text{ mL} = 20 \text{ mL}$$

Solution 2: Using the dimensional analysis method,

$$1000 \text{ mg} \times \frac{5 \text{ mL}}{250 \text{ mg}} = 20 \text{ mL}$$

Translate the amount in milliliters to teaspoonsful: 5 mL = 1 tsp, so 20 mL = 4 tsp. The patient's instructions will say, "Take 20 mL (or 4 teaspoonsful) two times daily."

Example 5.2.6 A patient is to take 7 mL of amoxicillin 250 mg/5 mL. How many milligrams are present in one dose?

Solution 1: Using the ratio-proportion method,

$$\frac{x \text{ mg}}{7 \text{ mL}} = \frac{250 \text{ mg}}{5 \text{ mL}}$$

$$x \text{ mg} = 350 \text{ mg}$$

Solution 2: Using the dimensional analysis method,

$$7 \text{ mL} \times \frac{250 \text{ mg}}{5 \text{ mL}} = 350 \text{ mg}$$

Example 5.2.7 A patient is taking 4 tsp of diphenhydramine elixir at bedtime. He wishes to take oral tablets instead of the elixir. The 12.5 mg/5 mL elixir comes in a 4 fl oz bottle and is 14% alcohol. The 25 mg tablets come in a 100-count bottle. How many tablets will he need to take to equal the dose in the 4 tsp of elixir?

Begin by determining the milligrams per dose of the oral liquid using one of the following methods.

Solution 1: Using the ratio-proportion method,

$$\frac{x \text{ mg}}{20 \text{ mL}} = \frac{12.5 \text{ mg}}{5 \text{ mL}}$$

x mg = 50 mg

Solution 2: Using the dimensional analysis method,

$$20 \text{ mL} \times \frac{12.5 \text{ mg}}{5 \text{ mL}} = 50 \text{ mg}$$

Now, compare the milligrams to the alternative tablet product.

Solution 1: Using the ratio-proportion method,

$$\frac{x \text{ tablets}}{50 \text{ mg}} = \frac{1 \text{ tablet}}{25 \text{ mg}}$$

$$x$$
 tablet = 2 tablets

Solution 2: Using the dimensional analysis method,

$$50 \text{ mg} \times \frac{1 \text{ tablet}}{25 \text{ mg}} = 2 \text{ tablets}$$

Since the patient's dose is 50 mg, and the tablets come in 25 mg, he will need to take two tablets to provide the proper amount of the drug.

Example 5.2.8 How many milligrams of medication are in 1 tbsp of medication that contains 50 mg/tsp?

Convert both volumes to the metric system using the following values from Table 5.2.

1 tbsp = 15 mL1 tsp = 5 mL

Using these equivalences, this problem can be solved in two ways.

Solution 1: Using the ratio-proportion method,

$$\frac{x \text{ mg}}{15 \text{ mL}} = \frac{50 \text{ mg}}{5 \text{ mL}}$$
$$x \text{ mg} = 150 \text{ mg}$$

Solution 2: Using the dimensional analysis method,

$$15 \text{ mL} \times \frac{50 \text{ mg}}{5 \text{ mL}} = 150 \text{ mg}$$

Calculating the Amount to Dispense

How long the amount of medication dispensed will last the patient must be determined when the prescription is entered into the patient's computerized record. Pharmacies typically bill liquid medications by the milliliter and solid medications by the unit such as a tablet. Insurance companies require claims for reimbursement for prescription drugs to include the amount of drug dispensed. This amount is calculated by multiplying the amount of drug needed for a single day by the number of days of treatment. Not only is this amount needed for insurance purposes, but the pharmacy also needs to ensure that the patient is receiving enough medication to last for the duration of treatment, whether the medication is in liquid or solid form.

Example 5.2.9 A patient is taking 2 tsp of medication every 8 hours. He has a 6 fl oz bottle of medication. How much medication will the patient take in one day, and how many days will the medication last?

Begin by converting all of the stated volumes to the metric system using the conversion values in Table 5.2.

1 tsp = 5 mL; therefore, 2 tsp/dose = 10 mL/dose 1 fl oz = 30 mL; therefore, 6 fl oz/bottle = 180 mL/bottle

Next, determine how much medication is needed for one day of treatment. The dose is every 8 hours, and there are 24 hours in a day, so

24 hr/day \times 1 dose/8 hr = 3 doses/day 3 doses/day \times 10 mL/dose = 30 mL/day

Finally, determine the number of days the medication will last.

180 mL/bottle \times 1 day/30 mL = 6 days/bottle

Example 5.2.10 A patient is to take 1 tsp of a medication twice daily, and she has a 4 fl oz bottle of medication. How much medication will the patient take in a day, and how many days will the medication last?

Begin by converting all of the stated volumes to the metric system using the conversion values in Table 5.2.

1 tsp = 5 mL; therefore, 1 tsp/dose = 5 mL/dose 1 fl oz = 30 mL; therefore, 4 fl oz/bottle = 120 mL/bottle Next, determine how much medication is needed for one day. The dose is taken twice daily, so there are 2 doses/day.

 $2 \text{ doses/day} \times 5 \text{ mL/dose} = 10 \text{ mL/day}$

Finally, determine the number of days the medication will last.

 $120 \text{ mL/bottle} \times 1 \text{ day/10 mL} = 12 \text{ days/bottle}$

Example 5.2.11 A patient has a prescription that says the following: "Take Magic Cough syrup 1–2 tsp every 4–6 hours prn cough. Disp: 8 fl oz." How many days will the cough syrup last?

Begin by converting all of the stated volumes to the metric system using the conversion values in Table 5.2.

1 tsp = 5 mL; therefore, 1-2 tsp/dose = 5-10 mL/dose 1 fl oz = 30 mL; therefore, 8 fl oz/bottle = 240 mL/bottle

Next, determine how much medication is needed for one day. Assume that the patient will take as much medication as possible as frequently as allowed. This will give the minimum number of days the medication will last.

There are 24 hours in a day, so if the patient takes a dose every 4 hours,

24 hr/day \times 1 dose/4 hr = 6 doses/day 6 doses/day \times 10 mL/dose = 60 mL/day

Finally, determine the number of days the medication will last.

240 mL/bottle \times 1 day/60 mL = 4 days/bottle

Note that the bottle will last longer if the patient takes 1 tsp every six hours.

Some prescriptions do not come with explicit instructions as to how much medication is to be dispensed. The prescription may say, "Take 2 tsp every morning for 10 days." The quantity indicated on the prescription may also say "QS," which means to dispense a "quantity sufficient" to meet the needs of the patient with the instructions given. When the duration of treatment is indicated, the amount of medication needed for a single day and the total amount to be dispensed can be calculated as demonstrated in the following examples.

Example 5.2.12 A patient comes to the pharmacy with a prescription that does not indicate a quantity. It says, "Amoxicillin 125 mg/5 mL, 1 tsp tid for 10 days." What is the total amount of medication to be dispensed?

Begin by converting all of the dosage volumes to the metric system using the conversion values in Table 5.2.

1 tsp = 5 mL; therefore, 1 tsp/dose = 5 mL/dose

Next, determine how much medication is needed for one day. Because "tid" means three times daily,

 $5 \text{ mL/dose} \times 3 \text{ doses/day} = 15 \text{ mL/day}$

Finally, determine the amount of medication to dispense.

 $15 \text{ mL/day} \times 10 \text{ days} = 150 \text{ mL}$

Example 5.2.13 A patient is to take 2 tsp of a medication four times daily for 5 days. How much will be needed?

Begin by converting all of the dosage volumes to the metric system using the conversion values in Table 5.2.

1 tsp = 5 mL; therefore, 2 tsp/dose = 10 mL/dose

Next, determine how much medication is needed for one day.

 $10 \text{ mL/dose} \times 4 \text{ doses/day} = 40 \text{ mL/day}$

Finally, determine the amount of medication to dispense.

 $40 \text{ mL/day} \times 5 \text{ days} = 200 \text{ mL}$

The same procedure is used when calculating the number of tablets needed to fill a prescription or the number of days a given prescription will last.

Example 5.2.14 A patient has brought in a prescription for an antidiabetic drug. The prescription says, "Take 2 tablets before breakfast, 1 before lunch and supper, and 1 at bedtime." Determine the quantity needed for a 30-day supply.

Begin by determining the number of tablets required for one day.

2 before breakfast + 1 before lunch + 1 before supper + 1 at bedtime = 5

The patient will take 5 tablets/day, so a 30-day supply wil be

5 tablets/day \times 30 days = 150 tablets

Example 5.2.15 A patient is to take a prescription for prednisone that uses a tapered dosing schedule. Determine the number of 5 mg tablets needed.



Prednisone 5 mg Oral Tablets

Take 40 mg for 2 days Take 35 mg for 1 day Take 30 mg for 2 days Then decrease by 5 mg each day until gone. In this problem, the number of tablets taken each day changes, so the most straightforward way to determine the number of tablets needed is to make a list of how many tablets the patient will take each day of treatment.

Day 1: 40 mg/day \div 5 mg/tablet = 8 tablets
Day 2: 40 mg/day \div 5 mg/tablet = 8 tablets
Day 3: 35 mg/day \div 5 mg/tablet = 7 tablets
Day 4: 30 mg/day \div 5 mg/tablet = 6 tablets
Day 5: 30 mg/day \div 5 mg/tablet = 6 tablets
Day 6: 25 mg/day \div 5 mg/tablet = 5 tablets
Day 7: 20 mg/day \div 5 mg/tablet = 4 tablets
Day 8: 15 mg/day \div 5 mg/tablet = 3 tablets
Day 9: 10 mg/day \div 5 mg/tablet = 2 tablets
Day 10: 5 mg/day \div 5 mg/tablet = 1 tablet

The sum of the daily totals is 50 tablets for a 10-day regimen.

Problem Set 5.2.

✓ Self-check your problem set work at www.emcp.com.

Aspirin is typically contraindicated in children. If a child is unable to take acetaminophen or ibuprofen, however, aspirin may be used. Additionally, aspirin is indicated for some conditions in children such as antiplatelet therapy and antirheumatic therapy. Determine the milligram dose of aspirin every four hours for each child in the following questions using the dosing table provided.

	As	pirin		1. 4 years
Age (years)	Weight	kg	Dose (mg every 4 hr)	2. 7 years
2–3	24–35	10.6–15.9	162	2 10
4–5	36–47	16–21.4	243	3. 10 years
6–8	48–59	21.5–26.8	324	4 14
9–10	60–71	26.9–32.3	405	4. 14 years
11	72–95	32.4–43.2	486	
12–14	≥96	≥43.3	648	

Levothyroxine is indicated for children with hypothyroidism. Many states require infants to be tested for hypothyroidism shortly after birth so that therapy can begin immediately if needed. In adult patients, the dose is adjusted up or down based on blood titers and clinical signs and symptoms. Newborn patients are more difficult to assess, so a standard dosing table based on kilograms has been developed. Determine the daily dose of levothyroxine for each child in the following questions using the dosing table provided.

	Levothyroxine	
Age	Normal range per day (mg)	Daily dose per kg (mg)
0–<6 mo	7.5–30	2.4–6
6–<12 mo	30–45	3.6–4.8
1–5 yr	45–80	3–3.6
6–12 yr	60–90	2.4–3
>12 yr	>90	1.2–1.8

Applications

Calculate the following using either the dimensional analysis method or the ratio-proportion method.

- 9. A patient takes 1 tsp daily of a medication with the concentration 80 mg/15 mL. How many milligrams are in one dose?
- 10. A patient needs to have 60 mg of medication, and the drug has the concentration120 mg/5 mL. How many teaspoonsful will the patient take?
- 11. If there are 24 mg in a teaspoonful of liquid medication, how many grams are in 8 fl oz?
- 12. How many milligrams are in 4 fl oz of liquid medication with the concentration of 65 mg/tbsp?
- 13. How many milligrams are in a 2 tsp dose of liquid medication if there are 2.5 g in 2 fl oz?
- 14. How many milligrams are in a 1 tbsp dose of liquid medication if there are 260 mg in 600 mL?

- 15. A prescription is received for Drug YXZ to be taken 2 tsp bid. The pharmacy's supply of the drug is 25 mg/tsp. How many grams are needed to prepare 20 fl oz?
- 16. A prescription is received for Drug YXZ to be taken 1 tbsp qam. The pharmacy's supply of the drug is 30 mg/15 mL. How many milligrams are in a 1 tsp dose?
- 17. A prescription is received for Drug YXZ to be taken 1 tbsp bid. The pharmacy's supply of the drug is 40 mg/mL. How many grams of medication are needed to prepare 1 pint?
- A patient is taking ³/₄ tsp of an antibiotic suspension three times a day.
 - a. How long will a 150 mL bottle of antibiotic suspension last this patient?
 - b. How many milliliters will be left after 10 days?

- 19. An antibiotic suspension is available in 80 mL, 150 mL, and 200 mL bottles.
 - a. What size bottle of antibiotic suspension will a patient need in order to take 1 tsp twice daily for 14 days?
 - b. How much will remain after 14 days?
- 20. How many days will a 12 fl oz bottle last if a patient takes 1 tbsp tid?
- 21. A patient is on an alternate-day therapy consisting of 2 tsp of a medication one day and 1 tbsp the next. How long will a 300 mL bottle last?
- 22. If there are 25 mg in a tablespoonful of liquid medication, how many grams are in 20 fl oz?
- 23. A patient uses an antacid 1 fl oz tid and hs. How many 12 fl oz bottles will this patient need to last 14 days?
- 24. A mother of two children with poison ivy needs to know how many 4 fl oz bottles of antihistamine to purchase to last 4 days. One child takes 1 tsp tid and the other takes 2 tsp qid.
- 25. How many prednisone 5 mg tablets are needed to fill the following prescription?



Prednisone 5 mg

Take 4 tab \times 2 days Take 3 tab \times 2 days Take 1 tab \times 1 day

26. How many milliliters of nystatin must be dispensed for the following prescription?



Nystatin Suspension

use 1 mL in each cheek pouch q3h, dispense qs 10 days

- 27. There are 25 mg in a teaspoonful of medication. You are dispensing 12 fl oz.
 - a. How many milligrams will be in the bottle?
 - b. If the patient is to get a total of 9 g for a full therapy program, how many refills will be needed?
- 28. For the prescription below, how many fluid ounces of nystatin must be dispensed?



Nystatin Oral Suspension

Take # teaspoonsful 3 times daily for 15 days

29. A prescription received reads, "Take 2 tbsp of an oral suspension three times daily for 20 days." How many milliliters should be dispensed?

Use the label below to answer the following questions.



- 30. How many milligrams are in ³/₄ tsp?
- 31. How many milligrams are in $1\frac{1}{2}$ tsp?
- 32. How many milliliters are needed to provide 125 mg?
- 33. How many milliliters are needed to provide 500 mg?

34. The following prescription for buttocks cream has been brought into the compounding pharmacy for compounding on January 3, 2007.



Aquaphor nystatin cream Desitin ointment Combine in three equal parts for a total of 180 g. The compound expires in six months.

- a. How much of each ingredient will you use?
- b. What size of ointment jar (ounces) will you use to store the compound?
- c. What expiration date will you put on the compound?

35. The following prescription for absolute (dehydrated) alcohol has been brought into the compounding pharmacy. How many syringes will be sent to the floor?



- 1. Obtain a 12 fl oz bottle of absolute alcohol from the narcotics cabinet.
- 2. Filter through a 0.2 micron filter.
- 3. Send to the floor in 60 mL syringes.

5.3 TEMPERATURE MEASUREMENT

Celsius

a thermometric scale in which 100° is the boiling point for water and 0° is the freezing point for water

Fahrenheit

a thermometric scale in which 212° is the boiling point for water and 32° is the freezing point for water Temperature is a factor in dealing with chemical compounds. Two temperature scales are used to measure temperatures: the **Celsius** system and the **Fahrenheit** system. Both were developed almost 300 years ago.

Understanding Temperature Measurement Systems

Daniel Fahrenheit, a German physicist, invented an alcohol thermometer in 1709, a mercury thermometer in 1714, and a temperature scale in 1724. This temperature scale was based on ice water and salt as a low point (0° F) and the human body temperature as the high point (100° F). Fahrenheit used his own body temperature as the standard, but in the years that followed, scientists learned that body temperature varied. Therefore, the Fahrenheit scale was keyed to water for both the low point and the high point. The freezing point of water at sea level was set at 32° F, and the boiling point of water at sea level was set at 212° F.

About 1742 Anders Celsius, a Swedish astronomer, developed what became the Celsius or centigrade thermometer. In Celsius measurement, water freezes at 0° C and boils at 100° C.

Converting Celsius and Fahrenheit Temperatures

Both measurement systems are in common use today. Pharmacy personnel must know the two systems and be able to convert back and forth between them. The formulas for converting from one temperature measuring system to another are based on the fact that each Celsius degree equals 1.8 or $\frac{9}{5}$ of each Fahrenheit degree. The conversion formulas are as follows.

Celsius to Fahrenheit:

$${}^{\circ}F = \left(\frac{9}{5} \times {}^{\circ}C\right) + 32$$

or

$$^{\circ}F = (1.8 \times ^{\circ}C) + 32$$

Fahrenheit to Celsius:
$$^{\circ}C = \frac{5}{9} (^{\circ}F - 32)$$

or

$$^{\circ}C = \frac{^{\circ}F - 32}{1.8}$$

$$\left(\frac{9}{5} \times 40\right) + 32 = 72 + 32 = 104^{\circ} \text{ F}$$

or

 $(1.8 \times 40) + 32 = 72 + 32 = 104^{\circ} F$

Example 5.3.2 Convert 82° F to its equivalent in Celsius.

$$\frac{5}{9}(82 - 32) = \frac{5(50)}{9} = 27.777^{\circ}$$
 C, rounded to 27.8° C

or

$$\frac{82 - 32}{1.8} = \frac{50}{1.8} = 27.777^{\circ} \text{ C, rounded to } 27.8^{\circ} \text{ C}$$

Completing a Temperature Chart

Often medication comes with specific instructions regarding refrigeration. To store medication under "refrigerated" conditions means to store it between 2° C and 5° C (35.6°–41° F). It is very important that temperatures of refrigerators for storing medications be monitored daily.

Most pharmacies have specific charts for recording temperatures of refrigerators and freezers used for storage. See Figure 5.2 and Figure 5.3 for examples of these charts.

Month. 10 9 8-7-**Degrees Celsius** 6-5 4-3-2 1 0-7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 2 3 5 6 4 Days of Month Graph refrigerator temperature on chart once daily. If temperature is less than 2 degrees or greater than 5 degrees, check the thermostat setting and correct as necessary. Recheck temperature in one hour, and if temperature is out of stated range, contact maintenance for evaluation and repair. Contact the appropriate area for storage of supplies. Documentation of Repairs: _ Documentation of Cleaning: _

Figure 5.2 Refrigerator Temperature Chart (Celsius)



Chart (Fahrenheit)



Problem Set 5.3.

		0
Convert the following Fahrenheit temperatures to	13.	27° C
1 0° E	14.	31° C
	15.	38° C
2. 23° F	16.	40° C
3. 36° F	17.	49° C
4. 40° F	18.	63° C
5. 64° F	19.	99.8° C
6. 72° F	20.	101.4° C
7. 98.6° F		

- 8. 100.5° F
- 9. 102.8° F
- 10. 105° F

Applications 21. When making a mixture, you are instructed to

- Convert the following Celsius temperatures to Fahrenheit.
- 11. -15° C
- 12. 18° C

5.3 Temperature Measurement 119

heat the mixture to 130° C. You have only a

Fahrenheit thermometer. What is the equiva-

lent temperature on the Fahrenheit scale?

✓ Self-check your problem set work at www.emcp.com.

22. The following prescription is sent to the hospital pharmacy.



Alteplase in a Syringe

alteplase, 2 mg/mL 50 mg sterile water for injection 25 mL

- 1. Reconstitute the alteplase with SWFI.
- 2. Draw up 5 mL in 10 mL syringes.
- 3. Label syringes with contents, concentration, and date of preparation.
- 4. Place syringes in freezer. They should be frozen with the premix piggybacks.
 The syringes are stable for six months, or 180 days, -20° C.
- a. What is the Fahrenheit temperature at which you should store this product?
- b. What expiration date should you put on this compound if today is February 1, 2007?

- 23. A prescription is sent to the hospital pharmacy requesting a substance to be heated in a 300° F oven for 12–18 hours. At what Celsius temperature does the oven need to be set?
- 24. Convert the following refrigerator temperatures and log them on the Celsius chart. Note any temperatures out of the safe range.

Date	Degrees F	Degrees C
5/5	36.1	a.
5/6	37.7	b.
5/7	39.0	с.
5/8	35.7	d.
5/9	36.9	e.
5/10	34.9	f.
5/11	36.4	g.
5/12	36.8	h.
5/13	35.5	i.
5/14	38.8	j.



25. Convert the following refrigerator temperatures and log them on the Fahrenheit chart. Note any temperatures out of the safe range.

Date	Degrees C	Degrees F
7/12	1.8	a.
7/13	3.1	b.
7/14	2.8	с.
7/15	3.0	d.
7/16	4.5	e.
7/17	3.2	f.
7/18	3.9	g.
7/19	2.5	h.
7/20	4.1	i.
7/21	4.7	j.





Convert the given volumes within the household measure system.

- 1. 3 tsp = _____ fl oz
- 2. 8 fl oz = _____ tsp

Convert the given volumes between the household measure and metric systems.

- 3. 8 mL = _____ tsp
- 4. 8 fl oz = _____ mL

Answer the following questions.

- 5. How many kilograms does a patient weighing 192 lb weigh?
- 6. How many 5 mL doses are in a 5 fl oz bottle of antibiotic preparation?
- 7. How many 3 tsp doses are in 500 mL?

Determine the dose of acetaminophen for each of the following children using the dose table provided.

Acetaminophen				
Age	Dose (mg)	Age	Dose (mg)	
0–3 mo	40	6–8 yr	320	
4–11 mo	80	9–10 yr	400	
1–<2 yr	120	11 yr	480	
2–3 yr	160	12–14 yr	640	
4–5 yr	240	>14 yr	650	

- 8. 22 lb, 11 months
- 9. 21 lb, 15 months

Calculate the following using either the dimensional analysis or the ratio-proportion method.

- 10. If there are 125 mg in a teaspoonful of liquid medication, how many grams are in 8 fl oz?
- 11. If there are 62.5 mg in a teaspoonful of liquid medication, how many milligrams are in a tablespoonful?
- 12. How many milligrams are in a teaspoonful of liquid medication if there are 75 mg in a tablespoonful?
- 13. A prescription is received for Drug YXZ to be taken 1 tsp tid. The pharmacy's supply of the drug is 10 mg/200 mL.
 - a. How many milligrams are in a 1 tsp dose?
 - b. What is a day's dose in milligrams?
- 14. How long will a 4 fl oz bottle of cough syrup last if the child is using 2.5 mL every 8 hours?
- 15. How many prednisone 10 mg tablets are needed to fill the following prescription?



Prednisone 10 mg

Take 80 mg \times 2 days Take 70 mg \times 1 day Take 60 mg \times 2 days Take 50 mg \times 1 day Take 40 mg \times 2 days Take 30 mg \times 1 day Take 20 mg \times 2 days Take 10 mg \times 1 day Take 5 mg \times 2 days Use the label to answer the following questions.



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- 16. How many milligrams are in $\frac{1}{2}$ tsp?
- 17. How many milligrams are in ³/₄ tsp?

- 18. How many milliliters are needed to provide 40 mg?
- 19. How many milliliters are needed to provide 5 mg?
- 20. Convert the following temperatures and log them on the Celsius chart.

Date	Degrees F	Degrees C
6/21	43	a.
6/22	40	b.
6/23	41	с.
6/24	38	d.
6/25	39	e.
6/26	40.5	f.
6/27	37	g.



