2 Organizing Mathematics for Medication Administration

Introduction

Utilizing an organized mathematical method for calculating medication dosages will assist healthcare professionals in administering drugs safely. The three methods discussed in this chapter are ratio and proportion, dosage formula, and dimensional analysis. The following pretest will assist in determining your proficiency in using the three methods.

Pretest

Solve the following equations. Be sure to label all answers, and remember to show all work and to proof all answers.

1. $\frac{1 \text{ kg}}{2.2 \text{ lb}} = \frac{x \text{ kg}}{540 \text{ lb}}$

   $x =$ _____

2. $\frac{1 \text{ g}}{1000 \text{ mg}} = \frac{x \text{ g}}{5600 \text{ mg}}$

   $x =$ _____

3. $\frac{1 \text{ grain}}{60 \text{ milligrams}} = \frac{x \text{ grains}}{15 \text{ milligrams}}$

   $x =$ _____

4. 15 ml : 1 tsp :: x ml : 7.5 tsp

   $x =$ _____

5. 1 milligram : grain $^1/_{60}$ :: x milligrams : grain $^1/_{10}$

   $x =$ _____

6. 100 mg : 1 ml :: x mg : 3.5 ml

   $x =$ _____

7. $x \text{ tablets} = \frac{1 \text{ tablet}}{0.25 \text{ milligram}} \times \frac{1.25 \text{ milligram}}{1}$

   $x =$ _____

8. $x \text{ ml} = \frac{5 \text{ ml}}{100 \text{ mg}} \times \frac{250 \text{ mg}}{1}$

   $x =$ _____

9. $x \text{ tablets} = \dfrac{1 \text{ tablet}}{50 \text{ milligrams}} \times \dfrac{25 \text{ milligrams}}{1}$

   $x =$ _____

10. $x \text{ ml} = \dfrac{10 \text{ milliliters}}{100{,}000 \text{ units}} \times \dfrac{1{,}000{,}000 \text{ units}}{1}$

    $x =$ _____

Approaches for Solving Mathematical Equations

Healthcare personnel approach mathematical equations in a logical and organized fashion in order to keep clients assigned to their care safe. This chapter discusses in detail the three most common methods for organizing medication calculations:

1. Ratio and proportion method
2. Dosage formula method
3. Dimensional analysis method

One constant with all three techniques is the need to know the equivalents of the units of measurement. Memorization of these mathematical facts is essential regardless of the process selected to solve mathematical equations.

Medication Administration Tip

Mathematical conversion between systems requires a comparison of the system of measurement ordered to the system of measurement available (Potter & Perry, 2005, p. 835).

Medication Administration Tip

Pharmacokinetics is the study of how medications enter the body, reach the point of action, and are metabolized and excreted by the body (Potter & Perry, 2005, p. 825).

Ratio and Proportion Method

The ratio and proportion method for calculating mathematical equations has been in use for many years. Some consider the method to be antiquated, and others regard it as a comfortable fit. It is mainly used to convert units of measurement within the same system and between systems of measurement. There are two acceptable approaches for setting up a ratio and proportion problem.

The first approach is to cross-multiply and solve for x. Given

$$\frac{A}{B} = \frac{C}{D}$$

cross-multiply and solve for x:

$$A \times D = B \times C$$

EXAMPLE:

$$\frac{1 \text{ tablet}}{500 \text{ mg}} = \frac{x \text{ tablets}}{1000 \text{ mg}}$$

cross-multiply: 1 tablet × 1000 mg = x tablets × 500 mg
solve for x: 1000 = 500x = 2 tablets

The ratio and proportion equation is designed to solve for the unknown variable or x, which is placed in the numerator position. When setting up the equation, remember that like units of measurement must occur across from each other.

EXAMPLE:

mg (the numerator) is to ml (the denominator) as mg (the numerator) is to ml (the denominator).

The second approach is to multiply the means (the middle) and the extremes (the ends) and to solve for x. Given

$A : B :: C : D$

Multiply the means ($B \times C$) and the extremes ($A \times D$) and solve for x. This variation is used less than the first but is just as accurate.

EXAMPLE:

1 tablet : 500 mg :: x tablets : 1000 mg

Multiply: 500 x = 1000
Solve for x: x = 2 tablets

When you set up the equation to multiply the means and the extremes, the units of measurement appear in the same order on both sides of the equation: mg × ml on one side and mg × ml on the other.

Medication Administration Tip

Cross-multiply:	*Means:*
$\frac{\text{mg}}{\text{ml}} = \frac{\text{mg}}{\text{ml}}$	mg : ml :: mg : ml

No matter which version of ratio and proportion you choose to use, you must know the equivalents for the different systems of measurement (see Chapter 1).

Medication Administration Tip

To convert milligrams to grams, divide by 1000 or simply move the decimal point three spaces to the left (Potter & Perry, 2005, p. 835).

Practice Questions for Ratio and Proportion

Solve for x. Be sure to label the answer, show all work, and proof all answers.

1. 60 milligrams : grain I :: x milligrams : grain XVI$\overline{\text{ss}}$

   x = _____

2. 1000 mg : 1 g :: x mg : 3 g

   x = _____

3. $\frac{1000 \text{ ml}}{1 \text{ L}} = \frac{x \text{ ml}}{0.5 \text{ L}}$

   x = _____

4. $\frac{15 \text{ ml}}{1 \text{ tbs}} = \frac{x \text{ ml}}{5 \text{ tbs}}$

   x = _____

5. $\frac{0.125 \text{ milligram}}{1 \text{ tablet}} = \frac{x \text{ milligrams}}{2 \text{ tablets}}$

   x = _____

Dosage Formula Method

The dosage formula method for calculating medication administration is an alternative to the less used ratio and proportion method. The three most commonly used formulas for medication and intravenous fluid administration are

- $\frac{D}{H} \times Q = X$
- $\frac{V}{T} \times DF = R$
- $\frac{TV}{TT} = HR$

EXAMPLE:

MD orders 1000 mg of a medication. On hand are 500 mg tablets.

Set up: $\frac{1000 \text{ mg}}{500 \text{ mg}} \times 1 \text{ tablet}$

Solve: $\frac{1000}{500} = 2 \text{ tablets}$ ■

OR

EXAMPLE:

MD orders 1 gram of a medication. On hand are 500 mg tablets.

Set up: $\frac{1 \text{ gram}}{500 \text{ mg}} \times 1 \text{ tablet}$

Solve: $\frac{1 \text{ gram}}{500 \text{ mg}} = \frac{1000 \text{ mg}}{500 \text{ mg}} = 2 \text{ tablets}$

*Note: The dose ordered must be converted to the dose on hand in order to solve the equation. In this example, the 1 gram was converted to 1000 mg because the tablets on hand were in mg. ■

EXAMPLE:

MD orders 1000 ml to run in 8 hours. Drop factor on the tubing is 10.

Set up: $\frac{1000 \text{ ml}}{8 \text{ hours}} \times \frac{10}{60}$

Solve: $\frac{10{,}000}{480} = 20.8 = 21 \text{ gtts/min}$

Medication Administration Tip

Here is what the dosage formula method abbreviations mean:

D = doctor's order
H = on hand/available
Q = quantity
X = dose to be administered
V = volume to be infused
T = time needed to infuse intravenous fluid
DF = drop factor (C = calibration may also be used.)
R = rate of intravenous fluid administration in gtts/min
TV = total volume
TT = total time
HR = rate of intravenous fluid administration in ml/hr

Medication Administration Tip

To convert liters to milliliters, multiply by 1000 or simply move the decimal point three spaces to the right (Potter & Perry, 2005, p. 835).

To use the dosage formula method, select the formula required to make the necessary calculation, then substitute the letters for the values pertinent to the equation.

Medication Administration Tip

A basic formula to use when calculating solid or liquid medication dosages is (Potter & Perry, 2005, p. 835):

$$\frac{\text{Dose ordered}}{\text{Dose on hand}} \times \text{Amount on hand} = \text{Amount to administer}$$

Practice Questions for Dosage Formula

Solve for dosage. Be sure to label the answer, show all work, and proof all answers.

1. $\frac{500 \text{ mg}}{1 \text{ g}} \times \frac{5 \text{ ml}}{1} =$ _____

2. $\frac{120 \text{ milligrams}}{\text{grain I}} \times \frac{1 \text{ tablet}}{1} =$ _____

3. $\frac{100{,}000 \text{ units}}{1{,}000{,}000 \text{ units}} \times \frac{10 \text{ milliliters}}{1} =$ _____

Medication Administration Tip

Medications, such as heparin, penicillin, and insulin, are supplied in units. There is no conversion to be completed as the unit is a unique measurement.

4. $\frac{1 \text{ gram}}{500 \text{ milligrams}} \times \frac{1 \text{ capsule}}{1} =$ _____

5. $\frac{32 \text{ units}}{100 \text{ units}} \times \frac{1 \text{ milliliter}}{1} =$ _____

Dimensional Analysis Method

The dimensional analysis method is a widely used alternative to the ratio and proportion and the dosage formula methods. There are no formulas to memorize with dimensional analysis, which is often referred to as logical and commonsensical. The steps to using the dimensional analysis method are as follows:

- *Step 1:* Determine the unit of measurement for the unknown in the equation. This value, usually written as x, may be expressed in terms of tablets, capsules, milligrams, milliliters, or any other unit of measurement. The labeled x is then written to the left of the equation and followed by an equals (=) sign.
- *Step 2:* Set up the rest of the equation to the right of the equals sign. This allows you to determine the dosage. In other words, the amount to give equals (=) what is on hand or available × what is desired/ordered.

EXAMPLES:

$$x \text{ tablets} = \frac{\text{On-hand tablets}}{\text{Milligrams}} \times \frac{\text{Milligrams}}{1}$$

$$x \text{ milliliters} = \frac{\text{On-hand milliliters}}{\text{Grains}} \times \frac{\text{Grains}}{1}$$

- *Step 3:* Once you have the method written up, cancel out all units of measurement except the unknown x. Solve the equation. Your answer is with the only remaining unit of measurement on the left side of the equation. The numerator for the desired dose (the unknown) and for the on-hand amount must be the same.

EXAMPLE:

$$x \text{ tablets} = \frac{1 \text{ tablet}}{500 \text{ mg}} \times 1000 \text{ mg}$$

Solve for x: $x \text{ tablets} = \frac{1000}{500} = 2 \text{ tablets}$

Medication Administration Tip

Forms of oral medications include tablets (scored and unscored), capsules, gelatin-coated liquid, extended-release capsules, and enteric-coated tablets (Potter & Perry, 2005, p. 823).

Practice Questions for Dimensional Analysis

Solve for x. Remember to label the answer, show all work, and proof all answers.

1. $x \text{ tablets} = \dfrac{1 \text{ tablet}}{0.25 \text{ milligram}} \times \dfrac{0.125 \text{ milligram}}{1}$

   $x =$ _____

2. $x \text{ ml} = \dfrac{5 \text{ ml}}{2 \text{ g}} \times \dfrac{0.75 \text{ g}}{1}$

   $x =$ _____

3. $x \text{ milligrams} = \dfrac{1500 \text{ milligrams}}{3 \text{ tablets}} \times \dfrac{1 \text{ tablet}}{1}$

   $x =$ _____

4. $x \text{ vials} = \dfrac{1 \text{ ml vial}}{100 \text{ mg}} \times \dfrac{25 \text{ mg}}{1}$

   $x =$ _____

5. $x \text{ capsules} = \dfrac{1 \text{ capsule}}{500 \text{ milligrams}} \times \dfrac{1000 \text{ milligrams}}{1}$

   $x =$ _____

Medication Administration Tip

To administer medications, the nurse must understand basic arithmetic to calculate doses, to mix solutions, and to perform a variety of other activities. This skill is important because medications are not always dispensed in the unit of measure in which they are ordered (Potter & Perry, 2005, p. 835).

POSTTEST

Solve the following problems using the three approaches for solving mathematical equations. Be sure to label all answers, show all work, and proof all answers.

1. *Ordered:* Codiene 30 mg PO STAT
   Supply: Codiene grain I tablets
   Give: _____

Ratio and proportion method:

Dosage formula:

Dimensional analysis:

2. *Ordered:* Potassium chloride (KCl) 20 mEq IVPB STAT
   Supply: KCl 40 mEq in 20 ml
   Give: _____
   Ratio and proportion method:

   Dosage formula:

   Dimensional analysis:

Medication Administration Tip

Potassium chloride (KCl) is supplied in milliequivalents, abbreviated as mEq. There is no conversion to be completed as the milliequivalent is a unique measurement.

3. *Ordered:* Prednisone 20 milligrams po TID
   Supply: Prednisone 5-milligram scored tablets
   Give: _____
   Ratio and proportion method:

   Dosage formula method:

   Dimensional analysis method:

4. *Ordered:* Tetracycline 100 mg intramuscularly BID
   Supply: Tetracycline 250 mg in 5 ml
   Give: _____
   Ratio and proportion method:

   Dosage formula method:

   Dimensional analysis method:

5. *Ordered:* Phenobarbital liquid 0.5 g po QID
   Supply: Phenobarbital 250 mg per ml in a 10-ml vial
   Give: _____
   Ratio and proportion method:

Dosage formula method:

Dimensional analysis method:

6. *Ordered:* Atropine 0.3 mg intramuscularly on call to operating room
   Supply: Atropine 0.4 mg in 0.5 ml
   Give: _____
   Ratio and proportion method:

   Dosage formula method:

   Dimensional analysis method:

7. *Ordered:* Lasix 40 mg IV push STAT and Q8H
   Supply: Lasix 20 mg per 5 ml in a 20-ml vial
   Give: _____
   Ratio and proportion method:

   Dosage formula method:

   Dimensional analysis method:

8. *Ordered:* Robaxin 0.4 g IV Q6H
   Supply: Robaxin 150 mg per ml
   Give: _____
   Ratio and proportion method:

   Dosage formula method:

   Dimensional analysis method:

9. *Ordered:* Stadol 1.5 mg IV Q4H PRN for pain
   Supply: Stadol 2 mg per ml in a 5-ml vial
   Give: _____
   Ratio and proportion method:

   Dosage formula method:

   Dimensional analysis method:

10. *Ordered:* Apresoline 15 milligrams po TID
    Supply: Apresoline 10-milligram tablets
    Give: _____
    Ratio and proportion method:

Dosage formula method:

Dimensional analysis method:

11. *Ordered:* Demerol 75 mg intramuscularly on call to operating room
    Supply: Demerol 100 mg in 2 ml
    Give: _____
    Ratio and proportion method:

    Dosage formula method:

    Dimensional analysis method:

12. *Ordered:* Benadryl 25 mg po Q4H PRN for itchiness
    Supply: Benadryl 12.5 mg in 5 ml
    Give: _____
    Ratio and proportion method:

    Dosage formula method:

    Dimensional analysis method:

13. *Ordered:* Regular insulin 15 units subcutaneously every morning
    Supply: Regular insulin 100 units per milliliter in a 10-milliliter vial
    Give: _____
    Ratio and proportion method:

    Dosage formula method:

    Dimensional analysis method:

14. *Ordered:* Heparin 10,000 units intrafat Q12H
    Supply: Heparin 15,000 units per 1 milliliter
    Give: _____
    Ratio and proportion method:

    Dosage formula method:

    Dimensional analysis method:

15. *Ordered:* Valium 2 mg intramuscularly Q6H PRN for agitation
    Supply: Valium 5 mg per ml
    Give: _____
    Ratio and proportion method:

    Dosage formula method:

    Dimensional analysis method:

Answers

Answers to Pretest

1. 245.45 kg
2. 5.6 g
3. grain ¼
4. 112.5 ml
5. 6 milligrams
6. 350 mg
7. 0.5 tablet
8. 12.5 ml
9. 0.5 tablet
10. 100 ml

Answers to Practice Questions for Ratio and Proportion

1. 990 milligrams
2. 3000 mg
3. 500 ml
4. 75 ml
5. 0.25 milligram

Answers to Practice Questions for Dosage Formula

1. 2.5 ml (500 mg ÷ 1 g = 0.5 g ÷ 1 g)
2. 2 tablets (60 milligrams = grain I; 120 milligrams ÷ 60 milligrams)
3. 1 milliliter
4. 2 capsules
5. 0.32 milliliter

Answers to Practice Questions for Dimensional Analysis

1. ½ tablet
2. 1.875 ml
3. 500 milligrams
4. 0.25 vial
5. 2 capsules

Answers to Posttest

1. *Answer:* ½ tablet

   Ratio and proportion method:

   $$\frac{1 \text{ tablet}}{60 \text{ milligrams}} = \frac{x \text{ tablets}}{30 \text{ milligrams}} = ½ \text{ tablet}$$

   Dosage formula method:

   $$\frac{30 \text{ milligrams}}{60 \text{ milligrams}} \times \frac{1 \text{ tablet}}{1} = ½ \text{ tablet}$$

   Dimensional analysis method:

   $$\frac{1 \text{ tablet}}{60 \text{ milligrams}} \times \frac{30 \text{ milligrams}}{1} = ½ \text{ tablet}$$

2. *Answer:* 10 ml

   Ratio and proportion method:

   $$\frac{20\text{ ml}}{40\text{ mEq}} = \frac{x\text{ ml}}{20\text{ mEq}} = 10\text{ ml}$$

   Dosage formula method:

   $$\frac{20\text{ mEq}}{40\text{ mEq}} \times \frac{20\text{ ml}}{1} = 10\text{ ml}$$

   Dimensional analysis method:

   $$\frac{20\text{ ml}}{40\text{ mEq}} \times \frac{20\text{ mEq}}{1} = 10\text{ ml}$$

3. *Answer:* 4 tablets

   Ratio and proportion method:

   $$\frac{1\text{ tablet}}{5\text{ milligrams}} = \frac{x\text{ tablets}}{20\text{ milligrams}} = 4\text{ tablets}$$

   Dosage formula method:

   $$\frac{20\text{ milligrams}}{5\text{ milligrams}} \times \frac{1\text{ tablet}}{1} = 4\text{ tablets}$$

   Dimensional analysis method:

   $$\frac{1\text{ tablet}}{5\text{ milligrams}} \times \frac{20\text{ milligrams}}{1} = 4\text{ tablets}$$

4. *Answer:* 2 ml

   Ratio and proportion method:

   $$\frac{5\text{ ml}}{250\text{ mg}} = \frac{x\text{ ml}}{100\text{ mg}} = 2\text{ ml}$$

   Dosage formula method:

   $$\frac{100\text{ mg}}{250\text{ mg}} \times \frac{5\text{ ml}}{1} = 2\text{ ml}$$

   Dimensional analysis method:

   $$\frac{5\text{ ml}}{250\text{ g}} \times \frac{100\text{ mg}}{1} = 2\text{ ml}$$

5. *Answer:* 2 ml

   Ratio and proportion method:

   $$\frac{250\text{ mg}}{10\text{ ml}} = \frac{x\text{ ml}}{500\text{ mg}} = 2\text{ ml}$$

   Dosage formula method:

   $$\frac{500\text{ mg}}{250\text{ mg}} \times \frac{1\text{ ml}}{1} = 2\text{ ml}$$

   Dimensional analysis method:

   $$\frac{1\text{ ml}}{250\text{ mg}} \times \frac{500\text{ mg}}{1} = 2\text{ ml}$$

6. *Answer:* 0.375 ml

Ratio and proportion method:

$$\frac{0.5\text{ ml}}{0.4\text{ mg}} = \frac{x\text{ ml}}{0.3\text{ mg}} = 0.375\text{ ml}$$

Dosage formula method:

$$\frac{0.3\text{ mg}}{0.4\text{ mg}} \times \frac{5\text{ ml}}{1} = 0.375\text{ ml}$$

Dimensional analysis method:

$$\frac{0.5\text{ ml}}{0.4\text{ mg}} \times \frac{0.3\text{ mg}}{1} = 0.375\text{ ml}$$

7. *Answer:* 10 ml

Ratio and proportion method:

$$\frac{5\text{ ml}}{20\text{ mg}} = \frac{x\text{ ml}}{40\text{ mg}} = 10\text{ ml}$$

Dosage formula method:

$$\frac{40\text{ mg}}{20\text{ mg}} \times \frac{5\text{ ml}}{1} = 10\text{ ml}$$

Dimensional analysis method:

$$\frac{5\text{ ml}}{20\text{ mg}} \times \frac{40\text{ mg}}{1} = 10\text{ ml}$$

8. *Answer:* 2.7 ml

Ratio and proportion method:

$$\frac{1\text{ ml}}{150\text{ mg}} = \frac{x\text{ ml}}{400\text{ mg}} = 2.7\text{ ml}$$

Dosage formula method:

$$\frac{400\text{ mg}}{150\text{ mg}} \times \frac{1\text{ ml}}{1} = 2.7\text{ ml}$$

Dimensional analysis method:

$$\frac{1\text{ ml}}{150\text{ mg}} \times \frac{400\text{ mg}}{1} = 2.7\text{ ml}$$

9. *Answer:* 0.75 ml

Ratio and proportion method:

$$\frac{1\text{ ml}}{2\text{ mg}} = \frac{x\text{ ml}}{1.5\text{ mg}} = 0.75\text{ ml}$$

Dosage formula method:

$$\frac{1.5\text{ mg}}{2.0\text{ mg}} \times \frac{1\text{ ml}}{1} = 0.75\text{ ml}$$

Dimensional analysis method:

$$\frac{1\text{ ml}}{2\text{ mg}} \times \frac{1.5\text{ mg}}{1} = 0.75\text{ ml}$$

10. *Answer:* 1.5 tablets

Ratio and proportion method:

$$\frac{1 \text{ tablet}}{10 \text{ milligrams}} = \frac{x \text{ tablets}}{15 \text{ milligrams}} = 1.5 \text{ tablets}$$

Dosage formula method:

$$\frac{15 \text{ milligrams}}{10 \text{ milligrams}} \times \frac{1 \text{ tablet}}{1} = 1.5 \text{ tablets}$$

Dimensional analysis method:

$$\frac{1 \text{ tablet}}{10 \text{ milligrams}} \times \frac{15 \text{ milligrams}}{1} = 1.5 \text{ tablets}$$

11. *Answer:* 1.5 ml

Ratio and proportion method:

2 ml / 100 mg × x ml / 75 mg = 1.5 ml

Dosage formula method:

$$\frac{75 \text{ mg}}{100 \text{ mg}} \times \frac{2 \text{ ml}}{1} = 1.5 \text{ ml}$$

Dimensional analysis method:

$$\frac{2 \text{ ml}}{100 \text{ mg}} \times \frac{75 \text{ mg}}{1} = 1.5 \text{ ml}$$

12. *Answer:* 10 ml

Ratio and proportion method:

$$\frac{5 \text{ ml}}{12.5 \text{ mg}} = \frac{x \text{ ml}}{25 \text{ mg}} = 10 \text{ ml}$$

Dosage formula method:

$$\frac{25 \text{ mg}}{12.5 \text{ mg}} \times \frac{5 \text{ ml}}{1} = 10 \text{ ml}$$

Dimensional analysis method:

$$\frac{5 \text{ ml}}{12.5 \text{ mg}} \times \frac{25 \text{ mg}}{1} = 10 \text{ ml}$$

13. *Answer:* 0.15 ml

Ratio and proportion method:

$$\frac{1 \text{ milliliter}}{100 \text{ units}} = \frac{x \text{ milliliters}}{15 \text{ units}} = 0.15 \text{ milliliter}$$

Dosage formula method:

$$\frac{15 \text{ units}}{100 \text{ units}} \times \frac{1 \text{ milliliter}}{1} = 0.15 \text{ milliliter}$$

Dimensional analysis method:

$$\frac{1 \text{ milliliter}}{100 \text{ units}} \times \frac{15 \text{ units}}{1} = 0.15 \text{ milliliter}$$

14. *Answer:* 0.7 ml

Ratio and proportion method:

$$\frac{1 \text{ milliliter}}{15{,}000 \text{ units}} = \frac{x \text{ milliliter}}{10{,}000 \text{ units}} = 0.7 \text{ milliliter}$$

Dosage formula method:

$$\frac{10{,}000 \text{ units}}{15{,}000 \text{ units}} \times \frac{x \text{ milliliter}}{1} = 0.7 \text{ milliliter}$$

Dimensional analysis method:

$$\frac{1 \text{ milliliter}}{15{,}000 \text{ units}} \times \frac{10{,}000 \text{ units}}{1} = 0.7 \text{ milliliter}$$

15. *Answer:* 0.4 ml

Ratio and proportion method:

$$\frac{1 \text{ ml}}{5 \text{ mg}} = \frac{x \text{ ml}}{2 \text{ mg}} = 0.4 \text{ ml}$$

Dosage formula method:

$$\frac{2 \text{ mg}}{5 \text{ mg}} \times \frac{1 \text{ ml}}{1} = 0.4 \text{ ml}$$

Dimensional analysis method:

$$\frac{1 \text{ ml}}{5 \text{ mg}} \times \frac{2 \text{ mg}}{1} = 0.4 \text{ ml}$$

Reference

Potter, A. P., & Perry, A. G. (2005). *Fundamentals of nursing*. St. Louis, MO: Mosby.