PROCALC
TYPE I - 5 & 14 QUESTIONS

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Mission Statement

This manual is prepared to help nursing students understand and perform the mathematics part of nursing for dispensing medications as per doctor’s orders, no matter what the dispensing form of the medication or the units attached to the medication.

Knowledge of Abbreviations

Medication administration orders are based on commonly used abbreviations. These abbreviations must be memorized and known because they represent, among other things, when, how much, how often, and by what route drugs are to be given to the patient.

The abbreviations have been grouped for easier learning associations by both words and phrases, liquid/volume measurements and weight measurements

Words and Phrases Abbreviations

a	before	fl	Fluid
$\overline{c}$	with	KVO	keep vein open
p	after	prn	as necessary
$\overline{s}$	without	q	every
ac	before meals	qs	quantity sufficient
pc	after meals	$\overline{ss}$	half
AM	morning	stat	immediately
PM	afternoon	supp	suppository
BSA	Body Surface Area	susp	suspension
cap(s)	capsule(s)	tab(s)	tablet(s)
DC	Discontinue	tinct	tincture
elix	elixir		

HOUR - MINUTE & DOSES BY HOURS

HOUR - MINUTE

hr	hour
hs	hour of sleep, at bed time
min	minute

DOSES BY HOURS

qh	every hour
q2h	every two hours
q4h	every four hours
q6h	every six hours
q8h	every eight hours

DOSES –TIMES A DAY

bid	twice a day
tid	three times a day
qid	four times a day
qd	every day
qod	every other day

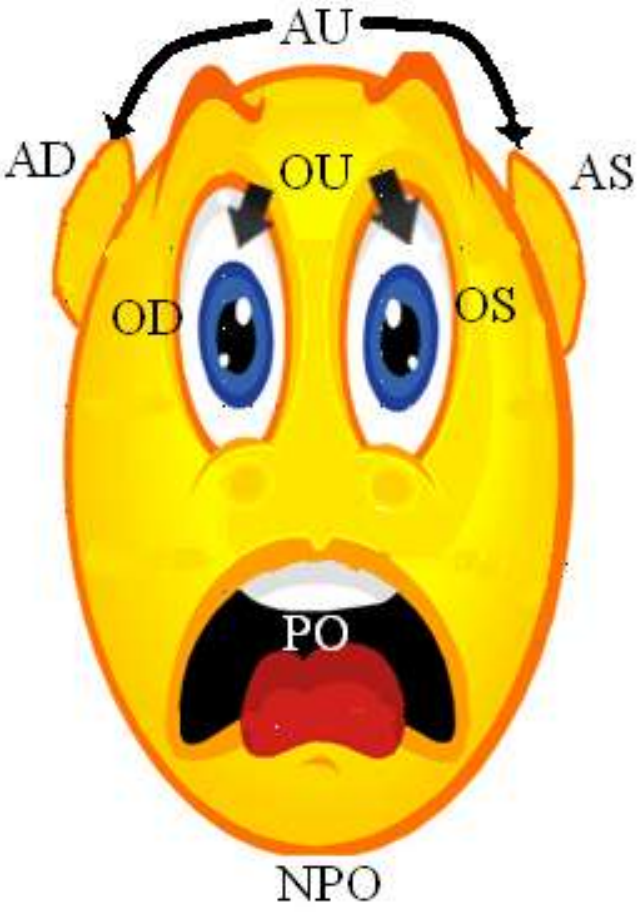
DRUG ROUTES OTHER THAN BY MOUTH

ID	intradermal
IM	intramuscular
IV	intravenous
IVPB	intravenous piggyback
SC or SQ	subcutaneous
SL	sublingual

Facial Anatomy

(When facing the patient – your left side is the patient's right side)

AD	right ear
AS	left ear
AU	both ears
OD	right eye
OS	left eye
OU	both eyes
PO	by mouth
NPO	nothing by mouth



Drug Measurement Systems

Other than labeled measurements, there are **three** common systems of drug measurement that are used to administer drug doses:

- The **household** system

  Examples: Teaspoon, tablespoon, etc.
- The **apothecary** system

  Examples: Minim, grain, etc.
- The **metric** system

  Examples: milliliter, microgram, milligram, gram, etc.

METRIC SYSTEM (GENERAL)

Quantity	General Unit	Symbol
Length	meter	m
Weight	gram	g
Volume	liter	L or l
Time	minute	min

METRIC SYSTEM PREFIXES

General Unit	m, g, L or l, min	1
kilo	**k**	**1,000**
deci	**d**	**0.1 = 1/10**
centi	**c**	**0.01 = 1/100**
milli	**m**	**0.001 = 1/1,000**
micro	**mcg or μ**	**0.000001 = 1/1,000,000**

Equivalents

Because three different bases of drug measuring has come about over hundreds of years, a system of equivalent meshing of the three systems has evolved. Following are lists of liquid/volume and weight abbreviations combining the three systems, after which the quantity measurement equivalents are listed.

Liquid/Volume Measurement Abbreviations

mEq	milliEquivalent	mL or ml	milliliter
dr	dram	oz	ounce (fluid)
gal	gallon	pt	pint
gtt(s)	drop(s)	qt	quart
IU	international units	tbs	tablespoon
L or l	liter	tsp	teaspoon
M	minim	U	units
mgtt	microdrop		

Weight Measurement Abbreviations

g	gram
gr	grain
kg	kilogram
lb	pound
mcg	microgram
mg	milligram
oz	ounce (solid)

Liquid/Volume Equivalents

1 gtt = 1 M	1 dr = 4mL
16 (15*) gtt = 16 (15*) M = 1 mL	
1 tsp = 60 M = 5 mL	
3 tsp = 1 tbs = 15 mL	
2 tbs = 1 oz = 30 mL	
240 (250**) mL = 1 measuring cup = 8 oz	
480 (500**) mL = 16 oz = 1 pt = 2 cups	
1,000 mL = 1 L = 32 oz = 2 pt = 1 qt	
4 qts = 1 gal	

* Use either number depending on whether numbers are odd or even to facilitate easier math

** Use number in parenthesis when referring to cups, pints, and quarts otherwise use first number for cc, mL, and other metric numbers

Solid Weight Equivalents

(RN & LPN Test: Only use 1 gr = 60 mg for all medications)

1 mg	= 1,000 mcg	
1 g	= 1,000 mg	= 1,000,000 mcg
1 gr	= 60 mg*	
5 gr	= 300 (325**) mg	
7.5 gr	= 450 (500***) mg	
10 gr	= 600 (650**) g	
15 gr	= 900 (1,000 ***) mg	= 1 g
1 oz	= 1/16 lb	= .0625 lb
2.2 lb	= 1 kg	= 1,000 g

* Use this relationship up to and including 5 gr

** Refers to Aspirin and Tylenol equivalents **only**

*** Real life value

Time Equivalency

60 minutes = 1 hour

Non-Specific Unit Delivery Systems

Milliequivalent (mEq), International Units (IU), and Units are quantities in medication delivery systems such as milliequivalent per tablet or IU's per capsule not given usual units of measurements as to weight or volume as shown on the equivalent tables. As new drugs are developed they maybe given any unit values or names.

Analysis of Equivalents by Ratio/Proportion

$$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{8}{16} = \frac{10}{20}$$

$$\frac{1}{5} = \frac{2}{10} = \frac{5}{25} = \frac{20}{100}$$

$$\frac{3}{2} = \frac{9}{6} = \frac{27}{18} = \frac{13.5}{9}$$

$$\frac{7}{15} = \frac{28}{60} = \frac{14}{30}$$

In general, fractions are not only abstract proportions. Most times, fractions have dimensional units associated with them. When the numerator and denominator have the same units (dimensions), they are called proportions such as relating two pieces of lumber of different sizes. When the numerator and denominator are dimensioned differently, as in miles per gallon or quarters per dollar, they are called proportional rates. The setup of the initial equivalency equation must have the same units in the numerator and the denominator respectively.

Procalc math uses proportional rates to administer dosages of medicine. On the following pages, **3 methods** will be shown to explain how to work Procalc problems. To illustrate these methods, examples will be shown using dollars and quarters per dollar for the dimensions. After the illustrations, practical Procalc problems will be worked.

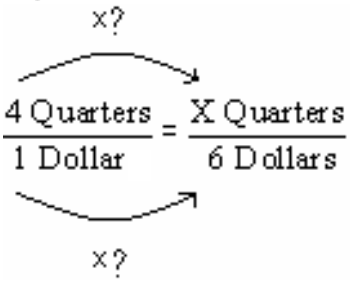
Solving by Equivalents (Method 1)

Relationship 4/1
4 Quarters = 1 Dollar Or

Relationship 1/4
1 Dollar = 4 Quarters

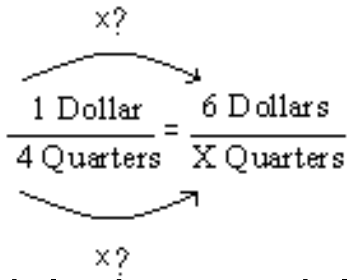
How many quarters equal 6 dollars?
This is a direct relationship

$$\frac{4\text{ Quarters}}{1\text{ Dollar}} = \frac{X\text{ Quarters}}{6\text{ Dollars}}$$

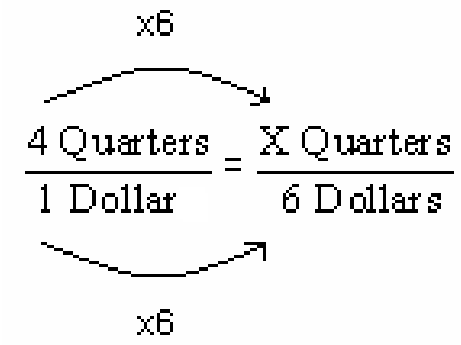


Or

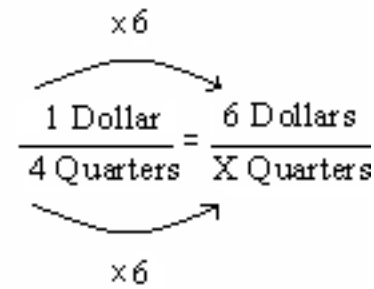
$$\frac{1\text{ Dollar}}{4\text{ Quarters}} = \frac{6\text{ Dollars}}{X\text{ Quarters}}$$



How many times do we have to multiply the one dollar to get to the 6 dollar figure? 6 times



Or



Do the same operation to the numerator, multiplying by six and get the equivalent value for the second ratio

$$\frac{4\text{ Quarters}}{1\text{ Dollar}} = \frac{24\text{ Quarters}}{6\text{ Dollars}}$$

or

$$\frac{1\text{ Dollar}}{4\text{ Quaters}} = \frac{6\text{ Dollars}}{24\text{ Quarters}}$$

X = 24 Quarters

Solving by Cross Multiplication (Method 2)

The proportion that was setup in the equivalent Method 1, is the basis of the other two methods of solving.

$$\frac{4 \text{ Quarters}}{1 \text{ Dollar}} = \frac{X \text{ Quarters}}{6 \text{ Dollars}}$$ **Cross Multiply**

$$4 \text{ Quarters } (6 \text{ Dollars}) = X \text{ Quarters } (1 \text{ Dollar})$$

$$\frac{4 \text{ Quarters } (6 \cancel{\text{ Dollars}})}{1 \cancel{\text{ Dollar}}} = X \text{ Quarters}$$ Solve for **X**

$$24 \text{ Quarters} = X \text{ Quarters}$$

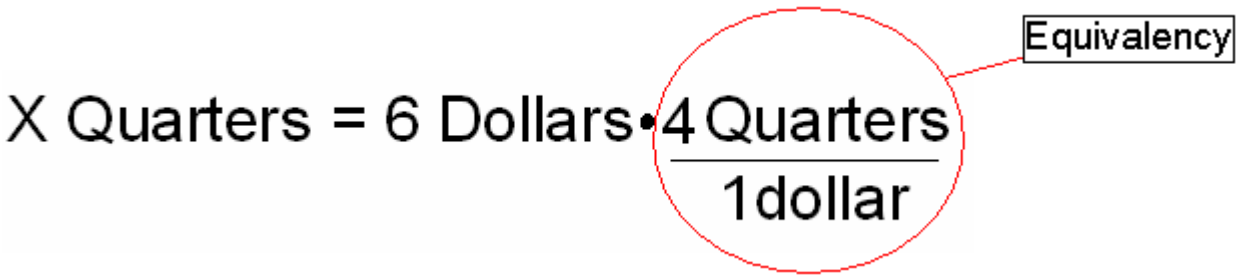
Being able to cancel the dollar units in the numerator and denominator is the basis of the third method, solving by dimensional analysis.

Solving by Dimensional Analysis (Method 3)

The key to this method is to know the proper ratios that relate one dimensional unit to another.

X = The amount of quarters needed.

To find X, multiply the dollar equivalence needed, so that this ratio will set up the denominator units to cancel the units of the given dollars, in the numerator leaving the units of the numerator to be the result required to answer the question.



$$X \text{ Quarters} = 6 \cancel{\text{Dollars}} \cdot \frac{4 \text{ Quarters}}{\cancel{1 \text{dollar}}}$$

$$X = 24 \text{ Quarters}$$

Note: This is the same equation from the cross multiplication in *Method 2*

Applying Method 3 Directly to Drug Applications

$$X \text{ Quarters} = 6 \cancel{\text{Dollars}} \cdot \frac{4 \text{ Quarters}}{\cancel{1 \text{dollar}}}$$

In the previous example, the 6 Dollars represents the prescribed amount and the 4 Quarters per 1 Dollar represents the inverses of 1 Dollar per 4 Quarters as the available equivalency is generally presented.

The required units, based on the problem, is to find quarters. One would have to use the equivalency so that the Dollars would cancel out and the Quarters would remain in the numerator to obtain the required answer.

Note: There are two equivalencies relating to the Quarters and Dollar. These are, 1 Dollar per 4 Quarters or 4 Quarters per 1 Dollar. As shown, the numerators and denominators are different. Since we were trying to find the numbers of quarters in six dollars, it is necessary to cancel Dollars with Dollars. Therefore, we need to use the equivalency of 4 Quarters per 1Dollar to be able to cancel Dollars and remain with Quarters in the numerator to get the proper results.

Applying this method to drug applications, the equation would be as follows:

$$X_r = \text{Prescription}_{\text{units}} \left(\frac{\text{Available Equivalency}_{\text{required units}}}{\text{Available Equivalency}_{\text{units}}} \right) = P_u \left(\frac{A_r}{A_u} \right)$$

Rounding

The chart above shows the names of some of the columns for numbers that include decimals. To calculate an answer for a problem, use all decimal places given in the problem when adding, subtracting, multiplying, and/or dividing to get any answer. Than refer to the information below to the find the necessary number of decimal places for the category of the calculations.

To round any number for the category needed, look to the column to the right of the column for the necessary number of decimal places. If the column to the right has a number five or greater, increase the previous column by one unit; if the number in the column to the right is four or lower, drop that number and remain with number that is the previous column.

Rounding Parameters	Rounding Examples
oz – do not round Kg – always round to tenths mL – for preparing oral liquids or injectables: <1 to hundredths, >1 to tenths mL – for IV infusions (pumps):<10 to tenths, >10 to whole numbers mcg – round to whole numbers mg, grams, units, mEq: <1 to thousandths 1-10 to tenths >10 to whole numbers	1. Round to whole numbers a) 35.52 = 36 b) 156.2 = 156 2. Round to tenths a) 15.173 = 15.2 b) 20.54 = 20.5 3. Round to hundredths a) 25.337 = 25.34 b) 112.524 = 112.52 4. Round to thousandths a) 155.3254 = 155.325 b) 32.8756 = 32.876

Metric conversions, mcg, mg, g

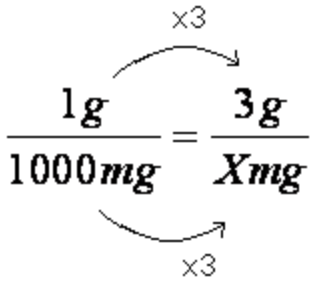
3 g of Ceptaz (Ceftazidime) must be prepared.Ceptaz is available in mg. How many mg of Ceptaz should be prepared?

Hint: 1 g = 1,000 mg

Equivalent

Method 1:

$$\frac{1g}{1000mg} = \frac{3g}{Xmg}$$



$$X = 3{,}000mg$$

Cross Multiplication

Method 2:

$$1g(Xmg) = 3g(1{,}000mg) \qquad Xmg = \frac{3g(1{,}000mg)}{1g} \qquad X = 3{,}000mg$$

Dimensional Analysis

Method 3:

$$X_r = P_u\left(\frac{A_r}{A_u}\right) \qquad Xmg = 3g\left(\frac{1000mg}{1g}\right) = 3000mg$$

Metric conversions, mcg, mg, g

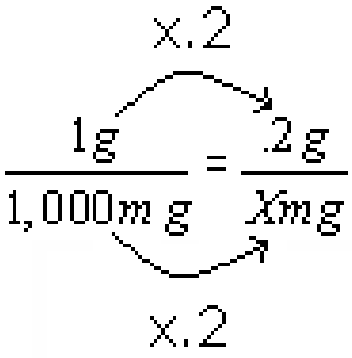
Suprax (Cefixime) is available in mg. 0.2 g of Suprax must be prepared. How many mg Suprax should be prepared?

Hint: 1 g = 1,000 mg

Equivalency

Method 1:

$$\frac{1g}{1{,}000mg} = \frac{.2g}{Xmg}$$



$$X = 200mg$$

Cross Multiplication

Method 2:

$$1g(Xmg) = .2g(1{,}000mg) \qquad Xmg = \frac{.2g(1{,}000mg)}{1g} \qquad X = 200mg$$

Dimensional Analysis

Method 3:

$$X_r = P_u\left(\frac{A_r}{A_u}\right) \qquad Xmg = .2g\left(\frac{1000mg}{1g}\right) = 200mg$$

Metric conversions, mcg, mg, g

An IV solution contains 2 mg of Epinephrine. 2 mg of Epinephrine is equivalent to how many mcg?

Hint: 1 mg = 1,000 mcg

Equivalency
Method 1:

$$\frac{1mg}{1{,}000mcg} = \frac{2mg}{Xmcg}$$

$$\frac{1mg}{1{,}000mcg} \overset{\times 2}{=} \frac{2mg}{Xmcg} \qquad X=2{,}000mcg$$

Cross Multiplication
Method 2:

$$1mg(Xmcg) = 2mg(1{,}000mcg) \qquad Xmcg = \frac{2mg(1{,}000mcg)}{1mg} \qquad X=2{,}000mcg$$

Dimensional Analysis
Method 3:

$$X_r = P_u\left(\frac{A_r}{A_u}\right) \qquad Xmcg = 2mg\left(\frac{1000mcg}{1mg}\right) = 2000mcg$$

Metric / apothecary conversions - gr, mg

10 gr of Ferrous Gluconate must be prepared. Ferrous Gluconate is available in mg. How many mg of Ferrous Gluconate should be prepared?

Hint: 1gr = 60mg

Equivalency
Method 1:

$$\frac{1gr}{60mg} = \frac{10gr}{Xmg}$$

$$\frac{1gr}{60mg} \overset{\times 10}{=} \frac{10gr}{Xmg} \quad X=600mg$$

Cross Multiplication
Method 2:

$$1gr(Xmg)=10gr(60mg) \qquad Xmg = \frac{10gr(60mg)}{1gr} \qquad X=600mg$$

Dimensional Analysis
Method 3:

$$X_r = P_u\left(\frac{A_r}{A_u}\right) \qquad Xmg = 10gr\left(\frac{60mg}{1gr}\right) = 600mg$$

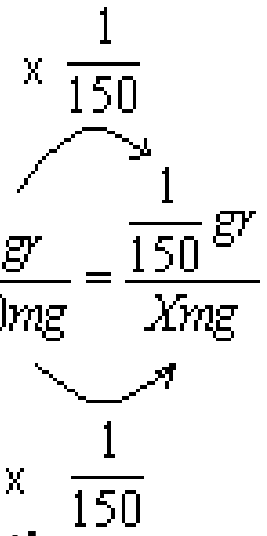
Metric / apothecary conversions, gr, mg

Atropine Sulfate is available in mg. 1/150 gr of Atropine Sulfate must be prepared. How many mg of Atropine Sulfate should be prepared?

Hint 1gr = 60 mg

Equivalency Method 1:

$$\frac{1gr}{60mg} = \frac{\frac{1}{150}gr}{Xmg}$$



$$X = \frac{60}{150}mg = \frac{2}{5}mg = .4mg$$

Cross Multiplication Method 2:

$$1\text{gr}(\text{Xmg}) = \frac{1}{150}\text{gr}(60\text{mg}) \qquad \text{Xmg} = \frac{\frac{1}{150}\text{gr}(60\text{mg})}{1\text{gr}} \qquad X = \frac{60}{150}mg = \frac{2}{5}mg = .4mg$$

Dimensional Analysis Method 3:

$$X_r = P_u\left(\frac{A_r}{A_u}\right) \qquad Xmg = \frac{1}{150}gr\left(\frac{60mg}{1gr}\right) = \frac{60}{150}mg = \frac{2}{5}mg = .4mg$$

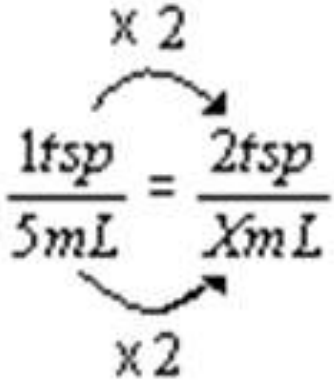
Metric / household conversions – tsp, mL

2 tsp of cough medicine has been prescribed. A measuring device marked in mL is being used. How many mL should be administered?

Hint 1 tsp = 5 mL

Equivalency Method 1:

$$\frac{1tsp}{5mL} = \frac{2tsp}{XmL}$$



$$X = 10mL$$

Cross Multiplication Method 2:

$$1tsp(XmL) = 2tsp(5mL) \quad XmL = \frac{2tsp(5mL)}{1tsp} \quad X = 10ml$$

Dimensional Analysis Method 3:

$$X_r = P_u\left(\frac{A_r}{A_u}\right) \qquad Xml = 2tsp\left(\frac{5ml}{1tsp}\right) = 10ml$$

Metric / household conversions – tsp, mL

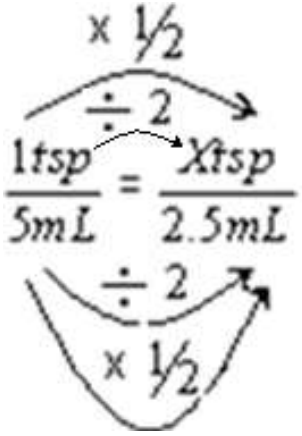
2.5 mg of liquid Urecholine (Bethanechol Choloride) have been prescribed. A measuring device marked in tsp is being used.

2.5 mL is equivalent to how many tsp?

Hint 1 tsp = 5 mL

Equivalency
Method 1:

$$\frac{1tsp}{5mL} = \frac{Xtsp}{2.5mL}$$



$$X = .5tsp$$

Cross Multiplication
Method 2:

$$1tsp(2.5mL) = Xtsp(5mL) \quad Xtsp = \frac{1tsp(2.5mL)}{5mL} \quad X = .5tsp$$

Dimensional Analysis
Method 3:

$$X_r = P_u\left(\frac{A_r}{A_u}\right) \qquad Xtsp = 2.5ml\left(\frac{1tsp}{5ml}\right) = .5tsp$$

Metric / apothecary conversions, g, Kg, lbs, oz

An infant weighs 13 lbs, 13 oz. You determine that 13 lbs, 13 oz. is equivalent to ___kg.

Hint: 16 oz = 1 lb

$$\frac{"Y"oz}{\frac{16oz}{lb}} = "Y"oz\left(\frac{lb}{16oz}\right) = \frac{"Y"}{16} = Xlb$$

Hint: 1oz = 1/16 lb = .0625 lb

$$\frac{.0625lb}{1oz} = \frac{Xlb}{"Y"oz} \qquad \frac{"Y"oz(.0625lb)}{1oz} = .0625"Y" = Xlb$$

NOTE:"Y" is good for any amount of ounces

Add the result to the whole number of pounds, given in the problem, to get the total weight in pounds.

$$13oz = .0625(13)oz = .8125lb$$

$$13lb + .8125lb = 13.8125lb$$

Conversion of pounds to kilograms:

2.2 lb per kg

$$2.2\frac{lb}{kg}$$

$$\frac{13.8125lb}{2.2\frac{lb}{kg}} = 6.3kg$$

Common Fraction, Decimal, and Percent Equivalents

$\frac{1}{10}s$	$\frac{1}{8}s$	$\frac{1}{5}s$	$\frac{1}{4}s$	$\frac{1}{3}s$	$\frac{1}{2}s$	Dec. Value	Percent % (Dec.x100)
$\frac{1}{10}$						.1	10
	$\frac{1}{8}$					.125	$12\frac{1}{2}$
$\frac{2}{10}$		$\frac{1}{5}$				.2	20
	$\frac{2}{8}$		$\frac{1}{4}$			.25	25
$\frac{3}{10}$						.3	30
				$\frac{1}{3}$		$.\overline{33}$	$33\frac{1}{3}$
	$\frac{3}{8}$					.375	$37\frac{1}{2}$
$\frac{4}{10}$		$\frac{2}{5}$				.4	40
$\frac{5}{10}$	$\frac{4}{8}$		$\frac{2}{4}$		$\frac{1}{2}$	.5	50
$\frac{6}{10}$		$\frac{3}{5}$				.6	60
	$\frac{5}{8}$					.625	$62\frac{1}{2}$
				$\frac{2}{3}$		$.\overline{66}$	$66\frac{1}{3}$
$\frac{7}{10}$						.7	70
	$\frac{6}{8}$		$\frac{3}{4}$			.75	75
$\frac{8}{10}$		$\frac{4}{5}$				.8	80
	$\frac{7}{8}$					.875	$87\frac{1}{2}$
$\frac{9}{10}$						.9	90
$\frac{10}{10}$	$\frac{8}{8}$	$\frac{5}{5}$	$\frac{4}{4}$	$\frac{3}{3}$	$\frac{2}{2}$	1.0	100

Metric / apothecary conversions, g, Kg, lbs, oz

A adult weighs 172 lb, 7 oz. You determine that 172 lbs, 7 oz is equivalent to ___kg.

Hint: Convert ounces to pounds

$$a)\ lb = \frac{7oz}{16\frac{oz}{lb}} = .4375lb$$

$$b)\ lb = .0625(7oz) = .4375lb$$

$$172lb + .4375lb = 172.4375lb$$

$$\frac{172.4375lb}{2.2lb}\frac{(1kg)}{} = 78.4kg\ \ (rounded)$$

Labeled Prescription: mg and tabs

Order: Decadron 2 mg PO. In med cart: Decadron (dexamethasone) 0.25 mg scored tablets.

What is the correct number of tablets to give the client?

Hint: Label Equivalent .25 mg per scored tablet or .25mg/1tab

Equivalency Method 1:

$$\frac{.25mg}{1tab} = \frac{2mg}{Xtab}$$

$$\frac{.25mg}{1tab} \overset{\times 8}{=} \frac{2mg}{Xtab} = 8tabs$$

or

$$\frac{\frac{1}{4}mg}{1tab} = \frac{2mg}{Xtab}$$

$$\frac{\frac{1}{4}mg}{1tab} \overset{\times 8}{=} \frac{2mg}{Xtab} = 8tabs$$

Cross Multiplication Method 2:

$$.25mg(Xtab) = 2mg(1tab) \quad Xtab = \frac{2mg(1tab)}{.25mg} \quad X = 8tabs$$

or $$\frac{1}{4}mg(Xtab) = 2mg(1tab) \quad Xtab = \frac{2mg(1tab)}{\frac{1}{4}mg} \quad X = 8tabs$$

Dimensional Analysis Method 3:

$$X_r = P_u\left(\frac{A_r}{A_u}\right)$$

*X*tabs = $$2mg\left(\frac{1tab}{.25mg}\right) = 8tabs \quad or \quad 2mg\left(\frac{1tab}{\frac{1}{4}mg}\right) = 8tabs$$

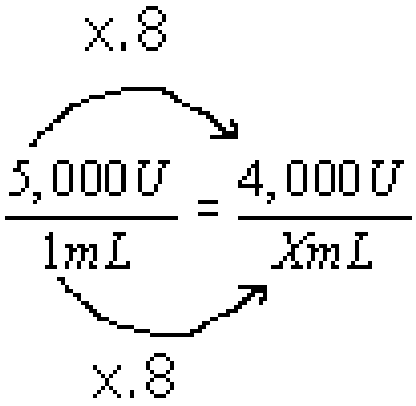
Labeled Prescription: Units and mL

A patient has an order for Heparin 4,000 Units SQ Q AM. The heparin sodium pre-filled disposable syringe is labeled 5,000 U/mL. How many mL should the nurse administer?

Hint: The labeled equivalency equals 5,000 Units per mL

Equivalency
Method 1:

$$\frac{5,000U}{1mL} = \frac{4,000U}{XmL}$$



$$X = .8mL$$

Cross Multiplication
Method 2:

$$5,000U(XmL) = 4,000U(1mL) \qquad XmL = \frac{4,000U(1mL)}{5,000U} \qquad X = .8mL$$

Dimensional Analysis
Method 3:

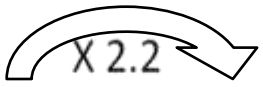
$$X_r = P_u\left(\frac{A_r}{A_u}\right) \qquad XmL = 4000U\left(\frac{1ml}{5000U}\right) = .8ml$$

Labeled Prescription: Units and mL

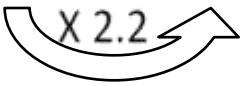
594 mg of Cefizox (Ceftizoxime) must be prepared. The Cefizox is available in vial of powdered drug containing 1 g. Directions accompanying the drug state: Add 3 mL of diluent to yield 270 mg in 1 mL. How many mL should be administer?

Hint: The labeled equivalency equals 270 mg per 1 mL.

Equivalency
Method 1:



$$\frac{270\ mg}{1\ ml} = \frac{594\ mg}{X ml} \qquad \frac{270\ mg}{1\ ml} = \frac{594\ mg}{X ml} \qquad X = 2.2ml$$



Cross Multiplication
Method 2:

$$270mg\,(Xml) = 594mg\,(1ml)$$

$$Xml = \frac{594mg\,(1ml)}{270mg} = 2.2ml$$

Dimensional Analysis
Method 3:

$$X_r = P_u\left(\frac{A_r}{A_u}\right) \qquad X_{ml} = 594_{mg}\left(\frac{1_{ml}}{270_{mg}}\right) = 2.2ml$$

Labeled Prescription: gr, mg, and mL

Ordered Tylenol 5 grains. Have Tylenol in 80 mg in .8mL. How many mL will you give?

Hint: 60mg = 1gr

Equivalency

Method 1: $\frac{80mg}{.8mL} = \frac{5gr}{XmL}\left(\frac{60mg}{1gr}\right)$

$\frac{80mg}{.8mL} = \frac{300mg}{XmL}$

x 3.75

$\frac{80mg}{.8mL} = \frac{300mg}{XmL}$

x 3.75

$X = 3mL$

Cross Multiplication

Method 2:

$$80mg(XmL) = 300mg(.8mL)$$

$$XmL = \frac{300mg(.8mL)}{80mg} = \frac{240mL}{80} = 3mL$$

Dimensional Analysis

Method 3:

$$X_r = P_u\left(\frac{A_r}{A_u}\right)$$

$$Xml = 5gr\left(\frac{60mg}{1gr}\right)\left(\frac{.8ml}{80mg}\right) = \frac{240ml}{80} = 3ml$$

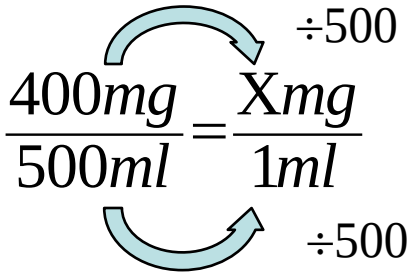
TYPE 14
DRUG USAGE PER VOLUME

In this type of problem, you are relating a unit proportion to a full proportion of the same drug solution. A unit ratio occurs when the number value of the denominator dimension is 1, as in 1 ml. You will be given one whole proportion and one part of the other and asked to find the missing value.

PRACTICE PROBLEM

400 mg of Aminophylline has been added to D5W. The final solution has a volume of 500 ml. You realize that the IV solution contains ____ mg of Aminophylline per ml. Set up the final solution strength as a ratio with dimensions, equal to the unknown unit ratio with the dimensions in the same positions respectively. Fill in the amounts given for each part of the equation using 1 for the unit amount and x for the missing amount.

SOLUTION METHOD 1EQUIVALENCY



$$\frac{400mg}{500ml}=\frac{Xmg}{1ml}$$

$$Xmg=\frac{400mg}{500}=.8mg$$

SOLUTION METHOD 2
CROSS-MULTIPLICATION METHOD

$$400mg\bullet 1ml=500ml\bullet Xmg$$

$$Xmg=\frac{400ml}{500ml}\bullet 1mg=.8mg$$

Conclusion

Knowledge of the procedures of this manual will simplify the math for dispensing medication in the **LPN** program and will be an excellent preparation for the math for the **RN** program.