Nursing Math Simplified

"Math Magic"

Susan Garner Moore, R.N.
St. Petersburg Junior College

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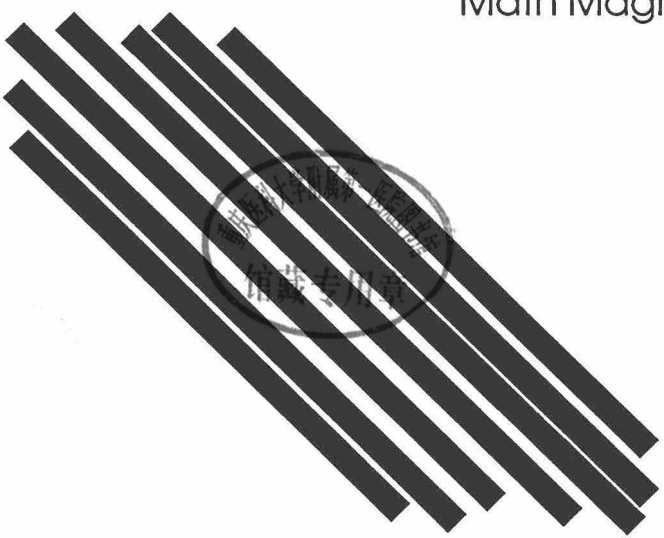

by Susan Garner Moore, R.N.
St. Petersburg Junior College

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Preface

This book addresses itself to both students and professionals who have to make nursing calculations. It is short because it covers only what they need to know.

Nursing Math Simplified can be used alone or in conjunction with a textbook for practice calculating medication dosage and intravenous fluids. To familiarize students with the clinical setting, exercises include doctor's orders and authentic medication labels. Additionally, answers to all exercises are in the back and examples are in every chapter.

I have seen that students can pass the nursing examination and competently administer medications in the clinical area if they master basic concepts and apply them to a variety of situations. My purpose is not merely to add another nursing manual to the list, but to consolidate only the necessary concepts into a single book of a practical size.

Acknowledgements

I am indebted to the many students and graduates who have encouraged me to publish the book, to Bobbi St. Michel who lovingly typed the fledgling attempts like they were her own, to Lora Hunter, Sue Slaven and my other friends at the college for their support, to Dr. Raymond Hill of the University of South Florida for his guidance, to Joe Howland and staff at H&H Publishing Company for validation that it was worth publishing and finally to my husband Shields and my children, Mark, Marcie, Marvin, Paul, and Joel, who always knew "Mom could do it." To each of you my deepest thanks. Without you, *Nursing Math Simplified* would never have become a reality.

Susan Garner Moore, R.N.
St. Petersburg Junior College

Introduction

Many people are uncomfortable with math. Some have programmed themselves over the years with statements like "I never was good at math" or "Everyone knows girls can't do math" or "Math scares me to death." Others have tried one method after another or mixed several methods until they are thoroughly confused. The rise in popularity of Math Anxiety courses bears out these statements.

As a nurse, you will be expected to administer medications and intravenous fluids. In order to do this, it is imperative that you know how to calculate ordered dosage. This book is intended for those students having difficulty with the math necessary to correctly administer medications.

Equivalents used in this book

1000 mL*	=	1 qt or 1 Liter
30 mL	=	1 oz (fl)
1 mL	=	15 or 16 m**
4 mL	=	1 dr (ʒ)
1 g*	=	15 gr
60 mg	=	1 gr
1 kg	=	2.2 lb
1 g	=	1000 mg
1 mg	=	1000 mcg
8 dr (fl)	=	1 oz (fl)
1 T or tbs	=	15 mL
1 t or tsp	=	5 mL

Note

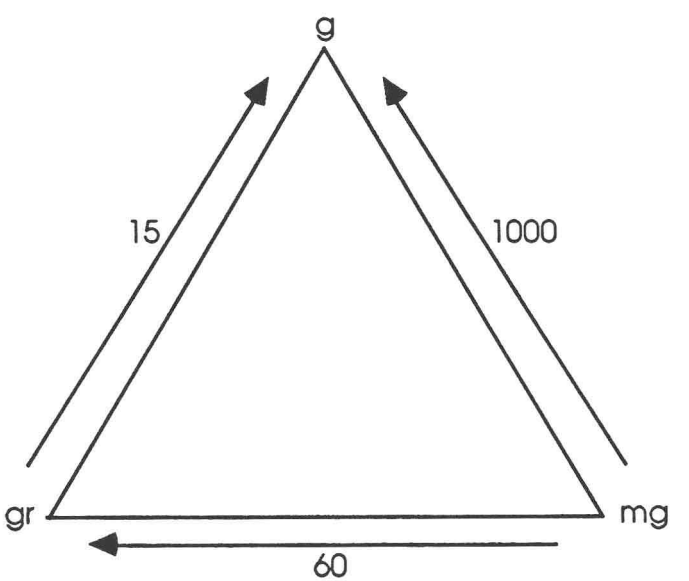
*Throughout this book the International Systems of Unit (SI) will be used in abbreviation. It is not uncommon to see milliliter written as ml or gram written as gm or Gm.

These are acceptable but mL and g are preferred.

**Use the amount which makes your calculation easier.

The following is an aid for those who are very visual. Perhaps it will help you as it has helped many students in the past. Use it when solving medication problems. The triangle simply says:

60 mg = 1 gr, 1000 mg = 1 g and 15 gr = 1 g.



Contents

One

Getting Started

Discovering Where You Need Help

To see where you need help, work as many of the following problems as you can. Then turn to page 49 and check your answers. If you already know your area of need, look in the table of contents for the pages you want to study.

1. Multiplication and division of decimals and fractions.

   1. $\frac{1}{2} \times \frac{1}{4} =$
   2. $\frac{2}{3} \times \frac{3}{5} =$
   3. $\frac{4}{1} \times \frac{1}{200} =$
   4. $\frac{2}{3} \times \frac{1}{2} =$

5. $\frac{1}{8} \div \frac{1}{8} =$

6. $\frac{4}{5} \div \frac{7}{8} =$

7. $0.5 \times .62$

8. 2.7×0.1

9. $.6\overline{).30}$

10. $3.5\overline{)0.70}$

11. $.002\overline{)0.610}$

12. $1.6\overline{)33}$

13. $7.7 \times .33$

14. 2.24×0.12

2. Calculate dosage of like units of measure.

	Doctor's Order	On Hand
15.	gr x	1 tab = gr v
16.	500 mg	1 cap = 250 mg
17.	gr $\frac{1}{300}$	1 tab = gr $\frac{1}{150}$
18.	0.125 mg	1 tab = 0.25 mg

3. Calculate dosage of unlike units of measure.

	Doctor's Order	On Hand
19.	gr $\frac{1}{300}$	1 tab = 0.4 mg
20.	1 g	1 cap = 250 mg
21.	0.25 mg	1 mL = gr v
22.	0.5 g	1 cap = gr 7.5

4. Calculate dosage using units.

	Doctor's Order	On Hand
23.	5000 units	1 mL = 10,000 units
24.	200,000 units	1 mL = 1,000,000 units
25.	10 units	1 mL = 100 units

5. Calculate dosage when medication is ordered per kg of body weight.

	Doctor's Order	On Hand	Weight in Pounds
26.	5 mg/kg	1 mL = 10 mg	75
27.	1.5 mg/kg	1 mL = 20 mg	150
28.	0.25 g/kg	1 mL = 5 g	110

6. Calculate mL/hr an I.V. will infuse.

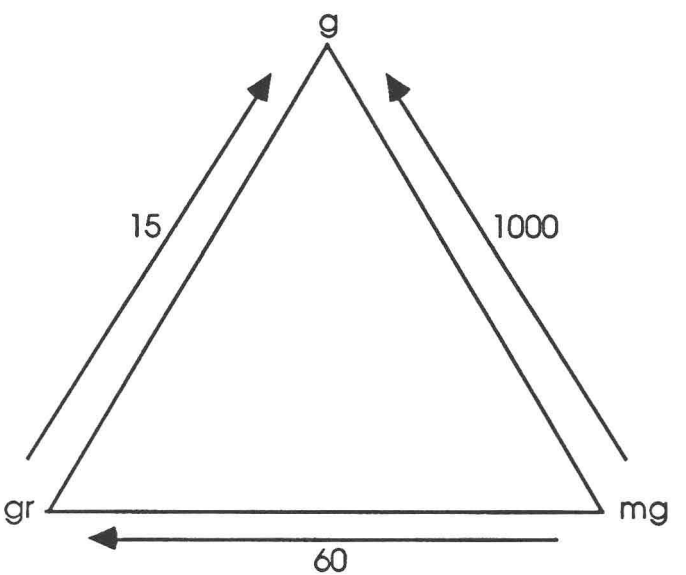
	Total Amount to be Infused	Total Hours	Drop Factor
29.	1000 mL D5W	10	15 gtt/mL
30.	500 mL D5W	24	60 gtt/mL
31.	450 mL	11	10 gtt/mL

7. Calculate the drops per minute flow rate of an I.V.

	Amount	Corresponding Time	Drop Factor
32.	1000 mL	10 Hr	10 gtt/mL
33.	2500 mL	24 Hr	60 gtt/mL
34.	50 mL	1 Hr	15 gtt/mL

8. Calculate the total time an I.V. will infuse.

	Total Amount to be Infused	Drop Factor	Clue
35.	1000 mL	10 gtt/mL	50 gtt/min
36.	550 mL	60 gtt/mL	60 gtt/min
37.	250 mL	15 gtt/mL	50 gtt/min


g
15
1000
gr
mg
60

Two

How to Calculate Medication Dosage

Calculating Dosage in Like and Unlike Units of Measure Using Math Magic (Dimensional Analysis)

Somehow the words **Dimensional Analysis** strike fear in the hearts of the brave, terror in the faint and at least "I'll never do it" in others. That's why I would rather call this fantastic way of solving problems Math Magic. There are no formulas to remember, no wondering where to put what numbers — just an easy, foolproof way to do your math. To illustrate how easy it is, let's use something we all know about — Aspirin. The doctor comes in and orders gr x (10) of aspirin for Mr. Brown. You go to the medication room and take the bottle off the shelf. The label reads 1 tablet is gr v (5).

Now let's do this one with our Math Magic. We can never give a medication without an order, so the doctor's order comes first and has top priority.

Dr.'s order gr x

Next we look at what we have on hand to fill the order with.

Dr.'s order x what's on hand

$$\frac{\text{Dr.'s order}}{1} \times \frac{\text{Form (tablet, capsule, mL)}}{\text{Dosage (grains, grams, mg)}}$$

Now look back at the problem.

1. What did the doctor order? gr x (10)
2. What do I have on hand? 1 tablet is gr v (5)

Problem

$$\frac{\text{gr x}}{1} \times \frac{\text{1 tab}}{\text{gr v}} =$$

Cancel out your words. You now have a simple math problem. The gr cancelled out, so you know to label your answer tabs.

$$\frac{\cancel{\text{gr x}}}{1} \times \frac{\text{1 tab}}{\cancel{\text{gr v}}} =$$

Now you can solve the problem with either of two ways. Either cancel your numbers within the problem

$$\frac{\cancel{\text{gr x}}^{2}}{1} \times \frac{\text{1 tab}}{\cancel{\text{gr v}}_{1}} = \frac{2}{1} = 2 \text{ tab}$$

or multiply straight across and then divide.

$$\frac{\cancel{\text{gr x}}}{1} \times \frac{\text{1 tab}}{\cancel{\text{gr v}}} = \frac{\text{x}}{\text{v}} = 2 \text{ tab}$$

Do you have that? If not, go back and review it once more. Let's go a little bit further. Suppose the doctor comes in and orders 600 mg of aspirin. We go to the medication room and find the same bottle of aspirin we found last time. The label reads 1 tablet is gr v (5).

Ask yourself:

1. What did the doctor order? 600 mg
2. What do I have on hand? 1 Tab is gr v (5)

Problem $\frac{600\text{ mg}}{1} \times \frac{1\text{ tab}}{\text{gr v}} =$

Now we have a problem; mg and gr, like apples and oranges, don't mix. What we need is an equivalent. If you are not sure of the equivalent look at the equivalency chart in the front of the book.

Problem $\frac{600\text{ mg}}{1} \times \frac{1\text{ tab}}{\text{gr v}} \times \frac{1\text{ gr}}{60\text{ mg}} =$

How did we know to put 1 gr over 60 mg? Remember we said all the words must cancel out except the units in which we are giving the medicine. Now go ahead and cancel your words and divide by 60.

$$\frac{\overset{10}{\cancel{600\text{ mg}}}}{1} \times \frac{1\text{ tab}}{\cancel{\text{gr}}\text{ v}} \times \frac{1\cancel{\text{ gr}}}{\underset{1}{\cancel{60\text{ mg}}}} =$$

Then divide by 5 and multiply across.

$$\frac{\overset{2}{\cancel{10}}}{\cancel{600\text{ mg}}} \times \frac{1\text{ tab}}{\cancel{\text{gr}}\ \cancel{\text{v}}_{1}} \times \frac{1\cancel{\text{ gr}}}{\underset{1}{\cancel{60\text{ mg}}}} = \frac{2}{1} = 2\text{ tab}$$

Or multiply across, if you prefer:

$$\frac{600\cancel{\text{ mg}}}{1} \times \frac{1\text{ tab}}{\cancel{\text{gr}}\text{ v}} \times \frac{1\cancel{\text{ gr}}}{60\cancel{\text{ mg}}} = \frac{600}{300} = \frac{2}{1} = 2\text{ tab}$$

Wasn't that easy? Anytime you have a problem where the doctor orders one unit of measure and you have another unit of measure on hand, you do the problem the same way.

Try this one. The doctor comes in and orders 300 mg of liquid aspirin. You go to the medication room and on the shelf is a bottle labeled 1 mL is gr v. As he leaves he says, "Give the medication in minims." Does that strike terror in your heart? Don't worry, let's do it.
Ask yourself three questions.

1. What did the doctor order? — 300 mg to be given in minims
2. What do I have on hand? — 1 mL is gr v (5)
3. Do I need an equivalent? — Yes, 2. gr 1 = 60 mg; 1 mL = 15 m

Problem

$$\frac{300\text{ mg}}{1} \times \frac{1\text{ mL}}{\text{gr v}} \times \frac{\text{gr 1}}{60\text{ mg}} \times \frac{15\text{ m}}{1\text{ mL}}$$

Now cancel out all your words. You are left with minims and that is what you want your answer in. Now do the math.

Problem First divide by 15.

$$\frac{300\ \cancel{\text{mg}}}{1} \times \frac{1\ \cancel{\text{mL}}}{\cancel{\text{gr}}\ \text{v}} \times \frac{\cancel{\text{gr}}\ 1}{\cancel{60\ \text{mg}}\ {}_{4}} \times \frac{{}^{1}\cancel{15}\ \text{m}}{1\ \cancel{\text{mL}}} =$$

Then divide by 5.

$$\frac{{}^{60}\cancel{300\ \text{mg}}}{1} \times \frac{1\ \cancel{\text{mL}}}{\cancel{\text{gr}}\ \cancel{\text{v}}\ {}_{1}} \times \frac{\cancel{\text{gr}}\ 1}{\cancel{60\ \text{mg}}\ {}_{4}} \times \frac{{}^{1}\cancel{15}\ \text{m}}{1\ \cancel{\text{mL}}} =$$

Last divide by 4.

$$\frac{{}^{15}\cancel{60}\ \cancel{300\ \text{mg}}}{1} \times \frac{1\ \cancel{\text{mL}}}{\cancel{\text{gr}}\ \cancel{\text{v}}\ {}_{1}} \times \frac{\cancel{\text{gr}}\ 1}{\cancel{60\ \text{mg}}\ {}_{1}\cancel{4}} \times \frac{{}^{1}\cancel{15}\ \text{m}}{1\ \cancel{\text{mL}}} = \frac{15}{1} = \text{m } 15$$

Or multiply across if you prefer.

$$\frac{300\ \cancel{\text{mg}}}{1} \times \frac{1\ \cancel{\text{mL}}}{\cancel{\text{gr}}\ \text{v}} \times \frac{\cancel{\text{gr}}\ 1}{60\ \cancel{\text{mg}}} \times \frac{15\text{ m}}{1\ \cancel{\text{mL}}} = \frac{4500}{300} = \text{m } 15$$

If you can do the above problems and understand what you are doing, you can do any medication problem.