MATH FOR NURSING AND ALLIED HEALTH

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Nurses and other allied health professionals must understand medications and their administration to patients. Although the doctor and pharmacist play key roles, the nurse or other professional gives the meds to the patient and MUST be accurate in dosage.

Orders for medications might look like this!

3mg/kg/min

2 drops in each eye bid

250 mg tablet qd

60-120mcg/kg/hour

3 tsp.Qid

30mcgtts/min

How will you translate these orders into the actions of administering the appropriate medication?

First, you do the math!

There are two math formulas commonly used in nursing math calculations.

- Ratio and Proportion on p. 4
- IV Flow Rate on p. 6-8

Need some review? Check these topics in the T/LC's *Math for Science* handout

- Metric to metric conversions
- Metric-English conversions
- Measurements in Nursing
- Percentages
- Ratio and Proportion

METRIC SYSTEM PRACTICE PROBLEMS

1. A liter contains ______________ cc
2. The prefix milli- means 1/1000 or .001 parts of a unit. Therefore, 1 milliliter (mL) = ____ L.
3. One liter contains________ mL.
4. Therefore, 1 mL = _____ cc
5. One kilogram = 1000 g. Therefore, 1 g = _____ kg
6. One milligram = _______ g
7. One gram = _______ mg
8. Convert the following to milligrams. 0.9 g = ______ mg 0.3 g = ______ mg.
9. You have 250 mg tablets; the doctor orders 1 g. How many tablets do you give?
10. Always give the least number of tablets for the proper dosage. The order is 3 mg of a drug. You have 1.5 mg tab and 2 mg tablet, how would you fill the order?
11. The order is 5 mg of a drug; on hand are 1 mg tab, 2 mg tab, and 2.5 mg tab. Give _______
12. A scored tablet may be broken in half. The whole tablet contains 50 mg. Each half contains ___ mg.
13. Convert the following:

1 g = ____ mg	0.015 g = ____mg	750 mg = _____ g
250 mg = ____g	5 mL = ____ cc	650 mg = _____ g
0.5 L = ____ mL	0.0004 gm = _____ mg	
1.2 g = _____ mg	0.008 g = ____ mg	

14. The order is 0.5 g of Chloromyedin. On hand are 250 mg capsules. Give _____ capsules.

Answers on page 17.

BASIC ENGLISH-METRIC CONVERSION PROBLEMS

1. How many quarts are equivalent to 18 pints?

2. Change 1.5 oz into an equal volume of tablespoons (Tbsp).

3. 500 milliliters equals what volume in cc?

4. Convert 2.15 kg to grams.

5. How many mg are equivalent to 2.5 mcg?

6. Change 0.155 hours into an equivalent time in minutes only **and** in seconds only;
   e.g. 0.155 hours = X minutes and 0.155 hours = X seconds.

7. 4 ¼ pints are equal to what volume in ounces (oz.)?

8. Convert 35 Tbsp into an equal volume of liters.

9. How many mcg are equivalent to 0.25 g?

10. How many hours are equal to 1440 seconds?

11. A patient weighs 154 lbs. What is this patient's weight in kilograms?

12. An IV was administered for 390 minutes. How many hours and minutes was the IV running?

13. Dan must drink 2250 cc of water each day. How many liters of water will he drink?
    Round your answer to the nearest tenth liter.

14. The order is for .045g of medication per dose. What is the dose in mg?

15. The doctor instructed Bob to take 2 tablespoons of cough syrup every 12 hours. Bob only has teaspoons available to measure with. How many teaspoons should he take for each dose?

16. There are 2 bottles of milk of magnesia on the shelf at the pharmacy. One contains 9.5 oz and the other has 300 cc. Which has the larger volume?

17. The humidifier for the 3rd North nursing station holds 4 gallons of water. How many ounces will completely fill the reservoir?

Answers on page 17.

RATIO AND PROPORTION IN ALLIED HEALTH MATH

A **ratio** is composed of two numbers that are related to each other. In health care, medications are often expressed as a ratio. For example:

- 125 mg/ 1 tablet or 125 mg **:** 1 tablet, read as 125 mg per 1 tablet
- 350 mg / 5 tablets or 350 mg **:** 5 tablets, read as 350 mg per five tablets
- 250 mg / 10 mL or 250 mg **:** 10 mL, read as 250 mg per 10 mL

A **proportion** shows two ratios that are equal, like this: $\frac{4}{12}=\frac{1}{3}$

Sample Problem Proportion is often used to calculate a dosage. Suppose a drug comes in tablets of 150mg. The dosage ordered is 375mg. How many tablets are needed? Here is the problem:

$$\frac{150mg}{1\,tablet}=\frac{375mg}{x\,tablet(s)}$$

To solve for ***x***, we have to ***cross-multiply:***

$$\frac{150mg}{1\,tablet} \times \frac{375mg}{x\,tablet(s)}$$

$$150mg * x\ tablet = 375mg * 1\,tablet$$

$$x\ tablet=\frac{375\,\cancel{mg}*1\,tablet}{150\,\cancel{mg}}$$

x = 2.5 *tablets*

ALLIED HEALTH MATH RATIO/PROPORTION PROBLEMS SET 1

1. The order is for 80 mg Amoxicillin IM. The vial of the medication is labeled 100 mg/mL. How many mL will you give?

2. You are ordered to give a patient 250 mg Keflin. The bottle says to add 9.5cc of sterile water to the vial to yield 0.5 g/cc. How many cc's will you give?

3. The order is for 100,000 Units penicillin. The penicillin on hand is labeled 250,000 Units/mL. How much of the drug will you administer?

4. The order is for Aspirin 162 mg for a temp over 102. The medication is available in 81 mg tablets. How many tablets should be given?

5. The order is one 125 mg tablet per 25 kg patient weight bid. Your patient weighs 165 lbs. How many tablets will you administer per dose? How many per day?

6. Verapamil is ordered 120 mg PO bid. The medication cart has Verapamil in 30 mg capsules. How many would you administer during your 8 hour shift? Is this a safe dose?

7. Order: Demerol 75 mg IM q 3-4 hours prn. Available is Demerol 50 mg/mL. What is the maximum mL's of Demerol the patient might receive during your 12 hour shift?

8. The doctor ordered Ampicillin 300mg/kg/day for your patient and has ordered the medication tid. How many mg per dose would you administer to a 59 lb. patient?

9. How much would you draw up if a 70 mEq dosage is to be added to an IV from the stock solution of 200mEq/10cc?

10. The label reads 250mcg/mL and the order is for 0.6 mg. How many mL will be administered?

ALLIED HEALTH MATH RATIO/PROPORTION PROBLEMS SET 2

1. The order is for aspirin 650 mg q 6 hours for pain. It comes as 325 mg tablets. How many tablets would be given per dose? How many tablets would be taken per day?

2. The doctor orders 500,000 Units of penicillin for the patient. The capsules available are 200,000 Units and 100,000 Units. How many capsules would be given per dose?

3. You are preparing an injection of morphine. The order reads 15 mg IM. The stock morphine is 48mg/2mL. You will draw up_____ mL

4. You are asked to prepare a 300 mcg dose. The medication is labeled 0.4mg/ ml How many ml will you need for the prescribed dose?

5. The order is for an injection of 20 mg of X and 10 mg of Y. On the shelf, you have 50 mg/mL of X and 75 mg/3 mL of Y. What will be the total volume in your syringe?

6. The recommended pediatric dosage of Velosef is 20mg/kg/day. What is the daily dose, in mg, for a child weighing 36 lbs.? The stock vial of Velosef is labeled 208mg/mL. How many mL would be given in a daily dose? If the order is for Velosef IM tid, what volume is given per dose?

7. The patient is receiving an antibiotic IV at the rate of 50mL/hr. The IV solution contains 1.5g of the antibiotic in 1000 mL. Calculate the mg/hr given

8. The order is: 25 mcg/kg/min. The patient weighs 44 kg. How many mg of medication will the patient receive in one hour? Per day?

9. An IV medication of 235 mL is to infuse at the rate of 60 mL/hr. What is the total infusion time?

10. An IV of 550 mL infused in 638 minutes. The IV infused at ______ mL/hr.

See answers for both sets on page 18

ABOUT IV FLOW RATE

You may see flow rates expressed in different ways, using different names for the basic factors, but remember this ONE basic formula!

$$\text{Flow rate} = \frac{\text{(Volume) Administrative set}}{\text{Time}}$$

Here are some of the other factor names you might see.

FACTOR	OTHER NAME(S)	UNITS REPRESENTED
Flow rate	drip rate; drop rate	gtts/minute OR µgtts/minute
Volume	------	Cubic centimeters (cc), or Milliliters (mL) or Liters(L)
Administrative set	set; drip factor; drop factor; microdrip	gtts/mL OR µgtts/mL
Time	------	minutes are preferred

RULES FOR CALCULATIONS USING THE FLOW RATE FORMULA

1. Identify the values of the three factors in the given data.
   You may need to use intermediate steps to determine these.
2. Plug them into the appropriate spots in the formula
3. DO THE MATH!
4. Generally for IV drips, the flow rate should be rounded to a whole number. There are **no** partial drops (gtts)! Some critical care IV pumps ***can*** drip at a tenth (0.1) of a drip and syringe dosages ***can be*** rounded to a tenth (usually a tenth of a mL). However, when solving flow rate problems, round to a whole number unless you are specifically told otherwise.
5. Other Handy Information:

Medications Usually Measured in Units (U):	Penicillin, Heparin, Insulin, Pitocin
Examples of IV Solutions:	5%DW means 5 parts dextrose **:** 100 parts water, or 5 g dextrose in 100 mL water 10% Na means 10 parts sodium **:** 100 parts water, or 10 g Na in 100 mL water
Solute:	A dissolved substance, such as the dextrose or Na above
Solvent:	The liquid in which another substance is dissolved, such as the water in the examples above
Percent Concentration:	number of grams of solute in 100 mL of solution
Titration factor:	Adjusting infusion or IV dosage over time to obtain a measurable response

Sample Problem #1: Solve for Flow Rate

The order is to infuse 250 mL of NS in 100 minutes. The set is 15 gtts/mL. What is the flow rate?

$$Flow\ rate = \frac{250\,mL * 15\,gtts/mL}{100\,\text{min}}$$

$$Flow\ rate = 3750\,gtts \div 100\,\text{min}$$

$$Flow\ rate = 37.5\ or\ 38\,gtts/\text{min}$$

Sample Problem #2: Solve for Volume

The order is for an IV of D5W to infuse at 35 gtts/min for 4 hours. If the set is 20 gtts/mL, what volume will infuse?

$35\ gtts/\text{min} = \frac{x(20\,gtts/mL)}{240\,\text{min}}$
$\frac{35\text{ gtt}}{1\text{min.}} = \frac{x\ (20\text{ gtt/mL})}{240\text{ minutes}}$

Sample Problem #3: Solving for Time

A doctor orders 2 liters of 0.9% NS to infuse at 75 mcgtts/min. How long will it take to infuse the whole 2 liters? Remember: if the flow rate is in mcgtts/minute, use a microdrop set of 60 gtt/mL.

$$75\,mcgtts/\text{min} = \frac{2000\,mL * 60\,mcggts/mL}{x\,\text{min}}$$

$$75\ x = 2000 * 60$$

$$75\ x = 120{,}000$$

$$x = \frac{120{,}000}{75}$$

$$x = 1600 \text{ minutes}$$

1600 minutes = 26.67 hours, or 26 hrs. 40 min

Sample Problem #4: Solving for Time Using an IV Pump

If you use an IV pump, you will need to set it to run at mL per hour; use this formula to solve for time.

$$\text{Total infusion time} = \frac{\text{Volume to infuse}}{\text{mL/hour or mL/minute}}$$

What mL/hour setting on the pump will you use to run an IV for 6 hours and infuse 500 mL?

$$6\ hours = \frac{500\ mL}{x}$$

$$6x = 500$$

$$x = 500 \div 6 = 83 \text{ mL/hour}$$

Note: the answer is 83.333, but you must round to a whole number for the pump setting.

ALLIED HEALTH MATH IV FLOW RATE PROBLEM SET 1

1. The patient is to receive heparin at 1500 Units per hour. The IV contains 25,000 Units in 250 mL of D5W. Find the rate in mL/hr.

2. The order is for 125 mg Aldomet given q 6hr IVPB. The medication is diluted in 100cc of 5% dextrose. Using 60 µgtts/mL set, find the flow rate to deliver the volume in two hours.

3. Order is for Keflin 500 mg IVPB q 6 hrs for a 19 kg child. The pharmacy sends you Keflin 500 mg in 50 mL NS. What would the flow rate be if it is delivered over 30 minutes with a microdrip set? The safe child dosage is 80-160 mg/kg/da. Is the dosage you have calculated a safe dosage ?

4. The IV has gone sub-q. The amount infused was 250 mL. The IV was hung with 500 mg of Aminophyline in 1000 mL. How much Aminophyline did the patient receive? How long did it take to run the 250 cc if the set was 15 gtts/mL an-d the rate was 30 mL/hr?

5. If an IV ran for 7 hours and 30 minutes, how much volume was given if there was a 15 gtts/mL set and the flow rate was 80mL/hr?

6. You are to set the IV pump to deliver 300 cc over 6.5 hours. What cc/hr rate would you set?

7. The order is for Penicillin G 775,000 Units q 4 hrs for a child. The Penicillin on shelf is 250,000 Units/ml. The recommended time to infuse is 30 minutes. What mL/hr will you set the IV pump at?

8. The order is for Dobutamine 250mg/250cc. The doctor wants the medication delivered at 3.5 mcg/kg/min. The patient weighs 154 lbs. Using an IV pump, determine the flow rate in mL/hr.

9. The patient's IV has Dopamine 200 mg in 250 mL D5W. The drip must run at 8 mcg/kg/min and your patient weighs 66 kg. What will the rate of mL/hr be?

See answers on page 18-19.

ALLIED HEALTH MATH FLOW RATE PROBLEM SET 2

1. A physician orders 1000 ml of D5NS (dextrose 5% in normal saline) for a child to be given at 100 mL/hr. Calculate the flow rate if the delivery system is 10 gtt/mL.

2. An IV mixture is labeled 225 mg/250 cc. The physician prescribes 3 mcg/kg/min for a 50-kg patient. What is the flow rate if a microdropper administration set is used?

3. A physician prescribes 100 mL of an IV fluid. If the patient is to receive 5 mL/10 min via a microdropper administration set, calculate the flow rate.

4. A physician orders isotonic sodium lactate 5 mL/kg body mass to be administered intravenously for a 164-lb patient with severe acidosis. The rate of flow is 15 drops/min, and the administration set is 20 gtt/mL. What is the running time?

5. A physician orders 75 mL of 5% protein hydrolysate, 25 mL of dextrose, and 20 mL of isotonic salt solution for a child, to be administered intravenously at the rate of 60 gtt/min via a microdropper administration set. What is the running time?

6. An IV of 600 mL was ordered to infuse in 3 hours using a 15 gtt/mL set. With 2 hours remaining you discover only 200 mL is left in the bag. At what rate will you need to set the flow?

7. The doctor orders 125 mg of medication per hour. The label on the IV bag reads 5g/1000mL. The set delivers 15 gtts/mL. How many mL should infuse each hour? The current flow rate is 10 gtts/min. Is this correct? If not, what is the correct flow rate?

8. An IV was started at 9:00 a.m. with orders to infuse 600 mL over 7 hrs. At 12 noon the IV infiltrated with 400 mL left in the bag. At 1:00 p.m. the IV was restarted. The set calibration is 20 gtt/mL. Calculate the new flow rate to deliver the fluid on time.

See answers on page 20.

ALLIED HEALTH MATH PERCENT SOLUTIONS: GRAMS/CALORIES

The Relationship of Ratio, Decimals, and Percents

Numbers	Ratios or Fractions	Reduced Ratios	Decimal	Percent
13 parts in 100	13:100 or 13/100	Same as ratio	0.13	13%
36 parts in 100	36:100 or 36/100	9:25 or 9/25	0.36	36%
67 parts in 201	67:201 or 67/201	1:3 or 1/3	0.33	33%
36 parts in 72	36:72 or 36/72	1:2 or 1/2	0.5	50%

In allied health math, a percentage solution can involve the number of grams of drug (solute) per 100 mL(cc) of solution or the number of calories per unit.

Counting calories? 1 g CHO (carbohydrate) OR 1 g protein = 4 cal; 1 g fat = 9 cal

Examples:

- 100 mL of a 1% solution will contain 1 gram of drug or solute
- 100 mL of a 3% solution will contain 3 grams of drug or solute
- 50 mL of a 1% solution will contain 0.5 grams of drug or solute
- 200 mL of a 3% solution will contain 6 grams of drug or solute

Tip: Given the Percent, Calculate the Amount of Drug

Sample problem: How many grams of drug will 100 mL of a 10% solution contain?

Solution:

$$\frac{10g\ drug}{100mL\ solution} = \frac{x\ g\ drug}{100mL\ solution},\ or\ \frac{a}{b} = \frac{c}{d}$$

$$c = \frac{a*d}{b};\ then\ x = \frac{10*100}{100},\ so\ x = 10$$

Use the sample to solve the problems on the next page.

ALLIED HEALTH MATH PERCENT SOLUTIONS: GRAMS/CALORIES

Remember: 4 cal/gram for carbs

1. How many calories does a patient receive in 1000 ml of a 10% dextrose IV?

2. The doctor has ordered 900 calories to be given to the patient in an IV of 20% dextrose. How many grams of dextrose would provide the 900 calories? How many mL of the solution would be given?

3.The order is for Mannitol 2g/kg for a patient weighing 137 lbs. A Mannitol solution of 30% is available. How many mL of the solution should be administered? How many calories would be given?

4. In one day, a patient is given 2 IV's: 1750 mL of D5NS and 500 mL 10% Dextrose. How many total grams of dextrose were given? How many calories?

5. The patient should receive 30 mg of sodium in every 100 mL of IV saline. What would the percentage of sodium be in this IV solution?

6. The order is for KCL Elixir, 30 mEq po bid. Available is 20 mEq/15 mL which should be diluted in 4 ounces of juice. How many ounces of juice should be used per dose? Per day? How many ml of the fluids are given each day?

See answers on page 20

NUR215 MATH—MATERNITY NURSING

1. The order reads: 200mL of NSS in 30 minutes, then maintain at the rate of 100mL per hour. If the drop factor is 15gtts/mL, what would the initial flow rate be? What would the maintenance flow rate be? If the initial 1000mL total is given and the IV was started at 10 am, when will the IV finish?

2. An IV is ordered for pain in your postpartum patient: 0.4mg IM Atropine and 20mg IM Demerol. On the shelf are Demerol 100mg/mL and Atropine 1 mg/mL. How many total mL will be drawn up in the syringe?

3. Your patient's order is 2000mL 10% DW q 12 hours. How many calories will she receive in 24 hours?

4. A titration of 0.15-0.35 mg/min of Ritodrine is ordered for your patient's premature labor. The solution infusing has a strength of 150mg/500mL D5W. What is the dosage range in mL/min? Her contractions stop at 40 mL/hour, and you are instructed to maintain this rate. What dosage, in mg, should now be infusing per minute?

See answers on p. 20.

ALLIED HEALTH MATH PROBLEM SET I

1. Patient T.J. is to receive 350 mg of aminophyline in 150 mL of D5W over a one hour period. Drop factor is 15 gtts/ml. Nurse Safety would give _____ gtts/ min.

2. Order: 500 cc D5W at 100 cc/hr. What drop rate per minute is needed when a 15 gtt/mL tubing is used?

3. If a patient must receive Drug X, 0.4 mg and the label reads "Each tablet 1.6 mg", how much of Drug X would you give the patient?

4. 500 mL of St D/NS IV is ordered q 4 hr. The drop factor is 15 gtt/mL. What is the correct flow rate?

5. How long will it take 2000 mL of solution to infuse when 75 mL infuse every hour?

6. The doctor has ordered 1000 mL of IV fluid to run at 45 gtt/min, using a 15 gtt/cc dropper. Approximately how long should the IV run?

7. The doctor orders 120 mg per 1000 mL at 400mL/24hrs. How many mg of drug will the patient receive every 8 hours?

8. The doctor ordered 10 cc of Milk of Magnesia. How many ounces would be necessary to give 12 doses?

9. One thousand (1000) mL is ordered every 8 hours: the drop factor is 15 gtt/mL. Calculate the flow rate.

10. Rose Bush weighs 178 lbs. She must receive an IV medication based on body weight. The order reads, "give 3 mg per kilogram". The label reads “10 mg per cc". How much medication would you give?

11. The doctor orders 100 mg of medication per hour. The label on the IV bag reads 5g/1000mL The set delivers 15 gtts/ml. How many mL should infuse each hour? The current drip rate is 10 gtts/min. Is this correct? If not, what is the correct drip rate?

12. An IV of 500 mL was ordered to infuse in 3 hours using a 15 gtt/ml set. With 1 ½ hours remaining you discover only 150 mL is left in the bag. At what rate will you need to reset the flow?

13. If the order reads "give .2 mg of Drug Z and 65 mg of Drug N", how much fluid will you have in your syringe? The labels read Drug Z, “0.4 mg/ ½ cc" and Drug N, “75 mg in 1 cc".

14. An IV of 1000 mL was ordered to infuse in 8 hours. With 3 hours of infusion time left you discover that 600 mL have infused. The set delivers 20 gtt/mL. Recalculate the drip rate.

15. A physician orders isotonic sodium lactate 50 mL/kg body mass to be administered intravenously for a 164-lb patient with severe acidosis. The rate of flow is 150 gtts/min, and the administration set is 20 gtt/mL. What is the running time?

See answers on p. 20

ALLIED HEALTH PROBLEM SET II

1. The dosage ordered is 200 mg. You have available dosage strength of 250 mg in 1.5 mL. Determine the volume required to prepare the needed dosage.
2. Prepare a dosage of 0.6 mg from an available strength of 1000 mcg per 2 mL.
3. Set your IV to administer 100 mL of medication in 40 min. using a set calibrated at 15 gtt/mL.
4. An IV of 1200 mL is ordered to run for 16 hours. Calculate the flow rate if the set is calibrated at 15 gtt/mL.
5. The order is to give 1.5 oz of Maalox. How many tbsp would you give?
6. The physician ordered Synthroid (sodium levothyroxine) 25 mcg q A.M. Available are 0.05 mg tablets. How many tablets will you give?
7. A patient is to receive 600 mL DSRL at a flow rate of 12 gtt/min using a set calibration of 10 gtt/mL. Calculate the infusion time.
8. Using a microdrip set, determine the infusion time of 100 mL of D5NS infusing at a rate of 40 gtt/min.
9. Determine the infusion time of 1.5 liters 5% DW at a flow rate of 33 gtt/min and a set calibration of 15 gtt/mL. How many grams of Dextrose were infused? How many calories?
10. The doctor asks at what time a patient's infusion will be completed. There are 250 mL left in the IV with a flow rate of 25 gtt/min and set calibration of 10 gtt/mL. The time is now 1:00 pm; what would the total infusion time be for 1000 mL?
11. An IV of 1000 mL was to infuse over 10 hours at 25 gtt/min. After 6 hours you discover that only 400 mL have infused. Recalculate the flow rate using a set calibrated at 15 gtt/mL.
12. The doctor has ordered an antibiotic whose average adult dose is 250 mg. What will the dose be for a child with a BSA of 0.46 M^2. (average adult BSA is 1.7 M^2)?
13. Dosage recommended is 5 mg per M^2. The child has a BSA of 1.1 M^2 . Calculate the dosage.
14. A dosage of 200 mcg is ordered. The strength available is 0.3 mg in 1.5 mL. Determine the required dosage in mL.
15. If the order reads, "give .3 mg of Drug Z and 65 mg of Drug N," how much fluid will you have in your syringe? The labels read Drug Z: .45 mg/ .5 cc and Drug N: 0.075 g in 1 cc.
16. How many tsp. can you get out of a 1.5 liter bottle of fluid?
17. If the IV is absorbing at 4.5 cc/minute, how long will it take for 90 cc to be absorbed?
18. A 50 mL piggyback IV is to infuse over 15 min. The set calibration is 15 gtt/mL. After 5 minutes the IV contains 40 mL. Calculate the flow rate to deliver the volume on time.
19. An IV was started at 9:00 a.m. with orders to infuse 500 mL over 6 hrs. At 12 noon the IV infiltrated with 350 mL left in the bag. At 1:00 p.m. the IV was restarted. The set calibration is 20 gtt/mL. Calculate the new flow rate to deliver the fluid on time.
20. Physician's order: Add 500 mg of Lidocaine to 500 mL of 5% D/W, infuse at a rate so patient will receive 0.01 mg/kg/min. Drop factor: 12 gtt/1 mL. Patient weighs 55 kg. Calculate the rate of flow.
21. If the IV is mixed so that each 150 mL contains 500 mg of Drug X, how long will it take for 800 mg of Drug X to be absorbed? (Rate is set at 5 mL/minute)

See answers on p. 21.

ALLIED HEALTH MATH PROBLEM SET III

1. An injection of 4 mg of Valium has been prescribed for a patient suffering from muscle spasms. An ampule of Valium labeled 5 mg/mL is on hand. How many mL should be injected?
2. Desired medication: 450 mcg. Medication on hand: 0.3 mg scored tabs. How many tabs will you administer?
3. A physician prescribes 2g/M^2 body surface of a syrup for a patient who has a body surface of 0.9 m^2. The syrup is available as 500 mg/ 5 mL. How many mL should you administer?
4. If a patient is to take 1 ½ oz. of milk of magnesia, how many tbsp should the patient take?
5. Order: 50,000 units of penicillin G potassium per kg body mass per day, to be administered in four equally divided doses. Penicillin G potassium 500,000 unit tabs are available. How many tabs will a 176-lb patient receive per dose?
6. A physician prescribes potassium chloride 10 mEq diluted in 1 glass of juice qd. Potassium chloride 20 mEq per 15 mL is available in a 500 mL bottle. How many mL per dose of potassium chloride should be dissolved in the juice?
7. A physician prescribes 0.15 mg qd. of a drug. The drug is available as 0.05 mg/mL. How many mL per dose should be administered?
8. Doctor Gomez orders 1500 mL of isotonic saline solution to run over a 24-hour period. What is the rate of flow if the administration set reads 20 gtt/mL?
9. A patient is to receive 2 mg/min of an IV medication. On hand is an IV bottle labeled 600 mg/200mL. Find the rate of flow if a microdropper administration set is used
10. A physician prescribes a medicated IV solution labeled 250 mg/200 cc. He prescribes 4 mcg/kg/min for a 50 kg patient. If the administration set is 60 microgtt/mL, calculate the rate of flow.
11. Dr. Zhivago prescribes glucose 10%, 1000 ml for 10 hours via a 15 gtt/mL delivery system. What is the rate of flow?
12. Dr. Johnson orders 1000 ml of D5NS (dextrose 5% in normal saline) for a patient to be given at 100 mL/hr. Calculate the rate of flow if the delivery system is 10 gtt/mL.
13. An IV mixture is labeled 200 mg/500 mL. A 154-lb patient is to receive 2 mcg/kg/min via a microdropper administration set. Calculate the rate of flow.
14. Ampicillin 2 mL added to 50 mL NS over 10 minutes is prescribed for a patient suffering from an upper respiratory infection. Calculate the rate of flow if the administration set reads 10 gtt/mL.
15. A physician orders penicillin G potassium 4,000,000 U IV in 100 mL of dextrose to be administered q6h over 1 hour via a 20 gtt/mL administration set. Penicillin G potassium is available in a 5,000,000 U vial. The directions for reconstitution are, "Add 8 mL of sterile water for injection to contents of vial. Resultant solution has a concentration of 500,000 Units/mL." Calculate the rate of flow.

See answers on p. 21.

ALLIED HEALTH MATH PRACTICE TEST

1. The order is to give IV heparin 1100 units per hour. The IV contains 26,000 units of heparin per liter. Determine the rate of the IV in cc/hr.

2. The order is to administer lidocaine at a rate of 30 cc/hr using a concentration of 4 mg /cc. Determine how many mg/min the patient is receiving.

3. The patient is receiving Aminophylline (theophylline) at 40 cc/hr. The concentration of the medication is 500 mg per 1000 cc. Determine how many mg/hr the patient is receiving.

4. The order is to add 100 mg of morphine to 500 cc of IV fluid and administer at a rate of 30 cc/hr. Determine how many mg/hr the patient is receiving.

5. A doctor orders a patient to receive 1200 Units of heparin every hour IV continuously. The solution is 35,000 Units heparin in 1 L of D5 **V2** NS. Calculate the mL/hr the patient will receive.

6. During morning rounds you time a patient's IV at 20 gtt/min. The solution infusing is 25,000 units heparin in 1 L of D5W. The administration set delivers IO gt/mL. The doctor has ordered 1500 units of heparin per hour. Is the patient receiving the ordered dosage?

7. The patient is to receive 10 milliunits of Pitocin (oxytocin) per minute. The IV contains 10 units of Pitocin in 1 liter of 5% dextrose. Determine the rate of the IV in gtts/min and cc/hr using a drop factor of 60 gtts/cc.

8. The patient is to receive Pitocin (oxytocin) at a rate of 8 milliunits per minute. The IV contains 10 units of Pitocin in 1000 cc. Using a drop factor of 60 gtts/cc, find the rate in gtts/min and cc/hr.

9. A physician orders a patient to receive 1000 Units heparin IV hourly from a solution containing 20,000 Units in 500 mL D5NS. Determine the flow rate if the set calibration is 60 gtt/mL.

See answers on p. 21.

ANSWER KEYS

METRIC SYSTEM CONVERSION PRACTICE—p.2

1. 1000 cc
2. 1/1000 or 0.001 L
3. 1000 mL
4. 1 cc
5. 1/1000 or 0.001 kg
6. 1/1000 or 0.001 g
7. 1000 mg
8. 900 mg; 300 mg
9. 250 mg/tablet x 4 tablets = 1000 mg = 1 g dose
10. 1.5 mg/tablet x 2 tablets = 3 mg dose
11. 2.5 mg/tablet x 2 tablets = 5 mg dose
12. ½ tablet = 25 mg
13. 1 g = 1000 mg   0.015 g = 15 mg   0.008 g = 8 mg
    250 mg = .25 g   750 mg = .75 g   0.5 L = 500 mL
    5 mL = 5 cc   650 mg = .65 g   1.2 g = 1200 mg   0.0004 g = 0.4 mg
14. 2 capsules

BASIC ENGLISH-METRIC CONVERSIONS—p. 3

1. 9 quarts
2. 3 Tbsp
3. 500 cc
4. 2150 g
5. 0.0025 mg
6. 9 minutes 18 seconds
7. 68 oz
8. 0.525 L
9. 250,000 mcg; 2.5 x 10^5 mcg
10. 0.4 hrs
11. 70 kg
12. 6 hrs. 30 minutes
13. 2.3 L
14. 45 mg
15. 6 tsp
16. 300cc bottle
17. 512 oz

ALLIED HEALTH MATH RATIO/PROPORTION PROBLEM SET 1—p. 4-5

1. 0.8 ml
2. 0.5 cc
3. 0.4 ml
4. 2 tablets
5. 3 tablets/dose,
   6 tablets per day
6. 4 capsules
7. 6 mL (range 4.5-6 mL)
8. 2700 mg per dose
9. 3.5 cc
10. 2.4 ml

ALLIED HEALTH MATH RATIO/PROPORTION PROBLEM SET 2—p. 5

1. 2 tablets per dose, 8 tablets per day
2. 2 of the 200,000U and 1 of the 100,000U
3. 0.6 mL
4. 0.75 mL
5. 0.8 mL (.4 ml of X and .4 ml of Y)
6. 327 mg daily, 1.6 ml daily, 0.5mL per dose
7. 75 mg/hr
8. 66 mg/hr, 1584 mg/day
9. 3 hr 55 min
10. 51.7 mL/hr

IV FLOW RATE PROBLEMS I—p. 9

1. 15 mL/hr
2. 50 μgtts/min
3. 100 gtts/min. Dose is safe.
4. 125 mg; 8 hrs 20 min
5. 600 mL
6. 46 cc/hr
7. 6.2 mL/hr
8. 14.7 mL/hr, or 15 mL/hr if necessary to round
9. 39.6 mL/hr

COMPLETE SOLUTIONS TO THREE IV FLOW RATE PROBLEMS IN SET I—p. 9

3. Order is for Keflin 500 mg IVPB q 6 hrs for a 19 kg child. The pharmacy sends you Keflin 500 mg in 50 mL NS. What would the flow rate be if it is delivered over 30 minutes with a microdrip set? The safe child dosage is 80-160 mg/kg/day.

Flow rate solution: $$\frac{50\,mL * 60\,\frac{gtt}{mL}}{30\text{ min}} = \frac{100gtt}{\text{min}}\ or\ \frac{100mL}{hour}$$

Is this a safe dosage?

- The safe dosage is 80-160 mg/kg/day.
- For this patient's weight of 19 kg, the safe dose would be 1520-3040 mg/day.
- The order is for 500 mg q 6 hr, which equals 2000 mg/day.
- The dose is safe.

5. The IV has gone sub-q. The amount infused was 250 mL. The IV was hung with 500 mg of Aminophyline in 1000 mL. How much Aminophyline did the patient receive?

$$\frac{500mg}{1000\,mL} = \frac{x\,mg}{250mL} \quad x = 125mg$$ Aminophyline

How long did it take to run the 250 mL if the set was 15 gtts/mL and the rate was 30 mL/hr?

$$\frac{250\ mL}{30\ mL/hr} = 8.33\ hrs = 8\ hrs.\ 20\text{ min}$$

9. The order is for Dobutamine 250mg/250cc. The doctor wants the medication delivered at 3.5 mcg/kg/min. The patient weighs 154 lbs. Using an IV pump, determine the flow rate in mL/hr.

$$\frac{1000\,mcg}{1\,mL} - \frac{245\,mcg}{x\,mL} - .245\ mL/\text{min} * 60\text{ min} - 14.7\ mL/hr$$

If the IV pump cannot be calibrated to .1 mL, the answer should be rounded to 15 mL/hr

FLOW RATE PROBLEMS 2—p. 1

1. 17 gtts/min
2. 10 microgtts/min
3. 30 microgtts/min
4. 8 hours 17 minutes
5. 2 hours
6. 25 gtts/min
7. 25 mL/hr; no; correct rate is 6 gtts/min
8. 44 gtts/min

PERCENT SOLUTIONS: GRAMS/CALORIES—p. 12

1. 400 calories
2. 225 g, 1125 mL
3. 415 ml, 498 calories
4. 137.5 g, 550 calories
5. 0.03% sodium
6. 6 ounces of juice per dose; 12 ounces of juice per day; 405 mL fluids given per day

NUR215 MATH—MATERNITY NURSING—p. 12

1. Initial 100 gtts/min; maintenance 25 gtts/min; 6:30 pm
2. 0.6 mL
3. 1600 calories
4. dosage range 0.5mL to 1.2mL per minute; maintenance dosage 0.2 mg/min

ALLIED HEALTH MATH PROBLEM SET 1—p. 13

1. 38 gtts/min
2. 25 gtts/min
3. 1/4 tab
4. 31 gtts/min
5. 26 hr 40 min
6. 5 hr. 33 min
7. 16 mg
8. 4 ounces
9. 31 gtts/min
10. 24.3 ml
11. 20 ml; No, the drip rate is wrong; 5 gtts/min
12. 25 gtts/min
13. 1.1 cc
14. 44 gtts/min
15. 8 hr. 17 min.

ALLIED HEALTH PROBLEM SET II—p. 14

1. 1. 2 ml
2. 1. 2 ml
3. 38 gtts/min
4. 19 gtts/min
5. 3 tbsp
6. ½ tab
7. 8 hr. 20 min.
8. 2 hr. 30 min.
9. 11 hr. 22 min., 75 g, 300 calories
10. 2:40 pm, 6 hrs 40 min.
11. 38 gtts/min
12. 67.6 mg.
13. 5.5 rng
14. 1 mL
15. 1.2 cc
16. 300 tsp
17. 20 min.
18. 60 gtts/min
19. 58 gtts/min
20. 7 gtts/min
21. 48 minutes

ALLIED HEALTH MATH PROBLEM SET III—p. 15

1. 0.8 mL
2. 1.5 tabs
3. 18 mL
4. 3 Tbsp
5. 2 tabs per dose
6. 7.5 mL per dose
7. 3 mL per dose
8. 21 gtts/min.
9. 40 gtts/min.
10. 10 microgtts/min.
11. 25 gtts/min.
12. 17 gtts/min.
13. 21 microgtts/min.
14. 52 gtts/min.
15. 36 gtts/min.

ALLIED HEALTH MATH PRACTICE TEST—p. 16

1. 42cc/hr
2. 2 mg/min
3. 20mg/hr
4. 6mg/hr
5. 34 mL/hr
6. No; the patient is receiving double the ordered dose.
7. 60 gtts/min; 60 cc/hr
8. 48 gtts/min; 48 cc/hr
9. 25 gtts/min