

DRUG CALCULATION COMPETENCY

RN Refresher Course 2009

COMPETENCY STATEMENT

Demonstrates ability to use basic mathematic concepts related to the correct administration of medications.

INSTRUCTIONAL STRATEGIES

Review of basic math concepts, completion of calculation practice test, self-review of basic pharmacology concepts from fundamentals of nursing.

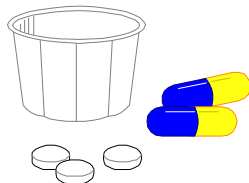
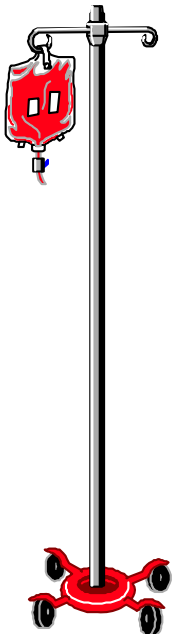
PASSING CRITERIA

Successful completion of 2009 Drug Calculation Test with a minimum score of 88%.

PERFORMANCE CRITERIA

Demonstrates ability to successfully complete a written Drug Calculation test identifying accurate calculations involving:

- ✓ Using decimals and fractions.
- ✓ Addition, subtraction, multiplication, and division.
- ✓ Finding a percent of a number.
- ✓ Systems of measurement, equivalents, and conversions.
- ✓ Solving for X (determining amount of medication to be administered when the desired dose differs from the medication on hand).
- ✓ Calculating IV flow rates.



DECIMALS & FRACTIONS

(ten thousands) (thousands) (hundreds) (tens) (ones) • (tenths) (hundredths) (thousandths)

↑
↑
decimal point

- ◆ Whole numbers are to the left of the decimal.
- ◆ Fractions are to the right of the decimal.
- ◆ Fractions with the highest number representing tenths has the higher value.
- ◆ When the tenths are identical, the higher number representing hundredths indicates the larger fraction.

FRACTIONS

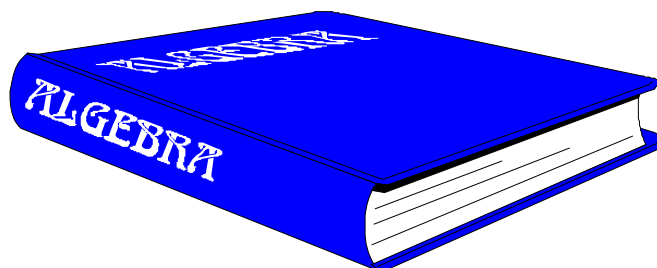
$\frac{1}{2}$ numerator
 denominator

- ◆ When the numerators are the same, the fraction with the lowest denominator has the higher value.

Example: $\frac{1}{100}$ is greater than $\frac{1}{150}$

- ◆ When the denominators are the same, the fraction with the higher numerator has the higher value.

Example: $\frac{3}{5}$ is greater than $\frac{2}{5}$



ADDITION, SUBTRACTION, MULTIPLICATION, DIVISION

ADDITION & SUBTRACTION

- ◆ When adding decimals, place all decimal points in a straight line for ease and accuracy.

Example:

$$\begin{array}{r} 5.42 \\ 2.7 \\ + \underline{.032} \\ 8.152 \end{array}$$

- ◆ Always add or subtract from right to left.

MULTIPLICATION & DIVISION

- ◆ When multiplying decimals, the decimal point in the product is placed the same number of places to the left as the total of numbers to the right of the decimal points in the numbers multiplied.

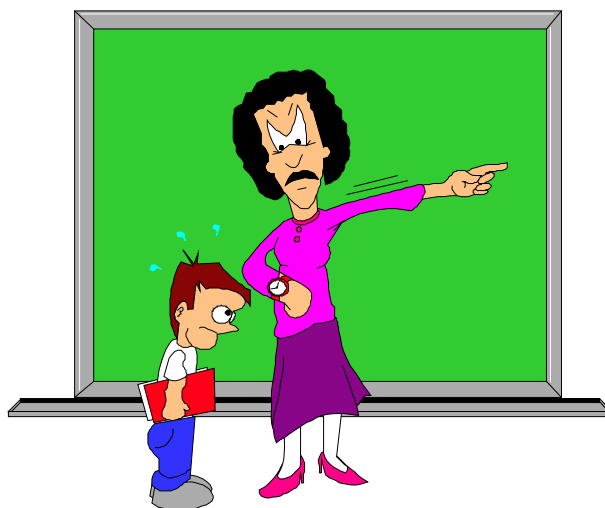
Example:

$$\begin{array}{r} .53 \\ \times .48 \\ \hline .2544 \end{array}$$

- ◆ If there are insufficient numbers to allow for the placement of the decimal, add enough zeros to the left to correct this.

Example:

$$\begin{array}{r} 0.12 \\ \times 0.2 \\ \hline 24 \end{array} \quad \text{answer} = .024$$



FIND A PERCENT OF A NUMBER

To find a percent of a given number, first change the percent to a decimal or fraction, whichever is most convenient, and multiply.

For example, find 25% of 60

First, change percent to decimal or fraction:

$$25\% = 0.25 \text{ or } 25/100 = \frac{1}{4}$$

Then, multiply:

$$0.25 \times 60 = 15$$

$$\text{or } \frac{1}{4} \times 60 = 15.$$

Solve the following:

Example 1: 75% of 80 = 60

Example 2: 15% of 60 = 9

Example 3: 7% of 124 = 8.68

Apply this mathematical principle to solve the following case scenario.

Order is to: Reduce the patient's Lantus dose by 20%.

The current Lantus dose is 30 units.

To calculate the new Lantus dose:

Step 1: 20% of 30 = 6,

Step 2: Decrease the dose by 6 units (30-6=24),

Answer. New dose is 24 units of Lantus.

SOLVE FOR WHAT PERCENT ONE NUMBER IS OF ANOTHER

To find what percent one number is of another, the second number is divided into the first and the decimal result is then changed into a percent.

For example, 14 is what percent of 70?

$$14/70 = 0.2$$

$$0.2 = 20\%$$

Answer: 14 is 20% of 70.

Solve the following:

Example 1: 40 is what % of 80 = 50%

Example 2: 60 is what % of 40 = 150%

Example 3: 5 is what % of 200 = 2.5%

Apply this mathematical principle to solve the following case scenario.

Your patient's blood pressure drops from 130/84 to 96/62.

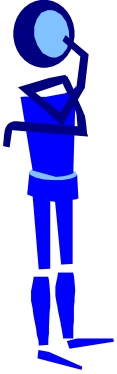
A systolic drop of 34 points (130-96 = 34). What percent did the blood pressure drop?

Step 1: 34 is what percent of 130?
 $34/130 = 0.2615$

Step 2: Convert to percentage. $0.2615 = 26\%$

Answer: 34 is 26% of 130. The patient's systolic blood pressure dropped by 26%.

MEASUREMENTS, EQUIVALENTS, CONVERSIONS



1 oz = 30 ml
1 tsp = 5 ml
1 tbs = 15 ml
1000 ml = 1 liter
1000 mg = 1 gram
1000 mcg = 1 mg
1 kg = 2.2 lbs

SOLVING FOR X (DOSAGE CALCULATION)

THREE BASIC RULES FOR ALL DOSAGE CALCULATIONS

- 1. Routinely double check all math*
- 2. Assess each answer to determine if it is logical*
- 3. Seek out help if you have any question about accuracy*



USING RATIO AND PROPORTION

Always write known quantities on the left.

Always use same sequence (mg : ml :: mg : ml)

Write incomplete or unknown quantities on the right. This is also dosage ordered.

For example: Give 700 mg of a drug with a dosage strength of 500 mg per 2 ml.

$$500 \text{ mg} : 2 \text{ ml} :: 700 \text{ mg} : X \text{ ml}$$

Multiply the means (inside) and the extremes (outside)

$$500 X = 2 \times 700$$

$$X = \frac{2 \times 700}{500}$$

$$X = \frac{1400}{500}$$

$$X = 2.8 \text{ ml}$$

If the drug weights are of different units of measurement, you must convert first.

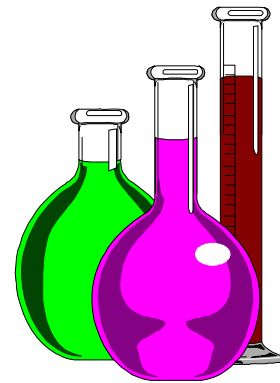
For example: Give 750 mg of medication. Drug is available as 1 gm/10ml.

Convert gm to mg
1000:10::750:X
1000X = 7500
 $X = \frac{7500}{1000}$ X = 7.5 ml

USING THE FORMULA METHOD

$$\frac{D}{H} \times Q = X$$

D = desired, dose ordered (mg, g, etc)
H = have on hand, dosage strength available (mg, g, etc)
Q = quantity, volume dosage strength is available in (ml, l, etc)
X = unknown, volume of desired dose (ml, l, etc)



For example: 80 mg dosage is ordered, dosage strength available is 100 mg/ 2 ml

$$\frac{80}{100} \times 2 = X$$

$$0.8 \times 2 = 1.6 \text{ ml}$$

As before, if the drug weights are of different units of measurement, you must convert first.

For example: 500 mg dosage is ordered, dosage strength available is 1 gram/5ml

Convert 1 gram = 1000 mg

$$\frac{500}{1000} \times 5 = X$$

$$0.5 \times 5 = 2.5 \text{ ml}$$



IV FLOW RATES (ml/hr)

WE USE VOLUME INFUSION PUMPS.
THEREFORE, OUR FLOW RATES WILL BE IN ML/HOUR.

FORMULA METHOD OF FLOW RATE CALCULATION

$$\text{FLOW RATE} = \frac{\text{VOLUME}}{\text{TIME}}$$

For example: Order is for 1 liter normal saline to infuse over 2.5 hours.

First, convert the liter into mls. 1 liter = 1000mls

$$\text{FLOW RATE} = \frac{1000}{2.5} = 400 \text{ mls/hr}$$

RATIO METHOD FOR DOSAGE CALCULATIONS

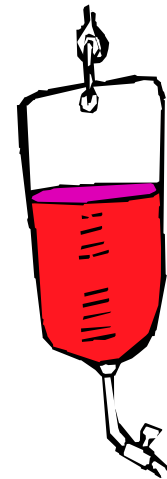
Order is for Heparin to infuse at 1200 units/hr. Heparin 25,000 units in 500 mls NS.

First, calculate concentration. $X = \frac{\text{total medication}}{\text{Volume fluid}} = \frac{25,000}{500} = 50 \text{ units/ml}$

50units:1 ml::1200 units: X ml

$$50X = 1200$$

$$X = \frac{1200}{50} = 24 \text{ml/hr}$$



DRUG CALCULATION PRACTICE QUESTIONS

1. Heparin 6500 units IV push has been ordered. It is available as 15,000 units/ml. How many mls should be given?
 - a. 0.1 ml
 - b. 0.2 ml
 - c. 0.3 ml
 - d. 0.4 ml
2. Erythromycin 250mg in 100mL D5W to infuse over $\frac{1}{2}$ hr. Calculate the ml/hour.
 - a. 250 ml/hr
 - b. 125 ml/hr
 - c. 200 ml/hr
 - d. 100 ml/hr
3. Your patient weighs 130 lb. You are ordered to administer 15mg/Kg/24hrs of a medication in divided doses every 8hrs. How many mg of the medication would you give per dose?
 - a. 325 mg
 - b. 295 mg
 - c. 275 mg
 - d. 130 mg
4. A medication order is to give 500mg I.M. q 12 hr. Available is 0.5grams/2ml. How many ml would be administered per dose?
 - a. 500 ml
 - b. 2 ml
 - c. 1 ml
 - d. 0.5 ml
5. The epidural orders are to turn off the infusion and call the anesthesiologist if the systolic BP is reduced by 25% of pre-op baseline. Pre-op baseline was 138/84, patient's blood pressure is now 102/64. The systolic BP has been reduced by:
 - a. 20%
 - b. 23%
 - c. 25%
 - d. 26%

ADDITIONAL DRUG CALCULATION PRACTICE QUESTIONS

6. A medication is available in 500mg tablets. The physician has ordered 0.5 grams. How many tablets should be given?
- 1 tablet
 - 2 tablets
 - 0.5 tablets
 - 2.5 tablets
7. A patient is ordered to receive 5 grams of glucose IV per hour. The patient has a 1L bag of D₅W hanging. 1000 ml D₅W = 50 grams of glucose. What would be the rate per hr?
- 50 ml/hr
 - 100 ml/hr
 - 150 ml/hr
 - 200 ml/hr
8. Your patient has been receiving 20 units of Lantus, but now has become NPO for surgery. The order reads that if your patient is NPO, reduce Lantus by 20%. How much Lantus should you administer now that the patient is NPO?
- 12 units
 - 14 units
 - 16 units
 - 18 units
9. Convert 3oz to mls. _____.
10. Calculate the following percentage: 180 is ____% of 210?
- 14%
 - 42%
 - 64%
 - 86%

<u>Answers</u>	
1.	d
2.	c
3.	b
4.	b
5.	d
6.	a
7.	b
8.	c
9.	90
10.	d