

# Review of the Ratio Proportion Method

A key mathematical calculation for dose preparation

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**Objectives.** At the completion of this program, the pharmacy technician will be able to: 1) Describe the ratio proportion method; 2) Apply the ratio proportion method to solve pharmacy calculation questions.

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Target Audience: Technicians



**EXAMPLE:** You have a bottle labeled ampicillin 250 mg per 5 mL. The doctor has ordered a 125 mg dose. How much do you give the patient?

**Remember #1:** You need three out of 4 pieces of information.

You have a bottle labeled ampicillin 250 mg (1) per 5mL (2). The doctor has ordered a 125 mg (3) dose. How much do you give?

**Remember #2:** What you know or what you have goes to the left.

You HAVE a bottle labeled ampicillin 250 mg per 5 mL.

$$\begin{array}{r} 250 \text{ mg} \\ \text{-----} \\ 5 \text{ mL} \end{array} =$$

**Remember #3:** The unknown (x) or what you need will be on the right. The doctor has ordered a 125 mg dose. How much do you give?

$$\begin{array}{r} 125 \text{ mg} \\ \text{-----} \\ x \end{array}$$

**Remember #4:** Both sides of the equation must be equal. Numerators must match and denominators must match.

$$\begin{array}{r} 250 \text{ mg} \quad 125 \text{ mg} \\ \text{----} = \text{----} \\ 5 \text{ mL} \quad x \text{ mL} \end{array}$$

NUMERATORS ARE BOTH MILLIGRAMS  
DENOMINATORS ARE BOTH MILLILITERS

Now you can proceed with cross multiplication.

$$250 \times x = 125 \times 5 \text{ (or 625)}$$

Divide both sides by 250 to isolate the variable.

$$x = \frac{625}{250}$$

x = 2.5 Using this answer, substitute for x in the problem.

$$x = 2.5 \text{ mL}$$

## TRY SOME PRACTICE PROBLEMS

A) The surgery department has a number of patients scheduled. These patients will require a low molecular weight heparin (LMWH). You need to draw up the following doses.

Dalteparin is available in a multidose vial containing 25,000 units/mL.

1. Dalteparin 2500 units \_\_\_\_\_mL
2. Dalteparin 5000 units \_\_\_\_\_mL

**R**atio proportion is often used by pharmacy technicians to calculate a particular dose or the volume or quantity needed for a particular dose.

A ratio is a relationship between two numbers. For example, the concentration of a particular medication is 200 mg per 5 mL. There is a relationship between these numbers because every 5 mL contains 200 mg of the drug product.

Proportion is the equality of two ratios.

$$\begin{array}{r} A \quad C \\ \text{----} = \text{----} \\ B \quad D \end{array}$$

In other words, the numerator on the left (A) has the same relationship to its denominator (B) as the numerator on the right (C) has to its denominator (D). The proportion shows a relationship between the two ratios. We use an equal sign between the ratios because they are equal to each other.

If we substitute the numbers A=1, B=4, C=4, D=16, we see that both relationships are the same.

In both cases, the denominators are four times the numerators.

$$\begin{array}{r} 1 \text{ (A)} \quad 4 \text{ (C)} \\ \text{-----} = \text{-----} \\ 4 \text{ (B)} \quad 16 \text{ (D)} \end{array}$$

When applying this to pharmacy calculations, keep in mind the following points:

- You must have three out of four pieces of information to set up the problem.
- What you know or what you have will be placed to the left of the equal sign.
- The unknown (x) or what you need will be placed to the right of the equal sign.
- Both sides of the equation must be equal. This means that when setting up the problem, the numerators must have the same units and the denominators must have the same units.

3. Dalteparin 15,000 units \_\_\_\_\_mL

Answers: 1) 0.1 mL 2) 0.2 mL 3) 0.6 mL

B) You are compounding IVs needed during the next 24 hours. Several patients with infections have been started on daptomycin. The drug has been reconstituted to a concentration of 50 mg/mL. How many milliliters need to be drawn up and injected into a 100-mL minibag for the following doses?

1. Daptomycin 375 mg \_\_\_\_\_mL

2. Daptomycin 450 mg \_\_\_\_\_mL

3. Daptomycin 280 mg \_\_\_\_\_mL

Answers: 1) 7.5 mL 2) 9 mL 3) 5.6 mL

C) A TPN order requires the following electrolytes to be added. The following are the vials on hand

- Potassium chloride 2 mEq/mL 20-mL vial
- Sodium chloride 4 mEq/mL 20-mL vial
- Calcium gluconate 0.465 mEq/mL 10-mL vial
- Magnesium sulfate 4.06 mEq/mL 10-mL vial
- Sodium phosphate 3 mM/mL 30-mL vial

1. KCl 24 mEq \_\_\_\_\_mL

2. Ca gluconate 9 mEq \_\_\_\_\_mL

3. NaCl 30mEq \_\_\_\_\_mL

4. Mg sulfate 4.06 mEq \_\_\_\_\_mL

5. Na phosphate 15 mM \_\_\_\_\_mL

Answers: 1) 12 mL 2) 19.4 mL 3) 7.5 mL 4) 1 mL 5. 5 mL ●

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\*See next page for questions.



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### QUIZ ANSWER FORM circle one answer per question

1) a b c d

2) a b c d

3) a b c d

4) a b c d

5) a b c d

6) a b c d

7) a b c d

8) a b c d

9) a b c d

10) a b c d

11) a b c d

12) a b c d

13) a b c d

14) a b c d

15) a b c d

16) a b c

17) a b

18) \_\_\_\_\_

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## SELF ASSESSMENT QUESTIONS

### Review of the Ratio Proportion Method

- A KCl 20% solution has 40 mEq in 15 mL. Give 20 mEq. How many milliliters are needed?
    - 7.5 mL
    - 2.5 mL
    - 0.75 mL
    - 11.5 mL
  - Bicillin CR is given as an IM preparation. There are 600,000 units/mL, and the dose is 1.5 million units (1,500,000 units). What is the volume to be administered?
    - 0.25 mL
    - 0.025 mL
    - 2.5 mL
    - 0.0025 mL
  - You have a heparin vial which reads 10,000 units per mL. The dose ordered is 25,000 units. How many milliliters will that dose require?
    - 4 mL
    - 0.4 mL
    - 25 mL
    - 2.5 mL
  - Digoxin 0.375 mg is ordered. You have in stock 0.25 mg tablets. How many tablets do you give?
    - 2 tablets
    - 1.5 tablets
    - 0.5 tablets
    - 15 tablets
  - Keflex suspension comes as 125 mg/5mL. If the patient needs 300 mg, how many milliliters will you need?
    - 12 mL
    - 2 mL
    - 10 mL
    - 0.48 mL
  - A cancer patient is receiving morphine. The bag is infusing at 2 mg/hr. How many milligrams of morphine has the patient received after 12 hours?
    - 2 mg
    - 6 mg
    - 12 mg
    - 24 mg
  - D5W is running at 125 mL/hr. How many hours will it take for a 1-liter bag to run?
    - 1 hr
    - 12.5 hr
    - 8 hr
    - 125 hr
  - Ceftriaxone is reconstituted to a concentration of 100 mg/mL. How many milliliters are needed for a 250 mg dose?
    - 4 mL
    - 0.4 mL
    - 2.5 mL
    - 0.25 mL
  - A patient needs tobramycin 140 mg in 100 mL 0.9% NaCl. Tobramycin is available in 2-mL vials containing 40 mg/mL. What volume of tobramycin should be drawn up for each 140 mg dose?
    - 3.5 mL
    - 5.6 mL
    - 2.5 mL
    - 0.04 mL
  - A cefazolin 1 gram vial is reconstituted with 2.5 mL of sterile water to provide a concentration of 330 mg/mL. What volume of cefazolin should be added to a 50-mL minibag to deliver a 500 mg dose?
    - 2 mL
    - 0.6 mL
    - 1.52 mL
    - 1.25 mL
- For questions 11 - 13:  
You are asked to draw up insulin syringes. You are using Regular insulin 100 units/mL. How much insulin is needed for the following doses?
- Regular insulin 40 units
    - 0.04 mL
    - 0.4 mL
    - 4 mL
    - 2.5 mL
  - Regular insulin 15 units
    - 6 mL
    - 0.15 mL
    - 0.015 mL
    - 1.5 mL
  - Regular insulin 33 units
    - 3.3 mL
    - 3 mL
    - 0.33 mL
    - 0.033 mL
  - Vancomycin 1.25 gm IV is ordered. A vancomycin vial is reconstituted to provide a concentration of 100 mg/mL. How much vancomycin is injected into the minibag for the 1.25 gm dose?
    - 12.5 mL
    - 1.25 mL
    - 25 mL
    - 0.8 mL
  - An order is written for gentamicin 220 mg. Gentamicin is available in 2-mL vials containing 40 mg/mL. The volume of gentamicin needed to make the 220 mg dose is \_\_\_\_\_.
    - 4 mL
    - 2.75 mL
    - 11 mL
    - 5.5 mL
  - How do you rate this lesson?
    - Very Good
    - Good
    - Poor
  - Did it meet the learning objectives?
    - Yes
    - No
  - How long did it take you to complete this lesson?



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