Introduction

An essential skill in nursing practice is dosage calculation - the ability to correctly calculate and check medication dosages before administering them. As a Nursing Science Major and applicant to the Career Ladder Track, you are eligible to challenge out of HSNS 1101, Dosage Calculation for Nurses, by taking an examination. You will have one opportunity to pass the challenge examination with a score of 90% or higher. If you do not pass the exam, you will need to successfully complete HSNS 1101, Dosage Calculation for Nurses, prior to admission to the program. The challenge exam or the course must be completed no more than one year prior to admission to the program.

Procedure For Challenge-

1. According to Rose State College policy, a student must be enrolled in Rose State classes to Challenge HSNS 1101.

2. Go to the Office of Admissions in the Administration Building and request a form called "Application for Credit by Examination". Complete the application, indicating the name of the course as “HSNS 1101: Dosage Calculation for Nurses.” Obtain the necessary signatures on that form in the Health Sciences Center, room 152.

3. Return the form to the Office of Admissions, and go to the Cashier's window to pay a fee of $5.00.

4. Take the form to the Testing Center, Room 103 in the Learning Resources Center, at least 1½ hours prior to their closing time. They will administer the test and notify the Director of the Nursing Science Program that it is complete. You will be required to show your Rose State student ID before the exam will be administered.

5. You will be notified of your results on the exam via an email to your RSC student email in approximately one week. If you are successful on the exam, credit will be noted on your transcript. The Director will complete the form for credit by examination and send it to the Office of Admissions once you are admitted and enrolled in the nursing program. If you are not successful on the exam, you will need to enroll in HSNS 1101 Dosage Calculation for Nurses.
What You Will Need To Know

Dosage calculation incorporates a number of math skills, including:

- Addition and subtraction
- Multiplication and division
- Fractions, especially multiplying and dividing
- Decimal points: adding, subtracting, multiplying, and dividing
- Converting decimals to fractions and vice-versa
- Solving equations to determine the value of X

The Dosage Calculation Challenge Exam will incorporate the above math skills to help you solve dosage problems in these areas:

- Calculating drug dosages in the metric system
- Calculating drug dosages using household measurements
- Dosage calculations using conversions within & between systems of measurements
- Calculating drug dosages in units & milliequivalents
- Calculating pediatric dosages
- Reconstituting powdered drugs for injection & related dosage calculations
- Calculating drip rates
- Calculating IV infusion rates
- Calculating dosages of critical care medications

To help you determine areas of strength and weakness in mathematics, your professors have prepared a short self-assessment test. (See attached) You may take and grade this test yourself. If you miss more than one question per section, you will want to review that section.

How To Prepare

There are a number of ways that you can review dosage calculation skills, depending on the amount of review needed and your personal preference. Some suggested methods follow.

If you did well on the test overall, but had problems in one or two sections, you might wish to utilize a dosage calculation book from the Learning Resources Center. There are several dosage calculation books available for checkout in the LRC.

If you feel highly insecure about your basic mathematics skills and did poorly on the self-assessment test, you will want to spend more time in review and preparation and/or enroll in a math class.

If you find it difficult to learn just by reading the book and would like personalized help with basic math skills, you can obtain it in various ways. In the Science and Math Division, there is a Math Lab in Room 119, which is available for all students on campus. In this lab are computer-assisted learning packages and audiovisual materials. Although there are no tutors in this lab, there are lab monitors who are available to assist you to locate and utilize the appropriate learning materials. The lab is open Monday through Thursday, 8:00 a.m. to 8:00 p.m., Friday, 8:00 a.m. to 12:00 noon, and 3:00 p.m. to 5:00 p.m., and on Saturday, 9:00 a.m. to 1:00 p.m.
Math tutors are available in the Learning Resources Center. Although these services are primarily meant for individuals who are taking math classes, Nursing Science students can utilize these services, since a part of the program focuses on math. These tutors can help with basic math skills, but be sure to have a specific type of problem in mind with which you are requesting help. To schedule a session with a general math tutor, go to the tutoring desk in the Learning Resources Center. Dosage calculation tutors may also be available there.

Another option for math help is to take a course called MATH 0103 Arithmetic Skills Development. One hour of class and four hours per week in the Math Lab are required for this course. If you are weak in basic math skills, you may want to consider taking this course. In order to evaluate your basic math skills, you may take the COMPASS Pre-Algebra/Numerical Skills test in the Testing Center of the Student Services Building. A score of less than 31 indicates a definite need for the Arithmetic Skills Development course. If your score is greater than 31 but less than 61, you could take a course called MATH 0113 Pre-Algebra.

**Rounding Your Answers**

Students frequently have questions about whether an answer should be rounded. Generally, numbers of 5 or more are rounded up to the next number. Numbers of less than 5 are rounded down. In dosage calculation, you must consider the equipment you will use! Dosages of 1 cc or less should be drawn up in a 1-cc syringe. The dosage can be measured out to the hundredth place, for example, 0.75 cc. Therefore, if you obtain an answer of 0.383 cc, then you would round it to 0.38 cc. Dosages of between 1 and 3 cc are given in a 3 cc syringe. The dosage can be measured out to the tenth place, for example, 1.2 cc. Therefore, if you obtain an answer of 1.26 cc, then you would round it to 1.3 cc.

**See attached RSC Rounding Rules** for more information on rounding.

**Choose to Take the Challenge Examination / Unsuccessful on the Challenge Examination**

If you do not choose to take the Dosage Calculation challenge examination, or if you are unsuccessful on the challenge examination, you should enroll in HSNS 1101, Dosage Calculation for Nurses. This course meets the first and second eight-weeks of the Fall or Spring semester and is also offered in the Summer. Permission of the Program Director is required for enrollment.

Instruction on dosage calculation skills will be provided. However, instruction in basic math skills is not provided. If you feel you need work on basic math skills, you should consider the above mentioned Math classes prior to enrolling in Dosage Calculation. In order to pass the Dosage Calculation course, a 90% or higher on the final exam, which is similar to the challenge examination, must be earned by the second attempt.

**Students are allowed TWO opportunities to take and successfully complete HSNS 1101 Dosage Calculation for Nurses. Any student who has not successfully completed the course after two attempts will not be eligible for admission to the Nursing Science Program.**
Self-Assessment On Dosage Calculation Skills

**Instructions:**

The purpose of this self-assessment is to help you to determine areas of strength and weakness, so that you may review as needed. Complete the problems to the best of your ability. On the last page of the test are the answers. If you miss more than one problem per section, you will need to review material related to that section. The self-assessment includes practice problems on basic arithmetic skills. Although these are not included as such on the challenge exam, they are basic knowledge needed for dosage calculation.

Section I: Addition, Subtraction, Multiplication and Division

1. 280 + 343 = 
2. 434 − 280 = 
3. 980 × 24 = 
4. 1,882 ÷ 116 = 

Section II: Fractions

5. 7/15 × 8/12 = 
6. 3 4/8 × 3/16 = 
7. 3/4 ÷ 1/9 = 
8. 12 ÷ 1/3 = 

Section III: Decimal Points

9. 16.19 − 3.86 = 
10. 1.86 × 12.1 = 
11. 0.89 × 7.65 = 
12. 63.8 ÷ 0.9 = 
13. 39.7 ÷ 1.3 = 

Rev 3.14
Section IV: Solving Equations To Determine The Value of X – (Including Ratio And Proportion).

14. \( \frac{75}{30} \times 3 = \) ___________.
15. \( \frac{0.3}{1.2} \times 2 = \) ___________.
16. \( \frac{12}{5} = \frac{24}{x} = \) ___________.
17. \( \frac{40}{2} = \frac{30}{x} = \) ___________.

Section V: Calculating Drug Dosages In The Metric System And With Household Measurements

18. Mysoline 375 mg is ordered. Scored tablets available are 250 mg. How many tablets would you give?

_____________________

19. A dosage of 25 mg of methazolamide has been ordered. Scored tablets available are 50 mg. How many tablets would you give?

_____________________

20. Estinyl tablets are 0.05 mg. How many tablets would you prepare to give a 0.1 mg dosage?

_____________________

21. Terpin hydrate 2 tsp. has been ordered. How many mLs would you give?

_____________________

22. You are preparing a 30 mg IM dosage of phenobarbital from a solution with a strength of 45 mg per mL. How many mLs will you give?

_____________________

23. Codeine IM is available in a 30 mg per mL solution. How many mLs would you prepare to give a 60 mg dosage?

_____________________

Rev 3.14
Section VI: Converting Within & Between Systems

24. Benztropine mesylate 1500 mcg has been ordered t.i.d. The dosage strength available is 0.5 mg per tablet. How many tablets would you give?

25. An initial dose of 1.1 g has been ordered. Capsules are 550 mg in strength. How many capsules would you give?

26. You are preparing a 15 mg dosage of morphine from a solution labeled 30 mg per oz. How many mL will you prepare?

Section VII: Calculating Drug Dosages in Milliequivalents & Units

27. The order is for Phizerpen-AS 400,000 U q12h. Vial strength is 300,000 U per mL. How many mLs would you give?

28. A 5,000 U per mL solution of heparin sodium is available. How many mL would you prepare to give a 7,500 U dosage?

Section VIII: Reconstituting Powdered Drugs For Injection

29. Amoxil oral suspension is prepared as a 7.5 g powder for reconstitution. The directions are to add 111 mL of water and shake until dissolved. The reconstituted solution has a strength of 250 mg per 5 mL. How many mLs would you prepare to give a 0.5 g dosage?

30. To prepare a 100 mg/mL solution of Chloromycetin from the powdered drug, you must add 10 mL of sterile water to the vial. How many mL would you draw up to give a 0.25 g dosage?
Section IX: Calculating IV Drip Rates

31. The doctor orders the IV to run at 125 mL per hour. The drip chamber delivers 10 gtts per mL. How many gtts per minute will the nurse set the infusion rate?

__________________________

32. The doctor orders the IV to run at 150 mL per hour. The drip chamber delivers 20 gtts per mL. How many gtts per minute will the nurse set the infusion rate?

__________________________

Section X: Calculating IV Infusion Rates

33. The nurse notices 450mL of D5W is left to count at 0700 and the bag is infusing at 40 mL/hr. At what time (in hours and minutes) will the nurse expect to hang a new bag?

__________________________

34. The doctor orders gentamicin 350 mg q 8 hr. The gentamicin is packaged in 150mL. The prescribed rate of infusion is 75 mL per hour. How long will it take to infuse the gentamicin?

__________________________

35. How many hours will it take to infuse 1000 mL of D5NS if the ordered infusion rate is 125 mL per hour?

__________________________

36. The nurse hangs an IVPB with 1 gram of Ampicillin in 50 mL. The order is to infuse the medication over 45 minutes. At what rate (mL/hr) will the nurse set the infusion pump?

__________________________
Section XI: Calculating Pediatric Dosages and Critical Care Dosages

37. The recommended daily dosage of PO Keflex is 25-50 mg/kg/day in divided doses q6h. For a child weighing 44 lbs., what is the safe recommended dosage range for a 24 hour period?

__________________________

38. Ordered Erythromycin 30 mg/kg/day in divided doses tid. For a child weighing 11 lbs., how many mg of Erythromycin should be given in a single dose?

__________________________

39. Order: Regular Insulin IV at 12 U/hr. The concentration is Insulin 200U in 500mL of 0.9% NS. The IV pump should be programmed for how many mL/hr?

__________________________

40. Order: Nipride 10 mcg/Kg/min for a client who weighs 200 lb. How many mg/hr will this client receive?

__________________________

41. On hand is Nipride 1Gm in 1000 mL D5W. The IV pump should be programmed for how many mL/hr to deliver the ordered dose in problem #40.
<table>
<thead>
<tr>
<th>Section I</th>
<th>Section V</th>
<th>Section X</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 623</td>
<td>1. ½ tablets</td>
<td>33. 1815 or 6:15pm</td>
</tr>
<tr>
<td>2. 154</td>
<td>½ tablet</td>
<td>34. 2 hr</td>
</tr>
<tr>
<td>3. 23,520</td>
<td>2 tablets</td>
<td>35. 8 hr</td>
</tr>
<tr>
<td>4. 16.224137</td>
<td>10 mL</td>
<td>36. 67 mL/hr</td>
</tr>
<tr>
<td><strong>Section II</strong></td>
<td><strong>Section VI</strong></td>
<td><strong>Section XI</strong></td>
</tr>
<tr>
<td>5. 14/45</td>
<td>2 mL</td>
<td>37. 500-1000mg/24h</td>
</tr>
<tr>
<td>6. 21/32</td>
<td>3 tablets</td>
<td>38. 50 mg/dose</td>
</tr>
<tr>
<td>7. 6 ⅔</td>
<td>2 mL</td>
<td>39. 30 mL/h</td>
</tr>
<tr>
<td>8. 36</td>
<td>2 capsules</td>
<td>40. 55 mg/hr</td>
</tr>
<tr>
<td><strong>Section III</strong></td>
<td><strong>Section VII</strong></td>
<td><strong>Section IX</strong></td>
</tr>
<tr>
<td>9. 12.33</td>
<td>15 mL</td>
<td>21 gtt/min</td>
</tr>
<tr>
<td>10. 22.506</td>
<td>1.3 mL</td>
<td>10 mL</td>
</tr>
<tr>
<td>11. 6.8085</td>
<td>1.5 mL</td>
<td>21 gtt/min</td>
</tr>
<tr>
<td>12. 70.888</td>
<td>10 mL</td>
<td>50 gtt/min</td>
</tr>
<tr>
<td>13. 30.538461</td>
<td>2.5 mL</td>
<td>50 gtt/min</td>
</tr>
<tr>
<td><strong>Section IV</strong></td>
<td><strong>Section VIII</strong></td>
<td><strong>Section IX</strong></td>
</tr>
<tr>
<td>14. 7.5</td>
<td>2 mL</td>
<td>21 gtt/min</td>
</tr>
<tr>
<td>15. 0.5</td>
<td>31</td>
<td>50 gtt/min</td>
</tr>
<tr>
<td>16. 10</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>17. 1.5</td>
<td></td>
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</tbody>
</table>
The following rounding rules will be utilized on exams in the nursing program. These rules will apply to all dosage calculation problems including pediatric and critical care calculations. Each dosage calc question will specify how many places to round your answer and the dosage form e.g. mL or tabs. Answers that are rounded incorrectly will be marked off.

- **WHEN WORKING THROUGH PROBLEMS DROP NUMBERS AFTER THE HUNDREDTH PLACE.**

  ***********************
  Example #1 – Round 5.537 mL to 5.53 mL
  Example #2 – Round 8.921 mL to 8.92 mL
  ***********************

- **rules for rounding final answers.**

  Final answers will either be rounded to the hundredth place, tenth place, or to a whole number depending on the situation.

  - When final answers are ≥ 1mL, round to the nearest tenth. To express a number to the nearest tenth, carry out the problem to the hundredths place (two places after the decimal). If the number in the hundredths place is 5 or greater, add one to the tenths place. If the number is less than 5, drop the number to the right of the desired decimal place. Answers containing trailing zeros will be counted as a wrong answers.

    ********************
    Example #1 – Round 1.25 mL to 1.3 mL
    Example #2 – Round 2.34 mL to 2.3 mL
    ********************

  - When final answers are < 1mL, round to the nearest hundredths place. Answers without a leading zero in front of the decimal place will be counted wrong.

    ********************
    Example #1 – Round 0.257 mL to 0.26 mL
    Example #2 – Round 0.341 mL to 0.34 mL
    ********************

  - When calculating oral medications, round to the nearest mL or fluid oz, unless a syringe will be used to measure and deliver the medication to the client, then round according to the rules above.

    ********************
    Example #1 – Round 1.34 mL to 1 mL
    Example #2 – Round 2.56 oz to 3 oz
    ********************

  - When calculating IV drip rates, round to the nearest whole number.

    ********************
    Example #1 – Round 33.25 gtt/minute to 33 gtt/minute
    Example #2 – Round 124.56 mL/hour to 125 mL/hour
    ********************

  - When calculating dosages involving tablets or capsules, round to the whole number unless a scored tablet is indicated in which case ½ (or 0.5) tablet may be indicated.