BRONX COMMUNITY COLLEGE
DIVISION OF ACADEMIC AFFAIRS

NURSING AND ALLIED HEALTH SCIENCES PROGRAM
ASSESSMENT PLANNING TEMPLATE

December 11, 2009

Department/Program	Nursing and Allied Health Sciences
Department Chairperson	Prof. Lois Augustus
Academic Assessment Review Leader	Prof. Deborah Morris
Course to be Assessed	PHM 10-Pharmacology Computations

1. What student learning outcomes will be assessed?

The student learning outcomes to be assessed will be for PHM 10—Pharmacology Computations.

- **Upon the completion of the course, the student will be able to:**

    a. Perform the basic components of mathematics—addition, subtraction, division, and multiplication.

    b. Understand the relationships between decimals, fractions, and percentages.

    c. Interpret use of Roman Numerals from 1- 30.

    d. Identify conversion equivalents.

    e. Convert units of measurements within and between the Apothecary System and the Metric System.

    Sample: gr ½ = _____mg
                 Apothecary   Metric

                 gr 15 3/4= _____g
                 Apothecary   Metric

    f. Convert units of measurements within and between the Household System and Metric System.

    Sample: 1 ½ tsp=_____mL
                 Household   Metric

                 45 mL=_____tbs
                 Metric   Household

g. Convert units of measurements within and between and the Metric System and Apothecary and Household System.

    Sample: 4 kg=_____g
                Metric   Metric

                27 lb=_____kg
                Apothecary/Household   Metric

h. Use a formula to calculate dosages to be administered or using ratio and proportion (Oral and Parenteral).

    Sample – **Oral**
                <u>Order</u>: 500 mg po of a medication
                <u>Available</u>: Capsules labeled 250 mg

            Formula: $\dfrac{500 \text{ mg}}{250 \text{ mg}} \times 1 \text{ caps} = \text{x caps}$

            Ratio and Proportion:

            250 mg: 1 caps = 500mg: x caps **OR** $\dfrac{250 \text{ mg}}{1 \text{ caps}} = \dfrac{500 \text{ mg}}{\text{x caps}}$

    Sample – **Parenteral**
                <u>Order</u>: 15 mg IM of a medication
                <u>Available</u>: 30 mg per 2 mL

            Formula: $\dfrac{15 \text{ mg}}{30 \text{ mg}} \times 2 \text{ mL} = \text{x mL}$

            Ratio and Proportion:

            30 mg: 2 mL = 15 mg: x mL **OR** $\dfrac{30 \text{ mg}}{2 \text{ mL}} = \dfrac{15 \text{ mg}}{\text{x mL}}$

- *What program/course teaching goals do these outcomes fulfill?*

The outcomes fulfill one of the PHM 10 course teaching goals and are one of the primary goals of the Nursing and Allied Health Program. Each outcome is connected to a specific course objective.

One of the program goals is to prepare students to accurately compute medication dosages which are essential skills for all professional nurses. To perform these tasks, PHM 10 students must have a thorough knowledge of pharmacology mathematical computations to be successful in the course and future nursing courses.

PHM 10 COURSE OBJECTIVES

At the completion of this course, the student will be able to demonstrate through paper and pencil testing the following:

1. Identify the basic pharmacology language, symbols, weights and measures. **(e, f, g)***

2. Write the meaning of a given abbreviation in the Metric, Apothecary, and Household Systems. **(e, f, g)***

3. Identify conversion equivalents. **(d)***

4. Convert within the same system. **(g)***

5. Convert between Apothecary, Metric, and Household Systems. **(e, f, g)***

6. List the 6 Rights of Medication administration. **(h)***

7. Identify equipment used in medication administration. **(h)***

8. Identify components of a medication label. **(h)***

9. Identify acceptable abbreviations used in medication orders. **(e, f, g)***

10. Interpret a given medication order. **(e, f, g, h)***

11. Use a formula to calculate dosages to be administered. (Oral and Parenteral) **(h)***

12. Calculate a dosage based on body weight. **(g, h)***

13. Utilize a formula to calculate intravenous infusion rates. **(h)***

14. Calculate intravenous caloric intake. **(h)***

*Alphabetical letters relate to the correlation between the Learning Outcomes and the Course Objectives in PHM 10.

- *In what course will these outcomes be addressed?*

As stated, these outcomes are addressed in PHM 10—Pharmacology Computations.

- *Identify any of the outcomes that speak to the College's general educational goals and proficiencies and explain this relationship.*

    Communication, Reasoning and Analysis, and Mathematical Methods are the principal General Education Proficiencies that are incorporated into the learning outcomes.

    a. Students will acquire the skills to listen, read, and interpret information related to the calculation of medication **(Communication).**

    b. Students will analyze problems, through the application of Apothecary, Metric, and Household Systems, in order to determine the correct dosages to administer **(Reasoning and Analysis).**

    c. Students will apply the basic components of mathematics that are the foundation in understanding and calculating the conversion of units of measurements within and between Apothecary. Metric, and Household Systems **(Mathematical Methods).**

2. What is the rationale for assessing them?

A shocking number of patients die every year in United States hospitals as the result of medication errors and many more are harmed. It is estimated that 3,000 to 6,800 deaths are caused annually by medication math errors. www.alysion.org/dimensional/analysis.

The responsibility of medication administration is a critical function performed by all nurses. The first step in assuming this responsibility is to learn how to calculate medication dosages accurately. Difficulties often arise when converting from one system of measurements to another and when converting standard mathematic calculations. In order to calculate correct dosages, students must have the ability to perform basic math skills. Basic math skills are inherent in all aspects of dosage calculation.

Students enrolled in PHM 10 demonstrate a deficiency in basic math skills despite the requirement to pass the COMPASS with a score of **35 or better** in M1 (basic math portion). Two courses were analyzed to determine the passing rate based up various cutoff rates. The cutoff rate for the Nursing Program is **35 or better** in the COMPASS M1 test. Using the 35 or better score, **59.1 percent** passed PHM 10.

Table 1: PHM 10 Pass Rate, Spring and Summer 2009

		N	%
Valid	Passing	133	**59.1**
	Not Passing	92	40.9
	Total	225	100.0
Missing	System	5	
	Total	230	

However, when the cutoff rate was increased to **45**, **64.7 percent** would have passed PHM 10.

Table 2: PHM 10 Cutoff by M1 Cutoff 45, Spring and Summer 2009

			Pass		Total
			Passing	Not Passing	Passing
m1_r1	<45	N	37	43	80
		%	46.3%	53.8%	100.0%
	>=45	N	86	47	133
		%	**64.7%**	35.3%	100.0%
	Total	N	123	90	213
		%	57.7%	42.3%	100.0%

As illustrated in the following tables, when the M1 cutoff rate is raised to **50**, **69.8 percent** of the students would have passed PHM 10.

Table 3: PHM 10 Cutoff by M1 Cutoff 50, Spring and Summer 2009

			Pass		Total
			Passing	Not Passing	Passing
m1_r2	<50	N	55	56	111
		%	49.5%	50.5%	100.0%
	>=50	N	67	29	96
		%	**69.8%**	30.2%	100.0%
	Total	N	122	85	207
		%	58.9%	41.1%	100.0%

At **55**, there is a slight decrease to **68.6 percent** in the prediction of successful completion of PHM 10.

Table 4: PHM 10 Cutoff by M1 Cutoff 55, Spring and Summer 2009

			Pass		Total
			Passing	Not Passing	Passing
m1_r3	<55	N	64	63	127
		%	50.4%	49.6%	100.0%
	>=55	N	59	27	86
		%	**68.6%**	31.4%	100.0%
	Total	N	123	90	213
		%	57.7%	42.3%	100.0%

Students with stronger arithmetic skills achieve higher grades in PHM 10. Students who score an ACT COMPASS score of **60** or above report a passing rate of **70 percent** compared with only **59 percent** for the PHM 10 group, as a whole based on all Spring and Summer 2009 enrollees.

Calculation skills are imperative if nurses are to provide safe, competent care to clients. Deficiencies in calculation skills can affect a student's progression within the Nursing Program. Competency in calculation of dosages is tested in each nursing course. A student's outcome in PHM 10 has been found to be a predictor of success in the Nursing Program.

- *What problems or issues regarding student learning need to be addressed in your department? Why?*

    1. **Student Retention of Previous Learning**—Students' lack of ability to apply previous learning of basic mathematics to Pharmacological Computations. Students **must** be able to apply pharmacological skills learned in PHM 10 throughout the Nursing Curriculum. Competency in Pharmacology is tested at each level in the Nursing Curriculum. In addition, students must be able to pass a pharmacology exam before being hired—post-graduation when seeking employment.

    2. **Reading Skills**—Students must be able to read information from medication labels and follow directions regarding the mixing of medications and must be able to extract the necessary information to be used in safely calculating the dose/s to be administered.

    3. **Critical Thinking**—Students have deficits in the application of knowledge to arrive at a reasonable and rational answer in relation to a dosage being calculated. A number of students have difficulty using logic in interpreting given information (reading labels, etc.) in the process of solving pharmacological problems. Critical thinking and the ability to think logically are important skills needed to ensure safe and competent client care.

- *What curriculum components—including those in recently implemented, new, or revised courses appear to be most challenging for the students?*

    1. Retention of previous and current knowledge.

    2. Student's continue to have difficulty in computational skills that are required to safely and accurately calculate medication dosages—understand and correctly set up the problem to be solved; accurately compute the numerical calculation; and choose the correct measuring device to administer medications.

    3. Time Management for practice of problems and need to schedule Workshops.

    4. Identification of their deficits in relation to dosage calculation.

- *Are there issues related to student learning or performance that have been raised by accrediting or other external evaluators? What are these issues?*

    1. When The New York State Education Department visited, they discussed the need to limit students' attempts at pre-nursing courses to be admitted to the clinical phase of the Nursing Program. Findings of The New York State Education Department indicated that multiple attempts in pre-nursing courses resulted in problems in succeeding in the Nursing Curriculum. According to The New York State Education Department in relation to PHM 10 and student performance, it is not the business of the Nursing Program to do Math Remediation and that students should be prepared in the basic math skills before entry into PHM 10—Pharmacology Computations.

    2. During the accreditation visit (2004) The National League for Nursing Accrediting Commission (NLNAC) noted that the students' outcomes in PHM 10 and BIO 23 were predictors of success in the Nursing Program. At that time, the Department put forth a proposal to College Senate limiting a student's attempt in the two courses (PHM10 and BIO 23) and required a grade of C+ or better.

3. What methods will be used to evaluate student work?

Short-term Assessment with Intervention

In collaboration with the Mathematics and Computer Science Department, a new Web-based Diagnostic Test was designed. The test will include all aspects of the mathematic requirements in PHM 10. The Diagnostic Test will be administered in the first week of PHM 10 classes. Approximately 100-120 students will be included.

PHM 10 faculty will grade the tests and Institutional Research and Development will analyze the data. PHM 10 faculty will discuss and review the findings of each student's performance to determine the appropriate intervention tailored and taught by PHM 10 faculty based upon each student's results. Students earning a grade based upon the scale below **will be required** to attend the number of Workshops indicated below:

77 or better	one Workshop
65-76	two Workshops
Below 64	three Workshops

Mandatory hours will be scheduled for the PHM 10 Workshops to reinforce and improve student performance in problem areas. The students attending the Workshops will earn **five percent** towards their overall grade.

The Workshop grading will include attendance and performance; and, if necessary, academic advisement for those students at the lower end of the scale. Students who do not attend the Workshops will be sent to the Nursing Advisor for further consultation.
In addition, the Math Lab in CPH 303 will be used so students can use mathematical software to practice areas in basic math and reinforce math concepts for PHM-10.

A second quiz will then be administered at the conclusion of the Workshops to determine the impact of the intervention upon the student's performance and learning outcomes for future success in the course as well as to meet the desired learning outcomes established.

Long-term Assessment

Quizzes, mid-term, and final exams include fill-in questions, calculation problems, and alternate format questions based upon factual and conceptual knowledge contained in course text and lecture.

1. **Quizzes—20%** To measure student's comprehension of content prior to each quiz. Each quiz consists of 20-25 questions which will also include calculations.

   Example of a Quiz Question:

   Select **all** that are correct by placing a check mark (✔) next to the statement. **(ALL MUST BE CORRECT.)**

   The apothecary system:

   - ☐ a. is sometimes referred to as the fractional system.
   - ☐ b. is used most often for dosage calculations.
   - ☐ c. uses fractions, Arabic numbers, and roman numerals to express values.
   - ☐ d. uses decimals to express values.
   - ☐ e. has approximate equivalents.
   - ☐ f. some units that are the same as those in household.

2. **Midterm Exam—25%** To measure student's comprehension of subject matter discussed during the first half of the semester—Apothecary, Metric, Household, Interpretation of orders, calculation of oral medication—tablets and capsules. The Exam will consist of 30 questions.

   Example of Midterm Question:
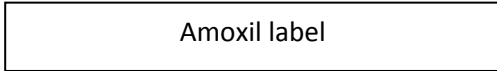
   Order: Brethine 5 mg po tid
   Available:

   ```
   Brethine label
         2.5 mg
   ```

   Answer:_____

3. **Final Exam—50%** To measure the student's understanding of content presented throughout the entire semester. The Exam will consist of 34 questions.

Example of Final Question:

A child weighing 29.5 lb has an order for Amoxil 125 mg po q8h (Use the label provided to answer the question.

Amoxil label

a) What is the daily dosage range for this child?_____
b) What is the divided dosage range for this child?_____
c) Is the dose ordered q8h safe? (Provide mathematical rationale.) _____

Answer:_____

The testing instruments consist of fill-in, matching, calculation problems, interpretation of medication orders and alternate format questions. (The questions selected have been integrated into the course because they represent test questions given throughout the Nursing Courses as well as on the Licensure Exam.)

Quizzes will be revised to include some basic mathematic questions relating to topics such as fractions and decimals in order to reinforce their importance in dosage calculation.

- **How many students will be involved?**

  Four sections of PHM 10 will be part of the target population for assessment. It is estimated that the target population will consist of approximately 100-120 students.

- **Which faculty will be involved?**

  The PHM 10 faculty that currently teaches the courses will be involved in the assessment process: Profs. Deborah Morris, Clarence Hodge and Paula Green.

4. What is the time line for assessment implementation for PHM-10?

Assessment Activity	Timeline
Short-Term Assessment with Intervention	
Administer Web Diagnostic Test	February 2010
Analysis of Student Performance	February 2010
Establish Tailored Workshops by PHM 10 Faculty	February 2010
Conduct Workshops and Provide Consultation	February 2010
Administer Quiz 2	February 2010
Long-Term Assessment	
Administration of various testing instruments	Spring 2010
Analysis of data after each testing period including sharing of findings with PHM 10 Faculty	Spring 2010
Establish an Action Plan based upon Student Outcomes	Spring 2010
Prepare Assessment Report	Spring 2010