

BOROUGH OF MANHATTAN COMMUNITY COLLEGE

City University of New York

Department of Mathematics**Mathematics for Health Sciences with****Elementary Algebra****MAT 104.5****Credits: 3****Class hours: 5****Semester: Fall 2026****Instructor: Ryan Utke****Office: TBA****Website: <https://ryanutke.github.io/MAT104-5.html>****Email: ryan.utke44@gc.cuny.edu****Office Hours: Wed 2-3, or by appointment****Course Description**

This course covers computations and measurements essential in the health science professional fields with an emphasis on nursing. Topics include systems of measurement and conversions, dosage computations by formula, dimensional analysis, and ratio-proportion methods, reconstitution of powdered medications, oral and parenteral dosage calculations, adult and pediatric dosage calculations based on body weight and body surface area (BSA), intravenous calculations, titration, and pediatric and critical care medication calculations. Supplemental co-requisite topics from elementary algebra and quantitative literacy cover review of real numbers, fractions and decimals, linear models, proportional reasoning, basic linear and literal equations, exponents, radicals, and operations related to health care professions. Students who passed MAT 104 cannot take MAT 104.5. Students who passed MAT 104.5 cannot take MAT 104.

Basic Skills

ACR 94, ESL 54; Placement based on CUNY Proficiency Math Index score less than 60 or completion of MAT 8. Students who passed MAT 12, MAT 14, MAT 41, MAT 51, or MAT 104 cannot take this course.

Student Learning Outcomes

Course Student Learning Outcomes	Measurements
Upon completion of the course, students will be able to:	
1. Interpret and draw appropriate inferences from quantitative representations, such as formulas, graphs, or tables. Throughout the course students utilize formulas related to dosage calculations by ratio and proportion method and formula method, unit conversions, intravenous flow rate (IV), and body surface area (BSA). Given the dosage strength of medication from the labels, students explore a direct variation provided by equations, graphs and tables and connections between all three representations of linear model. <i>Co-requisite supplemental quantitative reasoning and algebraic applications</i> such as <i>Balancing Blood Alcohol</i> , <i>Proportional Reasoning for Health Care</i> are designed to construct, analyze, and interpret linear models represented by equations, tables, and graphs. The topics are supported by algebraic review of real numbers, fractions and decimals, simplifying, clearing, performing operations related to health care professions.	Quizzes, tests, homework and/or projects
2. Use algebraic, numerical, graphical, or statistical methods to draw accurate conclusions and solve mathematical problems. During the course students develop quantitative reasoning and critical thinking applying ratio-proportion and dimensional analysis methods of unit conversions within and between metric and household systems necessary for health care calculations. They understand a necessity of verifying units in dosage calculations to avoid medication administration errors. Students determine BSA (body surface area) by using non-consistent multi-scale West Nomogram and apply formulas for calculating BSA, comparing and contrasting both methods. Students use formulas for calculating dosages based on body weight, IV (intravenous) dosages, and calculations of reconstituted solutions. In addition, focus on reading scales is applied: students choose an appropriate syringe and mark syringes to indicate how drugs, including insulin and multiple drugs administered in the same syringe, would be measured. <i>Co-requisite supplemental quantitative reasoning and algebraic applications</i> such as calculation the amount of Acetaminophen of different concentration, based on children's and infant's Acetaminophen.	Quizzes, tests, homework and/or projects

3. Represent quantitative problems expressed in natural language in a suitable mathematical format. The main focus of the course is to read, understand, and interpret medication orders provided by prescribers and calculate oral, parenteral, or intravenous (IV) dosages based on dosage strength available. Students will be able to understand the information, transcribe given information in formulas, and apply three methods of dosage calculation: ratio and proportion, formula, and dimensional analysis method with emphasis on using and analyzing units of measurement. Students also select an appropriate formula for BSA (body surface area) calculations based on the units of metric or household system, selecting an appropriate dosage strength for dosage calculations of reconstituted solutions, and calculating the range for safe daily dosage based on body weight. <i>Co-requisite supplemental quantitative reasoning and algebraic applications</i> support developing of proportional reasoning, operations with exponents and scientific notation, evaluating and simplifying square roots, and rounding.	Quizzes, examinations, homework and/or projects
4. Effectively communicate quantitative analysis or solutions to mathematical problems in written or oral form. Students interpret medication administration orders based on abbreviation, perform calculations and explain their problem solving strategies verbally during class or written in discussions provided in learning management systems (LMC), quizzes and exams. They provide feedback to classmate's work, compare and contrast different methods. For example, students post their solutions to the exam review problems to Discussion Board and reply to two other posts communicating mathematical concepts, methods, and quantitative analysis, or compare and contrast three methods of dosage calculations. <i>Co-requisite supplemental quantitative reasoning and algebraic applications</i> support quantitative analysis using critical thinking scenario and explaining course of action for nurses.	Quizzes, examinations, homework and/or projects
5. Evaluate solutions to problems for reasonableness using a variety of means, including informed estimation. Students assess whether the outcome of a given calculation is reasonable through quick mental estimation, checking answers against recommended ranges, and solving a problem using multiple methods. <i>Co-requisite supplemental quantitative reasoning elements</i> requiring estimation of the expected answer and explanation if the answer is reasonable are incorporated in the problem.	Quizzes, examinations, homework and/or projects
6. Apply mathematical methods to problems in other fields of study. Throughout the course students perform operations and methods applicable in chemistry, physics, economics and finance: converting between units, expressing numbers in scientific notation, calculate calibration of scales, reading scales and measuring the amount of medication, using the method of dimensional analysis, creating linear models (equations, graphs, tables), calculating absolute and relative change. <i>Co-requisite supplemental quantitative reasoning and algebraic applications</i> support understanding absolute and relative change in the problem situation Salary Increases.	Quizzes, examinations, homework and/or projects

Below are the college's general education learning outcomes; the outcomes that are checked in the left-hand column indicate goals that will be covered and assessed in this course.

	General Education Learning Outcomes	Measurements
✓	Communication Skills - Students will be able to write, read, listen and speak critically and effectively.	Quizzes, examinations, homework and/or projects
✓	Quantitative Reasoning- Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.	Quizzes, examinations, homework and/or projects
✓	Scientific Reasoning - Students will be able to apply the concepts and methods of the natural sciences.	
☐	Social and Behavioral Sciences- Students will be able to apply the concepts and methods of the social sciences.	
☐	Arts & Humanities- Students will be able to develop knowledge and	

	understanding of the arts and literature through critiques of works of art, music, theatre or literature.	
✓	Information & Technology Literacy- Students will be able to collect, evaluate and interpret information and effectively use information technologies.	Quizzes, examinations, homework and/or projects

Required Text and Supplementary Materials Both components are necessary for the course. Specific information will be provided on the first day of class. **Students are advised to not purchase any textbook before consulting with the course instructor.**

I. Co-requisite Elementary Algebra: BMCC Elementary Algebra Open Educational Resource (OER):

<http://helpyourmath.com/lectures.html>

II. Mathematics for Health Sciences*:

1. Purchase at BMCC Bookstore:

- a) **E-book with Webassign Printed Access Card:** Anna Curren and Margaret Witt. *Curren's Math for Meds: Dosages & Solutions*, Eleventh Edition. Cengage Learning, 2015. (ISBN : 9780357115572)

**Note: Cengage does not offer the textbook only option starting January 2022.*

- b) **Bundle:** Hard Copy + e-book with Webassign Printed Access Card: Anna Curren and Margaret Witt. *Curren's Math for Meds: Dosages & Solutions*, Eleventh Edition. Cengage Learning, 2015. (ISBN: 9780357761182)

2. Purchase Online:

Once a Cengage account is created with the class key provided by an instructor, student automatically will have a built-in discounted price for purchase.

- **E-book with Webassign (online purchase):** Anna Curren and Margaret Witt. *Curren's Math for Meds: Dosages & Solutions*, Eleventh Edition. Cengage Learning, 2015. (ISBN 13: 9780357115565)

Calculators are permitted on exams.

Evaluation & Requirements of Students At the beginning of the semester, the instructor will provide the exact grade distribution. The final grade in this course will be a letter grade corresponding to the cumulated percentage based on the weights of categories.

Suggested Grade Distribution:

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|----------------------------------|-----|
| • Homework | 15% |
| • Quizzes/Projects/Participation | 15% |
| • Exams | 40% |
| • Final Exam | 30% |

Outline of Topics

Weeks	Topics Covered (*SM - OER Supplemental Materials for Elementary Algebra Review)	Curren's Textbook Pages or *SM#	Assignments
Week 1	Section 1. Refresh Math * SM 1.1. Real Numbers and Their Subsets. Properties of Real Numbers. Comparing and Reducing Fractions. Comparing Decimals. Clearing Decimals in Fractions. Chapter 1. Relative Value, Addition and Subtraction of Decimals. *SM 1.2. Rounding Decimals	*SM 1.1 Ch.1 pages 2-10 *SM 1.2	Homework, Discussion, Quiz

Last updated: 08/07/2025

Week 2	Chapter 2. Multiplication and Division of Decimals. <i>*SM 1.3. Multiplication and Division of Fractions.</i> Chapter 3. Solving Common Fractions	Ch.2 pages 11-21 <i>*SM 1.3</i> Ch. 3 pages 22-35	Homework, Quiz
Week 3	Section 2. Introduction to Drug Measures <i>*SM 2.1. Introduction to the Method of Dimensional Analysis for Unit Conversions</i> <i>*SM 2.2. Proportional Reasoning for Unit Conversions</i> Chapter 4. Metric/International (SI) System Chapter 5. Unit, Percentage, Milliequivalent, Ratio, and Household Measures	<i>*SM 2.1</i> <i>*SM 2.2</i> Ch.4 pages 36-44 Ch. 5 pages 46-50	Homework, Quiz
Week 4	Section 3. Reading Medication Labels and Syringe Calibrations Chapter 6. Oral Medication Labels and Dosage Calculation Chapter 7. Safe Medication Administration Chapter 8. Hypodermic Syringe Measurement Chapter 9. Parenteral Medication Labels and Dosage Calculation	Ch.6 pages 54-76 Ch.7 pages 77-86 Ch.8 pages 87-101 Ch.8 pages 102-128	Homework, Quiz
Week 5	Chapter 10. Reconstitution of Powered Drugs Chapter 11. Measuring Insulin Dosages (p.144-163) <i>Exam 1 Review</i> Exam 1	Ch.10 pages 129-143 Ch.11 pages 144-163	Homework, Discussion, Exam 1
Week 6	Section 4. Methods of Dosage Calculations <i>*SM 4.1. Evaluating and Simplifying Algebraic Expressions. Addition and Multiplication Property of Equality. Solving Basic Linear Equations</i> <i>*SM 4.2. Solving Linear Equations. Quantitative Reasoning Application: Balancing Blood Alcohol</i> <i>*SM 4.3. Solving Linear Equations. Quantitative Reasoning Application: Proportional Reasoning for Health Care</i> <i>*SM 4.4. Quantitative Reasoning Application: Percentages in Many Forms. Proportional Reasoning and Percentages</i>	<i>*SM 4.1</i> <i>*SM 4.2</i> <i>*SM 4.3</i> <i>*SM 4.4.</i>	Homework
Week 7	Chapter 12. Ratio and Proportion <i>* SM 4.5. Linear Equations in Two Variables in the Context of Dosage Calculations. Paired Data and Graphing Ordered Pairs. Solutions to Linear Equations in Two Variables</i> <i>*SM 4.6. Graphing Linear Equations in Two Variables Intercepts</i> <i>*SM 4.7. Modeling Dosage: Finding the Equation of a Line for calculating dosages in mg, units, mEq based on the number of tablets, mL, and body weight</i>	Ch. 12 pages 164 - 193 <i>*SM 4.5</i> <i>*SM 4.6</i> <i>*SM 4.7</i>	Homework, Quiz
Week 8	<i>*SM 4.8. Method of Dimensional Analysis for Dosage Calculation. Quantitative Reasoning Application: What is the Correct Dose?</i> Chapter 13. Dimensional Analysis/Units Conversion <i>*SM 4.9. Solving Literal Equations</i> Chapter 14. Formula Method	<i>*SM 4.8</i> Ch.13 pages 194-218 <i>*SM 4.9</i> Ch.14 pages 219-227	Homework, Quiz

Week 9	Section 5. Dosage Calculation from Body Weight and Body Surface Area <i>*SM 5.1. Linear Inequalities. Expressing Safe Dosage Range as a Compound Inequality</i> Chapter 15. Adult and Pediatric Dosages Based on Body Weight <i>*SM 5.2. Multiplication and Division with Exponents</i> <i>*SM 5.3. Scientific Notation</i> <i>*SM 5.4. Evaluating and Simplifying Square Roots</i> Chapter 16. Adult and Pediatric Dosages Based on Surface Area	*SM 5.1 Ch. 15 pages 228-242 *SM 5.2 *SM 5.3 *SM 5.4 Ch.16 pages 243-253	Homework, Quiz
Week 10	<i>Exam 2 Review</i> Exam 2 Section 6. Intravenous Calculations Chapter 17. Introduction to IV Therapy	Ch.17 pages 254-268	Homework, Discussion, Exam 2
Week 11	<i>*SM 6.1. Measuring Flow Rate Change</i> Chapter 18. IV Flow Rate Calculation Chapter 19. Calculating IV Infusion and Completion Times	*SM 6.1 Ch.18 pages 269-288 Ch.19 pages 289-301	Homework
Week 12	Chapter 20. IV Medication and Titration Calculations Chapter 21. Heparin Infusion Calculations	Ch. 20 pages 302-321 Ch. 21 pages 322-330	Homework, Quiz
Week 13	<i>Exam 3 Review</i> Exam 3 Section 7. Pediatric Medication Calculation Chapter 22. Pediatric Oral and Parenteral Medication	Ch.22 pages 332-337	Homework, Discussion, Exam 3
Week 14	Chapter 23. Pediatric Intravenous Medications <i>Final Exam Review</i>	Ch. 23 pages 338-350	Homework, Discussion
Week 15	Final Examination		Final Examination

BMCC Policy on Plagiarism and Academic Integrity Statement

Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's Web site, www.bmcc.cuny.edu. For further information on integrity and behavior, please consult the college bulletin (also available online).

Gender-Inclusivity

BMCC community members have the right to use and be referred to according to their preferred name, title, and/or personal pronouns. Everyone also has the right to use all spaces according to their self-identification, including restrooms and locker rooms. To learn more about how to change your preferred

name and affirm your gender identity at CUNY (including requesting a new ID card and/or email address), go here: <https://www.bmcc.cuny.edu/student-affairs/lgbtq/> Anyone who has experienced harassment related to gender or sexual identification, who needs assistance, or who wishes to file a complaint, can contact the Office of Compliance and Diversity: <https://www.bmcc.cuny.edu/about-bmcc/compliance-diversity>

FREE BMCC STUDENT SUPPORT SERVICES

BMCC is committed to the health and well-being of all students. It is common for everyone to seek assistance at some point in their life, and there are free and confidential services on campus that can help.

Advocacy and Resource Center <https://www.bmcc.cuny.edu/student-affairs/arc/>, room S230, 212-220-8195. If you are having problems with food or housing insecurity, finances, health insurance or anything else that might get in the way of your studies at BMCC, contact the Advocacy and Resource Center for advice and assistance by email arc@bmcc.cuny.edu or call 212-220-8195. Assistance is also available through the Office of Student Affairs, S350, 212-220- 8130.

Counseling Center www.bmcc.cuny.edu/counseling, room S343, 212-220-8140. Counselors assist students in addressing psychological and adjustment issues (i.e., depression, anxiety, and relationships) and can help with stress, time management and more. Counselors are available for walk-in visits.

Office of Compliance and Diversity www.bmcc.cuny.edu/aac, room S701, 212-220-1236. BMCC is committed to promoting a diverse and inclusive learning environment free of unlawful discrimination/harassment, including sexual harassment, where all students are treated fairly. For information about BMCC's policies and resources, or to request additional assistance in this area, please visit or call the office, or email olevy@bmcc.cuny.edu, or twade@bmcc.cuny.edu. If you need immediate assistance, please contact BMCC Public safety at 212-220-8080.

Office of Accessibility www.bmcc.cuny.edu/accessibility, room N360 (accessible entrance: 77 Harrison Street), 212-220-8180. This office collaborates with students who have documented disabilities, to coordinate support services, reasonable accommodations, and programs that enable equal access to education and college life. To request an accommodation due to a documented disability, please visit or call the office.