

KINGSBOROUGH COMMUNITY COLLEGE
The City University of New York

CURRICULUM TRANSMITTAL COVER PAGE

Department: Math and Computer Science

Date: 04/11/2019

Title Of Course/Degree/Concentration/Certificate: Math for Everyday (MAT 8A0)

Change(s) Initiated: (Please check)

- | | |
|---|---|
| <input type="checkbox"/> Closing of Degree | <input type="checkbox"/> Change in Degree or Certificate |
| <input type="checkbox"/> Closing of Certificate | <input type="checkbox"/> Change in Degree: Adding Concentration |
| <input type="checkbox"/> New Certificate Proposal | <input type="checkbox"/> Change in Degree: Deleting Concentration |
| <input type="checkbox"/> New Degree Proposal | <input type="checkbox"/> Change in Prerequisite, Corequisite, and/or Pre/Co-requisite |
| <input checked="" type="checkbox"/> New Course | <input type="checkbox"/> Change in Course Designation |
| <input type="checkbox"/> New 82 Course (Pilot Course) | <input type="checkbox"/> Change in Course Description |
| <input type="checkbox"/> Deletion of Course(s) | <input type="checkbox"/> Change in Course Title, Number, Credits and/or Hours |
| | <input type="checkbox"/> Change in Academic Policy |
| | <input checked="" type="checkbox"/> Pathways Submission: |
| | <input type="checkbox"/> Life and Physical Science |
| | <input checked="" type="checkbox"/> Math and Quantitative Reasoning |
| | <input type="checkbox"/> A. World Cultures and Global Issues |
| | <input type="checkbox"/> B. U.S. Experience in its Diversity |
| | <input type="checkbox"/> C. Creative Expression |
| | <input type="checkbox"/> D. Individual and Society |
| | <input type="checkbox"/> E. Scientific World |
- Change in Program Learning Outcomes
- Other (please describe): _____

PLEASE ATTACH MATERIAL TO ILLUSTRATE AND EXPLAIN ALL CHANGES

DEPARTMENTAL ACTION

Action by Department and/or Departmental Committee, if required:

Date Approved: 4/11/2019 Signature, Committee Chairperson: Max Tran

If submitted Curriculum Action affects another Department, signature of the affected Department(s) is required:

Date Approved: _____ Signature, Department Chairperson: _____

Date Approved: _____ Signature, Department Chairperson: _____

I have reviewed the attached material/proposal

Signature, Department Chairperson: Rina Young

TO: Spring 2019 Curriculum Committee
FROM: Department of Mathematics & Computer Science
DATE: 04/11/2019
RE: New Course: Math for Everyday (MAT~~8~~AO)

The Department of Mathematics & Computer Science is proposing to add Math for Everyday (MAT~~8~~AO), as follows:

ADD:
MAT ~~8~~AO Math for Everyday

Rationale for New Course: Provision of an additional option for more choice of MQR for Liberal Arts students. MAT~~8~~AO includes practical, “hands-on” application of mathematics techniques for everyday life.

**KINGSBOROUGH COMMUNITY COLLEGE
THE CITY UNIVERSITY OF NEW YORK**

NEW COURSE PROPOSAL FORM

- 1. DEPARTMENT, COURSE NUMBER, AND TITLE (SPEAK TO ACADEMIC SCHEDULING FOR NEW COURSE NUMBER ASSIGNMENT):**

Department of Mathematics & Computer Science,
MAT890-- Math for Everyday

- 2. DOES THIS COURSE MEET A GENERAL EDUCATION/CUNY CORE CATEGORY?**

- Life and Physical Science
 Math and Quantitative Reasoning
 A. World Cultures and Global Issues
 B. U.S. Experience in its Diversity
 C. Creative Expression
 D. Individual and Society
 E. Scientific World

IF YES, COMPLETE AND SUBMIT WITH THIS PROPOSAL A CUNY COMMON CORE SUBMISSION FORM.

- 3. DESCRIBE HOW THIS COURSE TRANSFERS (REQUIRED FOR A.S. DEGREE COURSE). IF A.A.S. DEGREE COURSE AND DOES NOT TRANSFER, JUSTIFY ROLE OF COURSE, E.G. DESCRIBE OTHER LEARNING OBJECTIVES MET:**

Preliminary indications are that students will receive transfer credit for:

CUNY Pathways course fulfilling the Required Core, Mathematical and Quantitative Reasoning requirement.

- 4. BULLETIN DESCRIPTION OF COURSE:**

This course is designed to provide non-STEM students with critical-thinking and mathematical skills useful in making informed decisions on many aspects of modern life involving quantitative concepts. This course provide the quantitative reasoning skills for informed citizens to understand the world around them and to make choices affecting their lives. Topics include basic probability and risk assessment, financial math, data analysis, solution of elementary algebraic equations, modeling from data.in perspective, mathematics of finance, investments and loans, statistical reasoning, probability, and risk assessment.

Students who have completed MAT 800 will not receive credit for this course.

This course is appropriate for non-STEM major students. This course is NOT intended for students planning on taking MAT 900 - College Algebra.

- 5. CREDITS AND HOURS* (PLEASE CHECK ONE APPROPRIATE BOX BELOW BASED ON CREDITS):**

1-credit:	<input type="checkbox"/> 1 hour lecture <input type="checkbox"/> 2 hours lab/field/gym
2-credits:	<input type="checkbox"/> 2 hours lecture <input type="checkbox"/> 1 hour lecture, 2 hours lab/field <input type="checkbox"/> 4 hours lab/field

3-credits: 3 hours lecture 3 Credits 7 Hours
 2 hours lecture, 2 hours lab/field
 1 hour lecture, 4 hours lab/field
 6 hours lab/field

4-credits: 4 hours lecture
 3 hours lecture, 2 hours lab/field
 2 hours lecture, 4 hours lab/field
 1 hour lecture, 6 hours lab/field
 8 hours lab/field

More than 4-credits: Number of credits: ____ (explain mix lecture/lab below)

____ Lecture ____ Lab

Explanation: _____

***Hours are hours per week in a typical 12-week semester**

6. NUMBER OF EQUATED CREDITS IN ITEM #5: 4

7. COURSE PREREQUISITES AND COREQUISITES (IF NONE PLEASE INDICATE FOR EACH)

A. PREREQUISITE(S): For students who are eligible for a corequisite course per CUNY Math placement guidelines and likely to benefit from some developmental support, eligibility determined as follows: (1) Score of 40-56 on the Elementary Algebra portion of the ACCUPLACER CUNY Assessment Test in Math, or (2) passed MAT M100, or (3) passed a Kingsborough workshop culminating in passing the Departmental MAT M100 final exam, or (4) Appropriate corequisite designation.

B. COREQUISITE(S): N/A

C. PRE/COREQUISITE(S): N/A

8. BRIEF RATIONALE TO JUSTIFY PROPOSED COURSE TO INCLUDE:

A. ENROLLMENT SUMMARY IF PREVIOUSLY OFFERED AS AN 82 (INCLUDE COMPLETE 4-DIGIT 82 COURSE NUMBER)

B. PROJECTED ENROLLMENT: 84 -112 students per semester and winter and summer modules.

C. SUGGESTED CLASS LIMITS: 28 students

D. FREQUENCY COURSE IS LIKELY TO BE OFFERED: Every semester.

E. ROLE OF COURSE IN DEPARTMENT'S CURRICULUM AND COLLEGE'S MISSION:

This course is designed to provide non-STEM major students with critical-thinking and mathematical skills useful in making informed decisions on many aspects of modern life involving quantitative concepts. Topics include putting number in perspective, mathematics of finance, statistical reasoning and probability. Students will learn to communicate solutions to mathematical problems in written and oral form and will gain an understanding of various approaches to problem solving; interpretation and analysis of quantitative information in the everyday world.

9. LIST COURSE(S), IF ANY, TO BE WITHDRAWN WHEN COURSE IS ADOPTED (NOTE THIS IS NOT THE SAME AS DELETING A COURSE): N/A

10. IF COURSE IS AN INTERNSHIP, INDEPENDENT STUDY, OR THE LIKE, PROVIDE AN EXPLANATION AS TO HOW THE STUDENT WILL EARN THE CREDITS AWARDED. THE CREDITS AWARDED SHOULD BE CONSISTENT WITH STUDENT EFFORTS REQUIRED IN A TRADITIONAL CLASSROOM SETTING: N/A

11. PROPOSED TEXT BOOK(S) AND/OR OTHER REQUIRED INSTRUCTIONAL MATERIAL(S):
 Robert Blitzer, *Thinking Mathematically*, 7th Edition, Prentice Hall/Pearson Publishing, 2018.

12. REQUIRED COURSE FOR MAJOR OR AREA OF CONCENTRATION? No

13. IF OPEN ONLY TO SELECTED STUDENTS SPECIFY POPULATION:

This course is appropriate for non-STEM major students who meet the prerequisite.

14. EXPLAIN WHAT STUDENTS WILL KNOW AND BE ABLE TO DO UPON COMPLETION OF COURSE:

Students will be able to evaluate solutions to problems for reasonableness using a variety of means, including estimation. Students will learn effective communication of quantitative analysis or solutions to mathematical problems. Students will have the basic knowledge of the usage of algebraic, numerical, graphical, or statistical methods to draw accurate conclusions and solve mathematical problems. Students will understand the fundamentals of statistics. Students will know how to represent quantitative problems. Students will understand the principles of mathematical modeling. Students will understand the application of mathematical methods to problems in other fields of study. Students will learn the basic of simple and compound interests, annuities, loans and various money systems.

15. METHODS OF TEACHING –E.G. LECTURES, LABORATORIES, AND OTHER ASSIGNMENTS FOR STUDENTS, INCLUDING ANY OF THE FOLLOWING: DEMONSTRATIONS, GROUP WORK, WEBSITE OR E-MAIL INTERACTIONS AND/OR ASSIGNMENTS, PRACTICE IN APPLICATION OF SKILLS, ETC.:

Mathematics 8A0 is taught by classroom lecture and demonstration of specific mathematical concepts, operations, and procedures, combined with homework assignments designed to improve and solidify student understanding and mastery of these concepts, operations and procedures.

16. ASSIGNMENTS TO STUDENTS: Assignments are taken from the textbook, and are chosen at the discretion of the instructor. Students may use a Scientific Calculator.

17. DESCRIBE METHOD OF EVALUATING LEARNING SPECIFIED IN #15 - INCLUDE PERCENTAGE BREAKDOWN FOR GRADING. IF A DEVELOPMENTAL COURSE INCLUDE HOW THE NEXT LEVEL COURSE IS DETERMINED AS WELL AS NEXT LEVEL PLACEMENT.

Evaluation is based upon regular classroom examinations and a final examination. The instructor will administer a final exam that will constitute 40% of the final grade. The remaining 60% is to be divided between in-class tests, homework, and class participation at the discretion of the instructor. A final percentage of 60% or better will be deemed to sufficient to pass the course.

18. TOPICAL COURSE OUTLINE FOR THE 12 WEEK SEMESTER (WHICH SHOULD BE SPECIFIC REGARDING TOPICS COVERED, LEARNING ACTIVITIES, AND ASSIGNMENTS):

Hr	Topics	Suggested Exercises
	<u>PART I:</u>	
3	5.2 The integers; Order of Operations	p.273 # 7,9,13,19,25,35,37,39,59,63,71,85,91,95,97,99
2	6.1 Algebraic Expressions and Formulas	p.351 # 7,12,18,23,25,31,33,35,37,43,55,57
2	6.2 Linear Equations in One Variable and Proportions	p.366-7 # 11,19,23,32,33,36,39,47,48,53,55,63,67,69,71,89,90,105
2	6.3 Applications of Linear Equations	p.377 # 1,11. p.379 # 43,45,51,57
2	9.1 Measuring Length: The Metric System	p.590 # 1-33 odd, 49,53

	9.3 Measuring Weight and Temperature	p.608 # 1-13 odd. p.609 # 19-31 odd, 37,41,45
2	9.2. Measuring Area and Volume	p.599-600 # 3,5,7,13-23 odd, 29,33,39
2	6.4 Linear Inequalities in One Variable	p.388 # 23,33,42,47,51,52,61,63
4	5.4 The Irrational Numbers	p.300-1 # 11,19,23,31,33,41,49,51,55,59,63,65
2	5.6 Exponents and Scientific Notation	p.324-5 # 15,17,29,33,35,39,41,45,55,67,73,77,79,85,91,97
2	8.1 Percent, Sales Tax, and Discounts	p.501 # 7,13,31,37,41,43,47,49
5	8.3 Simple Interest (2 hr) 8.4 Compound Interest (3 hr)	p.518-9 # 4,7,13,17,23,31,37 p.527 # 16,17,19,21,25,31
	Review I. Homework I. EXAM I (2 hr)	
	<u>PART II:</u>	
2	8.5 Annuities, Savings, Investments	p.542-3 # 3,5,9,11,13,25,31
3	8.6 Installment loan, buying a car (2 hr) 8.7 Mortgages, the cost of home ownership (1 hr)	p.552 # 1, 3, 5, 11 p.561-2 # 1, 3, 7, 9, 11
1	8.8 Credit Cards, open-ended installment loans	p.570-1 # 1, 5, 7
1	Watch video or read on money systems	https://www.youtube.com/watch?v=2q-7d1PO_oQ Google Modern_Money_Mechanics.pdf
4	6.5 Quadratic Equations	p.403-4 #11,13,21,23,26,29,35,37,43,47,51,55
4	12.1 Sampling, Frequency Distributions, Graphs	p.782-3 # 8-16 all, 21
2	12.2 Measures of Central Tendency	p.797-8 # 6,13,23,27,37,50,51
2	12.3 Measures of Dispersion	p.806 # 4,11,18,27
4	12.4 The Normal Distribution	p.819-20 # 3,7,11,13,15,19,23,27,29,31,39,45,59,65
1	12.6 Scatter Plots, and Correlation (No correlation coefficient)	p.835-7 # 3,10,11,13,15,19,21
	Review II. Homework II. EXAM II (2 hr)	
	<u>PART III:</u>	
1	7.1 Graphing and Functions	p.422 # 21,23,25,33,43,47,55,57,58,59
4	7.2 Linear Functions and Their Graphs	p.435 # 3,9,11,15,19,23,29,39,43,45
2	7.3 Systems of Linear Equations in Two	p.449-50 # 13,15,17,19,33

	Variables	
7	11.1 The Fundamental Counting Principle (1 hr) 11.4 Fundamentals of Probability (2 hr) 11.6 Events Involving NOT and OR; Odds (2 hr) 11.7 Events Involving AND; Conditional Probability (2 hr)	p.698-9 # 3,7,9,12,15 p.721-3 # 1-10 all,11,13,15,19,21,26,27,31,35,37,39,41,45,67 p.741-3 # 3,5,6,13,15,17,19,25,27,31,35,37,69,73,75 p.753-5 # 1,3,5,15,19,31,33,35,65,67,69
4	11.2 Permutations (2 hr) 11.3 Combinations (2 hr)	p.706-7 # 3,9,13,19,25,31,33,39,45,49 p.713-4 # 1,3,5,13,15,17,19,31,37,47,51,55
1	11.8 Expected Value	p.761-2 # 3,7
2	7.6 Modeling Data; Exponential Functions	p.480-1 # 1,23,31
	Review III. Homework III. EXAM III (2 hr)	
	<u>PART IV:</u>	
	Review for FINAL EXAM (5 hr)	

19. SELECTED BIBLIOGRAPHY AND SOURCE MATERIALS:

1. Lippman, *Math in Society*, 2.5 th Ed,
2. Open Text <http://www.opentextbookstore.com/mathinsociety/>
Cornick, Guyu, and Puri, "My Math GPS: Elementary Algebra Guided Problem Solving (2016 Ed)" CUNY Academic Works, 2016. http://academicworks.cuny.edu/qb_oers
3. Bennet, *Using and Understanding Mathematics: A Quantitative Reasoning Approach*, 6th Edition, Pearson, 2014.
4. Aufmann, *Mathematical Thinking and Quantitative Reasoning*, 1st Edition, Cengage Learning, 2007.
5. Johnson, *Mathematics: A Practical Odyssey*, 8th Edition, Brooks Cole, 2015.
6. Scott, *Cornerstones of Algebra: Problem Solving, Quantitative Reasoning, and Critical Thinking*, 1st Edition, Kendall Hunt Publishing, 2012.
7. Sons, Nicholls, and Stephen, *Mathematical Thinking and Quantitative Reasoning*, 5th Edition, Kendall Hunt Publishing, 2012.
8. Triola, *Elementary Statistics*, 12th Edition, Pearson, 2012.
9. Bluman, *Elementary Statistics: A Step-by-Step Approach*, 9th Edition, McGraw-Hill Education, 2013.
10. Larson and Farber, *Elementary Statistics: Picturing the World*, 6th Edition, Pearson, 2014.
11. Navidi and Monk, *Elementary Statistics*, 2nd Edition, McGraw-Hill 2015.
12. Tussy, *Elementary Algebra*, 5th Edition, Brooks Cole, 2012.
13. Bittinger, Ellenbogen and Johnson, *Elementary Algebra, Concepts & Applications*, 9th Edition, Pearson, 2012.
14. Jacobs, *Elementary Algebra*, Revised Edition, Master Books, 2016.

CUNY Common Core Course Submission Form

Instructions: All courses submitted for the Common Core must be liberal arts courses. Courses submitted to the Course Review Committee may be submitted for only one area of the Common Core and must be 3 credits. Colleges may submit courses to the Course Review Committee before or after they receive college approval. STEM waiver courses do not need to be approved by the Course Review Committee. This form should not be used for STEM waiver courses.

College	Kingsborough Community College
Course Prefix and Number (e.g., ANTH 101, if number not assigned, enter XXX)	MAT 840
Course Title	Math for Everyday
Department(s)	Mathematics and Computer Science
Discipline	Mathematics
Credits	3
Contact Hours	7
Pre-requisites (if none, enter N/A)	Prerequisite(s): For students who are eligible for a corequisite course per CUNY Math placement guidelines and likely to benefit from some developmental support, eligibility determined as follows: (1) Score of 40-56 on the Elementary Algebra portion of the ACCUPLACER CUNY Assessment Test in Math, or (2) passed MAT M100, or (3) passed a Kingsborough workshop culminating in passing the Departmental MAT M100 final exam, or (4) Appropriate corequisite designation.
Co-requisites (if none, enter N/A)	N/A
Catalogue Description	<p>This course is designed to provide non-STEM students with critical-thinking and mathematical skills useful in making informed decisions on many aspects of modern life involving quantitative concepts. This course provide the quantitative reasoning skills for informed citizens to understand the world around them and to make choices affecting their lives. Topics include basic probability and risk assessment, financial math, data analysis, solution of elementary algebraic equations, modeling from data.in perspective, mathematics of finance, investments and loans, statistical reasoning, probability, and risk assessment.</p> <p>Students who have completed MAT 800 will <u>not</u> receive credit for this course.</p> <p>This course is appropriate for non-STEM major students. This course is NOT intended for students planning on taking MAT 900 - College Algebra.</p>
Special Features (e.g., linked courses)	
Sample Syllabus	Please see attached.
<p>Indicate the status of this course being nominated:</p> <p> <input type="checkbox"/> current course <input type="checkbox"/> revision of current course <input checked="" type="checkbox"/> a new course being proposed </p>	
<p>CUNY COMMON CORE Location</p> <p>Please check below the area of the Common Core for which the course is being submitted. (Select only one.)</p>	
<p>Required Core</p> <p><input type="checkbox"/> English Composition</p>	<p>Flexible Core</p> <p><input type="checkbox"/> World Cultures and Global Issues (A)</p>

<input checked="" type="checkbox"/> Mathematical and Quantitative Reasoning <input type="checkbox"/> Life and Physical Sciences	<input type="checkbox"/> US Experience in its Diversity (B) <input type="checkbox"/> Creative Expression (C) <input type="checkbox"/> Individual and Society (D) <input type="checkbox"/> Scientific World (E)
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Learning Outcomes

In the left column explain the course assignments and activities that will address the learning outcomes in the right column.

I. Required Core (12 credits)

A. English Composition: Six credits

A course in this area must meet all the learning outcomes in the right column. A student will:

	<ul style="list-style-type: none"> Read and listen critically and analytically, including identifying an argument's major assumptions and assertions and evaluating its supporting evidence.
	<ul style="list-style-type: none"> Write clearly and coherently in varied, academic formats (such as formal essays, research papers, and reports) using standard English and appropriate technology to critique and improve one's own and others' texts.
	<ul style="list-style-type: none"> Demonstrate research skills using appropriate technology, including gathering, evaluating, and synthesizing primary and secondary sources.
	<ul style="list-style-type: none"> Support a thesis with well-reasoned arguments, and communicate persuasively across a variety of contexts, purposes, audiences, and media.
	<ul style="list-style-type: none"> Formulate original ideas and relate them to the ideas of others by employing the conventions of ethical attribution and citation.

B. Mathematical and Quantitative Reasoning: Three credits

A course in this area must meet all the learning outcomes in the right column. A student will:

<p>Throughout the course devoted to analyzing a variety of data curves, utilizing the formula, table, and graph of each in conjunction. For examples: (1) Using a table and the corresponding saving plan formula with monthly compounding of interest to find how much money is in a bank account after a year when making regular deposit of \$50/month. (2) Using the 68-95-99.7 rule of a Normal curve and the z-score table of the standard normal curve to find how likely it is to get a 790 SAT score.</p>	<ul style="list-style-type: none"> Interpret and draw appropriate inferences from quantitative representations, such as formulas, graphs, or tables.
<p>Chapter 12 is devoted to statistical thinking, including tables and graphs, numerical measures of center and variation. For example: Calculate the mean and standard deviation of a data set, and then determine if the data values exhibit a normal distribution. Students will understand the importance of the mean as the average for a group of scores and the standard deviation as a measure of how spread out the data are away from the mean. The students are asked what a small standard deviation implies, namely that the data values are close together, whereas a large standard deviation implies that the data values are much more spread out. They will also visualize this using a typical bell-curve where the mean always lies at the center. A small standard deviation corresponds to a bell-</p>	<ul style="list-style-type: none"> Use algebraic, numerical, graphical, or statistical methods to draw accurate conclusions and solve mathematical problems.

<p>curve that is tall and narrow whereas a large standard deviation corresponds to a bell-curve that is short and wide.</p>	
<p>Exercises are regularly interspersed through out the course on translating quantitative problems from the everyday world into mathematical format. One instance from the percentage chapter ask the student to consider the following situation: Because of losses by your employer, you agree to accept a temporary 10% pay cut. Your employer promises to give you a 10% pay raise after six months. Will the pay raise restore your original salary? After some straightforward calculation with some arbitrary chosen salary, the answer is no.</p> <p>An instance from the financial math chapter involves expressing all the quantities given in a mortgage application into numbers that can be use in the appropriate formula to calculate the monthly payment and total payment. Students are ask to do this for a 15 year mortgage and 30 year mortgage plan, then they must compare the monthly payments and total payment of the two plans and explain under what circumstances one is better than the other.</p>	<ul style="list-style-type: none"> • Represent quantitative problems expressed in natural language in a suitable mathematical format.
<p>Exercises are regularly interspersed through the course in interpreting the result of a calculation in terms of what it means to our daily life in either a written or oral form.</p> <p>For example: A recent poll finds that 52% of surveyed voters plan to vote for Smith, and she needs more than 50% of the vote to win without a runoff. The margin of error is 3 percentage points. Will she win?</p> <p>Solution: We subtract and add the margin of error of 3 percentage points to find a confidence interval from $52\% - 3\% = 49\%$ to $52\% + 3\% = 55\%$. We can be 95% confident that the actual percentage of people planning to vote for Smith is in the confidence interval 49% to 55% of the vote. Since this confidence interval leaves open the possibility of a majority and less than a majority, the race is too close to call.</p>	<ul style="list-style-type: none"> • Effectively communicate quantitative analysis or solutions to mathematical problems in written or oral form.
<p>Specific questions on reasonableness are given as a follow-up to other work. Example: (1) If farm land in NY are priced at \$12,000 per acre and 20 acres are bought does \$600 total cost seems reasonable.? Using units analysis to check. The answer \$600 was obtained by dividing "12,000 by 20". When the operations are done with the units: $\\$12,000 / \text{acre} \div 20 \text{ acre} = \\$12,000 / \text{acre} \times 1/20 \text{ acre} = \\$600 / \text{acre} \times \text{acre}$, we see that the unit of acre did not cancel. The correct results when done with units is \$240,000: $\\$12000 / \text{acre} \times 20 \text{ acre} = \\$240000 \text{ acre/acre} = \\$240,000$ since $\text{acre/acre} = 1$.</p> <p>(2) Two friends are doing a rough calculation of how much garbage NYC residents produce per day. They estimate that each of the 8.3 million resident produces 1.8 pounds, 0.0009 ton, of garbage each day. The total garbage is 8.3×10^6 persons \times 0.0009 ton/person. One friend uses a calculator a got the answer of 225 tons. Is this reasonable? Using estimation we can quickly check 8.3×10^6 is nearly 10^7 and $0.0009 = 9 \times 10^{-4}$ is nearly 10^{-3} so the product should be nearly $10^7 \times 10^{-3} = 10^4$ (7-3) = $10^4 = 10000$ ton. Clearly 225 ton is too small.</p>	<ul style="list-style-type: none"> • Evaluate solutions to problems for reasonableness using a variety of means, including informed estimation.

<p>Some examples of applied problems:</p> <p>1. Use of scientific notation in astronomy and biology. Students will see how many quantities in these fields are best expressed in scientific notation. For example: the distance between the earth and the center of the galaxy is 3×10^{17} kilometers, the mass of the galaxy is 4×10^{41} kilograms, the human brain has 3×10^{10} neurons. Students learn to multiply, divide and raise to a power numbers in scientific notation. For example: The sun is 93,000,000 miles from the earth and light travels 186,000 miles per second. Use scientific notation to find how many seconds does it takes light from the sun to reach the earth? Answer: $(9.3 \times 10^7) / (1.86 \times 10^5) = (9.3 / 1.86) \times 10^{(7-5)} = 5 \times 10^2 = 500$ seconds. This is $500 / 60 = 8.33$ minutes.</p> <p>2. The Fundamental Counting Principle for setting up phone numbers and license plates. For example: in the original plan for 3-digit area codes devised by the Bell System in 1945, the first digit can be 2-9, the second digit can be 0 or 1, and the third digit can be 1-9. How many possible area codes are there? Answer: there are 8 possibilities for the first digit, 2 possibilities for the second digit and 9 possibilities for the third digit. By the Counting Principle the total number of area codes are: $8 \times 2 \times 9 = 144$.</p>	<ul style="list-style-type: none"> ● Apply mathematical methods to problems in other fields of study.
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<p>C. Life and Physical Sciences: Three credits</p> <p>A course in this area <u>must meet all the learning outcomes</u> in the right column. A student will:</p>	
	<ul style="list-style-type: none"> ● Identify and apply the fundamental concepts and methods of a life or physical science.
	<ul style="list-style-type: none"> ● Apply the scientific method to explore natural phenomena, including hypothesis development, observation, experimentation, measurement, data analysis, and data presentation.
	<ul style="list-style-type: none"> ● Use the tools of a scientific discipline to carry out collaborative laboratory investigations.
	<ul style="list-style-type: none"> ● Gather, analyze, and interpret data and present it in an effective written laboratory or fieldwork report.
	<ul style="list-style-type: none"> ● Identify and apply research ethics and unbiased assessment in gathering and reporting scientific data.
<p>II. Flexible Core (18 credits)</p> <p>Six three-credit liberal arts and sciences courses, with at least one course from each of the following five areas and no more than two courses in any discipline or interdisciplinary field.</p>	
<p>A. World Cultures and Global Issues</p>	

A Flexible Core course <u>must meet the three learning outcomes</u> in the right column.	
	<ul style="list-style-type: none"> ● Gather, interpret, and assess information from a variety of sources and points of view.
	<ul style="list-style-type: none"> ● Evaluate evidence and arguments critically or analytically.
	<ul style="list-style-type: none"> ● Produce well-reasoned written or oral arguments using evidence to support conclusions.
A course in this area (II.A) <u>must meet at least three of the additional learning outcomes</u> in the right column. A student will:	
	<ul style="list-style-type: none"> ● Identify and apply the fundamental concepts and methods of a discipline or interdisciplinary field exploring world cultures or global issues, including, but not limited to, anthropology, communications, cultural studies, economics, ethnic studies, foreign languages (building upon previous language acquisition), geography, history, political science, sociology, and world literature.
	<ul style="list-style-type: none"> ● Analyze culture, globalization, or global cultural diversity, and describe an event or process from more than one point of view.
	<ul style="list-style-type: none"> ● Analyze the historical development of one or more non-U.S. societies.
	<ul style="list-style-type: none"> ● Analyze the significance of one or more major movements that have shaped the world's societies.
	<ul style="list-style-type: none"> ● Analyze and discuss the role that race, ethnicity, class, gender, language, sexual orientation, belief, or other forms of social differentiation play in world cultures or societies.
	<ul style="list-style-type: none"> ● Speak, read, and write a language other than English, and use that language to respond to cultures other than one's own.

B. U.S. Experience in its Diversity	
A Flexible Core course <u>must meet the three learning outcomes</u> in the right column.	
	<ul style="list-style-type: none"> ● Gather, interpret, and assess information from a variety of sources and points of view.
	<ul style="list-style-type: none"> ● Evaluate evidence and arguments critically or analytically.
	<ul style="list-style-type: none"> ● Produce well-reasoned written or oral arguments using evidence to support conclusions.
A course in this area (II.B) <u>must meet at least three of the additional learning outcomes</u> in the right column. A student will:	

	<ul style="list-style-type: none"> ● Identify and apply the fundamental concepts and methods of a discipline or interdisciplinary field exploring the U.S. experience in its diversity, including, but not limited to, anthropology, communications, cultural studies, economics, history, political science, psychology, public affairs, sociology, and U.S. literature.
	<ul style="list-style-type: none"> ● Analyze and explain one or more major themes of U.S. history from more than one informed perspective.
	<ul style="list-style-type: none"> ● Evaluate how indigenous populations, slavery, or immigration have shaped the development of the United States.
	<ul style="list-style-type: none"> ● Explain and evaluate the role of the United States in international relations.
	<ul style="list-style-type: none"> ● Identify and differentiate among the legislative, judicial, and executive branches of government and analyze their influence on the development of U.S. democracy.
	<ul style="list-style-type: none"> ● Analyze and discuss common institutions or patterns of life in contemporary U.S. society and how they influence, or are influenced by, race, ethnicity, class, gender, sexual orientation, belief, or other forms of social differentiation.

C. Creative Expression

A Flexible Core course must meet the three learning outcomes in the right column.

	<ul style="list-style-type: none"> ● Gather, interpret, and assess information from a variety of sources and points of view.
	<ul style="list-style-type: none"> ● Evaluate evidence and arguments critically or analytically.
	<ul style="list-style-type: none"> ● Produce well-reasoned written or oral arguments using evidence to support conclusions.

A course in this area (II.C) must meet at least three of the additional learning outcomes in the right column. A student will:

	<ul style="list-style-type: none"> ● Identify and apply the fundamental concepts and methods of a discipline or interdisciplinary field exploring creative expression, including, but not limited to, arts, communications, creative writing, media arts, music, and theater.
	<ul style="list-style-type: none"> ● Analyze how arts from diverse cultures of the past serve as a foundation for those of the present, and describe the significance of works of art in the societies that created them.
	<ul style="list-style-type: none"> ● Articulate how meaning is created in the arts or communications and how experience is interpreted and conveyed.
	<ul style="list-style-type: none"> ● Demonstrate knowledge of the skills involved in the creative process.
	<ul style="list-style-type: none"> ● Use appropriate technologies to conduct research and to communicate.

D. Individual and Society

A Flexible Core course must meet the three learning outcomes in the right column.

	<ul style="list-style-type: none">● Gather, interpret, and assess information from a variety of sources and points of view.
	<ul style="list-style-type: none">● Evaluate evidence and arguments critically or analytically.
	<ul style="list-style-type: none">● Produce well-reasoned written or oral arguments using evidence to support conclusions.

A course in this area (II.D) must meet at least three of the additional learning outcomes in the right column. A student will:

	<ul style="list-style-type: none">● Identify and apply the fundamental concepts and methods of a discipline or interdisciplinary field exploring the relationship between the individual and society, including, but not limited to, anthropology, communications, cultural studies, history, journalism, philosophy, political science, psychology, public affairs, religion, and sociology.
	<ul style="list-style-type: none">● Examine how an individual's place in society affects experiences, values, or choices.
	<ul style="list-style-type: none">● Articulate and assess ethical views and their underlying premises.
	<ul style="list-style-type: none">● Articulate ethical uses of data and other information resources to respond to problems and questions.
	<ul style="list-style-type: none">● Identify and engage with local, national, or global trends or ideologies, and analyze their impact on individual or collective decision-making.

E. Scientific World

A Flexible Core course must meet the three learning outcomes in the right column.

	<ul style="list-style-type: none">● Gather, interpret, and assess information from a variety of sources and points of view.
	<ul style="list-style-type: none">● Evaluate evidence and arguments critically or analytically.
	<ul style="list-style-type: none">● Produce well-reasoned written or oral arguments using evidence to support conclusions.

A course in this area (II.E) must meet at least three of the additional learning outcomes in the right column. A student will:

	<ul style="list-style-type: none">● Identify and apply the fundamental concepts and methods of a discipline or interdisciplinary field exploring the scientific world, including, but not limited to: computer science, history of science, life and physical sciences, linguistics, logic,
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	<p>mathematics, psychology, statistics, and technology-related studies.</p>
	<ul style="list-style-type: none"> ● Demonstrate how tools of science, mathematics, technology, or formal analysis can be used to analyze problems and develop solutions.
	<ul style="list-style-type: none"> ● Articulate and evaluate the empirical evidence supporting a scientific or formal theory.
	<ul style="list-style-type: none"> ● Articulate and evaluate the impact of technologies and scientific discoveries on the contemporary world, such as issues of personal privacy, security, or ethical responsibilities.
	<ul style="list-style-type: none"> ● Understand the scientific principles underlying matters of policy or public concern in which science plays a role.