From: Albert Saiz  
To: MCP Incoming Class  
Reference: Working Hard on your Quantitative Skills to make the Most out of the MCP Program at MIT

Dear Student,

Welcome to the MCP program at MIT.

During your stay here you will take a number of classes, studios, and workshops that will help you become a well-rounded professional planner. Some of these classes - such as quantitative reasoning, economics, and spatial analysis - are grounded on quantitative analytical methods.

As you know, analytical and quantitative skills are becoming increasingly important in planning, local policy, urban economic development, and design. The information technology revolution has made it possible for planners to collect and analyze large quantities of data with which to study and predict human behavior and its interaction with the built environment. From predicting peak traffic flows in a toll road, to mapping the proximity of local schools to contaminant sites, to calculating the energy consumption of a newly-designed urban environment, planners are increasingly becoming users of quantitative methods.

You will leave MIT with competencies as a professional user of analytical methods. To get there - starting with your microeconomics class this Fall - you will need a degree of mathematical knowledge, including a comfort level using extensive algebra, graphs, and rudimentary calculus.

Not all students come from a quantitative background. The diversity of your educational and professional experiences makes DUSP the exciting place it is. However, we want to make sure that you start with a level playing field in the MCP core quantitative classes. Therefore, based on your quantitative GRE score, we strongly recommend that you work hard to strengthen your math and analytical skills before the Fall semester.

This letter is meant to assist you in working toward improving your analytical skills. The first step in that process is to build up your “MIT quant confidence.” Many of us do not come from a mathematical or technical educational background, and that is Ok. All of us, however, can develop the analytical skills that will make us successful at MIT. In my experience, some students can be a bit insecure about their quantitative skills in
the first weeks of class. However, hard work, dedication, and a strong motivation to improve yourself will make you into a successful professional user of analytical and quantitative methods in your future planning career.

So now you realized that you have what it takes to do well in your quantitative classes, and your “MIT quant confidence” is all pumped up! What next?

Next you have to work hard on preparation. If you do so, you will be successful in the core classes. I propose that you use the online materials below to prepare. However, *if your math skills are really rusty* (graphing a function anyone?) you should be taking a mathematics course to help you arrive in Cambridge. If the materials below (1 through 4) are too challenging, you may want to enroll in a college mathematics course that covers college-level algebra and pre-calculus during the summer. You also have to understand basic calculus; notably derivatives and differentiation rules. This kind of course is offered over the summer in most higher-education institutions. At the end of the document, we have listed the course objectives for Mathematics 095, the algebra course offered at a local college. We have also included a description of Math 197, their pre-calculus course. As a preliminary step to the “mathematics for economics” and differentiation classes below you should take a course that includes the concepts exposed in these two classes.

Complementarily – *at the very least* – you will re-wire your brain to think in analytical and quantitative terms by studying the following materials available on the Web.

1) Study from the Algebra Review materials provided online by the University of Guelph:


   You should have mastered these materials before arriving in Cambridge. Consider consulting the materials they suggest to prepare for the microeconomics class.

2) Study derivatives and differentiation rules with these materials from Columbia University:


3) Take the Math Refresher”, “Math for Economics,” and “Math Camp” Tutorials – in this order – from the school of public policy at GMU:

4) Work on the first 3 units (unit 1, unit 2, and unit 3) of our own Economics Department “Principles of Microeconomics” class:


Listen to the lectures, review the readings that you can access, work on the problems and graphs, and familiarize yourself with the language and tools of quantitative social science.

In sum, here are the steps to prepare yourself for your quantitative and analytics classes at MIT:

i. Build your MIT quant confidence. Everyone at DUSP will end up a professional user of analytical and quantitative data: including you.

ii. If you forgot the basic algebra and pre-calculus skills (operating equations and solving for unknowns, understanding and graphing functions), please take such courses during the summer prior to coming to class. See syllabuses below for examples.

iii. Study the online materials suggested in this memo.

iv. Come prepared and confident to the microeconomic class and ready to learn.

Please contact Sandra Wellford (wellford@mit.edu) or Albert Saiz (saiz@mit.edu) if you have any questions.

Best of luck for your preparation!  
The faculty at DUSP is looking forward to having you in class.

Albert Saiz
Appendix: Examples of Algebra and Pre-calculus classes that can help you prepare.

------------------------MAT095 FUNDAMENTALS OF ALGEBRA

*(offered at a local college)*

Course Objectives:

1. Identify variables, numerical and literal constants, and the numerical coefficient of a variable.
2. Evaluate an algebraic expression, given positive numerical values for the variables.
3. Identify examples of the associative and commutative properties for addition and for multiplication.
4. Use the distributive property for multiplication over addition to remove parentheses in an algebraic expression.
5. Determine whether or not a given positive number is a solution to a given equation.
6. Solve equations of the form \( x + a = b \) and \( x - a = b \), where \( a, b \), and the solutions are positive numbers.
7. Solve equations of the form \( ax = b \) and \( x/a = b \) where \( a, b \), and the solutions are positive numbers.
8. Use an equation of the form \( ax = b \) to solve percent, uniform motion, and unit price problems.
9. Graph a given integer on the number line, and write the coordinate of a point indicated on the number line.
10. Given two integers, use the symbols <, and > to indicate which is the smaller and which is the larger.
11. Find the absolute value of given integers, and use absolute value to find the distance of a point on the number line from the origin.
12. Find the sum of two integers.
13. Find the difference of two integers.
14. Find the product of two integers.
15. Find the quotient of two integers.
16. Evaluate expressions involving sums, differences, products, and quotients of integers
17. Combine like terms in an expression.
18. Find the sum or difference of two expressions.
19. Multiply an expression by a constant.
20. Simplify a general linear expression.
21. Solve linear equations of the form \( ax + b = c \) and \( ax + b = cx + d \).
22. Solve linear equations by simplifying one or more of the linear expressions.
23. Solve linear equations where one or more expressions have denominators which are constants.
24. Translate a verbal statement into a mathematical expression, and use such expressions to solve number problems.
25. Solve problems describing angles of a triangle, and perimeters of triangles and rectangles.
26. Solve problems involving values and mixtures.
27. Solve problems involving ratio and proportions.
28. Evaluate a formula given numerical values for the variables.
29. Solve a formula for a given variable.
30. Solve linear inequalities in one variable.
31. Plot a point with given coordinates in the Cartesian coordinate system.
32. Draw the graph of a line given the equation.
33. Find the y and x-intercepts of a line and use them to draw the graph.
34. Find the slope of a line determined by two given points, and find the slope and y-intercept of a line given its equation.
35. Solve systems of two linear equation in two variables by graphing.
36. Solve systems of two linear equations in two variables algebraically by the addition method.
37. Solve systems of two linear equations in two variables algebraically by the substitution method.
38. Solve applied problems using systems of two linear equations in two variables.
39. Draw graphs of linear inequalities in two variables.
40. Find the value of a power of a positive or negative integer.
41. Evaluate expressions involving powers of positive or negative integers.
42. Use rules of exponents to simplify expressions involving positive integral exponents.
43. Write numbers in scientific notation and multiply numbers given in scientific notation.
44. State the degree of a term, the degree of a polynomial, and write a polynomial in descending powers of a variable.
45. Find the sum and difference of two polynomials.
46. Multiply a polynomial by a monomial or a binomial.
47. Use long division to divide a polynomial by a monomial or a binomial.
48. Factor out a common factor from a polynomial.
49. Factor by grouping.
50. Factor the difference of two squares as a sum and difference of binomials.
51. Factor a perfect trinomial square as the square of a binomial.
52. Factor a trinomial into two binomial factors.
53. Solve equations which have a common variable factor.
54. Solve quadratic equations by factoring.
55. Solve problems involving rectangular areas using quadratic equations which can be solved by factoring.
56. Solve problems involving the Pythagorean theorem.

-----------------------------MAT197 Pre-Calculus
(offered at a local college)
Topics include functions and their graphs, polynomial functions, rational and radical functions, exponential and logarithmic functions, elements of trigonometry and trigonometric functions, analytic geometry, and sequence and series notation.