In a world that is constantly changing, there is no one subject or set of subjects that will serve you for the foreseeable future, let alone for the rest of your life. The most important skill to acquire now is learning how to learn. - John Naisbitt

Course Description:

The main goal of this course is to for you to acquire the tools you need to succeed in your future math and science courses. This includes not only calculation skills and how to apply these calculations to scenarios from science and economics, but also how to read math, how to study for a math exam, how to work together to solve problems, and how to harness your personal strengths for maximum efficiency in learning. The course is also designed to help you gain control over your own learning, which should help you to feel more confident in your math skills.

Learning Goals for Math 5a:

• Enter Math 10a (and other science, econ, psych, etc. classes) with stronger numeracy/precalculus skills than the average student.

• Learn how to learn/improve at math.

• Recognize opportunities to apply skills from this class in your life and in other classes.

Texts:

  
  – Available free online: https://yoshiwarabooks.org/mfg/MFG.html

  – The course will cover most of Chapters 1-7 of this text.

• *Algebra and Trigonometry*, OpenStax CNX, Abramson, Jun 25, 2018.

  – Available free online: https://cnx.org/contents/E6wQevFF011.1:Sc8taR03@8/Factoring-Polynomials or here: https://tinyurl.com/y7vku8bx

  – The course will cover Section 1.5 (factoring), Chapter 7, and Sections 8.1, 8.2, & 9.5 (trig) of this text.
Prerequisite:
There are no prerequisites for Math 5a. Students who are unsure of their placement and are considering Math 10a should take the calculus placement exam or consult with their instructor: http://www.brandeis.edu/registrar/newstudent/testing.html#mathtest.

Team-Based Learning and Flipped Classroom:
This is a Team-Based Learning course. At the beginning of the course, students will be assigned a team to work with for the duration of the semester. You are not required to meet your team outside of class, but you will work with your team in class.

The course is also flipped. This means we will not follow a traditional in-class lecture and out-of-class homework format. Instead, students will be expected to read about new material on their own outside of class, and the majority of class time will be spent with teams working together on activities designed to deepen interest and understanding.

The material for this course is divided into eight modules. Each module will take us about 4 class days to cover. The structure of each module can be broken down as follows:

- **Reading**: Before the first day of a module, students read the sections of the text that will be covered. This is done independently outside of class. Each reading assignment will include a reading guide (found on LATTE), telling you specific concepts to focus on and what we want you to get out of the reading. The reading is in place of homework assigned outside of class and you should plan to spend ~6 hours on each reading assignment.

- **Readiness Assessment Tests (RATs)**: On the first day of the module, you will take a closed-note multiple-choice quiz on the reading. Each RAT will be taken twice: first individually, then immediately afterwards as a team. The RAT is designed to hold you and your teammates accountable for the reading, and to help clear up any misunderstandings or questions there may be about the reading content. Retaking the assessment as a team will help you to deepen your understanding through discussion of the problems – you will benefit both from learning things that others picked up on that you may have missed, and by explaining what you learned from the reading to your teammates.

- **Team Activities**: The other days of a module are spent working on in-class activities in teams. You will work with your team to devise solutions and problem-solving strategies to a selection of problems. You are not expected to work on these assignments outside of the classroom.

- **Friday Assessments**: Every Friday, you will take a closed-note assessment (individually). Here you will have an opportunity to demonstrate mastery of any content outcomes that have been covered in any module up to that point. Practice problems will be provided on LATTE to help you study for the Friday Assessments.

Outcomes-Based Grading:
This course uses “outcomes-based grading”. This means that you earn a particular grade (A, B, C, etc.) by demonstrating mastery of a certain number of content outcomes (content outcomes include things like “Solve an exponential equation” – see LATTE for a complete list of content outcomes). You will demonstrate mastery by solving problems on the Friday Assessments, which will be graded on a credit/no credit basis. The great thing here is that
if you try a problem and your work doesn’t merit credit, you can try again the next week, and the week after that, until you get it right. Each week there will be new problems, and these problems will cover all the content outcomes we’ve worked on in the course up to that point. The expectations will be high (essentially a B+ level to earn credit), but you will not be penalized if you do not get credit – you just have to try again.

Another nice thing about this is that once you have demonstrated mastery for a particular outcome (by earning credit for that outcome on two different Friday Assessments), you can skip those problems on future Friday Assessments. Each problem will be labelled with its corresponding content outcomes, so you’ll know which ones you need to do.

Our expectation is that this grading paradigm will decrease anxiety and increase your control over your own learning. We’re really excited to provide this opportunity for you, and we’re happy to answer questions about how it works and why we think it will be better than more traditional grading schemes.

**Final grades in Math 5A will take into account the following:**

1. **Mastery of Content Outcomes.** This is the primary way that you will show you have learned the content of the course. (See “Outcomes-Based Grading” above for details about how to demonstrate mastery of outcomes.)

   Content outcomes are divided into three types: Basic, General, and Word Problems. The final letter grade is determined by the number of each type of outcome a student has mastered (see chart below).

2. **RATs & Participation.** This score includes student and team performance on the Readiness Assessments Tests (RATs) and class participation. Each of our eight Modules will have one RAT day and about three class activity days.

   - Each individual RAT is worth 10 points and each team RAT is worth an additional 10 points. **No make-up RATs will be given.** If you are absent, you will receive a 0 for both the individual and team RAT that day. However, your 3 lowest RAT Scores (team or individual) will be dropped.
   - On class activity days, teams will take their own attendance to determine class participation. If you are marked as attending class, you will earn 10 points for that day. If you are unable to attend class for some reason, it is up to the discretion of your team whether to sign you in and earn you points for that day. You will need to communicate with your team about when you will be absent and what you will do for your team to make up for any absences.

3. **Final Exam.** At the end of the semester, we will have a traditionally graded (i.e. partial credit can be earned) final exam.

4. **Reflections on Learning.** These short assignments are similar to a journal entry and ask you to reflect on your experience as a student in Math 5a. Prompts for the reflections, as well as more information about the requirements can be found on LATTE, and all reflections will be turned in via LATTE.

5. **Evidences of Transfer.** These short assignments ask you to find a connection between a topic covered in our class and your life outside of our class, and write a brief statement on this connection. Prompts, as well as more information about the requirements can be found on LATTE, and all reflections will be turned in via LATTE.
At the end of the semester, your base letter will be calculated using the following table. Scores shown are the \textbf{minimum} requirements for each grade.

<table>
<thead>
<tr>
<th>Base Letter Grade</th>
<th>Basic Outcomes Mastered</th>
<th>General Outcomes Mastered</th>
<th>Word Problem Outcomes Mastered</th>
<th>RATs &amp; Participation</th>
<th>Final Exam Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8 of 8</td>
<td>15 of 16</td>
<td>11 of 12</td>
<td>90%</td>
<td>80%</td>
</tr>
<tr>
<td>B</td>
<td>8 of 8</td>
<td>13 of 16</td>
<td>10 of 12</td>
<td>80%</td>
<td>70%</td>
</tr>
<tr>
<td>C</td>
<td>7 of 8</td>
<td>12 of 16</td>
<td>8 of 12</td>
<td>70%</td>
<td>60%</td>
</tr>
</tbody>
</table>

You must meet \textbf{ALL} requirements to earn the specified base letter grade. Failure to meet any 1 of the C standards will result in a D. Failure to meet 3 or more of the C standards will result in an E.

The reflections on learning and evidences of transfer will be used to modify the base letter grade (to a +/-) as follows. Again, the scores shown are the \textbf{minimum} requirements for each grade. Here, X is the grade determined by the first table.

<table>
<thead>
<tr>
<th>Final Grade</th>
<th>Reflections on Learning Completed</th>
<th>Evidences of Transfer Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>X+</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>X</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>X−</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Some examples of using this grading scheme are shown below:

<table>
<thead>
<tr>
<th>Basic Outcomes Mastered</th>
<th>General Outcomes Mastered</th>
<th>Word Problem Outcomes Mastered</th>
<th>RATs &amp; Participation</th>
<th>Final Exam Score</th>
<th>Reflections on Learning Completed</th>
<th>Evidences of Transfer Completed</th>
<th>Final Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>15</td>
<td>12</td>
<td>95%</td>
<td>82%</td>
<td>3</td>
<td>7</td>
<td>A−</td>
</tr>
<tr>
<td>8</td>
<td>14</td>
<td>10</td>
<td>90%</td>
<td>78%</td>
<td>12</td>
<td>9</td>
<td>B+</td>
</tr>
<tr>
<td>6</td>
<td>12</td>
<td>9</td>
<td>100%</td>
<td>57%</td>
<td>8</td>
<td>7</td>
<td>D</td>
</tr>
</tbody>
</table>

If you have questions about how this course is graded, please do not hesitate to reach out to your instructor!

\textbf{Calculators:}

You should have access to a graphing calculator (an online one is fine, for example: \url{http://wolframalpha.com}). Calculators are \textbf{not} allowed during RATs, Friday assessments, or the final exam.

\textbf{LATTE:}

All course materials for Math 5a will be available online on LATTE. Log in at \url{http://latte.brandeis.edu} using your Unet username and password.
Resources to help you succeed!

Reading Guides and Additional Practice Problems:
For each module, a reading guide will be available on LATTE to help guide you through the most important material of each section. There will also be additional practice problems with solutions that you can use to study for Friday Assessments. Each of these resources is optional, but you are encouraged to utilize them!

Office Hours:
You are encouraged to attend the office hours of either instructor or your TA. If you can’t attend office hours, don’t hesitate to ask for an appointment for another time. We are happy to meet with you!

Evening Help Sessions:
You are welcome (and encouraged!) to attend the Math Department’s evening help sessions whenever you like. These are drop-in sessions that are available to students in Math 5a, 10a and 10b every Monday, Tuesday, Wednesday and Thursday evening anytime between 7:00 pm and 9:00 pm. Help sessions are held in Goldsmith 101 and will begin on Tuesday, September 4th.

Four-Credit Course (with three hours of class-time per week):
Success in this 4 credit hour course is based on the expectation that students will spend a minimum of 9 hours of study time per week in preparation for class (readings, papers, discussion sections, preparation for exams, etc.).

Students with Disabilities:
If you are a student who needs academic accommodations because of a documented disability you should present your letter of accommodation to your instructor as soon as possible. If you have questions about documenting a disability or requesting academic accommodations you should contact Beth Rodgers-Kay in the Office of Academic Services at x63470 or at brodgers@brandeis.edu. Letters of accommodations should be presented at the start of the semester to ensure provision of accommodations. Accommodations cannot be granted retroactively.

Academic Integrity:
You are expected to follow the University’s policy on academic integrity, which is distributed annually as section 4 of the Rights and Responsibilities Handbook (see http://www.brandeis.edu/studentaffairs/srscs/rr/index.html). Instances of alleged dishonesty will be forwarded to the Department of Student Development and Conduct for possible referral to the Student Judicial System. Potential sanctions include failure in the course and suspension from the University. If you have any questions about how these policies apply to your conduct in this course, please ask.

Name/Pronouns:
If you have a preferred name and/or preferred pronouns you would like your instructor to use, please send them an email to let them know.
Topics Covered in Math 5a (Precalculus):

Readings from the Yoshiwara text are labelled with a Y and readings from the Abramson text are labeled with an A.

Module 0: Factoring
- A Section 1.5 Factoring Polynomials
- Y Section 6.1 Factors and $x$-Intercepts

Module 1: Trig I
- A Section 7.1 Angles
- A Section 7.2 Right Angle Trigonometry
- A Section 7.3 The Unit Circle
- A Section 7.4 The Other Trig Functions

Module 2: Power Functions
- Y Section 3.1 Variation
- Y Section 3.1 Integer Exponents
- Y Section 3.3 Roots and Radicals
- Y Section 3.4 Rational Exponents
- Y Section 4.3 Logarithms

Module 3: Functions and Graphs
- Y Section 1.1 Linear Models
- Y Section 1.2 Functions
- Y Section 1.3 Graphs of Functions
- Y Section 1.4 Slope and Rate of Change
- Y Section 1.5 Linear Functions

Module 4: More on Functions
- Y Section 2.1 Nonlinear Models
- Y Section 2.2 Some Basic Functions
- Y Section 2.3 Transformations of Graphs
- Y Section 2.4 Functions as Mathematical Models
- Y Section 2.6 Domain and Range

Module 5: Exponential Functions
- Y Section 4.1 Exponential Growth and Decay
- Y Section 4.2 Exponential Functions
- Y Section 4.4 Properties of Logarithms
- Y Section 4.5 Exponential Models

Module 6: Logarithmic Functions
- Y Section 5.1 Inverse Functions
- Y Section 5.2 Logarithmic Functions
- Y Section 5.3 The Natural Base
- Y Section 5.4 Logarithmic Scales

Module 7: Trig II
- A Section 8.1 Graphs of the Sine and Cosine Functions
- A Section 8.2 Graphs of the Other Trig Functions
- A Section 9.5 Solving Trigonometric Equations

Module 8: Polynomials and Rational Functions
- Y Section 6.1 Factors and $x$-Intercepts
- Y Section 6.2 Solving Quadratic Equations
- Y Section 6.5 Quadratic Inequalities
- Y Section 7.1 Polynomial Functions
- Y Section 7.4 Graphing Rational Functions
- Y Section 7.5 Equations That Include Algebraic Fractions

Note: Some topics may be added or omitted as time permits.

Now email your instructor with your favorite joke to show that you have read the syllabus!