Skills Needed for Success in Finite Mathematics

Students are sometimes concerned about whether they have the mathematical skills needed to succeed in a course. The purpose of this document is to help identify some of those skills that you should already possess so that you can be successful in Math 160, Finite Mathematics.

If you find that you are weak in some of these areas, then get help. Visit the Mathematics Enrichment Center and let them know you need help reviewing arithmetic and algebra skills for finite mathematics (if you just tell them you're in Math 160, they may have trouble finding someone to help) or see the instructor.

Rounding

Here are some guidelines for rounding numbers.

- When rounding to a certain number of decimal places, use the next digit to determine whether to round up or not. If the next digit is a 5 or larger, then round your digit up. If the next digit is a 4 or lower, then leave your digit as it is.

- Always carry more decimal places through the intermediate steps than you plan to give in the final answer. If you want 2 decimals in the final answer then you should carry at least 3 places until you get to the final answer. Your answer is more likely to match the answer in the back of the book if you do not round at all until the very end.

- In science courses, significant figures are preached and practiced. In this course, we typically do not round intermediate steps except when money is involved. In this case, we round dollar amounts to the nearest cent before continuing with the problem.

- A general rounding rule is to round the final answer to have one more decimal place than the original values. It is better to give more decimal places than needed than not enough.

- If the problem states the number of decimals to give, be sure to follow those instructions.

Percent, Decimal, and Fraction forms

The information we receive is often given as a percentage. Percentages are easier for most people to comprehend because we use them in real life. But when we perform calculations, we work with decimals or fractions. Fractions are preferred in many cases, since they are exact, but decimals are easier for people to work with on a calculator.

Most calculators do not even have a percent key anymore, so you will need to know how to convert between the different forms.

Percent means ”per hundred” so you can think of the percent symbol as meaning ”divided by 100.” That is how you convert from a percent to a decimal, you simply divide by 100. A shortcut way of doing that is to move the decimal point two places to the left. To convert from a decimal to a percent involves multiplying by 100 or moving the decimal place two places to the right.

One thing to be careful of is that we sometimes work with small percentages. For example 0.2% becomes 0.002 when you divide by 100 or shift the decimal two places to the left.

Fractions are easy to convert into decimals with a calculator. You just divide the number on top by the number on bottom. If the decimal repeats, you may put a line over the repeating part of the decimal. For example, the calculator says that 27/110 is 0.2454545455, but that last digit is a rounding issue, it is exactly $0.2\overline{45}$. The Math button on your calculator has an option to convert decimals into fractions.

In this class, I prefer exact forms unless we’re working with nasty numbers or monetary values. You wouldn’t say that it costs 147/17 dollars, you would display that as a rounded decimal of $8.65. On the other hand, instead of writing 1.46153846154, it looks much nicer, and takes less room, as the fraction 19/13.

We do not use mixed numbers in this class. Write them as improper fractions or decimals as appropriate.

Solving Equations

There is an algebra prerequisite for this course. You will need to know how to solve equations and systems of equations.

Here are some examples of the type of problems you will encounter in this course.

1. Consider the formula for the payment of a present value annuity, $\text{PMT} = \text{PV}\left(\frac{\text{i}}{1-(1+\text{i})^{-\text{n}}}\right)$. Find the present value (PV) if the payment (PMT) on a 360 month (n) mortgage is \$500. The periodic rate (i) is 0.5%.

   (a) Make the substitutions into the formula $500 = \text{PV}\left(\frac{0.005}{1-(1+0.005)^{-360}}\right)$

   (b) Simplify, $500 = 0.0059955053\text{PV}$

   (c) Solve $\text{PV} = \$83,395.81$

2. Supply is given by $p = 0.5q + 3.7$ and demand is given by $p = -1.5q + 20$, where p is the price in dollars and q is the quantity in hundreds. Find the equilibrium price and quantity, where supply and demand are equal.

   (a) Since both supply and demand are p, set them equal to each other and you'll have one equation that involves just q, $0.5q + 3.7 = -1.5q + 20$.

   (b) Solve that for q to get $q = 8.15$.

   (c) Now substitute that back into either equation to find p, $p = 0.5(8.15) + 3.7 = 7.775$ or $p = -1.5(8.15) + 20 = 7.775$

   (d) The equilibrium is reached when \$7.775 per unit is charged and 815 (the 8.15 is in hundreds) units are produced.

Graphing Lines

You will need to know how to graph lines and find the intersection of two lines.

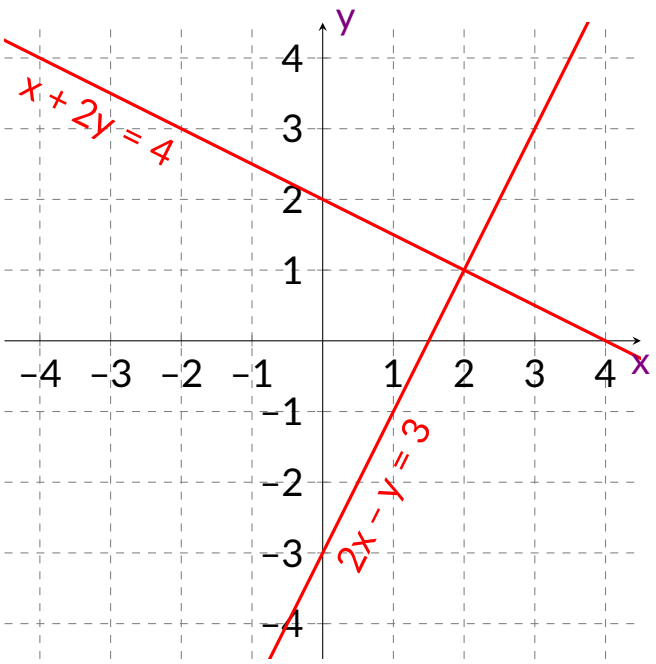
Find the intersection of $2x - y = 3$ and $x + 2y = 4$.

Many students like to put the equations into slope-intercept form, $y = mx + b$. This is often not the best form for finite mathematics. Instead, most of our equations will be written in standard form $Ax + By = C$. When written in this form, finding the x-intercept and y-intercept are often more useful.

The x-intercept is found by letting $y = 0$ and solving for x. The y-intercept is found by letting $x = 0$ and solving for y.

$2x - y = 3$ has an x-intercept of $x = 3/2$ and a y-intercept of $y = -3$.

$x + 2y = 4$ has an x-intercept of $x = 4$ and a y-intercept of $y = 2$.



From the graph, you can see that the solution is the point (2, 1).

Matrices

This course makes heavy use of matrices that were covered in College Algebra. Luckily, most of what you will need is reviewed during the course or the calculator is used.

A matrix is an array of numbers. Different textbooks use different grouping symbols. Some use parentheses ( ) and others use square brackets [ ]. In this course, we will use brackets around the matrices.

A very common use of matrices is to solve a system of linear equations. We convert the system of linear equations into an augmented matrix, which uses a vertical line to separate the left-hand side of an equation from the right-hand side of the equation.

Each variable becomes a column of the matrix and each equation becomes a row of the matrix.

The values inside the matrix represent the coefficients on the variable for the left-hand side or the constants for the right-hand side.

System of linear equations: $\begin{cases} 2x - y = 3 \\ x + 2y = 4 \end{cases}$

Augmented matrix: $\left[\begin{array}{cc|c} 2 & -1 & 3 \\ 1 & 2 & 4 \end{array}\right]$

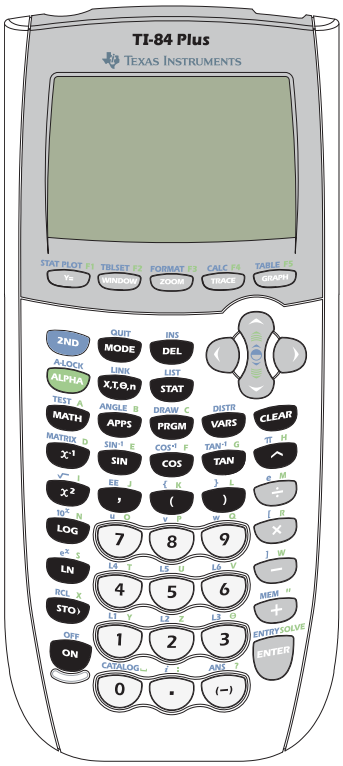
Calculator Usage

This is an applied course and almost every problem we do will be a story problem. Most of your previous math courses have been skills based; they have a skill they want you to master and they give you a problem to see if you can perform those tasks.

We will use the calculator extensively in this course. There are very few times that I ask you to do something without a calculator. Setting the problem up is the difficult part because we will use the calculator to find the answer once it is set up.

There are calculator programs that the instructor has written that will greatly reduce the work in this course. You are not expected to know how to use those programs, the instructor will show you how. You are expected to know how to use the basic features of the calculator including graphing equations.

The calculator programs only run on some version of the TI-83 or TI-84 calculators. Other graphing calculators like Casio or HP are not supported.



Reading Comprehension

You need to be able to read, comprehend, and follow instructions.

Do not jump straight to the problem without first reading the instructions.

Often times students will come up during a test and ask how many decimal places I want and I will point at the instructions to the problem that say ”Leave answers as fractions” or ”Give answers with four decimal places.” Other times, the instructions might say something like ”Set up the problem, but do not solve it,” which could obviously save you a lot of time.

Almost every problem in this course begins as a story. You need to be able to read through the story, determine what is given and what is asked for, and then find the answer. You need to be able to comprehend what you’re reading or you won’t even get to the math part of the problem.

One tip about reading a story problem is to look at the end. The book often asks a question as the last thing and this helps you identify what it is that you’re looking for. Once you know what you’re looking for, you can determine how to define your variables.

Until you become familiar with a section and know what the problems look like, read the entire problem before you write anything down. Then define your variables and go back and read the problem again, this time writing down key values.

Many problems can be written in table form, which then becomes a matrix. When writing your table, use the columns for the variables and the rows for the constraints or restrictions. It is very beneficial to label the rows and columns.

Note that answers to story problems often involve written answers with units, not just simple numbers. You need to be able to write as well as read. Always make sure you answer the problem. If the question is “how many thingamajigs the watchamacallit plant should produce?” then don’t answer $x_1 = 10$.