Homework in Math 126
Spring 2015

Expectations. To do as well as you are capable of doing in Math 126, you should expect to do

9–11 hours of work each week outside of class.

Kinds of problems. Several types of homework problems will be assigned in Math 126:

1. Some problems will be calculations, where the answer to the problem is a number, or a table of numbers. In these problems, show all your work, and if you use a new idea or clever method, indicate what your method is.

2. Many problems in this course will be *explorations*: You'll be given a rough description of a phenomenon or question ("Can we find 3 consecutive odd primes?") that you must then investigate by looking at *examples* and finding a *pattern*. (Make sure you organize your results neatly in columns, tables, etc.)

   You are encouraged to use a computer to help your explorations, as long as you do the "programming" yourself instead of using a canned package. No fancy programming or software is necessary, or even particularly helpful; almost all computer explorations for this class can be done with Excel, or some very simple computer language like BASIC. To show your work, include a printout of the results, along with a brief description of the spreadsheet/program you've created; alternately, just email me your spreadsheet/program at `hsu@math.sjsu.edu`.

3. Finally, some problems will be explanations/proofs, in which you are asked to "Show that..." or "Explain why..." something is true, or sometimes "Find a formula...". In these problems, the point is basically to give an explanation in complete sentences.

You will have several chances to work on, and revise, all homework problems. Specifically, this process has 3 steps: outline, submission, and revision.

1. An **outline** of each problem set will be due two classes before the completed version is due, and will be graded and returned by the class before the completed version is due. For example, the outline for problem set 01 is due **Fri Jan 30**; PS01 itself is due on **Mon Feb 02**.

   In each outline, you should do the following:

   (a) **Write down the definitions of all important new terms in the problem set** (e.g., greatest common divisor). The point is to show that you understand what each problem is asking. You do not need to include previous definitions, just the new ones.

   (b) **Write down the goal of each question** in one of the following ways:
   - If the question is a calculation, write down what kind of object you need to get for your final answer. (Again, if you do the same kind of calculation several times, you just need to describe the goal once.)
   - If the question is an exploration, describe what you are going to do to generate the examples in which you will look for a pattern.
   - If the question is a proof, express what you're trying to prove in "if-then" format, write down what you are **assuming** in your proof, and write down the **conclusion** you are trying to reach. Alternately, if you're doing a proof by contradiction, clearly state the assumption that you hope will lead to a contradiction. (For those less familiar with proof, to get a quick tour of the fundamentals, see sections 1–6 of the proof handout that can be downloaded from the course web page.)

   Note that these outlines are meant to replace quizzes, and are therefore not supposed to take a lot of time (maybe 20–30 minutes). The point is to show that you are capable of getting started on the problem set. See below for some suggestions on the outline for PS01.

   Late outlines will not be accepted, but to allow for illness, etc., your lowest outline grade will be dropped.

2. **Submit** the completed version. You do not need to include your outline.

3. After you get the graded problem set back, you have as many chances as you want to **revise** the problems as much as you like, usually until the next in-class exam. Each time you submit a revision, please attach the original completed version and all previous revisions, with the newest version on the top. You do not need to revise/rewrite questions that you have previously gotten correct; just correct the ones you got wrong.

Revising missed problem sets: It is possible to "revise" a problem set that is not turned in on the due date. However, each time you miss a due date, all previous homework from missed due dates becomes unrevisable. Note that "missing" a due date can also include turning a homework that, in my judgement, does not represent a sufficient effort to continue with the course.

Rules for working together: The basic rule about working together is that you are encouraged to talk to each other about homework, as everyone learns from such discussion, but you are not allowed to copy solutions. Please also do not let others "borrow" or make xeroxes of your homework. It is important to realize that people who copy homework almost always do worse as a result, so if you let someone copy your homework, you're not helping them at all. The only way to learn from the homework is to struggle through it yourself.

Homework copying will result in 0 grades both for the person copying and the person being copied from. Further problems may result in an academic dishonesty report being filed.

Guidelines for outlines

The outline for PS01 should go basically as follows.

Relevant definitions: It's a good idea to collect all relevant new definitions at the beginning of your outline, though you can also mix them in if you prefer. For example:

Defn. A **Pythagorean triple** is (etc.).

And so on.

Notes for each problem. This will vary slightly from problem to problem. Calculation problems are easy to outline (just explain what you have to calculate), so we'll look at exploration and proof problems.

For exploration problems, you give some idea of how you're going to generate the "data" in which you will then look for a pattern. Here's an example of what you should write in your outline:

> 1.1. Triangular numbers are numbers of the form $\frac{n(n+1)}{2}$. Start listing $\frac{n(n+1)}{2}$ for $n = 1, 2, \ldots$ and look for squares. Look for patterns in the entries that "work" (the triangular numbers that are squares) to try to find a more efficient way to look for triangle-square numbers.

For proof problems, unless you do proof by contradiction, you first figure out what is to be proven in "if-then" format. The "if" part becomes the assumption for the problem, and the "then" part becomes the conclusion. Example:

> 2.2. **Assume:** d divides both m and n. **Conclude:** d divides $m + n$ and $m - n$. Method: Use the definition of divides.

And an example of proof by contradiction, for later. (Problem 2.1 has not been assigned.)

> 2.1(a). **Assume:** (a, b, c) is a Pythagorean triple, and that neither a nor b is a multiple of 3. (I.e., assume that $a = 3x + 1$ or $3x + 2$, etc.) Deduce a contradiction.