Lesson Plans - Jan. 14

Housekeeping

1. When you get to class (hopefully 5-10 minutes early), write on the board:

   Math 111 - Plane Trigonometry
   Section BLANK
   Instructor: Prasad
   Contact: pvprasad@math.arizona.edu

   Make sure they know I am the instructor, and that I'll be back on Tuesday (Jan. 19)!

2. Make sure everyone gets a copy of each handout, and urge them to all read through the handouts themselves. I will not answer any questions which are answered on the handouts.

3. Take attendance. While you do this, pass out a sheet of paper with a column for their name and a column for the email address THAT THEY CHECK. I do not want their Arizona email if they never look at it.

4. What they need for this class:
   - *Plane Trigonometry* by Steve Wheaton. It's a blue book, and it's probably not a good idea to get it used online - they should buy it new from the bookstore to ensure the quality. (It's published in-house, so getting copies elsewhere is a little sketchy).
   - A notebook to take notes in
   - A folder to keep handouts and work

5. At the end of class, before you let them go (and DO NOT let them go early, even a little bit. Teach until 50 minutes are up, and then formally dismiss them).

Section 1.1: Angles and Triangles I gave you a plan for all of section 1.1, but you're probably not going to get through all of it. Just put a line through the last thing you discussed (if you put something on the board but did not have time to get back to it, let me know that, too).

1. Review of definitions: Sort the class into groups of four and get them to angle their desks near each other. It's best if you do the sorting, and for the first day, just group people with those sitting near them.
   Write the following up on the board:

   ray -
   angle -
   triangle -
   acute angle -
   obtuse angle -
   right angle -
   complementary angles -
   supplementary angles -

   Their task is to define these terms as clearly as they can in groups. Then, ask for volunteers to come put up their group's definition (one group per word, if possible). Then, go over the defintions they put up and finesse them into the correct definitions if necessary. (They have a really hard time defining "angle").

Correct definitions:
ray - "half a line"; has one endpoint, extends infinitely in the other direction
angle - amount of rotation, either clockwise or counter-clockwise
triangle - polygon with 3 sides
acute angle - angle whose measure is between $0°$ and $90°$
obtuse angle - angle whose measure is between $90°$ and $180°$
right angle - angle whose measure is EXACTLY $90°$
complementary angles - a pair of angles whose measures add up to $90°$
supplementary angles - a pair of angles whose measures add up to $180°$

2. Examples: You should write these problems up on the board, and they should try to solve them on their own (if they start to discuss the questions in pairs or whatever, don't stop them). Then after giving them a minute or two to work (these are easy so it won't take them long - keep an eye on them to see how quickly they finish), ask for the answers.

   (a) Find the complement and supplement of $16°$.
   Answer. Complement: $74°$; supplement: $164°$.

   (b) Say an angle has a measure of $y°$. How can we express the measure of its supplement?
   Answer. $(180 - y)°$.

   (c) (Writing problem: this means that their answer should be in complete, CLEAR sentences. Remind them that the sentence doesn't need to be long, but should contain an subject and a verb).
   How are the complement and supplement of the same acute angle related? Is this true for an obtuse angle?
   Answer. A good sample answer would look like this:
   If an acute angle has measure $x°$, then its complement would have measure $(90 - x)°$ and it's supplement would have measure $(180 - x)°$. So, the measure of the supplement of an acute angle is always $90°+$ the measure of the complement of that angle. This is not true for obtuse angles, because an obtuse angle does not have a complement.

3. Definitions, again. Proceed as you did with definitions the first time around. Drawing pictures to go along with these might help.

   right triangle - triangle containing one right angle
   acute triangle - triangle whose angles are ALL acute
   obtuse triangle - triangle containing one obtuse angle
   scalene triangle - triangle whose sides are all different lengths (angles are all different measures)
   isosceles triangle - triangle with two equal sides (angles opposite the equal sides are also equal: these are called *base angles*)
   equilateral triangle - triangle with three equal sides (and three equal angles)

   These are a little easier for them, and they mostly remember these definitions from geometry.

4. Fill in the blank: The measures of the angles in a triangle always add up to: ________.

5. Examples:

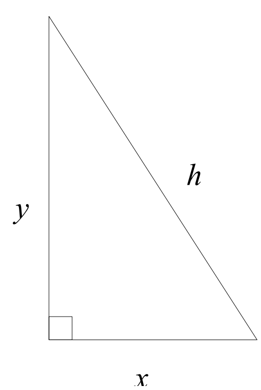
(a) A right triangle has a 52° angle. Find the measures of all the angles in the triangle.
Answer. The angles have measures: 90°, 52°, and 38°

(b) What are the measures of the base angles of an isosceles triangle whose non-base angle measures $x°$?
Answer. $(180 - x)°/2 = (90 - \frac{x}{2})°$

(c) What can you say about the other two angles of a right triangle?
Answer. They are complementary (to each other).

(d) (Writing). Explain how you would find the angles of an equilateral triangle.
Unacceptable Answer. 60°
Acceptable Answer. Angles in a triangle have measures which add up to 180°, and and equilateral triangle has all equal angles. If the measure of one angle is $x°$, we know that $3x° = 180°$, so $x° = 60°$. So each of the angles in an equilateral triangle has measure 60°.

6. Notes on Right Triangles (Consider this a little mini-lecture. It should take you about 4 minutes to get through it, and make sure you write/draw everything I've put down on the board):
Right Triangles



The sides x and y are called the *legs* of the right triangle, and the side h is called the *hypotenuse*. ONLY A RIGHT TRIANGLE HAS A HYPOTENUSE.
How are these lengths related?

Pythagorean Theorem.
$$x^2 + y^2 = h^2,$$
where x and y are the legs of a right triangle and h is the hypotenuse. This theorem is ONLY TRUE for RIGHT TRIANGLES.

7. Examples:

(a) A right triangle has legs of length 4 cm and 6 cm. What is the length of the hypotenuse?
Answer. Using the Pythagorean Theorem:
$$h^2 = x^2 + y^2 = 4^2 + 6^2 = 36 + 64 = 100.$$
Since $h^2 = 100$, we can take the square root of both sides to get $h = \sqrt{100} = \pm 10$. However, for now, we will consider lengths to be positive, so we have $h = 10$.

(b) A right triangle has a leg of length 1 in and a hypotenuse of length $\sqrt{5}$ in. What is the length of the second leg?
Answer. From the Pythagorean Theorem, again, we can see that

$$\begin{aligned} h^2 &= x^2 + y^2 \\ (\sqrt{5})^2 &= 1^2 + y^2 \\ 5 &= 1 + y^2 \\ 4 &= y^2 \\ \pm 2 &= y, \end{aligned}$$

so $y = 2$. Therefore, the second leg has length 2 in.

Homework
Read pages 1-3 in the book, and do the following problems:
Section 1.1: #2, 5W, 6, 9, 12, 18, 19, 25