Exam 2 covers the material from section 4.5 through section 8.1, inclusive. Circle inversion will not be included on the exam, but similar triangles will. You'll be given most of the regular class session to work on it (with no break in the middle, of course).

As far as the type of problem, you can expect a mixture similar to the first exam; go back and read through the solutions for that exam to see where the problems came from. You can expect a few which are very similar to homework problems and/or propositions or theorems which we devoted a lot of class time to. Somewhere on the exam you'll be asked to prove something you've never seen before – say, given some information about a triangle or quadrilateral, prove that two given points are equal, etc. *Don't freak out when you read this problem and think "I've never seen this!"* That's the point; I want to see if you can figure out a reasonable way to prove it.

As before, the exam is closed book, closed notes, closed calculator, etc. Don't trivialize a problem, meaning if I ask you to prove a result from class, you shouldn't just cite the theorem.

A few words of advice, by chapter:

Chapter 4: Officially the material covered by the exam starts with section 4.5, area, but you should still know what the medians, centroid, altitudes and orthocenter are. For area, I would consider Heron's Formula more important than Theorem 10. For sections 4.6 and 4.7, as with the first exam, I'm not interested in whether you can memorize long barycentric coordinate formulas for the circumcenter and incenter – but you should absolutely know what those points are, how to find them, and what properties they have. In 4.8 and 4.9, you should know what the Fermat minimizer of three given points is (e.g. Theorem 25), what the Fermat Point of a triangle is, and the connection between the two concepts. The extensive discussions involving calculus in 4.8 and the huge formulas (e.g. Proposition 28) are not vital. As for 4.10... Napoleon's Theorem is cool. I mean, how many geometry theorems do you know named after a short dictator who nearly took over all of western Europe and Russia?

Suggested review problems: any of the HW, plus 9, 18, 29, 48.

Chapter 5: With chapter 5, all of the trigonometry one might find in a precalculus (or high school geometry) class is now fair game. In terms of trig identities, standard ones (like Proposition 1 and Theorem 3) could arise. We saw in class that the Laws of Sines and Cosines can be very useful. You should also know something about when we can construct a triangle out of given information, such as Propositions 5 and 9 and the following discussion. In particular, including chapter 3, we have congruence theorems for SSS, SAS, ASA, but not SSA (except for right triangles) or AAA (which would imply similarity, but not necessarily congruence).

Suggested review problems: any of the HW, plus 14, 15, 18, 22

Chapter 6: Major results like Proposition 3 are important; results like Proposition 5 or 6 are useful, but rather than memorizing them you could aim to become familiar enough with the methods of this chapter so you could prove them if needed. One suggestion I can make after looking through your homework is that you shouldn't be afraid of "vector methods" – i.e. doing calculations involving the vertices of a quadrangle or the vectors between them. [See the homework solutions for examples of this, particularly the proof of Theorem 4 and Proposition 6, (iii) $\Rightarrow$ (i).] The long formula for finding the area of a parallelogram is less important than knowing how to break it down into two triangles and finding the area of those.

Since we went through three different proofs of Theorem 11 you can expect something with the interior angles of a polygon, whether regular or not. Theorem 14 is important, but is really just high-school level trigonometry once you draw the correct picture. 6.3 will be on the exam, but 6.4 won't.

Suggested review problems: any of the HW, plus 5, 6, 12, 20, 25, 30, 36, 48.

Chapter 7: You should be familiar with all of the isometries in the classification Theorem 21 and how to represent them with formulas. We spent a great deal of time in class developing the matrix form of a formula for a reflection, so you can expect to see it on the exam. I'd recommend using my approach (see the HW solutions) instead of the book's on p137 unless you're *really* comfortable with what you're doing. [There's nothing wrong with the book's approach per se, but you'll be on your own because we didn't cover reflections that way.] You should also have some awareness of what happens when you do one isometry followed by another – especially two reflections across mirrors which are parallel or intersect, since that was stressed in class and on the homework.

Suggested review problems: any of the HW, plus 3, 8, 15, 26, 27.

Chapter 8: Section 8.1 is the only part of this chapter which will be on the exam, allowing us to use ratios of sides of similar triangles to help solve other problems.

Suggested review problems: 1, 19.

Note that I've included a *lot* of possible review problems. The goal is not for you to do every single one of them. Pick and choose as appropriate; if you're very confident with chapter 5 you don't need to spend much time there. If you're not as sure of chapter 6 you might want to look at a few more of those review problems. As always, please feel free to email me with questions.