Section 9.3 More about angles

1. Terms you need to know and be able to apply.
   - Adjacent angles.
   - Supplementary angles.
   - Complementary angles.
   - Vertical angles.
   - Angles formed when two distinct lines are cut by another line (a transversal): interior, exterior, alternate interior, alternate exterior, corresponding.

2. Geometric Facts you need to know. Theorems you should be able to prove on an exam are marked by * (Numeration is not the same as in the book)
   - Theorem 1.(*) Vertical angles are congruent.
   - Theorem 2. Let two lines be cut by a transversal. If these two lines are parallel, then the corresponding angles are congruent, the alternate interior angles are congruent, and alternate exterior angles are congruent.
     Comment: This statement is equivalent to the fifth postulate. Read this postulate again, and think what happens if the angles above are not congruent.
   - Theorem 3. Let two lines be cut by a transversal. If the corresponding angles are congruent (or the alternate interior angles are congruent, or alternate exterior angles are congruent) then the lines are parallel.
     (Question: What kind of statement is this with respect to the previous theorem: inverse, converse, or contrapositive? If the previous theorem is true, does this mean that this theorem is also true or does this theorem still needs to be proven?)
   - Theorem 4.(*) The sum of the measures of the interior angles of any triangle is 180°.
     Questions:
     1. What is the measure of an angle in an equilateral triangle?
     2. How is the measure of an exterior angle of a triangle related to the measures of two interior opposite angles?
   - Theorem 5. The sum of the measures of the exterior angles of a convex polygon is 360°.
     Be able to justify this result for a specific polygon (say, hexagon) using "the walk around" approach.
   - Theorem 6.(*)
     a) The sum of the measures of the interior angles of any convex n-gon is 180°(n – 2).
     b) The measure of an interior angle of a regular n-gon is \( \frac{180°(n – 2)}{n} \).
     To prove a), use either Theorem 5 or division of the interior of the polygon into triangles (use diagonals or lines from some interior point).
     Question: What is the measure of an angle in i) a regular quadrilateral (other name?), (ii) a regular pentagon, (iii) a regular nonagon?
     Problem: The ratio of the angles of a pentagon is 1 : 2 : 2 : 3 : 4. What is the largest angle?
     Question: It would seem much easier just to use Theorem 6 to get that when n = 3 (a triangle), the sum of the measures of the interior angles is 180°. Why do we need to prove Theorem 4 first?
Exercises. This is not an easy material for you. Read the section and your lecture notes a couple of times before starting the homework. Pay attention to theorems and their proofs. All homework problems to this section are worth doing. Also, pay special attention to Communication, Open-ended, and Cooperative learning problems, they test your deeper understanding of the material and suggest a few interesting ideas.