Worksheet 7   Name:_____
A&S100
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1. On page 433 of your text, the author states:

   There are 21 different vertex types consisting of regular polygons ar-
   ranged about a vertex. However, only 11 of these give either regular or
   semiregular tilings.

   (a) Find all 21 vertex types.

   (b) Of these 21 vertex types, find two which do not give rise to either a regular or a semireg-
       ular tiling. You should be able to justify your answers with arguments similar to that
       given on page 433 to show that the vertex type shown in Figure 7.23 does not yield a
       semiregular tiling.

2. The following problems are exercises 39 and 40 on pages 459 of your text.

   (a) Suppose that a fullerene has p pentagonal faces, h hexagonal faces, and a carbon atom
       at each vertex. Each carbon atom is joined by three bonds to three other carbon atoms,
       and these bonds form the edges of a polyhedron.

       i. Explain why the fullerene has $\frac{1}{3}(5p + 6h)$ vertices.
       ii. Explain why the fullerene has $\frac{1}{2}(5p + 6h)$ edges.
       iii. Use the results of the previous parts and Euler's formula to show that any fullerene
            must have exactly 12 pentagonal faces.

   (b) Use the results of the previous exercise to find the number of hexagonal faces in the
       fullerene C_{540}.