Pentominoes and other 'Ominoes

Pentominoes are shapes made of five squares joined together edge to edge. There are twelve different shapes, not counting rotations and reflections.

1) In groups of two or three students, use graph paper and find all twelve pentominoes.

2) Work with the plastic pentominoes we have at school. Can you put the twelve shapes together to form a six by ten rectangle? There are 2,339 solutions to this puzzle, but finding just one can be hard! (By the way, how did people ever figure out how many solutions there are?!)

3) Here's another tiling problem. Can you place the twelve pentominoes on an 8 x 8 square? There will be four squares not used. Can you make a tiling so those four extra squares form a 2 x 2 square in the center?

4) Our school pentominoes are based on one-inch squares. Using our regular pentominoes, create a giant pentomino that is three times longer and three times wider than the ones we work with. How many of the regular pentominoes will you need to do that? (Each of the twelve shapes can be scaled up this way.)

5) Hexominoes are shapes made of six squares joined edge to edge. Can you find all 35 of them? As a bonus, can you show which of the hexominoes could be folded up to make a cube?

6) Looking for a big challenge? Can you find all the heptominoes? (That's all the 'ominoes made with seven squares.) How will you know when you find them all? Can you be sure you didn't count the same one twice?

7) A pentacube is a 3-D shape made of five cubes. How many are there? Can you make a neat drawing of at least one of them?

8) You can play a game using a set of twelve pentominoes and an 8 x 8 square. Take turns placing one of the pentominoes on the square grid. The first player who has no room to place one loses.

9) For an extra challenge, can you use the twelve pentominoes to make two 6 x 5 rectangles? (There's only one way to do that!) And by the way, how many ways can you divide twelve things into two groups of six?

10) Remember to write about what you did!

11) Have fun!