

University of Nevada, Las Vegas Computer Science 456/656 Spring 2016

Assignment 8: Due March 31, 2016

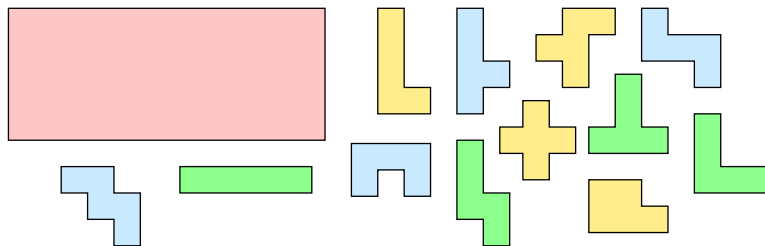
Name: _____

You are permitted to work in groups, get help from others, read books, and use the internet. But the handwriting on this document must be your own. You may attach extra sheets, using a stapler.

1. The *Partition Problem* is, given a finite set of weighted objects, can the objects be partitioned into two sets of equal weight?

Prove that the partition problem is \mathcal{NP} -complete. You may assume that the knapsack problem is \mathcal{NP} -complete.

2. The game *Pentominoes* can be bought in most toy stores. The goal is to fit the twelve small polygons shown, called “pentominoes,” into a rectangle.



More generally, suppose you are given n polygons of various shapes, as well as a rectangle. The problem is, can the polygons be fit together to exactly fill the rectangle? We will call that the *generalized pentomino* problem. Prove that the generalized pentomino problem is in the class \mathcal{NP} .

3. This problem is *strictly* for extra credit. Prove that the generalized pentomino problem is \mathcal{NP} -complete. You may assume that any problem is \mathcal{NP} -complete if I've told you so in class.