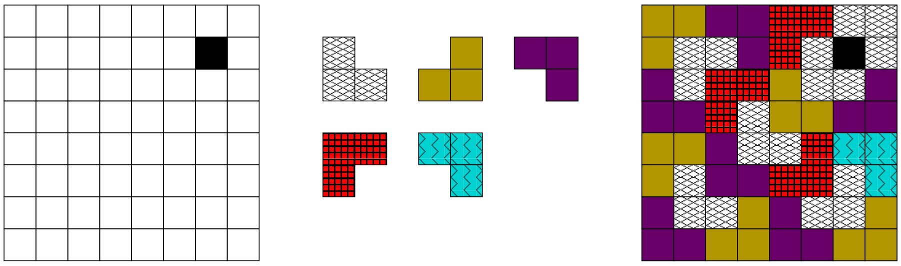
CS3233 Homework 3

Due on 12 August 2000 at 9:30am. 100 marks
Topics: Geometry and Divide and Conquer
Submit your answers to question 1 to the Spanish Judge. For questions 2 and 3, submit your answers to me.

1. **Geometry Programming Assignment**
   Pick two of the following questions from the Spanish Judge. The questions are $\{109, 132, 137, 190, 191, 340, 427, 438, 609\}$. [40]

2. **Tiling Using Triominoes**
   Given a 2^k by 2^k chessboard where $k \geq 1$ with a defective square, you are to tile the chessboard using triominoes. Note that the defective square can occur anywhere in chessboard. A 8×8 chessboard with a defective square is given in Figure 1(a). A triominoes is an "L"-shaped tile formed by three adjacent squares of a chessboard. See Figure 1(b) for examples of triominoes. Figure 1(c) shows a tiling of the chessboard with triominoes that covers every square of the board except the defective one.



(a) A defective chessboard (b) Triominoes (c) Tiling of defective chessboard using tri0minoes

Figure 1: An Example

   (a) Devise an algorithm that solves this problem. [15]
   (b) If no pair of triominoes that share an edge have the same color, how many colors of triominoes do you need. [15]

3. The *Maximum Subsequence Sum* problem is defined as follows. Given an array $A[1 \ldots n]$ of integers, find values of i and j with $1 \leq i \leq j \leq n$ such that
$$\sum_{k=i}^{j} A[k]$$
   is maximized. Devise a divide-and-conquer algorithm for solving the maximum subsequence problem in time $O(n \log n)$. [30]