This homework covers designing divide-and-conquer algorithms. It is due in class Wednesday, April 8.

See the Policies page on the course website for information about revise-and-resubmit, late work, and academic integrity as it applies to homework.

Write your solutions carefully — your work should be neat, readable, and organized. Keep in mind that what you hand in should be a presentation of your work, not your train-of-thought stratch work with a solution mixed in somewhere.

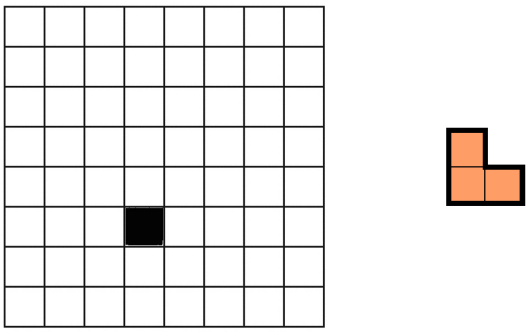
---

1. Do the homework #9 drill problems on Canvas. (Look for `hw9 drill` in the Quizzes section.) Use your answers in the algorithm development process for #2 below.

For the following problems, develop divide-and-conquer algorithms using the process discussed in class. Show your work — and your understanding of the steps in the process — by including each of the steps in your writeup. Don't just give an algorithm! See the posted writeups from class for examples. (Don't include the marked "commentary" parts.)

2. Given a collection of L-shaped tiles and an $n \times n$ board with one square blacked out, find an arrangement of tiles that covers all but the blacked-out square. (Each L-shaped tile covers three board squares.) Tiles may not overlap each other. You can assume n is a power of 2.

   An example of a board with one blacked-out square is shown below, along with an L-shaped tile.



3. In an array of numbers, an inversion is a pair of numbers which are out of order (according to increasing value). For example, an array containing `1 2 5 4 3` would have three inversions (5,4), (5,3), (4,3). Count the number of inversions in an array of length n.

4. A *watershed* is the area of land that drains into a particular water system — the Seneca Lake watershed, for example, is the area from which water drains into Seneca Lake. The picture below shows a 2D version of this concept — the landscape is shown in gray, the points where water falling on the landscape would collect are shown with black dots, and the watershed for each of the collection points is shown by the span of the black lines below the landscape. Given an array of n elevation values, report the collection points (as the array index of that point) and their watersheds (as a span of array indexes).