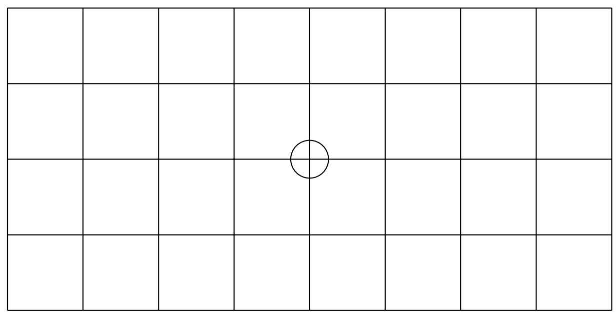
Directions: Show your work. You may work to solve these problems in groups, but all written work must be your own. See "Guidelines and advice" on the course webpage for more information.

1. How many was are there to arrange the letters of 'ECCENTRIC':
   (a) with no additional restrictions?
   (b) beginning *and* ending with a C?
   (c) beginning *or* ending with a C (or both)? (Note: CECENTRIC is allowed.)
   (d) with all three C's consecutive?

2. Lattice paths from $(0,0)$ to $(8,4)$.



   (a) How many lattice paths are there from $(0,0)$ to $(8,4)$ in which each step increases one of the coordinates by 1?
   (b) Suppose there is a deadly dragon that lives at the center $(4,2)$. How many lattice paths from $(0,0)$ to $(8,4)$ avoid the dragon?

3. How many ways are there to partition the integers $\{1,2,3,\ldots,2n\}$ into pairs? For example, when $n=2$, there are 3 ways: $\{12,34\},\{13,24\},\{14,23\}$. Note that the order of the pairs is not important (so $\{34,12\}$ is the same is $\{12,34\}$ and the order of within pairs is unimportant (so $\{21,34\}$ is the same as $\{12,34\}$).

   Hint: There are several ways to solve this. Here is one nice way. Count the number of permutations of $\{1,2\ldots,2n\}$ of length $2n$ in 2 different ways: one directly, and the other using the rule of product.

4. Let $f(n)$ be the number of ordered lists of positive integers that sum to n. For example:

n	$f(n)$	Lists with sum n
1	1	(1)
2	2	(1,1), (2)
3	4	(1,1,1), (2,1), (1,2), (3)

   It is pretty easy to guess a formula for $f(n)$. It is more difficult to give an argument that shows your formula for $f(n)$ is correct. Try to give one by using a graphical representation of the integer n as a line of n dots.