Name: _____

Directions: Show all work. No credit for answers without work.

1. How many ways are there to arrange the letters of 'SLEEPLESS':

    (a) [**2 points**] with no additional restrictions?

    (b) [**1 point**] beginning with an L?

    (c) [**1 point**] beginning with an L and ending with some letter besides L?

    (d) [**1 point**] if all three E's are to the left of all three S's?

2. Lattice paths from $(0,0)$ to $(9,5)$. Recall that each step of a lattice path increases one of the coordinates by 1; geometrically, we either move one unit in the horizontal direction or 1 unit in the vertical direction.

$(9,5)$

$\star$

$(0,0)$
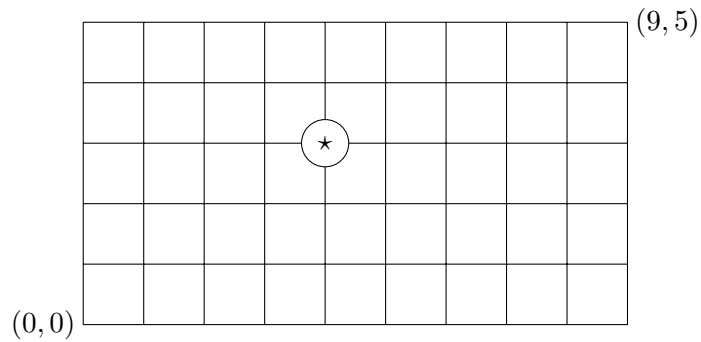
(a) [**2 points**] How many lattice paths are there from $(0,0)$ to $(9,5)$?

(b) [**2 points**] Suppose there is a prize (denoted by $\star$) at $(4,3)$. How many lattice paths visit $(4,3)$ and win the prize?

(c) [**1 point**] How many lattice paths miss the prize at $(4,3)$?