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- Assignment Instruction
    - Team work is NOT allowed.
    - Submit your answers in PDF version to the Blackboard.
    - No late submission accepted.
    - All solutions should be explained.
    - **!! Any unrecognized handwriting will cause ambiguity and result in a zero to your solutions!!**

1. (5 pts)
   Show that if a Decrement operation is included in the k-bit binary counter, a sequence of n operations (could be either Increment or Decrement) could cost $\Theta(nk)$. (using aggregate method)

2. (5pts)
   Suppose we perform a sequence of n operations on a data structure in which the ith operation costs i if i is an exact power of 2, and 1 otherwise. Use an accounting method of analysis.

3. (5pts)
   Below is the method to implement a queue with two stacks: s1 and s2.
   Enqueue: push an element on to s1.
   Dequeue: pop an element from s2. If s2 is empty, each element in s1 will be popped off and pushed on to s2. Then pop the top item from s2.

   Show that the amortized cost of this implementation is O(1).

4. (5pts)
   A maze is sized n×m. See the example below. At each cross (i,j), you can move forward, backward, up or down, as long as you do not move out of the maze. There is a symbol at each cross: "." shows the cross is reachable; "✱" shows the cross can not be reached.

Starting from a cross (a,b), design an algorithm to reach the destination (c, d) with minimal moves and return the number of moves. If (c,d) is not reachable from (a,b), return -1. (pseudo code is required)

Example:

Output: 5