

## Math 55 Discussion problems 6 Apr

- Find a recurrence relation for the number of bit strings of length  $n$  that contain three consecutive 0s.
  - What are the initial conditions?
  - How many bit strings of length seven contain three consecutive 0s?
- Find a recurrence relation for the number of ways to completely cover a  $2 \times n$  checkerboard with  $1 \times 2$  dominoes. [Hint: Consider separately the coverings where the position in the top right corner of the checkerboard is covered by a domino positioned horizontally and where it is covered by a domino positioned vertically.]
  - What are the initial conditions for the recurrence relation in part (a)?
  - How many ways are there to completely cover a  $2 \times 17$  checkerboard with  $1 \times 2$  dominoes?
- How many permutations of the 26 letters of the English alphabet do not contain any of the strings *fish*, *rat* or *bird*?
- Find the number of solutions of the equation  $x_1 + x_2 + x_3 + x_4 = 17$ , where  $x_i, i = 1, 2, 3, 4$ , are nonnegative integers such that  $x_1 \leq 3$ ,  $x_2 \leq 4$ ,  $x_3 \leq 5$ , and  $x_4 \leq 8$ .
- An integer is called squarefree if it is not divisible by the square of a positive integer greater than 1. Find the number of squarefree positive integers less than 100.
- How many onto functions are there from a set with seven elements to one with five elements?
- A small post office has only 4-cent stamps, 6-cent stamps, and 10-cent stamps. Find a recurrence relation for the number of ways to form postage of  $n$  cents with these stamps if the order that the stamps are used matters. What are the initial conditions for this recurrence relation?