

## HOMEWORK 2 (MATH 180, SPRING 2014)

**Read:** MN, sections 3.4-7 (second ed.)

**Solve:** Exc. 5 (§3.5), 1a (§3.6), 4, 6 (§3.7)

**I.** Let  $A = (0, 0)$  and  $B = (9, 12)$ . Compute the number of (shortest) grid walks  $\gamma : A \rightarrow B$ , such that

- a)  $\gamma$  goes through  $(9, 0)$
- b)  $\gamma$  goes through  $C = (4, 7)$
- c)  $\gamma$  goes through  $C$  or  $D = (2, 8)$
- d)  $\gamma$  goes through  $C$  or  $E = (6, 9)$
- e)  $\gamma$  goes through  $C$  and  $D$
- f)  $\gamma$  goes through  $C$  and  $E$
- g)  $\gamma$  goes through  $C$  or  $D$ , or  $E$
- h)  $\gamma$  goes through  $C$  or  $D$ , but not through  $E$
- i)  $\gamma$  goes through  $E$ , but not through  $D$  or  $C$
- j)  $\gamma$  goes through neither  $C$ ,  $D$ , or  $E$
- k)  $\gamma$  goes through a  $2 \times 2$  square around  $C$
- l)  $\gamma$  does not go through a  $2 \times 2$  square around  $E$

**II.** Let  $n = 88$ . Compute the probability that a random 8-subset of  $[n]$  has no elements divisible by 7, 11 and 13.

**III.** Use the formula for binomial coefficients to show that

$$\binom{88}{0} < \binom{88}{1} < \binom{88}{2} < \dots < \binom{88}{44}$$

**IV.** Compute the number of zeroes at the end of  $388!$

**V.** Use Stirlings formula to arrange the following numbers in increasing order:

$$100! \quad 50!^3 \quad 30!^5 \quad 10^{150} \quad \sqrt{150!} \quad \binom{400}{200}$$

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This Homework is due Wednesday April 16, at 12:59:59 pm. (right before class). Please read the collaboration policy on the course web page. Make sure you write your name in the beginning and your collaborators' names at the end. You MUST box all answers. Remember that answers are not enough, you also need to provide an explanation exhibiting your logic.

P.S. Problem I is worth 24 points, others 10 points. Consider checking your answer to Problem V on [wolframalpha.com](http://wolframalpha.com) (Note that you must provide logical reasoning to all problems).