

# HOMEWORK 1

**Section 1.5:** 3, 9, 13, 17, 23, 36, 42, 47, 51, 56, 70<sup>1</sup>

Lastly, skim the paper “More birthday surprises” on the website then answer at least 2/5 of these questions. You do not need to understand the whole paper! To get full credit on this part you only need to get 2 out of the 5 questions. The first two are the toughest. No extra credit for answering all of them, and no need to attempt all of them if you don’t feel like it.

Note that instead of  $C_{n,k}$  they write  $\binom{n}{k}$ . This is because mathematicians often use ‘ $C$ ’ to denote something else, and things like

$$\binom{r + y_1 - (p-1)(k-1) - y_1}{p-1}$$

are easier to look at than  $C_{r+y_1-(p-1)(k-1)-y_1, p-1}$ .

- (i) Explain why the formula at (7) holds given the assumption  $y_1 \geq n - r$ .
- (ii) Explain why (8) holds given the assumption  $y_1 < n - r$ .
- (iii) Why do they set  $r = n - k$  in (10)? Recall that  $r$  is first introduced in (2).
- (iv) What is the minimum number of people required so that

$$P(\text{some pair have birthdays within 4 days}) \geq .75$$

- (v) Show the steps for why (7) + (8) = (9).

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<sup>1</sup>give answers in terms of  $C_{n,k}$