

*Introduction to Probability, Second Edition*

Fifthist

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# Preface

This book is an unofficial solution manual for the exercises in *Introduction to Probability, Second Edition* by Joseph Blitzstein and Jessica Hwang.



# Chapter 1

## Probability and Counting

### 1.1 Counting

#### 1.1.1

##### **Intuition**

There are 11 slots to put letters into. We have one  $M$ , four  $I$ , four  $S$ , and two  $P$ . Then, there are  $\binom{11}{1}$  ways to place the  $M$ ,  $\binom{10}{4}$  ways to place  $I$ ,  $\binom{6}{4}$  ways to place the  $S$ , and  $\binom{2}{2}$  ways to place the  $P$ .

##### **Solution**

$$\binom{11}{1} \times \binom{10}{4} \times \binom{6}{4} \times \binom{2}{2}$$

#### 1.1.2

##### (a) **Intuition**

If the first digit can't be 0 or 1, we are left with 8 choices for the first digit. The remaining six digits can be any digits.

##### (a) **Solution**

$$8 \times 10^6$$

##### (b) **Intuition**

We can subtract the number of seven digits phone numbers that start with 911 from the total number of phone numbers we found in the previous part.

If a phone number starts with 911, it has ten choices for each of the remaining four digits.

(b) **Solution**

$$8 \times 10^6 - 10^4$$

### 1.1.3

(a) **Intuition**

Fred has 10 choices for Monday, 9 choices for Tuesday, 8 choices for Wednesday, 7 choices for Thursday and 6 choices for Friday.

(a) **Solution**

$$10 \times 9 \times 8 \times 7 \times 6$$

(b) **Intuition**

For the first restaurant, Fred has 10 choices. For all subsequent days, Fred has 9 choices, since he doesn't want to eat at the restaurant he ate at the previous day.

(b) **Solution**

$$10 \times 9^4$$

### 1.1.4

(a) **Intuition**

There are  $\binom{n}{2}$  matches in a round-robin setting. For a given match, there are two outcomes. Irrespective of the outcome, the next match also has two possible outcomes. Hence, we can use the multiplication rule to count the total possible outcomes.

(a) **Solution**

$$2^{\binom{n}{2}}$$

(b) **Intuition**

Since every player plays every other player exactly once, the number of games is the number of ways to pair up  $n$  people.



(b) **Solution**

$$\binom{n}{2}$$