

Math 186, Winter 2020, Prof. Tesler
Homework #1, Due Wednesday January 15, 2020

Larsen & Marx **Sixth Edition**:

2.2# 2, 4*, 26, 31, 32

2.3# 1, 5, 10

2.4# 1, 9, 22, 29, 34, 45

2.5# 1, 19

and the problems below: H-101 and H-102.

***Hints:**

- Some problems describe a scenario in words, and you must convert it to event notation. You should not start out by saying “ $P(A) = \dots$, $P(B) = \dots$ ” or “ $N(S) = \dots$ ”; you first need to define what each event $A, B, S, \dots$ means in that problem.
- 2.2.4: What matters is the set of cards you receive, rather than the order in which you receive the specific cards. So count the set $\{3\clubsuit, 5\spadesuit\}$ just once, rather than counting the two possible orders $(3\clubsuit, 5\spadesuit)$ and $(5\spadesuit, 3\clubsuit)$ separately.

Problem H-101. DNA sequences can be specified as strings in the alphabet of nucleotides, A, C, G, T; for example, AACGTC is a DNA sequence of length 6. (DNA is double-stranded; note that we are only specifying the sequence on one strand.)

- (a) How many DNA sequences have length 13?
- (b) How many DNA sequences of length 13 contain at least one C? (This restriction only refers to the one strand, not to the complementary strand.)
- (c) How many DNA sequences of length 13 contain at least one C but no G's? (This restriction only refers to the one strand, not to the complementary strand.)

Problem H-102. A gene is sequenced in a study sample comprised of three groups Q, R, S . The sample is 30% Q , 50% R , and 20% S .

The gene has two alleles, denoted V and W . Each individual has two copies of the gene, giving genotypes VV , VW , and WW . Within each group, the proportions of the genotypes are as follows:

Group	Genotype		
	VV	VW	WW
Q	10%	35%	55%
R	15%	40%	45%
S	25%	45%	30%

- (a) A random individual is selected from the sample. What is the probability their genotype is VW ?
- (b) If a randomly selected individual has genotype VW , what is the probability they are in group S ?