

APPM 3570/STAT 3100 Spring 2019 Homework 5 - NOT COLLECTED

- Chapter 4, Problems 8ad, 13, 15, 21,
- **Geometric distribution.** The Seawolves are a college basketball team with a probability p of winning each game they play. Treat each game as an independent event.
 - (a) What is the probability $P(k)$ that they will win their next k games in a row? Find a general formula for $P(k)$ for arbitrary $k = 0, 1, 2, 3, 4, \dots$
 - (b) Compute the probability that the Seawolves win at least w games in a row, $P(k \leq w) = \sum_{k=0}^w P(k)$.
 - (c) Show that the probability mass function $P(k)$ sums to 1, that is $\sum_{k=1}^{\infty} P(k) = 1$. Hint: You can do so by taking the limit as $w \rightarrow \infty$ of your result from (b).
 - (d) On a random season, the Seawolves either have a winning probability $p = 1/4$ or $p = 3/4$ with equal likelihood. That is, $1/2$ the seasons $p = 1/4$ and the other $1/2$, $p = 3/4$. Say you know they just won 5 games in a row. Use Bayes' Rule to compute the probability their winning probability is $p = 1/4$ or $p = 3/4$.
- **Proofreading errors.** A professional proofreader has a 98% chance of detecting a given error in a written work.
 - (a) If a work contains 4 errors, what is the probability they will catch all of them?
 - (b) If a work contains k errors, what is the probability they will catch all of them?
 - (c) If the proofreader has caught 5 errors, what is the probability these are the only errors in the work they are proofreading? You may assume that the prior probability assumed of there being $k = 1, 2, 3, \dots, 10$ errors is $p(k) = 1/10$. Then use Bayes' Rule.