PCBCH **Mr. Worrall**

Homework Sheet #3–Probability

March 28, 2022

Topic	**Assignment**
1) 16.1: Introduction	**1**) Read: 16.1 Ex. pp. 603-605/ 1, 5-13 odds, 17, 19, 23-29 odds
2) 16.2: Multiple Events/ Conditional Probability/ Independence	**2)** Read: 16.2 Ex. pp. 609-612/ 1-11 (odd), 21, 25, 27 Also: 1) Assuming their birthdays are random, what is the probability that, among 7 people, at least 2 of them have the same birthday? 2) What is the minimum number of people needed in order to have better than a 50% probability that at least two of them have the same birthday?
3) 16.3: Binomial/Multinomial Probability [and some calculator shortcuts]	**3)** Read: 16.3 Ex. pp. 616-617/ 1-15(odd), 16, 17 Also: **1.** Suppose that for the next 100 years there will always be a 30% chance that the groundhog sees his shadow on Groundhog Day. What is the probability that in those 100 years he will see his shadow somewhere between 20 and 40 (inclusive) of those days? (Assume there are exactly 100 Groundhog Days in that time.) **2.** Now suppose on those 100 Groundhog Days that there is always a 30% chance it will be sunny, a 10% chance of snow, and a 60% chance of overcast skies. **A.** What is the probability that there will be 30 sunny days, 10 snowy ones, and 60 overcast ones (out of those 100 days)? **B.** Find the probability that in the next 100 Groundhog Days there will be somewhere between (and including) 50 and 66 overcast days.
4) 16.4: Using Combinations w/ Probability	**4)** Read: 16.4 Ex. pp. 621-623/ 1, 3, 5, 15, 17-21(all)
5) Bayes' Theorem and Disease Testing	**5)** Read: 16.5 Ex pp 626-627/ 5, 11, 12; and a handout
6) Geometric Probability	**6)** Handout
7) 16.6: Expected Value	**7)** Read 16.6 Ex. pp. 633-635/ 1-13(odd), 17, 21, 23, 24 Also: Suppose you conduct the following experiment: Every time you encounter a person, you record their birthday. Keep doing this until you encounter a birthday you have already recorded. What is the expected value of this experiment? [Assume there are 365 days in a year and that each day of the year is equally likely as a birthday.]

Bonus 1: In a standard poker game (no wild cards), suppose you are dealt five cards and your hand contains exactly one pair. You trade in the three "worthless" cards for new ones. What is the probability that your hand "improves?" For those of you that are poker experts, I am not considering the case in which the high card of the three non-pair card improves – I am talking about a substantive transformation from one "kind" of hand into another.

Bonus 2: Consider the following experiment: you generate a random number between 0 and 1 and record its value. You do this a second time and compute the sum of the two numbers. You continue in this fashion (generate random number from 0 to 1 and add it to current cumulative total) until this sum exceeds 1. What is the expected value of the number of random numbers needed to accomplish this?