STAT 425 – HW9

Assigned on Mon Oct 10, due on Wed Oct 12

Section 2.2 Independent Events

1. Reconsider the “unfinished game” example: Heather and Tom play a game that involves a series of coin flips. They agree that if 5 heads occur before 5 tails do, then Heather wins the game. But if 5 tails occur before 5 heads do, then Tom wins the game. They each agree to pay $5 to play the game, so the winner will make a profit of $5. The first five coin tosses result in: H₁, T₂, T₃, H₄, H₅. Unfortunately, the game is interrupted at that point and can never be finished.

Recall that we listed the sample space of all possible outcomes (if the game were to be finished from this point) in class on day 1. Assume that coin tosses are independent of each other.

a) Determine the probability that Heather would win the game if it were continued from this point. Use good notation, and justify all steps in your calculation.

b) Determine the probability that more than 2 more tosses would be needed to complete the game. Again use good notation, and justify all steps in your calculation.

2. Suppose that you conduct a series of tests, each of which has a .05 probability of making a particular kind of error.

a) If you conduct 10 independent tests, what is the probability that you make at least one error? Use good notation, and justify all steps in your calculation.

b) Repeat a) for conducting 100 independent tests.

c) Determine how many tests you can perform and still have less than a 50% chance of making at least one error.

d) Now let the probability of making this error be p on any one test. Determine how small p needs to be in order for the probability of making at least one error in 10 independent tests to be no greater than .10.

3. Suppose that airplane engines work independently of each other and that an airplane can fly successfully as long as half or more of its engines are operating successfully. Let p represent the probability that an engine operates successfully. Determine the values of p (if any) for which a 2-engine plane is preferable to a 4-engine plane.

Not to hand in: Consider working on exercises 1-20 at the end of section 2.2 in the text.