

Exam 2: Take-Home

Name: _____

Math 262: Probability Theory

Due Monday, November 11, at the beginning of class

Take-Home Instructions:

1. *For this part of the exam, you may use your textbook, your notes, the course web site, and computing technology (such as R, Mathematica, Wolfram Alpha, or a calculator). Do not consult other books or web sites. If you use technology to compute something, indicate what you computed.*
2. *Do not talk with anyone other than the professor about these exam problems.*
3. *Read the questions carefully. Check your work.*
4. *Write your solutions neatly on other paper. Remember the honor pledge on this page, and hand in this page with your solutions.*

1. (12 points) In the game *Settlers of Catan*, each turn involves rolling two standard fair dice and observing their sum. If the sum is 7, then the robber is moved.

(Please ignore other aspects of the game, such as development cards or knights, that can move the robber. Assume that the robber moves once per turn, if and only if a 7 is rolled.)

- (a) What is the probability that the robber will move at least 4 times in the first 20 turns of the game?
 - (b) What is the probability that the first move of the robber will occur between the 4th and the 8th turn of the game?
 - (c) Let X be the number of turns required to move the robber 7 times. What is $P(X > 35 | X > 25)$?
 - (d) What is the probability that X is within one standard deviation of its mean?
2. (10 points) The pdf of a random variable X is $f(x) = kxe^{-x^2/4}$, for $x \geq 0$ and some constant k .
 - (a) What is the value of k ?
 - (b) What are the mean and variance of X ?
 - (c) Find an interval $[a, a + 1]$ such that $P(a \leq X \leq a + 1) \geq 0.4$.

St. Olaf Honor Pledge: I pledge my honor that on this examination I have neither given nor received assistance not explicitly approved by the professor and that I have seen no dishonest work.

Signed: _____

I have intentionally not signed the pledge. (Check the box if appropriate.)