Problem Set 4 for Math 17

Date Due: February 25, 2011

January 21, 2011

Problems:
Chapter 17 - 28, 32, 43 (use a probability argument)
Chapter 18 - 2, 18, 30, 32, 47, 50

Additional Problems -
1. A hotel is investigating the reduction in water usage after a revamped water conservation program asks patrons to consider reusing towels during their stays. Assume that the amount of water saved when one room reuses their towels is uniformly distributed between 15 and 35 gallons. The manager of the hotel is interested in some related probabilities and asks for your assistance.
a. What is the probability that the water savings from one room reusing their towels will be under 20 gallons?
b. What is the probability that the water savings from one room reusing their towels will be over 30 gallons if it is known to be over 27 gallons?
c. What is the probability that 2 randomly selected water savings from towel reuse will both be over 30 gallons?

2. A closed "biodome" for environmental research has a computer AI named HAL which oversees all the biodome settings. HAL has decided that the amount of rain which falls each day in the biodome should follow the probability distribution below, where X is the amount of daily rain in the biodome in inches. Note that for HAL, each day is independent of all other days, so a month is a random sample of 30 days.

x	0	.25	.5	1
P(X=x)	.2	.25	.3	?

a. Is X discrete or continuous?
b. What is P(X=1)?
c. Find the expected value and variance for X.
d. A biodome researcher asks HAL to create a new random variable, Y, which is the number of days in a week that it rains heavily, meaning .5 inches or more. What distribution does Y have? Be specific with parameter values.
e. What is the probability it rains heavily on only 2 or fewer days in a week?
f. Another researcher wants to consider a 3 month period (90 days), and wants to know the approximate probability that it rains heavily less than half of those days (45 days). Find this probability for the researcher, and be sure to check any conditions necessary for your approximation. Remember that for HAL, daily rainfall amounts are independent of each other.