Statistics 111 – Summer 2009
Homework 3
Due: Monday, June 15

Questions from the book:

1. Question 4.116 (Academic degrees and gender) pg 305
2. Question 4.130 (Toss a pair of dice two times) pg 307
3. Question 4.132 (Some probability distributions) pg 307
4. Question 1.126 (Compare an SAT score with an ACT score) pg 74
5. Question 1.139 (Length of pregnancies) pg 75
6. Question 5.54 (Flaws in carpets) pg 349
7. Question 5.56 (Risks and insurance) pg 349
8. Question 5.48 (ACT scores of high school seniors) pg 347
9. Question 5.70 (Genetics of peas) pg 351

More Questions (required):

10. Jules, Vincent, and Mia are physicians at the local hospital. One of their duties is being on call during non-working hours to handle any emergencies that might come up. Each carries a pager that can be activated by hospital personnel. Suppose Jules responds to his pager 60% of the time, Vincent responds to his pager 45% of the time, and Mia responds to her pager 65% of the time. If each person responds independently, what is the probability that at least one of them could be contacted in the event of an emergency?

11. A die is loaded in such a way that the probability of any particular face's showing is directly proportional to the number on that face. What is the probability that an even number appears when the die is tossed?

12. Laboratory data show that the time required to complete two chemical reactions in a production process varies. The first reaction has a mean time of 35 minutes and a standard deviation of 1.5 minutes; the second has a mean time of 20 minutes and a standard deviation of 1.2 minute. The two reactions are run in sequence during production. There is a fixed period of 4.5 minutes between them as the product of the first reaction is pumped into the vessel where the second reaction will take place.

    a) What is the mean time required for the entire process?

    b) Assuming the two reactions are independent, what is the standard deviation of the time required for the entire process? (Be careful. This is a hard question.)

13. Scores on a typical IQ test follow approximately a normal distribution with mean of 100 and SD of 17.

        a) What percent of the people taking the test score below 100? What percent of the people taking the test score between 90 and 110?
        b) Ginger takes the test and scores in the top 15% of all people taking the test. What was her minimum test score?

14. Say we have a random variables X, where X has a normal distribution with a mean of 0 and a standard deviation of 10. Of the two probabilities $P(-1 < X < 1)$ and $P(1 < X < 3)$, which is larger? Explain briefly (no calculation is necessary). Drawing a picture may be easiest.

15. Say we have two random variables X and Y, both of which have a normal distribution with a mean of 0. However, X has a SD of 10 while Y has a SD of 5. Of the two probabilities $P(-1 < X < 1)$ and $P(-1 < Y < 1)$, which is larger? Explain briefly (no calculation is necessary).

16. Is it more likely to observe eight or more heads in ten flips of a fair coin or to observe 16 heads or more in twenty flips?

17. In 1973, Charles Tart ran an experiment at UC Davis to test for ESP abilities. Tart used an electronic random number generator called the Aquarius with four "targets". The machine randomly picked one of the four targets, and the subject guessed which target the machine had picked. Tart selected 15 subjects who had "previously shown clairvoyant abilities". Each of the subjects made 500 guesses, for a total of 7500 guesses; of these, 2006 were correct — a proportion of .2675 correct guesses. Even if the subjects had no real ESP ability, we would expect them to be right in 1 out of 4 guesses.

        a. If the subjects have no real ESP ability, what is the probability that, just by random chance, they would guess at least .2675 of the answers correctly?
        b. Do you think the subjects had ESP? Why or why not?