Math 151, Spring 2011
Jo Hardin, HW #5

Homework due on THURSDAY, FEBRUARY, 17TH, START OF CLASS.

1. DeGroot (3^{rd} or 4^{th} ed.), section 3.1: # 2, 3, 5, 11

2. DeGroot (3^{rd} or 4^{th} ed.), section 3.2: # 4, 5, 6, 9, 12

3. Additional problem in R: Consider the following (built in) functions in R. Our goal is to understand these four different probability functions.

```
> pbinom(q, size, prob)     # cumulative dist func: gives P(X≤q)
> dbinom(x, size, prob)     # prob func: gives P(X=x)
> qbinom(p, size, prob)     # gives the cutoff for a given probability, p
> rbinom(n, size, prob)     # gives n random Binom(size,prob) observations
> ?pbinom                   # for the help manual on these functions
```

where size = number of trials, and prob = p.

Kissing the Right Way (from Chance and Rossman, Investigating Statistical Concepts, Applications, and Methods) Most people are right-handed and even the right eye is dominant for most people. Molecular biologists have suggested that late-stage human embryos tend to turn their heads to the right. German biophychologist Onur Güntürkün (2003) conjectured that this tendency to turn to the right manifests itself in other ways as well, so he studied kissing couples to see if both people tended to lean to their right more often than to their left. He and his researchers observed couples from age 13 to 70 in public places such as airports, train stations, beaches, and parks in the United States, Germany, and Turkey. They were careful not to include couples who were holding objects such as luggage that might have affected which direction they turned. In total, 124 kissing pairs were observed, and 80 couples turned to the right.

Dr. Güntürkün noted that about 2/3 of people have a dominant right foot or eye and conjectured that people would exhibit a similar tendency of "right-sidedness" when kissing.

(a) Explain why this example is or isn't well described by a Binomial distribution. (Hint: consider the 4 criteria discussed in class.)

(b) If in fact, kissing and dominant right foot/eye happen at the same rates, find the probability that 80 of 124 couples would turn their head to the right.

(c) If in fact, kissing and dominant right foot/eye happen at the same rates, find the probability that at least 80 of the 124 couples turn their head to the right [hint: be careful with the equality in the complement].

(d) If in fact, kissing and dominant right foot/eye happen at the same rates, find the median value for a study such as the one conducted above.

(e) If in fact, kissing and dominant right foot/eye happen at the same rates, find the 90% value for a study such as the one conducted above [that is, for studies as the one above, find the value that 90% of such studies are below, 10% are above.]

(f) If in fact, kissing and dominant right foot/eye happen at the same rates, find the 5% value for a study such as the one conducted above [that is, for studies as the one above, find the value that 95% of such studies are above, 5% are below.]

(g) Generate 10 values that could have come from 10 different studies (such as the one above), where kissing and dominant right foot/eye happen at the same rate.

(h) Explain the function: `pbinom` in words (feel free to use the example).

(i) Explain the function: `dbinom` in words (feel free to use the example).

(j) Explain the function: `qbinom` in words (feel free to use the example).

(k) Explain the function: `rbinom` in words (feel free to use the example).