

PROBLEMS FOR STAT 261, DUE MARCH 16, 2007

1) It is hypothesized that when homing pigeons are disoriented in a certain manner, they will fly off in a completely random direction. To test this, 116 pigeons are disoriented, let loose, and the direction of flight of each is recorded. The following are the resulting data:

Direction	# Pigeons	Direction	# Pigeons
0–45°	12	180–225°	13
45–90°	12	225–270°	20
90–135°	17	270–315°	17
135–180°	15	315–360°	10

Formulate explicitly the null hypothesis. Are the data consistent with the null hypothesis? Perform a hypothesis test at the 0.05 significance level.

2) Data were collected on a group of women, of the number of months required to conceive a fetus. The data were as follows:

# Months	# Women
1	380
2	153
3	94
4	45
5–6	93
7–9	51
10–12	46
13–24	68
25–48	20
49+	8

a) Test whether these data could reasonably be supposed to have come from a geometric distribution; that is, there is some p such that each woman who has not yet conceived has probability p of conceiving in the next month. Test at the 0.05 significance level.

b) The study that these data came from actually tried to fit the data to a compound geometric distribution: Each woman has a probability p of conceiving in any given month, but each woman has her own p . The p 's are independent, and chosen from the beta distribution with parameters a and b . The maximum likelihood estimator for a and b was found to be 1.29 and 2.17 respectively. Is the compound geometric distribution compatible with the data? Test at the 0.05 significance level. (Note: Computing the expected values in the different categories is more challenging here.)