Chi Square Practice Problems

1. A newly identified fruit fly mutant, cyclops eye (large and single in the middle of the head), is hypothesized to be autosomal dominant. The experimenter started with homozygous wild type females (yes, virgins) and homozygous cyclops males. The data from the F2 generation was 44 wild type males, 60 wild type females, 110 cyclops males and 150 cyclops females. Does this data support or reject the hypothesis? Use chi square to prove your position. Once you have your answer check my answer below.

2. Bow-legs is hypothesized to be X-linked recessive in Drosophila melanogaster. The P1 virgin females were, once again, homozygous wild type but the males were bow-legged. There were 52 wild type males and 67 wild type females in the F1 generation. The F2 generation contained 30 wild type males, 75 wild type females, 40 bow-legged males and no bow-legged females. Does this data support or reject the hypothesis? Use chi square to prove your position.

3. A poker-dealing machine is supposed to deal cards at random, as if from an infinite deck. In a test, you counted 1600 cards, and observed the following: spades were dealt 404 times, hearts were dealt 420 times, diamonds were dealt 400 times, and clubs were dealt 376 times. Is the machine equally likely to deal a card of any of the four suits? Are these discrepancies too much to be considered the result of random chance?

4. You are testing the same machine in #1 but this time jokers are included in the infinite deck. You counted 1662 cards, with these results: spades were dealt 404 times, hearts were dealt 420, diamonds were dealt 400 times, clubs were dealt 356 times and jokers were dealt 82 times. How many jokers would you expect out of 1662 random cards? How many of each suit? Is it possible that the cards are distributed by the machine randomly? Or are the discrepancies too large?

5. At a state university, the student population is approximately one-third male and two-thirds female. Over a two-day period the gender of each student entering the student union is recorded, with the following results: males, 452; females, 1548. Determine whether males and females are as likely to enter the union as would be predicted on the basis of their percentage in the student population.

6. A chimpanzee was trained to make same-different judgments about pairs of stimuli. For pictures of objects, the animal was correct on 23 out of 24 trials. Did the chimp perform significantly better than chance?

7. A genetics engineer was attempting to cross a tiger and a cheetah (It's a Chester Cheeger!). She predicted a phenotypic outcome of the traits she was observing to be in the following ratio: 4 stripes only: 3 spots only: 9 both stripes and spots. When the cross was performed and she counted the individuals she found 50 with stripes only, 41 with spots only and 85 with both. According to the Chi-square test, did she get the expected outcome?

8. In 1901, Bateson reported the first post-Mendelian study of a cross involving two characters. White leghorn chickens, having white feathers and large "single" combs, were crossed to Indian Game Fowl, having dark feathers and small "pea" combs. The F1 were white with pea combs, and the F2 distribution was: 111 white pea, 37 white single, 34 dark pea, and 8 dark single. What phenotypic ratio would you expect? Test your prediction using chi-square.

9. A professor wants to determine whether her department should keep the requirement of college algebra as a prerequisite for an Introductory Statistics course. Accordingly, she allows some students to register for the course on a pass-fail basis regardless of whether or not they have had the prerequisite. Of the 70 students in the class, 40 have had algebra and 30 have not. At the end of the semester, the professor compares the number of students passing or failing the class with whether or not they had algebra. 34 students who had algebra before passed the class while 12 students who didn't have algebra passed the class. Are students more likely to pass the course if they have taken college algebra?