Homework 3

For each problem, write down the hypothesis and also write your conclusion. You should also attach the codes. The level of significance is 0.05.

1. The eastern chipmunk trills when pursued by a predator, possibly to warn other chipmunks. Burke da Silva et al. (2002) released chipmunks either 10 or 100 meters from their home burrow, then chased them (to simulate predator pursuit). Out of 24 female chipmunks released 10m from their burrow, 16 trilled and 8 did not trill. When released 100 m from their burrow, only 3 female chipmunks trilled, while 18 did not trill. The two nominal variables are thus distance from the home burrow (because there are only two values, distance is a nominal variable in this experiment) and trill vs. no trill. Is it statistically significant that the proportion of chipmunks trilling is higher when they are closer to their burrow?
2. Custer and Galli (2002) flew a light plane to follow great blue herons (Ardea herodias) and great egrets (Casmerodius albus) from their resting site to their first feeding site at Peltier Lake, Minnesota, and recorded the type of substrate each bird landed on.

|  |  |  |
| --- | --- | --- |
|  | Heron | Egret |
| Vegetation | 15 | 8 |
| Shoreline | 20 | 5 |
| Water | 14 | 7 |
| Structures | 6 | 1 |

Is there no evidence that the two species of birds use the substrates in different proportions?

1. McDonald and Kreitman (1991) sequenced the alcohol dehydrogenase gene in several individuals of three species of Drosophila. Varying sites were classified as synonymous (the nucleotide variation does not change an amino acid) or amino acid replacements, and they were also classified as polymorphic (varying within a species) or fixed differences between species. The two nominal variables are thus synonymicity ("synonymous" or "replacement") and fixity ("polymorphic" or "fixed"). In the absence of natural selection, the ratio of synonymous to replacement sites should be the same for polymorphisms and fixed differences. There were 43 synonymous polymorphisms, 2 replacement polymorphisms, 17 synonymous fixed differences, and 7 replacement fixed differences.

Is there a significant difference in synonymous/replacement ratio between polymorphisms and fixed differences?

1. In a certain town, there are about one million eligible voters. A simple random sample of 10000 eligible voters was chosen to study the relationship between sex and participation in the last election. The results are summarized in the following 2X2 (read two by two) contingency table:

Men Women

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Voted 2792 3591

Didn't vote 1486 2131

We want to check whether being a man or a woman (columns) is independent of having voted in the last election (rows). In other words is "sex and voting independent"?

1. Suppose we hypothesize that we have an unbiased six-sided die. To test this hypothesis, we roll the die 300 times and observe the frequency of occurrence of each of the faces. Because we hypothesized that the die is unbiased, we expect that the number on each face will occur 50 times. However, suppose we observe frequencies of occurrence as follows:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Face Value | 1 | 2 | 3 | 4 | 5 | 6 |
| Occurrence | 42 | 55 | 38 | 57 | 64 | 44 |

What would we conclude?

1. Birth Dates of Hockey Players. The Toronto Globe and Mail of November 27, 1987 contained an article, written by Neil Campbell, entitled “NHL career can be preconceived.” In the article, Campbell claimed that the organization of hockey has turned half the boys in hockey-playing countries into second class citizens. The disadvantaged are those unlucky enough to have been born in the second half of the calendar year. Campbell calls this the Calendar Effect, arguing that it results from the practice of age grouping of very young boys by calendar year of birth. For example, all boys 7 years old in 1991, and born in 1984, would be in the same grouping. By 1991, those boys born in the first few months of 1984 are likely to be somewhat larger and better coordinated than those boys born in the later months of 1984. Yet all these players compete against each other. Campbell argues that this initial advantage stays with these players, and may become a permanent advantage by the time the boys are separated into elite leagues at age 9. In order to test whether this Calendar Effect exists among hockey players who are somewhat older, a statistics student collected data from the Western Hockey League (WHL) Yearbook for 1987-88. The birth dates for the players are as shown in the following Table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Quarter | Jan. to March | April to June | July to Sept. | Oct. to Dec. |
| # of players | 84 | 77 | 35 | 34 |

Based on the data, what is your conclusion?