

Assignment #10

Do the following exercises.

1. It is hypothesized that when homing pigeons are disoriented in a certain manner, they will exhibit no preference for any direction of flight after takeoff (so that direction X should be uniformly distributed on the interval from 0° to 360°). To test this, 120 pigeons are disoriented, let loose, and the direction of flight of each is recorded. The resulting data follow. Use the χ^2 test at level 0.10 to see whether the data support the hypothesis.

Direction	$[0^\circ, 45^\circ)$	$[45^\circ, 90^\circ)$	$[90^\circ, 135^\circ)$
Frequency	12	16	17
Direction	$[135^\circ, 180^\circ)$	$[180^\circ, 225^\circ)$	$[225^\circ, 270^\circ)$
Frequency	15	13	20
Direction	$[270^\circ, 315^\circ)$	$[315^\circ, 360^\circ)$	
Frequency	17	10	

2. The article “The Gap Between Wine Expert Ratings and Consumer Preferences” (*Intl. J. of Wine Business Res.*, 2008: 335-351) studied differences between expert and consumer ratings by considering medal ratings for wines, which could be gold (G), silver (S) or bronze (B). Three categories were then established: 1. Rating is the same [(G,G), (B,B), (S,S)]; 2. Rating differs by one medal [(G,S), (S,G), (S,B), (B,S)]; 3. Rating differs by two medals [(G,B), (B,G)]. The observed frequencies for these three categories were 69, 102 and 45, respectively. On the hypothesis of equally likely expert ratings and consumer ratings being assigned completely by chance, each of the nine medal pairs has probability $1/9$. Carry out an appropriate χ^2 test using a significance level of 0.10 by finding the P -value of the test.
3. In a genetics experiment, investigators looked at 300 chromosomes of a particular type and counted the number of sister-chromatid exchanges on each (“On the Nature of Sister-Chromatid Exchanges in 5-Bromodeoxyuridine-Substituted Chromosomes,” *Genetics*, 179: 1251-1264). A Poisson model was hypothesized for the distribution of the number of exchanges, x . Test the fit of a Poisson distribution to the data by first estimating θ and then combining the counts for $x \geq 8$ into one category.

Number of Exchanges	0	1	2	3	4	5	6	7	8	9
Observed Counts	6	24	42	59	62	44	41	14	6	2