## Ap Biology Chi-Squored Procice <br> problems

(Set I)
The integroxion of anolytical skills in the Ap Biology course hos provided a new chollenge for Ap Riology teachers. In on ortempt to facilihote student mostery of unfomilior skills I hove chosen to frontlood anolytical skills into beginning of my course. My students will be assessed with a minimum of g grid-in problems on each unit exam.

I hove experienced extreme dipliculties finding chi-squored problems thot ore not oll content specitic, but still oppropriote for the course. In order to implement the course long strofegy I needed a bank of problems thot students could complefe af ony hime in the course. live decicled to pass these problems lvye developed on to the Ap Biology teachers who are experiencing the some struggle!

Chi-Squared Formula: $x^{2}=\Sigma \frac{(O-E)^{2}}{E} \quad$ Where:
O = Observed Result F= Fxpected Resuli
$\Sigma=$ Sum of
Crioicol Vollues:

| $\begin{gathered} \text { Degrees } \\ \text { of } \\ \text { Freedom } \end{gathered}$ | Level of Proboloility (P) |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | . 98 | . 915 | . 80 | .50 | . 20 | .10 | .05 | .02 | . 01 | .00] |
| 1 | .000 | .004 | .064 | .455 | 1.64 | 2.71 | 3.84 | 5.411 | 6.64 | 10.83 |
| 2 | .040 | .103 | .466 | 1.388 | 3.22 | 4.61 | 5.9\% | 7.82 | 9.21 | 13.82 |
| 3 | .185 | . 352 | 1.005 | 2.356 | щ.64 | 6. 25 | 7.82 | 9.84 | III.35 | 115.27 |
| 4 | . 429 | . 711 | 1.6449 | 3.357 | 5.99 | 7.78 | 9.49 | 111.67 | 113.28 | 18.48 |
| 5 | . 752 | di45 | 2.343 | 4.355 | 729 | 9.24 | III,07 | 13.39 |  | 20.52 |

I. When studying animal behavior, the distribution of organisms within a choice chamber can be studied to identify animal preferences. 20 Isopods are placed in a 2-choice choice chamber. A cotton ball dampened with distilled water is placed in Chamber A; A dry cotton ball is placed in Chamber B. After 15 minutes 2 Isopods are located in Chamber B, and 18 isopods are found in Chamber A. Perform the chi-squared test to determine if the distribution of isopods is significant or due to random chance. (3 points)

| a. Complete the grid in space with the chisquared value. | b. Complete the grid in space with the critical value. |
| :---: | :---: |
| c. Do you reject the null hypothesis? Yes or No |  |

2. When a six-sided die is rolled, the roller has six possible outcomes. Emily claims that she nearly always rolls 5 . Emily believes that 5 is her lucky number, and something super-natural is leading to this pattern or outcomes. Emily rolls a die 300 times and records the outcomes. Perform a chi-squared test to determine if Emily is truly rolling a significant number of fives, or if Emily's rolls are simply due to chance. (3 points)

| Die Face | I | 2 | 3 | 4 | 5 | 6 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| \# of <br> times <br> rolled | 15 | 70 | 33 | 31 | 89 | 62 |

a. Complete the grid in space with the chisquared value.

b. Complete the grid in space with the critical value.

c. Do you reject the null hypothesis? Yes or No
3. When studying animal behavior, the distribution of organisms within a choice chamber can be studied to identify animal preferences. $9 \uparrow$ fruit flies are placed in a 2-choice choice chamber with a large middle passage where flies may remain. Chamber A contains a 5 g sample of over ripe grapes; the middle passage is empty. Chamber B contains a 5 g sample of not yet ripe grapes. After 40 minutes 20 flies are in the middle, 43 flies are in chamber A , and 36 flies are in chamber B. Perform the chi-squared test to determine if the distribution of fruit flies is significant or due to random chance. (3 points)
a. Complete the grid in space with the chisquared value.
b. Complete the grid in space with the critical value.

c. Do you reject the null hypothesis?

Yes or No
4. Mark accuses Brandon of using a weighted coin when they are flipping coins for a piece of pizza. Mark states that Brandon always chooses heads, and the coin seems to decide in Brandon's favor. To prove his innocence, Brandon flips the coin 30 times to demonstrate his innocence. After 30 flips the coin lands on heads 18 times, and the coin lands on heads tails I2. Perform the chi-squared test to determine if Brandon is truly cheating his friend.
a. Complete the grid in space with the chisquared value.

b. Complete the grid in space with the critical value.

c. Do you reject the null hypothesis?
5. In a marketing study, 120 Students are given a taste-test of 4 different colas. The results are recorded below is there a cola students prefer by taste?

|  | Cola A | Cola B | Cola C Cola D |
| :---: | :---: | :---: | :---: |
| \# of students choosing cola | 20 | 45 | 17 l |
| a. Co spc squ $\Theta$ | plete the gr with the c ared value. |  | b. Complete the grid in space with the critical squared value. |
| c. Do you reject the null hypothesis? Yes or No |  |  |  |

I. Solutions
a. Chi-squared value $=\mathbf{I 2} .8$
b. Critical Value $=3.84$
c. Yes
2. Solutions
a. Chi-squared value= 78.8
b. Critical Value= II. 07
c. Yes
3. Solutions
a. Chi-squared value 8.42
b. Critical Value= 5.99
c. Yes
4. Solutions
a. Chi-squared value $=1.20$
b. Critical Value= 3.84
c. NO
5. Solutions
a. Chi-squared value= 18.59
b. Critical value= $\mathbf{7 . 8 2}$
c. Yes

