Answer on Question #67471 – Math – Statistics and Probability

Question

School pep rally,. Randomly drew 36 names out of basket. Of the prize winners, 6 were freshmen, 14 were sophomores, 9 were juniors, and 7 were seniors. School is 30% freshmen, 25% sophomores, 25% juniors, and 20% seniors.

a. What are the expected frequencies of winners from each class? Expected frequency would be that the freshmen would hold the most prizes (being the largest class) followed by sophomores and Juniors and lastly the seniors as they have a smaller population.

b. Conduct a significance test to determine whether the winners of the prizes were distributed throughout the classes as would be expected based on the percentage of students in each group. Report your Chi Square and p values.

c. What do you conclude?

Solution

a. Expected frequencies.
   Freshmen: $36 * 0.3 = 10.8$.
   Sophomores: $36 * 0.25 = 9$.
   Juniors: $36 * 0.25 = 9$.
   Seniors: $36 * 0.2 = 7.2$.

b. Null hypothesis H_0: the data are consistent with a specified distribution.
   Alternative hypothesis H_a: the data are not consistent with a specified distribution.

Chi-square Goodness of Fit test.

Test statistic: $\chi^2 = \sum_{i=1}^{4} \frac{(O_i - E_i)^2}{E_i} = \frac{(6-10.8)^2}{10.8} + \frac{(14-9)^2}{9} + \frac{(9-9)^2}{9} + \frac{(7-7.2)^2}{7.2} =$
$= 4.92$.
P-value: $p = 0.178$.

c. Since P-value is greater than 0.05 we should conclude that there is no sufficient evidence that the winners of the prizes were not distributed throughout the classes as would be expected based on the percentage of students in each group.