**Mrs. Daniel-AP Stats**
**11.1 WS Solutions**

**Cheap Dice?**

**Hypothesis:**
$H_0$: The dice rolls are fair (evenly distributed between all 6 values).
$H_A$: The dice rolls are not fair (not evenly distributed).

**Assess Conditions:**
Random: random sample, stated.
Sample Size: We would expect each number to show up 10 times with a sample size of 60, since with a fair dice the probability of any given number is 1/6.
Independent: We can assume that all dice rolls are independent and that 6 dice is less than 10% of Mrs. Daniel's collection. She is a stats teacher!

**Name the Test:** $x^2$ Goodness of Fit

**Test Statistic:** $\chi^2 = \dfrac{(13-10)^2}{10} + \dfrac{(11-10)^2}{10} + \dfrac{(6-10)^2}{10} + \dfrac{(12-10)^2}{10} + \dfrac{(10-10)^2}{10} + \dfrac{(8-10)^2}{10} = 0.9 + 0.1 + 1.6 + 0.4 + 0 + 0.4 = 3.4$.

**Obtain p-value:** p-value: 0.64.

**Make a Decision:** Since the p-value is large, we fail to reject the null hypotheses.

**State a Conclusion:** Since the *P*-value is quite large, we have convincing evidence that the dice is fair. However, this doesn't *prove* that her die is fair.

**Landline Surveys?**

**Hypothesis:**
$H_0$: The age distribution of people who answer landline telephone surveys is the same as the age distribution of all US residents.
$H_a$: The age distribution of people who answer landline telephone surveys is not the same as the age distribution of all US residents.

**Assess Conditions:**
- *Random:* The data came from a random sample of US residents who answer landline telephone surveys.
- *Large Sample Size:* The expected counts are 1048(0.191) = 200.2, 1048(0.215) = 225.3, 1048(0.211) = 221.1, 1048(0.155) = 162.4, 1048(0.228) = 238.9. All expected counts are at least 5.
- *Independent:* Because we are sampling without replacement, there must be at least 10(1048) = 10,480 U.S. residents who answer landline telephone surveys. This is reasonable to assume.

**Name the Test:** Chi-square goodness-of-fit test.

**Test Statistic** $\chi^2 = \dfrac{(141-200.2)^2}{200.2} + \cdots = 48.2$, *df = 4*

**Obtain P-value**: p-value: 0.

**Make a Decision:** Because the *P*-value is practically zero, which is less than $\alpha$ = 0.05, we reject $H_0$.

**State Conclusion:** We have convincing evidence that the age distribution of people who answer landline telephone surveys is not the same as the age distribution of all US residents.