Lesson #52 · Topic 3H · Practice

Answer Key

b. all middle school students in this nutritionist's district and all high school students in this nutritionist's district

c. 1 variable – breakfast habits (home, school, skips)

2. a. Yes, the school counseor selected independent random samples from each grade level.

   b. Yes, 40 $\leq$ 0.10(all freshmen at this large school), 40 $\leq$ 0.10(all sophomores at this large school), and 40 $\leq$ 0.10(all juniors at this large school). With a school of over 3,000 students, **we** expect there to be at least **400 freshmen**, 400 sophomores, and 400 juniors.

   c. No. The expected counts for Freshmen, Sophomores, and Juniors who are in 2 or more clubs are all less than 5. All three expected counts are $\frac{(9)(40)}{120}$ =3 and 3 < 5.

3. a. H_0 : There is no difference in the population distributions of payment method (cash vs. no cash) between Store A and Store B.

   H_a : There is a difference in the population distributions of payment method (cash vs. no cash) between Store A and Store B.

   b. χ^2 = 0.50, df = 1, p -value = 0.4795

   c. $H_0 : p_A - p_B = 0$
   $H_a : p_A - p_B \neq 0$
   $p_A - p_B$ = true difference in population proportions of customers who pay with cash (Store A – Store B).

   d. z = 0.707, p -value = 0.4795

   e. The two tests produced the same p -value. The square of the z test statistic is equal to the χ^2 test statistic. $z^2 = \chi^2 \rightarrow (0.707)^2$ = 0.50

4. CLASSIFY:
Type of study: Observational study
Variables: Experience level (categorical), preferred defense (categorical)

CHOOSE:
χ^2 test for homogeneity at α = 0.05
H_0 : There is no difference in the distribution of preferred defenses to the King's Pawn Opening between novice and expert chess players.
H_a : There is a difference in the distribution of preferred defenses to the King's Pawn Openings between novice and expert chess players.

CHECK:
$\underline{\text{Random:}}$ independent random samples
$\underline{10\%}$: 76 $\leq$ 0.10(all novice chess players), 64 $\leq$ 0.10(all expert chess players)
$\underline{\text{Large Counts:}}$ all expected counts (34.20, 28.80, 29.31, 24.69, 12.49, 10.51) $>$ 5

CALCULATE:

$$\chi^2 = \frac{(37-34.2)^2}{34.2} + \frac{(26-28.8)^2}{28.8} + \frac{(32-29.31)^2}{29.31} + \frac{(22-24.69)^2}{24.69} + \frac{(7-12.49)^2}{12.49} + \frac{(16-10.51)^2}{10.51} = 0.229 + 0.272 + 0.247 + 0.293 + 2.413 + 2.868 \approx 6.322$$

$df = 2$
p -value = 0.0424
Using technology, $\chi^2 = 6.312$ and p -value = 0.0426

CONCLUDE:
Assuming H_0 is true (there is no difference in the distribution of defenses to the King's Pawn Opening between novice and expert chess players), there is a 0.0424 probability of getting a χ^2 test statistic of 6.322 or greater purely by chance. Because 0.0424 < 0.05, we reject H_0 and we do have convincing statistical evidence that there is a
openings between novice and expert chess players. The largest comp
players who prefer the Queen's Indian Defense was much higher than

5. C

6. B