Lesson 9.2.2

9-39. If the proportions are the same across Jermaine, Aliah, and Tobiah, students would be applying the marginal distribution ($\frac{506}{600}$ and $\frac{94}{600}$) to each individual person. This would result in the "homogeneity of proportions" and is the same strategy as for the independence condition. See table below for expected counts.

	Jermaine	Aliah	Tobiah
Make Basket	168.6667	168.6667	168.6667
Miss Basket	31.3333	31.3333	31.3333

9-40. H_0: The proportion of shots made is the same for Jermaine, Aliah, and Tobiah.
H_A: At least one proportion of shots made is different.

9-41. Students assume that each sample of 200 represents a SRS and that each individual shot within each sample represents an independent observation. Students also assume that the three samples themselves are independent of one another. (Students assume that the individuals did not influence one another.) The sample sizes were all sufficiently large for the expected counts to be at least 5.

9-42. See contributions in table below. Sum = 2.8257, df = 2, *p*-value: 0.2435. The χ^2 statistic and *p*-value are identical to the calculation in Lesson 9.1.1. Because the *p*-value is not lower than an assumed 5% level of significance, students do not have sufficient evidence to reject H_0. The group cannot conclude that one person's proportion of shots made significantly differs from the group.

	Jermaine	Aliah	Tobiah
Make Basket	0.2635	0.0105	0.1686
Miss Basket	1.4184	0.0567	0.9078

9-43. a. It is indicated that a SRS was taken from each of the 4 districts. Each district is serving as its own population, and the question is asking whether the proportions are the same across the four populations.

b. If there was one large sample and each person was categorized by district and then by voter status, it would have been analyzed as a chi-squared independence test. The calculations would remain the same either way.

c. <u>Identify</u>: H_0: the proportion/distribution of voter status is the same for all four districts. H_A: at least one district has a significantly different distribution of voter status. Sample evidence for H_A: observed frequencies do not match expected frequencies. $\alpha = 0.05$.
<u>Check conditions</u>: It was stated that each district represents an independent SRS, and the sample sizes are small compared to the total population of each district. All expected counts are at least 5.
<u>Calculate</u>: See tables at right for expected counts and χ^2 contributions.
<u>Conclude</u>: p-value: 0.0045. Because the p-value is less than the 5% level of significance, students have sufficient evidence to reject H_0. The evidence seems to indicate that at least one district has a different distribution of voter status.

Expected Counts:

	District 1	District 2	District 3	District 4
Y	156.0706	141.8824	156.0706	148.9765
N	36.2353	32.9412	36.2353	34.5882
U	27.6941	25.1765	27.6941	26.435

Contributions:

	District 1	District 2	District 3	District 4
Y	0.1062	0.2439	0.1647	1.515
N	1.8717	2.4912	0.0859	0.1937
U	5.4681	0.4008	0.3946	5.8496

d. The largest contribution was 5.8496 for the undecided voters in District 4.

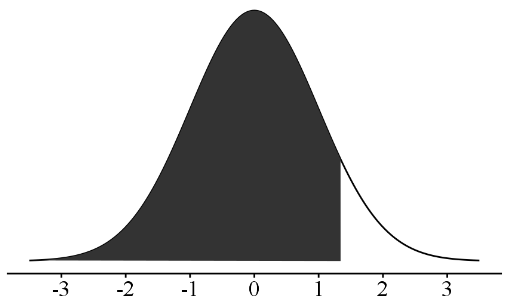
9-44. <u>Identify</u>: Chi-squared test of homogeneity. H_0: The distribution of proportions of seat times is the same for each city. H_A: At least one city differs in its distribution of proportions of seat times. Sample evidence for H_A: observed and expected frequencies do not match.
<u>Check conditions</u>: Random, to avoid bias. It is stated that there were three random samples. Independent trials, samples and large counts, so the sampling distribution is ≈ chi-squared. It is assumed that the three samples are independent of one another. All expected counts are higher than 5 (the smallest is 8).
<u>Calculate</u>: $\chi^2 = 2.5121$, df = 4, p-value = 0.6425.
<u>Conclude</u>: Because the p-value is so large (higher than $\alpha = 0.05$), students fail to reject H_0. Students cannot conclude that there is a difference in the distribution of proportions of seat times across these three cities.

9-45. a. P(Meg and another junior) = $P(M \cap J_B) = \left(\frac{1}{10}\right) \cdot \left(\frac{3}{10}\right) = \left(\frac{3}{100}\right)$

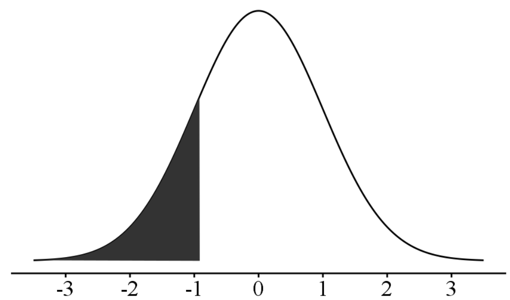
b. P(same class) = P(both juniors) + P(both seniors) = $P(J_A \cap J_B) + P(S_A \cap S_B)$ = $P(J_A) \cdot P(J_B) + P(S_A) \cdot P(S_B) = \left(\frac{6}{10}\right) \cdot \left(\frac{3}{10}\right) + \left(\frac{4}{10}\right) \cdot \left(\frac{7}{10}\right) = \frac{46}{100}$.

c. There are three ways of interest a junior and senior could be chosen: (i) A senior from A and a Junior from B, $P(i) = 0.4(0.3) = 0.12$; (ii) Meg is chosen from A and a senior from B, $P(ii) = 0.1(0.7) = 0.07$, (iii) Another junior $\cap$ (not Meg) is chosen from A and a senior from B, $P(iii) = 0.5(0.7) = 0.35$. Only one of these situations has Meg as captain. $P(\text{Meg} \mid \text{Jr and Sr}) = \frac{P(ii)}{P(i)+P(ii)+P(iii)} = \frac{0.07}{0.07+0.12+0.35} = \frac{0.07}{0.54} = 0.13$

9-46. Using an inverse normal probability density function or table: $z_1 = -0.9153$, $z_2 = 1.3408$, 256.65 = mean + (–0.9153)stDev, 324.56 = mean + (1.3408)stDev. Solving the system of equations gives mean = 284.2 Cal and standard deviation = 30.1 Cal. See diagrams below.



z = 1.3408



z = -0.9153

