Take-Home Test 3

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1.

a. 95% Confidence Interval for the control group is (17.9991, 27.4643)

b. 95% Confidence interval for the experimental group is (12.2281, 21.7861)

Test used: F-test for equality of variance

H0: σ^2control $\leq \sigma^2$experimental

Ha: σ^2control $> \sigma^2$experimental

Test statistic: F = 1.9275

Critical Value: 1.8770

Rejection region: F > 1.8770

p-value = 0.0436

Decision: Reject the null hypothesis because F is in the rejection region and p is less than alpha.

Conclusion: There is sufficient evidence to conclude that the variability in final exam scores is higher in the control group compared to the experimental group.

2.

a. 99% Confidence Interval is $(-0.0035, -0.0002)$

b. Test used: two proportions Z-test

H0: cancer chances with vasectomy $\leq$ cancer chances with no vasectomy

Ha: cancer chances with vasectomy $>$ cancer chances with no vasectomy

Test Statistic: z = 2.9548

Critical Value: z = 2.33

Rejection region: $z > 2.33$

p-value: 0.0016

Decision: Reject the null hypothesis because z is higher than the critical value and p is less than alpha.

Conclusion: The data supports the claim that men who have had a vasectomy are at greater risk of prostate cancer.

3.

a. Mean and standard deviation for the time (in hours) for each laptop brand.

Brand	Mean (hours)	Std Dev (hours)
A	7.675	1.4291
B	10.425	2.1986
C	8.7917	2.3521
D	5.900	1.1499

b. Test Used: One-way ANOVA

H0: $\mu_A = \mu_B = \mu_C = \mu_D$

Ha: At least one different mean

Test Statistic: $F = 10.29$

Critical Value: 2.851741

Rejection Region: $F > 2.851741$

p-value: 4.3e-05

Decision: Reject the null hypothesis because F is in the rejection region.

Conclusion: There is evidence that the mean battery charge is different among the brands.

4.

Test Used: Chi-squared Test for Independence

H0: Acreage and tenure are independent.

Ha: Acreage and tenure are associated.

Test Statistic: $X^2 = 451.97$

Critical Value: 15.5073

Rejection region: $X^2 > 15.5073$

p-value: 2.2e-16

Decision: Reject the null hypothesis because X^2 is in the rejection region and p is less than alpha

Conclusion: There is enough evidence to conclude that there is an association between the farm's acreage and the operator's tenure

5.

a. Test used: Chi-square goodness-of-fit.

H0: teams are evenly matched

Ha: teams are not evenly matched

Test Statistic: $X^2 = 5.6966$

Critical Values: 7.8147.

Rejection region: $X^2 > 7.8147$.

p-value: 0.1273

Decision: Fail to reject the null hypothesis at 5% level of significance because X^2 is below the rejection region.

Conclusion: There isn't enough evidence that the World Series teams are not evenly matched.

b. Test used: Chi-square goodness-of-fit.

H0: teams are evenly matched

Ha: teams are not evenly matched

Test Statistic: $X^2 = 5.6966$

Critical Values: 6.2514

Rejection region: $X^2 > 6.2514$

p-value: 0.1273

Decision: Fail to reject the null hypothesis at the 10% level of significance because X^2 is below the rejection region.

Conclusion: There isn't enough evidence that the World Series teams are not evenly matched.

c. The test is appropriate because the observations are independent and all expected frequencies are greater than 5.