INDEPENDENCE AND CORRELATION TESTING HOMEWORK.

1. Find the critical value(s) of the χ^2 distribution with 12 degrees of freedom if the area in the right tail is 0.15.

2. Find the critical value(s) of the χ^2 distribution with 79 degrees of freedom if the area of 0.005 is split equally among the two tails.

3. Find the critical values for a 95% standard deviation confidence interval using the χ^2 distribution with 15 degrees of freedom.

4. Find the critical values for a 99% standard deviation confidence interval using the χ^2 distribution and a sample of size 6.

5. Construct a 95% confidence interval for the population standard deviation if a sample of size 25 has standard deviation $s = 15$.

6. Construct a 99% confidence interval for the population standard deviation if a sample of size 8 has standard deviation $s = 7.5$.

7. Consider a sample of baby weights:

12.23, 12.32, 11.87, 12.34, 11.48, 12.66,

8.51, 14.13, 12.95, 10.30, 9.34, 8.63

(a) Find the sample standard deviation.
(b) Construct a 95% confidence interval for the population standard deviation.

8. Boxes of cereal are labeled as containing 14 ounces of product. Following are the weights of 10 randomly chosen boxes.

14.02, 13.97, 14.11, 14.12, 14.10,

14.15, 13.97, 14.05, 14.04, 14.11

(a) Find the sample standard deviation.
(b) Construct a 98% confidence interval for the population standard deviation.

9. A poll is conducted among 668 adults in which the subjects are asked whether they agree that the government should prohibit smoking in public places. In addition, each person was asked how many people live in their household. The results are summarized below.

	1	**2**	**3**	**4**	**5**
Agree	73	109	48	37	37
No Opinion	31	52	29	20	18
Disagree	42	71	38	40	23

Test whether the opinion about smoking in public places is dependent on the number of people in a household. Use 99% confidence level.

Ornithologists, scientists who study birds, tag sparrow hawks in 13 different colonies to study their population. They gather data for the percent of new sparrow hawks in each colony and the percent of those that have returned from migration. Of interest is the strength of the linear correlation between the two percentages.

Percent return	74,	66,	81,	52,	73,	62,	52,	45,	62,	46,	60,	46,	38
Percent new	5,	6,	8,	11,	12,	15,	16,	17,	18,	18,	19,	20,	20

10. State the null and the alternative hypotheses for your test.

11. Find a point estimate for the population linear correlation coefficient.

12. Find the p-value for this test.

13. State the conclusion of your test if you were using $\alpha = 0.02$ level of significance.

14. A test for correlation based on a sample of size $n = 35$ yields the test statistic $t_0 = 2.71$. Find the p-value of this test.

15. A test for independence based on a contingency table with 4 rows and 5 columns yields a test statistic $\chi_0^2 = 6.28$. Find the p-value of this test.

Are streets where cars travel faster noisier than the streets where cars travel slower? The following table present the average speeds in km/hr and the corresponding noise levels in decibels.

Speed	28,	36,	39,	29,	30,	30,	29,	33
Noise	78.1,	79.6,	81.0,	78.7,	78.6,	78.5,	78.4,	79.6

16. Test whether the noise level is linearly correlated with the average speed at 99.9% confidence level.

17. Find the equation of the linear regression line for predicting the noise level given the average speed.

ANSWERS.

1. 16.989

2. 48.265, 118.879

3. 6.262, 27.488

4. 0.412, 16.75

5. $(11.71, 20.87)$

6. $(4.41, 19.95)$

7.

(a) 1.798
(b) $(1.27, 3.05)$

8.

(a) 0.06363
(b) $(0.041, 0.1321)$

10. $H_0 : \rho = 0, \quad H_1 : \rho \neq 0,$ using two-tailed Pearson correlation test

11. -0.7484673

12. 0.003248

13. The data provides sufficient evidence to conclude that the percentages of returning and new sparrow hawks are linearly correlated.