# Inference Review

A scientist who worked on this study thinks that the proportion of species that become extinct is directly related to the size of the islands. This scientist investigated the relationship between the proportion of extinct birds and the area, in square kilometers, of islands. A least squares analysis was conducted on the proportion extinct and ln(area). The regression analysis output, the scatterplot, and the residual plot are shown below.

Predictor	Coef	StDev	T	P
Constant	0.28996	0.01269	22.85	0.000
ln(area)	-0.05323	0.00618	-8.61	0.000

S = 0.02863   R-Sq = 87.1%
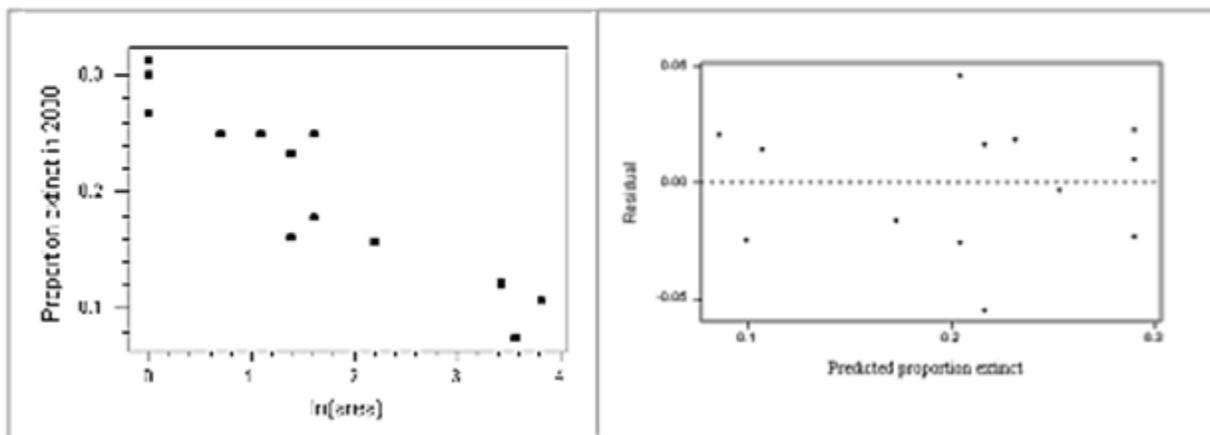
Estimate the slope of the least squares regression line using a 95 percent confidence interval. Interpret your answer in the context of this situation.

==Linear Regression t Interval for Slope==

A rural county hospital offers several health services. The hospital administrators conducted a poll to determine whether the residents' satisfaction with the available services depends on their gender. A random sample of 1,000 adult county residents was selected. The gender of each respondent was recorded and each was asked whether he or she was satisfied with the services offered by the hospital. The resulting data are shown in the table below.

	Male	Female	Total
Satisfied	384	416	800
Not Satisfied	80	120	200
Total	464	536	1,000

Using a significance level of 0.05, conduct an appropriate test to determine if, for adult residents of this county, there is an association between gender and whether or not they were satisfied with services offered by the hospital.

==Chi-Square Test for Association/Independence==

A French study was conducted in the 1990s to compare the effectiveness of using an instrument called a cardiopump with the effectiveness of using traditional cardiopulmonary resuscitation (CPR) in saving lives of heart attack victims. Heart attack patients in participating cities were treated with either a cardiopump or CPR, depending on whether the individual's heart attack occurred on an even-numbered or an odd-numbered day of the month. Before the start of the study, a coin was tossed to determine which treatment, a cardiopump or CPR, was given on the even-numbered days. The other treatment was given on the odd-numbered days. In total, 754 patients were treated with a cardiopump, and 37 survived at least one year; while 746 patients were treated with CPR, and 15 survived at least one year.

Perform a statistical test to determine whether the survival rate for patients treated with a cardiopump is significantly higher than the survival rate for patients treated with CPR.

<mark>Two-Proportion z Test</mark>

A husband and wife, Mike and Lori, share a digital music player that has a feature that randomly selects which song to play. A total of 2,384 songs were loaded onto the player, some by Mike and the rest by Lori. Suppose that when the player was in the random-selection mode, 13 of the first 50 songs selected were songs loaded by Lori.

Construct and interpret a 90 percent confidence interval for the proportion of songs on the player that were loaded by Lori.

<mark>One-Proportion z Interval</mark>

A large pet store buys the identical species of adult tropical fish from two different suppliers – Buy-Rite Pets and Fish Friends. Several of the managers at the pet store suspect that the lengths of the fish from Fish Friends are consistently greater than the lengths of the fish from Buy-Rite Pets. Random samples of 8 adult fish of the species from Buy-Rite Pets and 10 adult fish of the same species from Fish Friends were selected and the lengths of the fish, in inches, were recorded, as shown in the table below.

	Length of Fish	Mean	Standard Deviation
Buy-Rite Pets $(n_B = 8)$	3.4 2.7 3.3 4.1 3.5 3.4 3.0 3.8	3.40	0.434
Fish Friends $(n_F = 10)$	3.3 2.9 4.2 3.1 4.2 4.0 3.4 3.2 3.7 3.6	3.46	0.550

Do the data provide convincing evidence that the mean length of the adult fish of the species from Fish Friends is greater than the mean length of the adult fish of the same species from Buy-Rite Pets?

<mark>Two-Sample t Test</mark>

One of the two fire stations in a certain town responds to calls in the northern half of the town, and the other fire station responds to calls in the southern half of the town. One of the town council members believes that the two fire stations have different mean response times. Response time is measured by the difference between the time an emergency call comes into the fire station and the time the first fire truck arrives at the scene of the fire.

Data were collected to investigate whether the council member's belief is correct. A random sample of 50 calls selected from the northern fire station had a mean response time of 4.3 minutes with a standard deviation of 3.7 minutes. A random sample of 50 calls selected from the southern fire station had a mean response time of 5.3 minutes with a standard deviation of 3.2 minutes.

Construct and interpret a 95 percent confidence interval for the difference in mean response times between the two fire stations.

==Two-Sample t Interval==

Dominant Foot	Swelling in Dominant Foot	Swelling in Nondominant Foot	Foot with Neuroma
Left	1.40	1.10	Left
Left	1.55	1.25	Left
Left	1.65	1.20	Left
Left	1.55	1.40	Both
Left	1.70	1.40	Left
Left	1.85	1.50	Both
Right	1.45	1.20	Right
Right	1.65	1.30	Right
Right	1.60	1.40	Right
Right	1.70	1.45	Both
Right	1.85	1.45	Both
Right	1.75	1.60	Both

Can you conclude that there is a difference between the mean swelling in the dominant foot and the mean swelling in the nondominant foot for adult females who have Morton's neuroma in at least one foot? Give a statistical justification to support your answer.

==Paired t Test==