BIOS 600 · Quiz 9.1: Confidence Intervals and Sample Size

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1. **Honor Pledge:** I have neither given nor received unauthorized aid on this assignment.
(Sign and print your name.)

2. How should we interpret a 95% confidence interval for μ, the mean? (Circle the correct answer)

(a) There is a 95% probability that μ is between the upper and lower limits of the confidence interval.

(b) If we where to resample the population and recalculate the confidence interval several times, then we would expect 95% of confidence intervals to contain μ.

(c) 95% of the possible values for μ lie in the interval we created.

(d) None of the above.

3. A researcher collects 5 data points — 5.0, 4.1, 3.8, 4.4, 1.5 — and calculates a 95% confidence interval for the population mean, μ. Because the researcher knows the data are normally distributed but doesn't know σ^2, she correctly uses the following formula:

$$\begin{aligned} \bar{X} \pm t_{n-1,1-\alpha/2} \frac{s}{\sqrt{n}} &= 3.76 \pm 2.776 \frac{1.34}{\sqrt{5}} \\ &= 3.76 \pm 1.66 \\ &= (2.1, 5.42) \end{aligned}$$

However, the researcher realizes she really wants a 90% confidence interval. Calculate it. *(Hint: z-table and 2 sided t-table on back page.)*

4. Our same researcher wants to use the data she collected as the basis for a grant application for a better funded study. In the future study, the researcher will perform a two-sided test of the null hypothesis $H_0 : \mu = 3.5$. The researcher is willing to risk a type II error rate of 10% if, in truth, $\mu = 4$.

As part of the researcher's grant application, she needs to provide sample size calculations. She correctly uses the formula:

$$n = \sigma^2 \left[\frac{Z_{1-\alpha/2} - Z_\beta}{\mu_1 - \mu_0} \right]^2 .$$

What sample size did she submit in her application? *(Hint: z-table and 2 sided t-table on back page.)*

z Quantiles

p	q
0.025	-1.9600
0.05	-1.6449
0.1	-1.2816
0.15	-1.0364
0.2	-0.8416
0.25	-0.6745
0.3	-0.5244
0.35	-0.3853
0.4	-0.2533
0.45	-0.1257
0.5	0.0000
0.55	0.1257
0.6	0.2533
0.65	0.3853
0.7	0.5244
0.75	0.6745
0.8	0.8416
0.85	1.0364
0.9	1.2816
0.95	1.6449
0.975	1.9600

2 sided t-table

	p=0.5	0.6	0.7	0.8	0.9	0.95	0.98	0.99
df=1	1.000	1.376	1.963	3.078	6.314	12.706	31.821	63.657
2	0.816	1.061	1.386	1.886	2.920	4.303	6.965	9.925
3	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841
4	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604
5	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032
6	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707
7	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499
8	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355
9	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250
10	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169