Dear BIOSTATS 540 Fall 2022,
Here is some practice in interpreting word problems related to confidence intervals and hypothesis tests. In particular, these questions give you practice in "translation", that is – translating the wording of the question to knowing which test or confidence interval to produce. Note – The calculations are not given.

__#1.
A population of people has incomes with a standard deviation of σ = \$1,750. If a random sample of 25 people resulted in a mean income $\bar{X}$ = \$54,800, estimate μ by a 95% confidence interval.

__#2.
A fertilizer-mixing machine produced 10 100-pound bags with percentages of nitrate as follows: 9,12, 11, 10, 11, 12, 9, 10, 9, 11. Give a 90% confidence interval for μ.

__#3.
A sociologist found that 84 out of 124 Republicans he interviewed favored capital punishment, while 45 out of 98 Democrats did. Is there statistically significant evidence of a difference in the proportion of Republicans and Democrats who favor capital punishment?

__#4.
A machine is set to turn out ball bearings have a radius of 1 centimeter. A sample of 10 ball bearings produced by this machine has a mean radius of $\bar{X}$ = 1.004 centimeters with a standard deviation of s = .003. Is there statistically significant evidence that the machine is turning out ball bearings having a mean radius different from 1 centimeter?

__#5.
Suppose in a sample of 100 people the mean height was observed to be $\bar{X}$ = 67 inches. If the hypothetical height of the population has mean value μ = 66 and σ = 3 inches, would you reject μ = 66 with α = .05?

__#6.
Suppose that bacterial counts are approximately normally distributed, and that the variance of the bacterial count in the Smarmee River is σ^2 = 9,000,000. Counts for each of 25 days resulted in a mean count of $\bar{X}$ = 11,500. Give a 90% confidence interval for the mean bacterial count.

__#7.
A company is sued for job discrimination because only 19% of the newly hired candidates were minorities when 27% of all applicants were minorities. Is this strong evidence that the company's hiring practices are discriminatory?

__#8.
Researchers at White Kernel College want to test a new variety of corn seed which they have developed. They get nine farmers to plant the new seed on half of their land, and the usual seed on the other half. The number of bushels per acre which each farmer obtained is

New seed	132	154	121	163	159	138	143	136	149
Old seed	139	145	134	153	167	139	142	133	142

Set up a 95% confidence interval estimate of the mean difference in yield between the new and the old seed.

__#9.
The advertising manager of a breakfast cereal company would like to determine whether a new package shape would improve sales of the product. In order to test the feasibility of the new package shape, a sample of 40 equivalent stores was selected and 20 were randomly assigned as the test market of the new package shape, while the other 20 were to continue receiving the old package shape. The weekly sales during the time period studies were as follows:

New	**Old**
$\bar{X}_1$ = 130 boxes	$\bar{X}_2$ = 117 boxes
S_1 = 10 boxes	S_2 = 10 boxes

At the .05 level of significance, is there evidence that the new package shape resulted in increased sales?

__#10.
A sample of twenty-nine plant heights of members of a certain species had $\bar{X}_1$ = 10.74 cm and S^2 = 14.62 cm^2 and

the heights of sample of twenty-five from a second species had $\bar{X}_2$ = 14.32 cm and S^2 = 8.45 cm^2. Test the null hypothesis that the means of the two sampled populations are the same.

__#11.

A species of marine arthropod lives in seawater that contains calcium in a concentration of 32 mmole/kg of water. Thirteen of the animals are collected and the calcium concentrations in their coelomic fluid are found to be: 28, 27,29, 29, 30, 30, 31, 30,33, 27, 30, 32, and 31 mmole/kg. Test the appropriate hypothesis to conclude whether members of this species maintain a coelomic calcium concentration less than that of their environment.

__#12.

A jury list contains the names of all individuals who may be called for jury duty. The proportion of the available jurors on the list who are women is 0.53. Suppose 40 people are selected to serve as jurors, of whom 5 are women. Test the hypothesis that the selections are random with respect to gender.

__#13.

When Santa Claus' blood pressure is in control, his systolic blood pressure reading has a mean of μ = 130 mm Hg. For the last six times he has monitored his blood pressure, he has obtained the values: 140, 150, 155, 155, 160 and 140 mm Hg. Does this provide statistically significant evidence that his true mean has changed?

__#14.

The following table summarizes data on passengers in autos and light trucks who were involved in accidents in the past year. Do these data provide statistically significant evidence that failure to wear a seat belt is associated with a greater likelihood of sustaining an injury when an accident occurs?

		Injury	
Seat Belt		Yes	No
	No	38	270
	Yes	24	353

__#15.

An insurance company checks police records on 582 accidents selected at random and notes that teenagers were at the wheel in 91 of them. Give a 95% confidence interval estimate of the percentage of all auto accidents that involve teenage drivers.

__#16.

An advertising company is willing to renew its advertising contract with a local radio station only if the station can prove that more than 20% of the residents of the city have heard the ad and recognize the company's product. The radio station conducts a random phone survey of 600 people. Of these, only 133 remember the ad and recognize the company's product.

__#17.

Researchers investigated how the size of a bowl affects how much ice cream people tend to scoop when serving themselves. At an "ice cream social," people were randomly given either a 17 oz or a 34 oz bowl (both large enough that they would not be filled to capacity). They were then invited to scoop as much ice cream as they like. Here are the summaries:

	Small Bowl
n	= 26
$\bar{X}$	=5.07 oz
s	= 1.84 oz.

	Large Bowl
n	= 22
$\bar{X}$	= 6.58 oz
s	= 2.91 oz

Test the appropriate hypothesis.

__#18.

A company institutes an exercise break for its workers to see if this will improve job satisfaction, as measured by a questionnaire that assesses workers' satisfaction. Scores for 10 randomly selected workers before and after implementation of the exercise program are shown. The company wants to assess the effectiveness of the exercise program. Test the appropriate hypothesis.

	Satisfaction Score	
Employee ID	Before	After
1	34	33
2	28	36
3	29	50
4	45	41
5	26	37
6	27	41
7	24	39
8	15	21
9	15	20
10	27	37

__#19.

A man who moves to a new city sees that there are two routes that he could take to work. A neighbor who has lived there a long time tells him Route A will average 5 minutes faster than Route B. The man decides to experiment. Each day, he flips a coin to determine which way to go, driving each route 20 days. He finds that Route A takes an average of 40 minutes with standard deviation 3 minutes and Router B takes an average of 43 minutes with standard deviation 2 minutes. Test the appropriate hypothesis.

__#20.

Boys of a certain age have a mean weight of 85 lb. A complaint was made that in a municipal children's home the boys are underfed. As one bit of evidence, all 25 boys of the given age were weighted and found to have a mean weigh to $\bar{X}$ = 80.94 lb with standard deviation s = 12.3 lb. Carry out the appropriate hypothesis test to investigate the complaint.