__#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.

Design: single sample
Data is: continuous (normal)
Parameter of Interest: population mean μ where variance is KNOWN
Procedure to use: confidence interval for mean where variance is known. Confidence coefficient multipliers are from the Normal(0,1)

__#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.

Design: single sample
Data is: continuous (normal)
Parameter of Interest: mean where variance is NOT known
Procedure to use: confidence interval for mean where variance is NOT known. Confidence coefficient multipliers are from the Student t distribution with df = (n-1) = 9

__#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?

Design: 2 independent groups
Data is: discrete, binomial
Parameter of Interest: π_1, π_2
ONE sided or TWO sided: TWO sided
H_O: $\pi_1 = \pi_2$
H_A: $\pi_1 \neq \pi_2$
Procedure to use: 2 sample test of equality of binomial proportions

__#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?

Design: single sample
Data is: continuous, normally distributed, variance NOT known
Parameter of Interest: μ
ONE sided or TWO sided: TWO sided
H_O: $\mu = 1.00$
H_A: $\mu \neq 1.00$ two sided
Procedure to use: one sample t-test with df = (n-1) = 9

__#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?

Design: single sample
Data is: continuous, normally distributed, variance KNOWN
Parameter of Interest: μ
ONE sided or TWO sided: TWO sided
H_O: $\mu = 66$
H_A: $\mu \neq 66$ two sided
Procedure to use: one sample z- test

__#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.

Design: single sample
Data is: continuous (normal)
Parameter of Interest: mean where variance is KNOWN
Procedure to use: confidence interval for mean where variance is known. Confidence coefficient multipliers are from the Normal(0,1)

__#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***?

Design: single sample
Data is: discrete, binomial
Parameter of Interest: π
ONE sided or TWO sided: ONE sided
H_O: $\pi = .27$
H_A: $\pi < .27$ one sided
Procedure to use: single sample test of binomial proportion

__#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.

Design: paired data
Data is: continuous (normal)
Parameter of Interest: mean difference where variance of differences is NOT known
Procedure to use: confidence interval for mean difference where variance is NOT known. Confidence coefficient multipliers are from the student t distribution with df = (n-1) = 8

__#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?

Design: 2 independent groups
Data is: continuous, normal
Parameter of Interest: μ_1, μ_2 where variances are NOT known
ONE sided or TWO sided: ONE sided
H_O: $\mu_1 = \mu_2$
H_A: $\mu_1 > \mu_2$ where μ_1 = weekly sales with new package shape
Procedure to use: 2 sample student t test of equality of means

__#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***.

Design: 2 independent groups
Data is: continuous, normal
Parameter of Interest: μ_1, μ_2 where variances are NOT known
ONE sided or TWO sided: TWO sided
H_O: $\mu_1 = \mu_2$
H_A: $\mu_1 \neq \mu_2$
Procedure to use: 2 sample student t test of equality of means

__#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.

Design: single sample
Data is: continuous, normally distributed, variance NOT known
Parameter of Interest: μ
ONE sided or TWO sided: ONE sided
H_O: $\mu = 32$
H_A: $\mu < 32$ one sided
Procedure to use: one sample student t- test

__#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.

Design: single sample
Data is: discrete, binomial
Parameter of Interest: π
ONE sided or TWO sided: This could be either ONE or TWO sided, I'd say …..
H_O: $\pi = .53$
H_A: $\pi \neq .53$ two sided
Procedure to use: single sample test of binomial proportion

__#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***?

Design: single sample
Data is: continuous, normally distributed, variance NOT known
Parameter of Interest: μ
ONE sided or TWO sided: TWO sided
H_O: $\mu = 130$
H_A: $\mu \neq 130$ two sided
Procedure to use: one sample student t- test

__#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

Design: 2 independent groups
Data is: discrete, binomial
Parameter of Interest: π_1, π_2
ONE sided or TWO sided: ONE sided
H_O: $\pi_1 = \pi_2$
H_A: $\pi_1 > \pi_2$ where π_1 = likelihood of injury among NON-seat belt wearers
Procedure to use: 2 sample test of equality of binomial proportions

__#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.

Design: single sample
Data is: discrete, binomial
Parameter of Interest: π
Procedure to use: confidence interval for a binomial proportion. Confidence coefficient values come from a Normal(0,1)

__#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.

Design: single sample
Data is: discrete, binomial
Parameter of Interest: π
ONE sided or TWO sided: ONE sided
H_O: $\pi = .20$
H_A: $\pi > .20$ one sided
Procedure to use: single sample test of binomial proportion

__#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		Large Bowl
n	= 26	n	= 22
$\bar{X}$	=5.07 oz	$\bar{X}$	= 6.58 oz
s	= 1.84 oz.	s	= 2.91 oz

Test the appropriate hypothesis.

Design: 2 independent groups
Data is: continuous, normal
Parameter of Interest: μ_1, μ_2 where variances are NOT known
ONE sided or TWO sided: TWO sided
H_O: $\mu_1 = \mu_2$
H_A: $\mu_1 \neq \mu_2$
Procedure to use: 2 sample student t test of equality of means

__#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

Design: paired data
Data is: continuous, normal
Parameter of Interest: $\mu_{difference}$ where variance is NOT known
ONE sided or TWO sided: ONE sided
H_O: $\mu_{difference} = 0$
H_A: $\mu_{difference} > 0$ where difference is measured as d = (after - before)
Procedure to use: paired t test (or single sample t test of mean of difference)

__#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 Route B takes an average of 43 minutes with standard deviation 2 minutes. Test the appropriate hypothesis.

Design: 2 independent groups
Data is: continuous, normal
Parameter of Interest: μ_1, μ_2 where variances are NOT known
ONE sided or TWO sided: ONE sided
H_O: $\mu_A = \mu_B$
H_A: $\mu_A < \mu_B$
Procedure to use: 2 sample student t test of equality of means

__#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.

Design: single sample
Data is: continuous, normally distributed, variance NOT known
Parameter of Interest: μ
ONE sided or TWO sided: ONE sided
H_O: $\mu = 85$
H_A: $\mu < 85$ one sided
Procedure to use: one sample t-test with df = (n-1) = 24