

You may assume that the variable under consideration is normally distributed on both populations. The two population standard deviations cannot be assumed to be equal (use a NON-POOLED test)

- 1) A paint manufacturer wishes to compare the drying times of two different types of paint. Independent random samples of 11 cans of type A and 9 cans of type B were selected and applied to similar surfaces. The drying times were recorded. The summary statistics are as follows.

Type A	Type B
$\bar{x}_1 = 76.0$	$\bar{x}_2 = 64.0$
$s_1 = 4.5$	$s_2 = 5.1$
$n_1 = 11$	$n_2 = 9$

- a) Do the data suggest that Type A paint take longer to dry? Test the claim at the 0.01 level of significance.  
 b) Determine a 98% confidence interval for the difference,  $\mu_1 - \mu_2$ , between the mean drying time for paint of types A and B.  
 c) What is the interval suggesting about  $\mu_1$  and  $\mu_2$ ? Are they equal or is one of them larger than the other?
- 2) In a random sample of 360 women, 65% favored stricter gun control laws. In a random sample of 220 men, 60% favored stricter gun control laws.
- a) Test the claim that the proportion of women favoring stricter gun control is higher than the proportion of men favoring stricter gun control. Use a significance level of 0.05.  
 b) Construct a 90% confidence interval estimate for  $p_1 - p_2$ .  
 c) What is the interval suggesting?

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- 3) A researcher was interested in comparing the amount of time spent watching television by women and by men. Independent random samples of 14 women and 17 men were selected and each person was asked how many hours he or she had watched television during the previous week. The summary statistics are as follows.

Sample 1 (women)	Sample 2 (men)
$\bar{x}_1 = 12.6$	$\bar{x}_2 = 13.6$
$s_1 = 3.9$	$s_2 = 5.2$
$n_1 = 14$	$n_2 = 17$

- a) Do the data provide sufficient evidence to conclude that on average, women watch less hours of TV per week than men? Test at the 5% significance level.  
 b) Construct a 90% confidence interval estimate for the difference  $\mu_1 - \mu_2$   
 c) What is the interval suggesting about  $\mu_1$  and  $\mu_2$ ?

Identify the distribution of the sample mean. In particular, state whether the distribution of  $\bar{x}$  is normal or approximately normal and give its mean and standard deviation.

- 4) The heights of people in a certain population are normally distributed with a mean of 65 inches and a standard deviation of 3.4 inches. Determine the sampling distribution of the mean for samples of size 42.

- 5) You wish to estimate the proportion of all voters in California who plan to vote in favor of a certain ballot measure. How large of a sample should we select to be 99% confident that the sample proportion  $\bar{x}$  is within 0.015 from the population proportion  $p$ .
- Assume that in a preliminary study 29% of the voters sampled voted in favor.
  - Assume we have no results from a preliminary study.
- 6) A manufacturer considers his production process to be out of control when defects exceed 3%. In a random sample of 85 items, the defect rate is 5.9% but the manager claims that this is only a sample fluctuation and production is not really out of control.
- At the 0.05 level of significance, do the data provide sufficient evidence that the percentage of defects exceeds 3%?
  - Construct a 90% confidence interval estimate for the proportion of defective parts.
  - What does the interval suggest?
- 7) The forced vital capacity (FVC) is often used by physicians to assess a person's ability to move air in and out of their lungs. It is the maximum amount of air that can be exhaled after a deep breath. For adult males, the average FVC is 5.0 liters. A researcher wants to perform a hypothesis test to determine whether the average forced vital capacity for women differs from this value. The mean forced vital capacity for a random sample of 85 women was 4.8 liters.
- Do the data provide sufficient evidence to conclude that the mean forced vital capacity for women differs from the mean value for men of 5.0 liters? Perform the appropriate hypothesis test using a significance level of 0.05. Assume that  $\sigma = 0.9$  liters.
  - Construct a 95% confidence interval estimate for the mean forced vital capacity of women.
  - What does the interval suggest?
- 8) A survey of 865 voters in one state reveals that 459 favor the death penalty.
- At the 1% significance level can we support the claim that the majority of voters in the state favor the death penalty?
  - Construct the 98% confidence interval for the true proportion of all voters in the state who favor the death penalty. Does the interval support the claim stated in (a)? Explain.

Assume that the differences are normally distributed.

- 9) A coach uses a new technique in training middle distance runners. The times for 8 different athletes to run 800 meters before and after this training are shown below.

Athlete	A	B	C	D	E	F	G	H
Time before training (seconds)	116.9	108.4	114.1	112.8	116.9	117.1	114.8	111.5
Time after training (seconds)	117.5	107.1	111.7	113.6	115.1	117.2	111.2	107.6

- Do the data suggest that the training helps to improve the athletes' times for the 800 meters? Perform a paired t-test at the 5% significance level.
- Construct a 90% confidence interval estimate for the mean of the differences.
- What does the interval suggest?

10) A light-bulb manufacturer advertises that the average life for its light bulbs is 900 hours. A random sample of 15 of its light bulbs resulted in the following lives in hours.

995	590	510	539	739	917	571	555
916	728	664	693	708	887	849	

- a) Construct a box plot and a normal probability plot to confirm that there are no outliers and that the population is approximately normally distributed.
- b) At the 10% significance level, do the data provide evidence that the mean life for the company's light bulbs differs from the advertised mean?
- c) Construct a 90% confidence interval estimate for the life of the light bulbs. What does the interval suggest?

11) Ten different families are tested for the number of gallons of water a day they use before and after viewing a conservation video. Do the data suggest that the mean amount after the viewing is different from the mean amount before the viewing?

- a) Perform a paired t-test at the 5% significance level.
- b) Construct a 90% confidence interval estimate for the number of gallons of water used per day.
- c) What does the interval suggest?

Before	33	33	38	33	35	35	40	40	40	31
After	34	28	25	28	35	33	31	28	35	33

12) A newspaper in a large midwestern city reported that the National Association of Realtors said that the mean home price last year was \$116,800. The city housing department feels that this figure is too low. They randomly selected 66 home sales and obtained a sample mean price of \$118,900. Assume that the population standard deviation is \$3,700.

- a) Using a 5% level of significance, perform a hypothesis test to determine whether the population mean is higher than \$116,800.
- b) Construct a 90% confidence interval estimate for the mean home price in the midwestern city.
- c) What is the confidence interval suggesting about the mean home price of houses in the area?