## 8.4 Inferences from Matched Pairs (dependent)

**We'll be looking at data sets that are related--each value in one sample will be related to a value in the other sample.**

**ex. The effectiveness of the Grapefruit Diet will can be studied by measuring the weights of subjects b/f they begin the diet and again after they have been on it for 1 month.**

150
140

**Assumptions**

**1) The sample data consist of matched pairs--dependent sets of data.**

**2) The samples are simple random samples.**

**3) Either or both conditions are satisfied: The number of matched pairs > 30 or the pairs have differences that are from a population that has a normal distribution.**

## 8.3

$H_0: \mu_1 = \mu_2$

$H_a: \mu_1 > \mu_2$

Independent means

## 8.4

$H_0: \mu_d = 0$

$H_a: \mu_d > 0$

Dependent means

$150 > 140$

$150 - 140$

$+10$

$\mu_d$: mean of differences

If the test is one tail, how can you tell if it's left or right tail?

Do test scores increase due to test prep?

$720 < 750$

$720 - 750 = -30$

$H_0: \mu_d = 0$

$H_a: \mu_d < 0$

Does a new diet work?

$150 > 140$

$150 - 140 = +10$

$H_0: \mu_d = 0$

$H_a: \mu_d > 0$

To test the claim, we will need $\bar{d}$ , which is the mean of the differences between the two sets of data.

How to calculate :

1) Put first list of data in List 1 and second list in List 2.

2) Create a list 3 using L1 - L2.

3) Find the mean of list 3. $= \bar{d}$

$\bar{d}$ : mean of differences

To test whether a fuel additive improves gas mileage, investigators measured gas mileage of 7 cars with and without the fuel additive. At alpha = 0.10, can you conclude that the fuel additive improved gas mileage. Use the p-value method.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| w/o additive | 34.5 | 36.7 | 34.4 | 39.8 | 33.6 | 35.4 | 38.4 |
| with additive | 36.4 | 38.8 | 36.1 | 40.1 | 34.7 | 38.3 | 40.2 |

| 1) State Ho, Ha, and write a sentence for the claim. | 2) State when to reject Ho. |
|---|---|
| Ho: $\mu_d = 0$<br>Ha: $\mu_d < 0$<br>fuel additive improves gas mileage | reject Ho if pvalue < .10 |
| 3) Find the test statistic and p-value.<br>$t = -5.484$<br>pvalue = .000769 | 4) Conclusion<br>fuel additive improves mpg |

p. 472
#5b

Conf. int: T interval for $L_3$

| 1) Write the confidence interval. | 2) Is there a difference between the populations? Explain. |
| --- | --- |
| $(-1.734, .78359)$ | No, no difference. 0 is in the conf. int. |