

## 2-SAMPLE T TEST

*This test is used to compare 2 means from a between groups design*

The SAT scores of 13-year olds who took the test between 1980 and 1982 are below:

Group	n	x-bar	s
Males	19,883	416	87
Females	19,937	386	74

**Determine if male scores are significantly higher than female scores at the  $\alpha = .01$  level.**

**P) STATE POPULATION PARAMETERS:**

$\mu_m$  = the mean SAT math score of males

$\mu_f$  = the mean SAT math score of females

**H) STATE HYPOTHESES:**

$H_0: \mu_m = \mu_f$        $H_a: \mu_m > \mu_f$

**A) VERIFY CONDITIONS REQUIRED FOR TEST:**

Normal population or large sample size or justification for normality after omitting outliers

Since  $n_m > 30$  and  $n_f > 30$ , the Central Limit Theorem applies

**T) PERFORM TEST USING**

**a) TABLE C:**

i) Put data into lists and calculate x-bar/standard deviation (if necessary)

ii) Calculate t-statistic:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = 37.06$$

iii) Determine degrees of freedom:

Using smaller of  $n_1$  and  $n_2$ ,  $df = 19,883 - 1 = 19,882$

iv) Locate critical t-value

Table C ( $df = 1000$  and  $\alpha = .01$ ), the critical t value is 2.326.  
Since  $37.06 > 2.326$ , the P-value  $< .01$ .

**b) CALCULATOR:**

STAT ---> TESTS ---> 4: 2-Samp T Test ---> P-value = 0

$tcdf(\min, \max, df) = (37.06, 100, 19882) = 0$

**S) STATE CONCLUSION IN CONTEXT:**

There is very good evidence (P-value < .01) to reject  $H_0$  and conclude that 13-year old males scored higher on the math SAT test than 13-year old females between 1980 and 1982

**CONFIDENCE INTERVAL (Use PAIS):**

A 95% confidence level for the mean difference in SAT math scores between males and females can be found using:

STAT ---> TESTS ---> 0: 2-Samp T Int = (28.4, 31.6)

*We are 95% confident that 13-year old males scored between 28 and 32 points higher on the SAT math test than 13-year old females between 1980 and 1982.*