Quick Questions 16   Small Sample Hypothesis Testing Using Student's t Test

I. Place the number of the appropriate definition or formula next to the concept it defines.

A. Weighted or pooled estimate of the population variance __1__

B. Standard deviation of the differences __4__

C. t when comparing two dependent populations __5__

D. t when comparing two independent populations __2__

E. Used with one population __6__

F. Requires the use of the t distribution __3__

1. $\frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2}$	4. $\sqrt{\frac{\sum d^2-\frac{(\sum d)^2}{n}}{n-1}}$
2. $\frac{x_1-x_2}{\sqrt{s_w^2(\frac{1}{n_1}+\frac{1}{n_2})}}$	5. $\frac{\bar{d}}{\frac{s_d}{\sqrt{n}}}$
3. the population is approximately normal, $n \leq 30$, and the population variance isn't known	6. $\frac{\bar{x}-\mu}{\frac{s}{\sqrt{n}}}$

II. Linda is tracking the number of work days missed by employees before and after taking part in a company-sponsored lunchtime physical fitness program. Test at the .01 level of significance whether the average number of days missed went down for program participants.

Employee	A	B	C	D	E	F	G	
Before	8	9	6	8	3	4	5	
After	6	7	5	6	5	2	5	
d	2	2	1	2	-2	2	0	$\Sigma d = 7$
d^2	4	4	1	4	4	4	0	$\Sigma d^2 = 21$

$\bar{d} = \frac{\Sigma d}{n} = \frac{7}{7} = 1.0$

$s_d = \sqrt{\frac{\sum d^2-\frac{(\sum d)^2}{n}}{n-1}} = \sqrt{\frac{21-\frac{7^2}{7}}{7-1}} = 1.53$

$df = n-1 = 7-1 = 6$

α of $.01 \rightarrow t = 3.143$

$t = \frac{\bar{d}}{\frac{s_d}{\sqrt{n}}} = \frac{1.0}{\frac{1.53}{\sqrt{7}}} = 1.72$ Accept H_0 because 1.72 < 3.143. Days missed did not go down.

$H_0: \mu_d \leq 0$ and $H_1: \mu_d > 0$

III. Eight men applying to State University had a sample mean and variance on college board tests of 1,050 and 2,500 respectively. The respective numbers for nine women were 1,075 and 3,600. Test at the .05 level of significance whether women did better than men on these tests.

$n_1 = 8$
$\bar{X}_1 = 1,050$
$S_1^2 = 2,500$
$n_2 = 9$
$\bar{X}_2 = 1,075$
$S_2^2 = 3,600$
$\alpha = .05$

1. $H_o: \mu_2 \leq \mu_1$ and $H_1: \mu_2 > \mu_1$
2. $\alpha = .05$
3. The test statistic is $\bar{x}$
4. $df = n_1 + n_2 - 2 = 8 + 9 - 2 = 15$ α of $.05 \rightarrow t = -1.753$
5. Apply the decision rule.

$$t = \frac{\bar{X}_1-\bar{X}_2}{\sqrt{s_w^2(\frac{1}{n_1}+\frac{1}{n_2})}} = \frac{1,050-1,075}{\sqrt{3,086.7(\frac{1}{8}+\frac{1}{9})}} = -.93$$

$$s_w^2 = \frac{(n_1-1)s_1^2+(n_2-1)s_2^2}{n_1+n_2-2} = \frac{(8-1)2,500+(9-1)3,600}{8+9-2} = \frac{17,500+28,800}{15} = 3,086.7$$

Accept H_0 because -.93 is not beyond -1.753. Women's scores were not higher than men's scores.