MAT 135, Discussion Questions 5.02

1. How can we tell the difference between a situation where two-samples are dependent versus when they are independent?

dependent must have values, often displayed in a table

2. What is the formula for the test-statistic for two dependent samples?

$$t = \frac{\bar{d}_0 - \delta}{\frac{s_d}{\sqrt{n}}}$$

3. The value δ is sometimes used for the true mean difference between dependent samples. Why can we usually let this value be zero?

if we assume no change then $\delta = 0$

4. What is the formula for the confidence interval for the difference between dependent samples?

$$\bar{d}_0 \pm \overset{(\text{or } t_{\alpha/2})}{z_{\alpha/2}} \frac{s_d}{\sqrt{n}}$$

5. The manufacturer of hardness testing equipment uses steel-ball indenters to penetrate metal that is being tested. However, the manufacturer thinks it would be better to use a diamond indenter so that all types of metal can be tested. Because of the difference between the two types of indenters, it is suspected the two methods will produce different hardness readings. The metal specimens to be tested are large enough so that two indentations can be made. Therefore, the manufacturer uses both indenters on each specimen and compares the hardness readings. Based on the data below, do the two indenters produce different hardness measures?

Specimen	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	
Steel bar	50	57	61	71	68	54	65	51	53	L_1
Diamond	52	56	61	74	69	55	68	51	56	L_2

$L_1 - L_2 \Rightarrow L_3$

$H_0: \delta = 0$

$H_a: \delta \neq 0$

T-Test Data

$\mu_0 = 0$

List: L_3

$\neq \mu_0$

$t = -2.667$

$P = .0285 < .05$

reject null

there is evidence the hardness is different