MS 150 Statistics Test Five

A lawyer representing a group of children in Erewhon has retained you as a statistical consultant. The children allege that the super balls made by the Imperial Plastics Corporation of China are inconsistent in their bounciness from ball to ball. Before the lawyer files a suit, he wants to know if the differences observed by the children are statistically significant. If they are, the lawyer will need you to testify as an expert witness in the trial.

Two balls were randomly selected and each ball was dropped from a height of 100 cm. For each drop the bounce height was recorded. The ten bounce heights (b1 to b10) are recorded in each row below.

	b1	b2	b3	b4	b5	b6	b7	b8	b9	b10
Superball one (data x)	63	65	66	68	69	69	70	70	71	71
Superball two (data y)	47	77	76	74	75	71	68	72	83	80

To run this test, construct a 95% confidence interval to test whether the population mean difference μ_d could be zero. Bear in mind that the confidence interval is:

sample mean difference $- E < \mu_d <$ sample mean difference $+ E$

where the Margin of error E is calculated from:

$$Margin\,of\,error\,E = t_c\sqrt{\frac{(s_x)^2}{n_x}+\frac{(s_y)^2}{n_y}}$$

and the sample mean difference is the difference in the sample means.

1. Write the 95% confidence interval: _____ $< \mu_d <$ _____
2. _____ Based on this confidence interval, could the population mean difference be zero?
3. _____ Is the bounciness of the two balls significantly different at a 95% level of confidence?

The hypothesis test is as follows:

H_0: $\mu_d = 0$

H_1: $\mu_d \neq 0$

Use the TTEST function to find the p-value that the two samples have a population mean difference of zero. The function is as follows:

=TTEST(data_range_1;data_range_2;number of tails;3)

4. _____ What is the p-value?
5. _____ Is the mean difference in bounciness statistically significant at an alpha of 0.05?
6. _____ Do you **reject** the null hypothesis or **fail** to reject the null hypothesis?
7. _____ Do the children have a winning case at an alpha of 0.05?