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Practice Problems: Exercise 7 – Microengineering 110

Spring 2025

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1. The true average diameter of ball bearings of a certain type is supposed to be .5 in. A one-sample t test will be carried out to see whether this is the case. What conclusion is appropriate in each of the following situations? Assume that 95% confidence is required, unless indicated otherwise.

a. $n = 13, t = 1.6$

b. $n = 13, t = -1.6$

c.

d. $n = 25, t = -2.6$, 99% percent confidence is required

2. Cube compressive strength (MPa) of concrete specimens is provided below:

112.3, 97.0, 92.7, 86.0, 102.0, 99.2, 95.8, 103.5, 89.0, 86.7

Suppose the concrete will be used for a particular application unless there is strong evidence that true average strength is less than 100 MPa. Should the concrete be used? Perform a test of appropriate hypotheses.

3. Submerged arc welding (SAW) process is commonly used for joining thick plates and pipes. The heat affected zone (HAZ), a band created within the base metal during welding, was of particular interest to the investigators. Here are observations on depth (mm) of the HAZ both when the current setting was high and when it was lower.

Non-high 1.04 1.15 1.23 1.69 1.92 1.98 2.36 2.49 2.72 1.37 1.43 1.57 1.71 1.94 2.06 2.55 2.64
2.82

High 1.55 2.02 2.02 2.05 2.35 2.57 2.93 2.94 2.97

Does it appear that true average HAZ depth is larger for the higher current condition than for the lower condition? Carry out a test of appropriate hypotheses using a significance level of .01.

4. Lactation promotes a temporary loss of bone mass to provide adequate amounts of calcium for milk production. The total body bone mineral content (TBBMC) (g) for 10 people both during lactation (L) and in the postweaning period (P) is provided below:

	1	2	3	4	5	6	7	8	9	10
L	1928	2549	2825	1924	1628	2175	2114	2621	1843	2541
P	2126	2885	2895	1942	1750	2184	2164	2626	2006	2627

- a. Does the data suggest that true average total body bone mineral content during postweaning exceeds that during lactation by more than 25 g? State and test the appropriate hypotheses (HINT: Since we are testing for a difference of 25, define the appropriate equation carefully) using a significance level of .05.

- b. Perform a similar test using a 2-sample t-test. Does the (incorrect) use of the two-sample t test to test the hypotheses suggested in (a) lead to the same conclusion?
5. Data on cylinder strength (MPa) for various types of columns cured under both moist conditions and laboratory drying conditions is provided below.

	Type					
	1	2	3	4	5	6
M:	82.6	87.1	89.5	88.8	94.3	80.0
LD:	86.9	87.3	92.0	89.3	91.4	85.9
	7	8	9	10	11	12
M:	86.7	92.5	97.8	90.4	94.6	91.6
LD:	89.4	91.8	94.3	92.0	93.1	91.3

Does the drying method affect strength, assuming the data is paired?