

## 12.1 Homework for "t" Hypothesis Tests

**1)** Below are the estimates of the daily intakes of calcium in milligrams for 38 randomly selected women between the ages of 18 and 24 years who agreed to participate in a study of women's bone health.

808	882	1062	970	909	802	374	416	784	997
651	716	438	1420	1425	948	1050	976	572	403
626	774	1253	549	1325	446	465	1269	671	696
1156	684	1233	748	1203	1433	1255	1100		

- a) Construct a 99% confidence interval for the true mean daily calcium intake for women ages 18-24.
- b) A nutritionist believes that the average calcium intake for women ages 18 to 24 is 739 milligrams per day. If we were to test this claim based on the confidence interval above, state the null and alternative hypothesis and the alpha level, then state your conclusions.

**2)** The composition of the earth's atmosphere may have changed over time. One attempt to discover the nature of the atmosphere long ago studies the gas trapped in bubbles inside ancient amber. Amber is tree resin that has hardened and been trapped in rocks. The gas in bubbles within amber should be a sample of the atmosphere at the time the amber was formed. Measurement on specimens of amber from the late Cretaceous era (75 to 95 million years ago) gives these percents of nitrogen:

63.4	65.0	64.4	63.3	54.8	64.5	60.8	49.1	51.0
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Are these values significantly less than the present 78.1% of nitrogen in the atmosphere? Assume (this is not yet agreed on by experts) that these observations are an SRS from the Cretaceous atmosphere.

**3)** White blood cell counts are normally distributed with mean 7500. If a patient has taken 50 laboratory blood tests that have a mean of 7312.5 and a standard deviation of 393.44, does this give evidence at the 1% level that his white blood cell count is significantly different than normal?

**4)** For each of the following, decide if it describes 1 sample, 2 independent samples, or 2 dependent samples?

- a) We are testing to see if the mean volume of a bag of regular m&m's is equal to the stated volume of 8 ounces.
- b) We are testing to see if the mean volume of a bag of regular m&m's is equal to the mean volume of a bag of peanut m&m's.
- c) We are testing to see if there is a preference of regular m&m's or generic chocolate candies by doing a blind taste test in which subjects eat both kinds of chocolate candies in a randomly selected order, and rank both on a scale from 1-5.

- 5) An experiment was done by 15 students in a statistics class at the University of California at Davis to see if manual dexterity was better for the dominant hand compared to the nondominant hand (left or right). Each student measured the number of beans they could place in a cup in 15 seconds, once with the dominant hand and once with the nondominant hand. The order in which the two hands were measured was randomized for each student.

Student	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Dominant hand	22	19	18	17	15	16	16	20	17	15	17	17	14	20	26
Nondominant hand	18	15	13	16	17	16	14	16	20	15	17	17	16	18	25
Difference															

- Explain why the order of the two hands was randomized rather than, for instance, having each student tests the dominant hand first.
  - Compute a 90% confidence interval for the mean difference in the number of beans that can be placed into a cup in 15 seconds by the dominant and nondominant hands. FULL PROCESS!
  - Use the interval to address the question of whether manual dexterity is better, on average, for the dominant hand.
- 6) In a study of memory recall, eight students from a large psychology class were selected at random and given 10 minutes to memorize a list of 20 nonsense words. Each was asked to list as many of the words as he or she could remember both 1 hour and 24 hours later. Is there evidence to suggest that the mean number of words recalled after 1 hour exceeds the mean recall after 24 hours **by more than 3 words**? Use .01 significance level.

Student	1	2	3	4	5	6	7	8
1 hr later	14	12	18	7	11	9	16	15
24 hours later	10	4	14	6	9	6	12	12

7)

Paired t for height – momheight				
	N	Mean	StDev	SE Mean
Height	93	64.342	2.862	0.297
Momheight	93	63.057	2.945	0.305
Difference	93	1.285	3.136	0.325

95% CI for mean difference: (0.639, 1.931)  
t-Test of mean difference = 0 (vs > 0); t-Value = 3.95; p-Value = 0.000

- It has been hypothesized that college students are taller than they were a generation ago and therefore that college women should be significantly taller than their mothers. State the null and alternative hypotheses to test this claim. Be sure to define any parameters you use.
- Using the information in the Minitab output, the test statistic is  $t = \underline{\hspace{2cm}}$ . Identify the numbers that were used to compute the t-statistic. What formula was used to calculate the t-statistic?
- What are the degrees of freedom for the test statistic?
- Write the probability statement of the hypothesis test.
- Why is this a paired t test?