Lab 6 (80 pts.): Two Sample *T* and Matched Pairs T Procedure Objectives: Confidence interval and significance tests for two samples.

A (35 points) Food Intake and Weight Gain (Data Set: ex07-36wtgain.txt)

If we increase our food intake, we generally gain weight. Nutrition scientists can calculate the amount of weight gain that would be associated with a given increase in calories. In one study, 16 non-obese adults, aged 25 to 36 years, were fed 1000 calories per day in excess of the calories needed to maintain a stable body weight. The subjects maintained this diet for 8 weeks, so they consumed a total of 56,000 extra calories. According to theory, 3500 extra calories will translate into a weight gain of 1 pound. Therefore, we expect each of these subjects to gain 56,000/3500 = 16 pounds (lb). Here are the weights before and after the 8-week period expressed in kilograms (kg):

Subject	1	2	3	4	5	6	7	8
Weight before	55.7	54.9	59.6	62.3	74.2	75.6	70.7	53.3
Weight after	61.7	58.8	66.0	66.2	79.0	82.3	74.3	59.3
Subject	9	10	11	12	13	14	15	16
Weight before	73.3	63.4	68.1	73.7	91.7	55.9	61.7	57.8
Weight after	79.1	66.0	73.4	76.9	93.1	63.0	68.2	60.3

1. (5 pts.) Should you use two sample t or matched pairs t procedure to analyze the data? Please explain your answer without referring to the format of the data.
2. (5 pts.) Do you think these data are Normally distributed? Use graphical methods to examine the appropriate distribution. Write a short summary of your findings.
3. (10 pts) Find the 95% confidence interval of the weight gain and interpret your result.
4. (10 pts) Test the null hypothesis that the mean weight gain is 16 lb. (Hint: first convert pounds to kg. Because there are 2.2 kg per pound, you will need to divide the mean weight gain by 2.2.) Be sure to specify the null and alternative hypotheses, the test statistic with degrees of freedom, and the *P*-value. What do you conclude?
5. (5 pts) Compare the answers of 3 and 4. Are they saying the same thing? What are the practical consequences of the results?

B (45 points) House Prices (Data Set: houseprice.txt – web site)

How much more would you expect to pay for a home that has four bedrooms than for a home that has three? Here are some data for West Lafayette, Indiana. These are the asking prices (in dollars) that the owners have set for their homes.

Four-bedroom homes					
149,900	169,900	175,000	189,000	206,900	225,000
249,900	289,900	320,000	339,900	399,900	429,900
320,000	269,900				

Three-bedroom homes					
79,500	82,000	89,999	90,000	99,900	100,000
106,900	113,900	115,000	117,500	122,900	129,900
139,900	145,000	149,000	150,000	157,900	164,900
189,900	219,900	260,000	274,900	295,000	

1. (5 pts.) Should you use two sample t or matched pairs t procedure to analyze the data? Please explain your answer without referring to the format of the data.

2. (5 pts) Do you think these data are Normally distributed? Use graphical methods to examine the appropriate distributions. Write a short summary of your findings.
3. (5 pts) These data are not SRSs from a population. Give a justification for use of the two-sample *t* procedures in this case.
4. (5 pts) Would you consider using a one-sided alternative for this analysis? Explain why or why not.
5. (10 pts) Follow the four-step procedure, test the null hypothesis that the mean asking prices for the two sets of homes are equal versus the two-sided alternative. Give the test statistic with degrees of freedom, the *P*-value, and your conclusion. You may assume a 0.01 significance level in your discussion.
6. (5 pts) Give a 99% confidence interval for the difference in mean asking prices.
7. (5 pts) Interpret your 99% confidence interval.
8. (5 pts) Compare the answers of 5 and 6. Are they saying the same thing? What are the practical consequences of the results?