Homework 2

1. Fowle Marketing Research, Inc., bases charges to a client on the assumption that telephone surveys can be completed in a mean time of 15 minutes or less. If a longer mean survey time is necessary, a premium rate is charged. A sample of 35 surveys provided the survey times shown in the file named Fowle. Based upon past studies, the population standard deviation is assumed known with $\sigma = 4$ minutes. Is the premium rate justified?

   (a). Formulate the null and alternative hypotheses for this application.

   (b). At $\alpha = 0.01$, what is your conclusion?

   (c). What is your interpretation of the type II error for this problem? What is its impact on the firm?

   (d). What is the probability of making a Type II error when the actual mean time is 17 minutes?

   (e). Given $\alpha = 0.01$, if the firm want to control the probability of making a type II error to be less than 0.05 when the actual mean time is more than 17 minutes, how large the sample size is needed?

2. A production line operation is tested for filling weight accuracy using the following hypotheses.

Hypothesis	Conclusion and Action
$H_0 : \mu = 16$	Filling okay; keep running
$H_a : \mu \neq 16$	Filling off standard; stop and adjust machine

   The sample size is 30 and the population standard deviation is $\sigma = .8$. Use $\alpha = .05$.

   (a). What would a Type II error mean in this situation?

   (b). What is the probability of making a Type II error when the machine is overfilling by .5 ounces?

   (c). What is the power of the statistical test when the machine is overfilling by .5 ounces?

(d). Show the power curve for this hypothesis test. What information does it contain for the production manager?

3. In recent years more people have been working past the age of 65. In 2005, 27% of people aged 65-69 worked. A recent report from the Organization for Economic Cooperation and Development (OECD) claimed that the percentage working had increased (USA Today, November 16, 2012). The findings reported by the OECD were consistent with taking a sample of 600 people aged 65-69 and finding that 180 of them were working.

   (a). Develop a point estimate of the proportion of people aged 65-69 who are working.

   (b). Set up a hypothesis test so that the rejection of H_0 will allow you to conclude that the proportion of people aged 6569 working has increased from 2005.

   (c). Conduct your hypothesis test using $\alpha = 0.05$. What is your conclusion?

4. Consider the hypothesis test

$$H_0 : p_1 - p_2 \leq 0$$

$$H_a : p_1 - p_2 > 0$$

   The following results are for independent samples taken from the two populations.

   Sample 1

$$n_1 = 200$$

$$\bar{p}_1 = .22$$

   Sample 2

$$n_2 = 300$$

$$\bar{p}_2 = .16$$

   (a). What is the p-value?

   (b). With $\alpha = .05$, what is your hypothesis testing conclusion?

5. Scores in the first and fourth (final) rounds for a sample of 20 golfers who competed in PGA tournaments are shown in the following table. Suppose you would like to determine if the mean score for the first round of a PGA Tour event is significantly

different than the mean score for the fourth and final round. Does the pressure of playing in the final round cause scores to go up? Or does the increased player concentration cause scores to come down?

(a). Use $\alpha = .10$ to test for a statistically significantly difference between the

Player	First Round	Final Round	Player	First Round	Final Round
Michael Letzig	70	72	Aron Price	72	72
Scott Verplank	71	72	Charles Howell	72	70
D. A. Points	70	75	Jason Dufner	70	73
Jerry Kelly	72	71	Mike Weir	70	77
Soren Hansen	70	69	Carl Pettersson	68	70
D. J. Trahan	67	67	Bo Van Pelt	68	65
Bubba Watson	71	67	Ernie Els	71	70
Reteif Goosen	68	75	Cameron Beckman	70	68
Jeff Klauk	67	73	Nick Watney	69	68
Kenny Perry	70	69	Tommy Armour III	67	71

population means for first- and fourth-round scores. What is the p-value? What is your conclusion?

(b). What is the margin of error for a 90% confidence interval estimate for the difference between the population means? Could this confidence interval have been used to test the hypothesis in part (a)? Explain.

6. Home values tend to increase over time under normal conditions, but the recession of 2008 and 2009 has reportedly caused the sales price of existing homes to fall nationwide (Businessweek, March 9, 2009). You would like to see if the data support this conclusion. The file HomePrices contains data on 30 existing home sales in 2006 and 40 existing home sales in 2009.

   Use a parametric test method with $\alpha = 0.01$ to justify whether resale prices of existing homes have declined from 2006 to 2009.