

Assignment 2, due Feb. 4, 2020 at beginning of class

(Out of 50 points)

1. (Total 17 points) In a study comparing men that survive heart attacks to those that do not survive, emergency room records were obtained for a sample of 65 men who ultimately died and 65 men who survived. The arterial blood pressure at the time of admittance to the emergency room was determined. The mean arterial blood pressure for the sample of surviving patients is 91.8 and the sample standard deviation is 12.71. For the patients who did not survive, the mean and sample standard deviation are 87.31 and 13.60 respectively.

(a) Is there a significant difference between the mean arterial blood pressures of the two groups?

(2)

i. State the hypotheses.

(2)

ii. What is the pooled estimate of standard deviation.

(2)

iii. Calculate the observed value of the test statistic.

(1)

iv. What are the degrees of freedom of the test statistics

(2)

v. Bound the p-value as accurately as possible using the t-table on the class web site.

(1)

vi. Are the results statistically significant at the $\alpha = .01$ level of significance?

(5)

(b) Construct a 99% confidence interval for the mean difference in arterial blood pressure.

(2)

(c) Explain how this confidence interval can be used to test the null hypothesis, and confirm that it gives the same answer as does the test procedure.

2. (Total 18 points) Human beta-endorphin (HBE) is a hormone secreted by the pituitary gland under conditions of stress. A researcher conducted a study to investigate whether a program of regular exercise might lower the resting (unstressed) concentration of HBE in the blood. He measured blood HBE levels in January and again in May in 10 participants in a physical fitness program. The results are shown in the table below:

Participant	HBE Level (pg/ml)		
	January	May	Difference
1	42	22	20
2	47	29	18
3	37	9	28
4	9	9	0
5	33	26	7
6	70	36	34
7	54	38	16
8	27	32	-5
9	41	33	8
10	18	14	4
Mean	37.8	24.8	13.0
SD	17.6	10.9	12.4

(2)

(a) State the null and alternative hypotheses.

(2)

(b) Calculate the observed value of the test statistic.

(1)

(c) What are the degrees of freedom of the test statistic.

(2)

(d) Bound the P value as accurately as possible, using the t-table on the class web site.

- (2) (e) What assumption are you making about the population from which the data are sampled?
- (2) (f) Using a type I error probability of $\alpha = .05$, conclude whether or not the results are statistically significant.
- (2) (g) Describe what would constitute a type II error in the context of this problem.
- (5) (h) Construct a 95% confidence interval for the mean difference in HBE level.

3. (Total 15 points) Sixty-five pregnant women at a high risk of pregnancy-induced hypertension participated in a randomized controlled trial comparing 100mg of aspirin daily and a placebo during the third trimester of pregnancy. The observed rates of hypertension are shown in the following table

	Aspirin treated	Placebo treated	Total
Hypertension	4	11	15
No Hypertension	30	20	50
Total	34	31	65

- (2) (a) Assess whether aspirin is effective in reducing the risk of hypertension.
 - (2) i. State the hypotheses.
 - (3) ii. Calculate the observed value of the test statistic.
 - (2) iii. Calculate the p-value using the normal table.
 - (1) iv. Would you reject the null hypothesis when testing at level $\alpha = .05$?
- (6) (b) Calculate a 95% confidence interval for the difference in hypertension rates in the aspirin and placebo groups.
- (1) (c) Based on the 95% confidence interval, conclude whether or not the results are significant at the $\alpha = .05$ level