

## Homework 5

(Due Friday, March 3, by 4:00 p.m.)

Please submit your assignment *on paper*, following the Guidelines for Homework Write-Ups and Submissions. Please include your name (with your last name underlined), and your NetID at the top of the first page.

1. **Do Not** use a computer for this problem (a calculator is allowed).

Tom wishes to examine the relationship between the time the college male students spent on playing computer games and spent on exercising per month in the university he attends. A random sample of seven male students participated in this survey, with self-reporting results as below:

Computer Game Time in hours ( $x$ )	19	18	11	6	15	21	29
Exercise Time in hours ( $y$ )	32	38	52	30	56	9	7

$$\sum x = 119; \quad \sum y = 224; \quad \sum x^2 = 2,349; \quad \sum y^2 = 9,338; \quad \sum xy = 3,276;$$

$$\sum (x - \bar{x})^2 = 326, \quad \sum (y - \bar{y})^2 = 2,170 \quad \sum (x - \bar{x})(y - \bar{y}) = -532.$$

Assume that  $(X, Y)$  have a bivariate normal distribution.

- (a) Determine the sample correlation coefficient  $r$  between the time spent on playing computer games and the time spent on exercising.

- (b) Test  $H_0: \rho = 0$  vs.  $H_1: \rho \neq 0$  at  $\alpha = 0.05$ . Use  $T = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$ . Report the value of the test

statistic, the  $p$ -value for the test statistic, and the decision in the context of this problem. (For the  $p$ -value, you may give a range based on the  $t$ -table.)

- (c) Test  $H_0: \rho = 0$  vs.  $H_1: \rho \neq 0$  at  $\alpha = 0.05$ . Use  $W = \frac{1}{2} \ln\left(\frac{1+r}{1-r}\right)$ . Report the value of the

test statistic, the  $p$ -value for the test statistic, and the decision in the context of this problem.

- (d) Test  $H_0 : \rho = -0.6$  vs.  $H_1 : \rho < -0.6$  at  $\alpha = 0.05$ . Report the value of the test statistic, the  $p$ -value for the test statistic, and the decision in the context of this problem.
- (e) Suppose each of the seven participating students reported 1 hour less for the time spent on playing computer games. What is the correlation coefficient between the time spent on playing computer games and the time spent on exercising in this scenario? Explain or justify your answer.

2. **Do Not** use a computer for this problem (a calculator is allowed).

In order to compare the average GPA for the members of three activity clubs at a university, four students were randomly chosen from each club, and the results are given in the following table:

Club					$\bar{y}_j$	$s_j^2$
Drama ( $j = 1$ )	1.8	0.9	1.5	2.4	1.65	0.39
Writing ( $j = 2$ )	2.4	3.3	3.9	3.6	3.30	0.42
Statistics ( $j = 3$ )	2.1	2.4	3.0	3.9	2.85	0.63

Assume the three populations of GPAs are normally distributed with equal variances. Use the ANOVA F test to test  $H_0 : \mu_1 = \mu_2 = \mu_3$  at the 5% level of significance. Report the value of the test statistic, the critical value(s), and the decision. Also find the  $p$ -value (you may give a range).