Math 1410: Take-Home Assignment

Directions: Answer each part of the following questions and justify the answers with explanations where appropriate. Solutions should be typed.

1. Researchers are studying the efficiency of a new water filtration system and want to determine if an experimental filter removes more toxic particulate matter than the system currently being used. The data below represents toxic particulate in PPM (parts per million). Ten random samples were taken from each system.

Exp. System:	6	5	3	8	6	9	4	7	8	6
Std. System:	5	8	7	6	7	8	9	10	9	7

a. Calculate the means and standard deviations for both groups.

1. ***Ans Exp Means* = 6.2** **1.** ***Ans = Std means* = 7.8**

2. ***Ans Exp SD* = 1.8** **2.** ***Ans = Std SD* = 1.4**

b. What would the null hypothesis be?

Ans H0: P = 0: No significant difference

c. What would the alternative hypothesis be?

Ans H1:P ≠ 0: Significant difference between filters, which expiermiental filter will remove more toxic particulate from water

d. What is tcrit?

Ans Step 2: Tcrit value at 95% at 9 D.F. = 2.262

e. How did you select the probability value for this t-statistic?

f. What are your degrees of freedom?

Ans D.F. = n-1 = 10-1 = 9

g. What is t-calculation

1. $t = \frac{6.2 - 0}{} = \frac{6.2}{} = 10.896$

Ans = $1.8/\sqrt{10}$ 0.569

2. t = $\frac{7.8 - 0}{} = \frac{7.8}{} = 17.607$

***Ans* =** 1.4/√10 .443

h. Is there a significant difference between the groups?

***Ans* =** Yes

i. Interpret the answer

ii. The experimental filter removes more toxic particulate PPM from water

j. If you have made an error, would it be a type I or type II error? Why?

***Ans* =** Type I error, evidence supports that there is a significant difference that the experimental filter removes more toxic particulate from water.

2. A researcher wants to test the effects of sleep deprivation on coordination. The data below shows the number of errors people make on a common coordination task during a 1 hour interval when receiving 4 hours of sleep per night versus 8 hours of sleep. ***Conduct a formal hypothesis test and interpret a solution.***

8 hours:	21	18	30	15	12	20	23
4 hours:	31	16	28	32	23	19	30

1. ***Ans* = *Step 1: 8*** hr Subjects have better coordination then 4 hr subject

2. ***Ans* = *Step 2:*** Reject H0

3. Discuss the ethical considerations of the research investigation described in problem 2. What could a researcher do to minimize the risks to the subjects? How might the study be designed?

1. ***Ans* =** Possible sleep deprivation of the 4 hour group.

2. ***Ans*** = 4 hr group at greater risk for harm due to lack of common coordination researchers can ensure" common tasks" are face from endangerment provide appropriate nutrition to both groups.