**ChE 320\_Spr\_17\_HW 1 Solution**

1-6. Open-ended question, your answers may be different. Representative answer is provided here:

*Example of conceptual population: Conducting glass manufactured by the new method. (If used by industry, the population*

*Will exist. However, it does not physically exists yet. We only made 50 samples)*

*Example of physical population: A box of commercially available glass samples.*

*From both population, we can draw random samples to answer the question “What is the mean electrical conductivity of this*

*glass?”*

*In a box of glass, we generate a random number with our calculator’s Ran# button. It is a fraction. We multiply it by 10 and round it to nearest whole number. It always falls from 1-10. Say, its value is n. We take the nth glass from the previous sample. To start with, we start counting from the first sample. We do not take the first one as sample though.*

1-8. Open-ended question, answers may vary. A story clarifying this idea is presented here:

*“I always noticed that whenever I wear new shirt, I perform worst in the exam. I have plenty of data to corroborate this as a fact. The empirical model for this case is: If I wear a new shirt, I will perform badly in exam.*

*What is the mechanistic model?*

*Being a man of science, I could not accept the fact that I have such a superstition. I went to a psychiatrist. She asked me a lot of*

*apparently irrelevant questions and took a lot of money and the point when I was seriously considering to discontinue, gave me the following mechanistic model for the observation:*

*My mother had similar superstition. For this reason she never let me were new shirts during exams when I was kid. She allowed me to wear new shirts only in special occasions. Hence, new cloths are strongly associated with fun events in my mind. Hence, I stay distracted if I were new shirts. This distraction contributes to worst performance.*

*It seems credible mechanism to me!”*

1-12. No. Selecting the three consecutive bottles and going to the production line once every hour may result in data with specific pattern and that are not random. The bottles being produced thus do not have the same chance of being selected.

2-6. **Sample average**: 

**Sample standard deviation**:



**Dot Diagram**:

. . . . . . . ..

-------+---------+---------+---------+---------+--------- Crack length

1.40 1.75 2.10 2.45 2.80 3.15

2-8. **High Dose Group:**

**Sample average:**



**Sample variance:**



**Sample standard deviation**:



The sample standard deviation could also be found using



where





**Control Group:**

**Sample average:**



**Sample variance:**



**Sample standard deviation:**



The sample standard deviation could also be found using



where

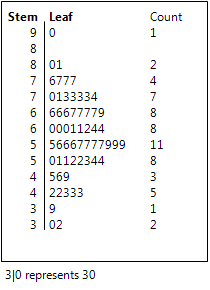




The control group has higher variance.

2-16. Stem-and-leaf of Suspended solids

N = 60



In this solution, the numbers are rounded up. However, other variations are also possible.

2-32.



Roughly 63% of defects are described by parts out of contour and parts under trimmed.

2-38. a) Sample Mean: 48.125, Sample Median: 49

b) Sample Variance: 7.247, Sample Standard Deviation: 2.692

c) The data appear to be skewed.



d) 5th Percentile: 43.25, 95th Percentile: 52

2-52. a) Positive sign



b)

= 0.993. X has a strong positive correlation with Y

**3.1-3.9**

3-1. Continuous

3-2. Discrete

3-3. Continuous

3-4. Discrete

3-5. Discrete (Strictly speaking it is discrete, but it can be written as continuous)

3-6. Continuous

3-7. Discrete (Strictly speaking it is discrete, but it can be written as continuous)

3-8. Continuous

3-9. Continuous