***SIE 330R Homework, Spring 2023***

# Quiz 1 (Chapter 1, due Jan 17, 2023)

Homework must be readable! Do not just send in numbers or charts. You must explain the homework answers Preferred to receive homework in Word doc format with any excel or Minitab results pasted into word document. You may choose to use pdf which is also OK.

**Put answers to all questions in one document NOT in separate documents**

1.2: Suppose that you want to investigate the factors that potentially affect cooking rice.

1. What would you use as a response variable that could impact the response?

* Color of rice after cooking.
* Weight of rice batch before and after cooking.
* Size of rice grains after cooking.

1. List all of the potential sources of variability that could impact the

response?

* Temperature
* Brand of rice
* Amount of rice cooked
* Type of rice
* Size of cooking pot

1. Complete the first 3 steps of the guidelines (State Problem, Identify

Response, Choice of Factor) for designing experiments (from section 1.4).

1. State Problem:

Maximize the number of cooked rice grains while minimizing the cooking time.

2. Identify Response:

Weight of cooked rice after a certain amount of time cooking in certain amount of water.

3. Choice of Factor:

- Temperature levels (F)

- Cooking Time (min)

- Weight of rice before and after cooking (g)

1.8: What is replication? Why do we need replication in an experiment? Present an example that illustrates the differences between replication and repeated measures.

Replication is running an experiment multiple times and measuring with the same settings multiple times ([Reference](https://www.google.com/search?q=replicable+vs+repeated+measurements&source=lnms&tbm=vid&sa=X&ved=2ahUKEwjLi46r5s_8AhXzLEQIHWs1DHEQ_AUoAnoECAEQBA&biw=957&bih=839&dpr=1#fpstate=ive&vld=cid:4981c84e,vid:HHWFFd1p488)). Replication is needed in an experiment to avoid bias and best reflect real life situations. Repeated measures are measurements done multiple times on a single run and averaged ([Reference](https://www.google.com/search?q=replicable+vs+repeated+measurements&source=lnms&tbm=vid&sa=X&ved=2ahUKEwjLi46r5s_8AhXzLEQIHWs1DHEQ_AUoAnoECAEQBA&biw=957&bih=839&dpr=1#fpstate=ive&vld=cid:4981c84e,vid:HHWFFd1p488)). An example of replication can include variability from changing equipment settings between runs or variability from other environmental factors that may change over time. Whereas a repeated measures example can be the operators of a factory configuring settings at predetermined levels, running production, and measuring the quality of five products. They then reset the equipment to new levels, run production, and measure the quality of five products. They continue until production is run one time at each combination of factor settings and five quality measurements are taken at each run. These previous two examples illustrate the differences between replication and repeated measures. ([Reference](https://support.minitab.com/en-us/minitab/21/help-and-how-to/statistical-modeling/doe/supporting-topics/basics/replicates-and-repeats-in-designed-experiments/#:~:text=The%20operators%20set%20the,taken%20at%20each%20run.))

1.9: Why is randomization important in an experiment?

***Randomization is important in an experiment because it avoids bias which ensures that every member of population has equal chance of being chosen for the sample. It is important for a sample to be as similar to the population as possible.***