Homework 2

Due January 30, 2020 at 11:59 PM

1. P. 47: 1 (5 points)

   Possible controlled variables: operator, lauch angle, launch force, paper clip size, paper manufactuer, plane constructor, distance measureer, and wind. The response is Flight Distance and the experimental variables are Design, Paper Type, and Loading Condition. Concomitant variables might be wind speed and direction (if these cannot be contrlled), ambient temperature, humidity and atmospheric pressure.

2. P. 47: 2 (5 points)

   Advantage: may reduce baseline variation (background noise) in the response, making it easier to see the effects of factors. Disadvantage: the variable may fluctuate in the real world, so controlling it makes the experiment more artificial — it will be harder to generalize conclusions from the experiment to the real world.

3. P. 64: 1 (5 points) Label the widgets 1, 2, ..., 491 (can also label 0, 1, 2, ..., 490). Choose the widgets labeled 121, 405, 91, 134, 464, 313, 249, 141.

4. P. 64: 2

   (a) (5 points) Possible responses: volume of poped corn, numer of unpoped kernels, and tasteof poped corn.

   (b) (5 points) Time poped (short vs. long) and Poping Method (frying vs. hot air poping) are two possible factors. A 2×2 factorial data structure would result from choosing two levels for each factor (as was done above). and testing all 4 factor level combinations:

Time	Poping Method
short	frying
long	frying
short	hot air
long	hot air

   (c) (5 points) You can randomly assign one-forth of the available kernels to each factor-level combination. You could randomize the order in which each test is performed. If the measurement of the response is subject to measurement error or time effects, you might also randomize the order in which each batch is measured.

   (d) (5 points) If there will be replications, there may not be enough popcorn in one package to supply the entire experiment; it may be necessary to use 2 or more packages of corn. In this case, package could be treated as blocking factor. For each package, one test could be performed for each factor-level combination.

5. P. 65: 8

   (a) (5 points) See P. 24. 8(b) for the factors and levels. Two possible responses would be flatness and concentricity (other reasonable responses are also OK).

(5 points) Replication dictates that at least one of the 8 factor-level combinations given in 8(b) be run at least twice. One possibility is to run each factor-level combination twice, for total of 16 runs.

Test Label	Test Order	Vendor	Heating Time	Cooling Method	Flatness	Concentricity
1		1	short	1		
2		1	short	1		
3		2	short	1		
4		2	short	1		
5		1	long	1		
6		1	long	1		
7		2	long	1		
8		2	long	1		
9		1	short	2		
10		1	short	2		
11		2	short	2		
12		2	short	2		
13		1	long	2		
14		1	long	2		
15		2	long	2		
16		2	long	2		

(b) (5 points) For the scenario in (a), you should use 16 slips of paper. Each slip corresponds to a run. Order the runs in the same order as their corresponding slips are picked from the hat. Avoid placing the slips into the har in any special order, and mix the slips well before picking them. All slips should be physicalling identical so that teh selection order is completely random.