STAT 321: Parachute Names: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Spring 2018 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Points: 40 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Parachute Experiment: Fractional Factorial Design

**Responses**

|  |  |
| --- | --- |
| Response | Goal |
| Fall Time (Seconds) | Maximize fall time |
| Distance from Target (Inches) | Minimize distance from target |

**Experimental factors under consideration**

|  |  |  |  |
| --- | --- | --- | --- |
| Factors | Type | Low | High |
| A: Weight | Numeric | E.g. Two army, 3 washers | Double low setting |
| B: Parachute Surface Area | Numeric | Less than one sheet of paper | Must be at least 2 x area of low setting |
| C: String Length | Numeric | 12-18 inches | Must be at least 2 x length of low setting |
| D: Fall Distance | Numeric | 2nd floor (18.2 ft) | 3rd floor (32.6 ft) |
| E: Parachute Vent | Text | No Vent | Vent |
| F: Parachute Shape | Text | Pick one: circle, square, triangle, rectangle, other | Pick another shape |
| G: Paper Color | Text | White | Non-white |

Use Minitab to setup a 27-3 design (i.e. a 1/8 fraction of a 2^7 design). For the numerical factors, make sure and specify the actual numerical value for the “low” and “high” setting when setting up your design. Run 2 **replicates** of your design.

Writing a Report

Your written report is NOT simply cutting and pasting computer output. You should assume that the reader knows nothing about your experiment. This should be similar to a scientific report, and it must contain the following sections.

1. An Introduction.   
This should briefly state the research problem.

2. A Methods Section.   
In this section, discuss the experimental setup, e.g. consider the following items.

1. What type of design was utilized for your experiment?
2. How many replicates were run?
3. What are the response variables under consideration?
4. What is the impact of having to run your experiment as a fractional factorial design?

3. A Results Section.   
The technical outcomes from the analysis are provided in this section.

1. A discussion of appropriate factors that are deemed statistically to have an impact on the response variable(s).
2. You should include any relevant graphs associated with statistically important factors.
3. A statistical evaluation of potentially optimal settings. Goal is to maximize fall time and minimize distance to target.
4. An evaluation of appropriateness of model assumptions.

4. A Discussion and Conclusions Section.

This section includes an overview or summary of your experimental findings. This section should be written so that a non-statistician can easily gain an understanding of your findings, i.e. less technical than Section 3. This section is often the only section read by design engineers or other decision makers, etc.