Name: _____   Partner(s): _____

<div align="right">_____</div>

Homework Questions for Investigation #1

Part I
Variables

1. After a forest fire, the rangers wish to study the growth rate of different native grass species in the soil. The rangers choose similar soil plots that have equal areas, equal slopes, and receive the same sunlight and weather conditions. What are the independent variable (IV), the dependent variable (DV) and the controlled variables (CV's) in this study?

   IV is: _____   DV is: _____

   CV's are: _____; _____; _____; _____

2. Is "native grass species" a qualitative or a quantitative variable? How do you know? Is "growth rate" a qualitative or quantitative variable? Again, how do you know?

3. If the rangers were to plot their data of their study described in Question 1, what type of graph would be the most appropriate to use in this case? Why? (Hint: What type of variable is the IV?)

Part II
Rules of the Game

4. Consider the theory that your research group formulated for the game presented in **Part II**. What would you need to do in order to check whether or not a hypothesized set of moves will take place?

5. How was this activity similar to the how scientists determine how nature behaves? How was it different?

Classification Activity

6. What type of graph would be the most appropriate for representing the data from the classification (color concentration) activity? Why?

7. Plot the <u>average</u> color concentration that you obtained from that activity in a separate sheet using <u>either graph paper or some plotting software</u> and attach it to this packet when submitted.

The table below lists data of the arm span and height of ten people. Use this information to answer homework questions 8-11.

Table 7

Participant	Arm Span (cm)	Height (cm)		Participant	Arm Span (cm)	Height (cm)
1	104	106		6	177	177
2	162	161		7	160	158
3	148	148		8	124	120
4	64	67		9	148	149
5	188	190		10	160	160

8. If you were to plot "Arm Span vs. Height" from the data shown in Table 7, would it be appropriate to make a bar graph? Why or why not? (You do not have to create the graph.)

9. According to "Arm Span versus Height" data in the table above, what seems to be the general relationship between the arm span and height of a "typical" human being? What important variable(s) should be controlled in order to have meaningful data?

10. Consider the "Arm Span versus Height" data in Table 7 above. Find the number of participants that can be classified as one of the following:

- "square" (Height = Arm Span ± 1.0 centimeter)
- "tall rectangle" (Height > Arm Span + 1.0 cm) or
- "wide rectangle" (Height < Arm Span – 1.0 cm)

and complete the following data table:

"Shape" of Participant	Number of Participants
Tall Rectangle	
Square	
Wide Rectangle	

11. What are the independent variable and dependent variable in the table shown in Question 10 above? If you were to plot the data in <u>this</u> table, what type of graph would be the most appropriate to create? Why? (You do not have to create the graph.)

Pendulum

12. Consider the three experiments performed during the pendulum investigation: Angle Variation, Mass Variation, and Length Variation). In the table below, identify for which (if any) of these three experiments the independent variable had a significant effect (more than 10% over the full range of the data) on the time period for one complete oscillation?

IV of Experiment	Significant Effect on the DV? (Yes / No)
Angle	
Mass	
Length	

13. <u>Using graph paper or a plotting routine</u>, plot the data that you acquired from the pendulum investigation. You should have three separate graphs since you actually performed three separate experiments with the pendulum. Each graph should plot the values of the independent variable (those chosen in advance) on the horizontal axis and the values of dependent variable (those found) on the vertical axis. Attach these three graphs to your packet when submitted. **Hints for the maximum grade:** Each graph should include the following: 1) a title, 2) axes labels (with correct units!), 3) proper scaling of the axes, and 4) a trendline sketched smoothly through the data.

14. If the independent variable in any of the three pendulum experiments did have a significant effect (more than 10% over the range of the data) on the time period for one complete oscillation, did the effect generally show a *linear* (straight-line) relationship to the time or was the trend curved? Support your answer with evidence.

15. Some older clocks use a pendulum to keep time. If such a clock were running slow, what would be the most effective adjustment that you could make (based on your observations in this investigation) so that the pendulum keeps the correct time?

16. Suppose you are at the park babysitting a child who is playing on the swings. If the child asked you to sit on the swing with the child on your lap, how would that affect the time it takes to complete one swing? Is this a significant effect?

17. Using your graph(s), determine what length you need to make a 50 g simple pendulum in order to have it undergo 12 complete oscillations in 15 s if released 30° from the vertical. Explain your reasoning. (Hint: First, calculate the period of one complete oscillation and show calculation. Then refer to one of your graphs.) Your instructor will provide the missing numbers.