Data Tables, Graphs, and Drawing Conclusions Name:_________________________Period:_____

Scenario A: A construction company gathers data for the following question

"How does the compression strength of a concrete column depend on the diameter of the column?"

Diameter of Column m (+/- 0.3)	Compression Strength lbs (±5) Trial #1	Compression Strength lbs (±5) Trial #2	Compression Strength lbs (±5) Trial #3	Average Compression Strength (lbs)	Compression Strength Uncertainty (lbs)
0.5	2620	2510	2370	2500	
1.0	4750	5025	5225	5000	200
1.5	7100	7825	7575		
2.0	9400	10275	10225	10000	400
2.5	11900	12475	13125		600

1. Fill out the average and uncertainty columns in the data table.
2. Graph this data on the table below.
3. What does the slope signify?

It tells us that the compression strength of the column increases by ___ pounds for every 1 meter increase in the diameter of column.

4. What kind of conclusion can be drawn from the graph?

*I conclude that there is a _________ relationship between ________________ and _________________. This can be modeled mathematically as _________ = 5000 * _____________. So I predict with ________ confidence based on my data that when the 1.8 m column is compressed with a 8000 lbs load it hold/break, because the best-fit line hits near the _____ of most of the data points and the this prediction is within my data range.*

Scenario B: A freshman basketball player gathers data for the following question.

"How is the rebound height of a basketball dropped from 8 m high affected by the air pressure inside of the ball?"

Pressure PSI (± 0.5)	Rebound Height cm (± 3) Trial #1	Rebound Height cm (± 3) Trial #2	Rebound Height cm (± 3) Trial #3	Average Rebound Height (cm)	Uncertainty in Average Rebound Height (cm)
0.1	0	0	0	0	0
5.0	102	99	99		2
7.1	203	198	204	202	
11.3	511	503	514	509	6

1. Fill out the average and uncertainty columns in the data table.
2. Using the Logger Pro program create a graph of rebound height vs pressure.

3. What kind of relationship is this? ___________

4. Using Vernier and the graph what kind of conclusion can be drawn from the graph? Include *a prediction for rebound height when the ball is pressurized to 12.0 psi and dropped from 8 m.*

Scenario C: An early 20th Century Lawyer turn Astronomer noticed a relationship between the distances of nearby galaxies and the speed in which they appear to be moving away and ask the following question.

"How does the distance a galaxy is from our Milky Way affect the speed at which it is moving away?"

Distance to other Galaxy Mpc (+/- 0.3)	Speed other Galaxy is moving away km/s (±30)
0.5	270
0.9	500
1.4	730
1.7	960
2.0	990

1. Graph this data on the table below.

2. What does the slope signify?

3. What kind of conclusion can be drawn from the graph?

Scenario D: Data for the following question is gathered while you are on a seesaw with an old childhood friend.

"How is the distance from the pivot point on the seesaw affect the force needed to support your 600 N friend?"

Distance m (+/- 0.1)	Force Needed N (± 6) Trial #1	Force Needed N (± 6) Trial #2	Force Needed N (± 6) Trial #3	Average Force (N)	Uncertainty in Force (N)
0.1	6010	6030	5930	6000	30
0.5	1222	1183	1207	1200	10
1.0	611	606	588		
1.3	462	470	455		
1.7	347	366	350	350	10

5. Fill out the average and uncertainty columns in the data table.
6. Using the Logger Pro program create a graph of Force Needed vs Distance.

7. What kind of relationship is this? ______________

8. Using the graph what conclusions and predictions can be made about the force needed to balance your 600 N friend when she is sitting 1.8 m away from the pivot point?

Scenario E: While blowing bubbles with your little cousin, you notice that the bigger the bubbles you make the more bubble solution you use. So you wonder, "How is the radius of a bubble effect how many bubbles you can make out of a 100 mL bottle of bubble solution" and take the following data:

Radius of Bubble cm (+/- .3)	Number of Bubbles Trial #1	Number of Bubbles Trial #2	Number of Bubbles Trial #3	Average Number of Bubbles (+/- 1)
0.5	444	457	451	451
1.0	119	119	122	120
2.0	31	31	30	31
4.0	8	7	8	8
8.0	2	2	2	2

1. Using the Logger Pro program to create a graph of max bubbles vs radius of bubble.

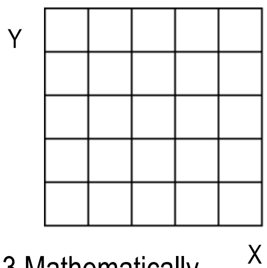
2. What kind of relationship is this? ______________

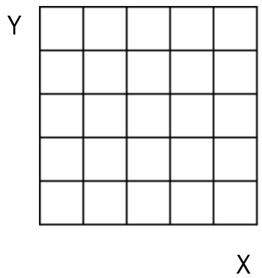
3. Using Vernier and the graph write only your predictions and reasoning in your confidence for the number of bubbles made if each one has a 16.0 cm radius?

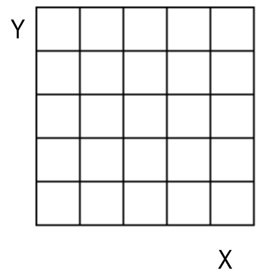
For questions 1 – 4 compete the four representations for the four patterns below.

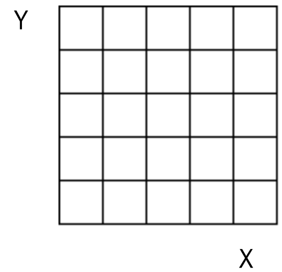
- Linear- constant = 10	-Quadratic- constant = 10	-Inverse- constant = 10	-Horizontal- constant = 10
<u>1a. Pattern:</u> Linear	**<u>1b. Pattern:</u>**	**<u>1c. Pattern:</u>**	**<u>1d. Pattern:</u>**

<u>2. Graphically</u>









<u>3.Mathematically</u>

Y = Y = Y = Y =

<u>4. Data Tables:</u>

X	Y
1	
2	
5	

X	Y
1	
2	
5	

X	Y
1	
2	
5	

X	Y
1	
2	
5	

5. <u>Visually</u> ______________________________.

x -> X	x -> X	x -> X	x -> X
y ->	y ->	y ->	y ->

6. In words:

7. At a high school level clearly explain why is it useful for people to find patterns in nature?

8. At a high school level clearly explain why in science we prefer a data-informed decision over a wild-guess:

9. What does it mean to use evidence-based reasoning

Questions on Patterns

Find 2 significant similarities between linear and quadratic:

1.

2.

Find 2 significant differences between linear and quadratic:

3.

4.

Find 2 significant differences between linear and inverse:

5.

6.

Find 2 significant differences between inverse and quadratic:

7.

8.

For each pattern use proportional reasoning to complete the relationship:

9. Linear
Y goes up by a factor of 9 then X ______________

X -> x then Y ->

y -> y then x ->

x goes up by a factor of 4 then y ______________

10. Quadratic
Y goes up by a factor of 16 then X _______

X -> x then Y ->

y -> y then x ->

x goes up by a factor of 4 then y ________

11. Inverse
Y goes down by a factor of 9 then X ___________

X -> x then Y ->

y -> y then x ->

x goes up by a factor of 4 then y ______________

12. Horizontal
Y goes down by a factor of 64 then X _____

X -> x then Y ->

y -> y then x ->

x goes up by a factor of 4 then y ________

13. Rank the four patterns from easiest to reason about to most difficult to reason about: