Successive Differences

Name _____

ID: 10124 Class _____

Problem 1 – Perimeter and Side Length

How does changing the side length of a square change its perimeter?

What is the relationship between side length and perimeter: linear, quadratic, or cubic?

Explore the model in the Cabri Jr. file **SQUARE**.

- Describe how the perimeter changes when the side length changes.

Side Length	Perimeter
1	
2	
3	
4	
5	
6	
7	
8	

Enter the data from the table in lists L1 and L2. Then calculate the successive differences in L3.

- What do you notice about the differences?

- How much does the perimeter of a square change for each unit of change in side length?

- What type of relationship is there between perimeter and side length: linear, quadratic, cubic, or none of these? Explain how you know.

Plot the data in L1 and L2 as a scatter plot.

- Which is the independent variable, side length (L1) or perimeter (L2)? Which is the dependent variable?

- What shape do the points describe?

Add a regression line.

- What is the regression equation?

- Describe the relationship between the regression line and the points.

Problem 2 – Surface Area and Edge Length

How does changing the edge length of a cube change its surface area?

What is the relationships between edge length and surface area: linear, quadratic, or cubic?

Explore the model in the Cabri Jr. file **CUBE**.

- Describe how the surface area changes when the edge length changes.

Edge Length	Surface Area
1	
2	
3	
4	
5	
6	
7	
8	

Calculate the successive differences of the surface area values in L3. Discuss the results with your class.

- How much does the surface area change for each unit of change in edge length?

- Is this data linear?

Calculate the **second differences** in L4.

- What do you notice about the second differences?

- The second differences measure the amount of change in surface area for each unit of change in edge length. How much do the second differences of the surface area change for each unit of change in edge length?

- What type of relationship is there between surface area and edge length: linear, quadratic, cubic, or none of these? Explain how you know.

Plot the data in L1 and L2 as a scatter plot.

- Which is the independent variable, the edge lengths or the surface areas? Which is the dependent variable?

- What shape do the points describe?

Add a regression curve.

- What is the regression equation?

- Describe the relationship between the regression curve and the points.

- What are third differences?

- What do you think it mean if the first and second differences of a function are not constant, but the third differences are?

Problem 3 - Exercises

For each set of data, calculate first, second, and third differences to determine if the function is linear, quadratic, cubic or none of these. Use a scatter plot and a regression line to check your answers.

1.

x	*y*	1st diff	2nd diff	3rd diff
7	114.6			
8	150.			
9	191.4			
10	237			
11	287.4			
12	342.6			
13	402.6			
14	467.4			

Function Type:

Regression Equation:

2.

x	*y*	1st diff	2nd diff	3rd diff
0	–25			
1	–24.5			
2	–21			
3	–11.5			
4	7			
5	37.5			
6	83			
7	146.5			

Function Type:

Regression Equation:

3.

x	*y*	1st diff	2nd diff	3rd diff
2	2			
3	3			
4	5			
5	7			
6	11			
7	17			
8	19			
9	23			

Function Type:

Regression Equation:

4.

x	*y*	1st diff	2nd diff	3rd diff
–4	–15			
–3	–13			
–2	–11			
–1	–9			
0	–7			
1	–5			
2	–3			
3	–1			

Function Type:

Regression Equation: