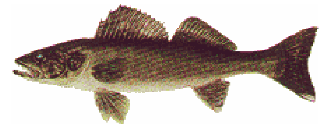
Revisiting Rates of Change –Making Predictions



A Fish Story: A pond was stocked with a type of fish called a "walleye." The table below gives the population of walleye in the pond for the 25 years following the stocking of the pond.

Graph the data using graphing technology. Is there a best model? If so, generate the equation of the model. ________________________________

a) Predict what years the first differences will be positive? Why?

b) Predict what years the first differences will be negative? Why?

c) Predict what years the second differences will be positive? Why?

d) Predict what years the second differences will be negative? Why?

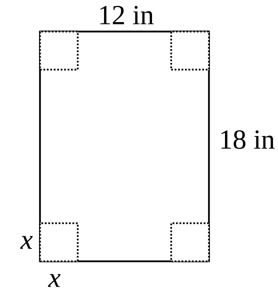
e) Is the first difference ever zero? Why or why not? If it is, when?

f) Is the second difference ever zero? Why or why not? If it is, when?

g) When is the first difference at its largest value? Smallest value?

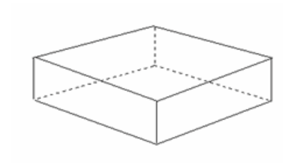
25-year Walleye Population	
Year	**Walleye Population**
0	3000
1	3400
2	3720
3	3976
4	4181
5	4345
6	4476
7	4581
8	4665
9	4732
10	4786
11	4829
12	4863
13	4890
14	4912
15	4930
16	4944
17	4955
18	4964
19	4971
20	4977
21	4982
22	4986
23	4989
24	4991
25	4993

<u>Open Topped Box</u>: A box is created by cutting out the four corners and folding up the sides. The volume of the box depends on the size of the squares that are cut away. The table below gives the volume of the box created for different sizes of squares that are cut away.



Graph the data using graphing technology. Is there a best model? If so, generate the equation of the model.________________________________

a) Predict for what square dimensions the first differences will be positive?



b) Predict for what square dimensions the first differences will be negative?

Volume of Box	
Dimensions of square	**Volume (in^3)**
0	0
0.5	93.5
1	160
1.5	202.5
2	224
2.5	227.5
3	216
3.5	192.5
4	160
4.5	121.5
5	80
5.5	38.5
6	0

c) Predict for what square dimensions the second differences will be positive?

d) Predict for what square dimensions the second differences will be negative?

e) Are the first difference ever zero? Why or why not? If it is, when?

f) Are the second difference ever zero? Why or why not? If it is, when?

g) When are the first difference at its largest value? Smallest value?

<u>Heat it Up</u>: A thermocouple is used to measure very high temperatures. A thermocouple is placed on the element of an electric range. The temperature of the element, T, in degrees Celsius, can be modeled by the equation $T = 150\log 4t$, where t is the time in seconds after the element is turned on.

Create a graph using graphing technology.

a) Predict what times the first differences will be positive?

b) Predict what times the first differences will be negative?

c) Predict what times the second differences will be positive?

d) Predict what times the second differences will be negative?

e) Is the first difference ever zero? Why or why not? If it is, when?

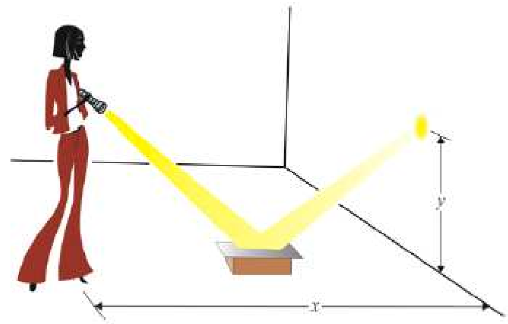
f) Is the second difference ever zero? Why or why not? If it is, when?

g) When is the first difference at its largest value? Smallest value?

Light It Up

The set up for the Light it Up activity is shown below. A group of students collected data for the height above the floor of the reflection (y) and the distance from the wall to the laser pointer (x). They came up with the following model:

$$y = \frac{3}{x-15} + 25$$



Graph the function using graphing technology.

a) Predict for what x values the first differences will be positive?

b) Predict for what x values the first differences will be negative?

c) Predict for what x values the second differences will be positive?

d) Predict for what x values the second differences will be negative?

e) Is the first difference ever zero? Why or why not? If it is, when?

f) Is the second difference ever zero? Why or why not? If it is, when?

g) When is the first difference at its largest value? Smallest value?