

Name Key Period _____ Date _____

Quadratic Relationships in Data Tables

Find the first and second differences for the data in the tables below. Using what you know about differences, determine what type of relationship is represented by the data.

x	y
0	-1
1	2
2	7
3	14
4	23

$\Delta y: +3, +5, +7, +9$
 $\Delta^2 y: +2, +2, +2$

Type:

Quadratic

x	y
1	-38
2	-45
3	-52
4	-59
5	-66

$\Delta y: -7, -7, -7, -7$

Type:

Linear

x	y
0	56
1	80
2	72
3	32
4	-40

$\Delta y: +24, -8, -40, -72$
 $\Delta^2 y: -32, -32, -32$

Type:

Quadratic

x	y
1	3
2	6
3	12
4	24
5	48

$\Delta y: \times 2, \times 2, \times 2, \times 2$

Type:

Exponential

Below are tables of quadratic data. Fill in the missing values.

x	y
0	0
1	2
2	8
3	18
4	32
5	50
6	72
7	98
8	128

$\Delta y: +2, +6, +10, +14, +18, +22, +26, +30$

x	y
0	0
1	-2
2	-2
3	0
4	4
5	10
6	18
7	28
8	40

$\Delta y: -2, +0, +2, +4, +6, +8, +10, +12$

x	y
0	3
1	5
2	9
3	15
4	23
5	33
6	45
7	59
8	75

$\Delta y: +2, +4, +6, +8, +10, +12, +14, +16$

x	y
0	20
1	12
2	6
3	2
4	0
5	0
6	2
7	6
8	12

$\Delta y: -8, -6, -4, -2, +0, +2, +4, +6$

There is a relationship between the second difference in the data and the value of "a" in a quadratic equation. Experiment with data tables you create to see if you can figure out the relationship.

$$y = x^2 + 3x - 1$$

x	y
0	-1
1	3
2	9
3	17
4	27

Handwritten differences: $\Delta y: +4, +6, +8, +10$; $\Delta^2 y: +2, +2, +2$

$$y = 2x^2 - x + 5$$

x	y
0	5
1	6
2	11
3	20
4	33
5	50

Handwritten differences: $\Delta y: +1, +5, +9, +13, +17$; $\Delta^2 y: +4, +4, +4, +4$

$$y = -3x^2 + 2x + 10$$

x	y
0	10
1	9
2	2
3	-11
4	-30

Handwritten differences: $\Delta y: -1, -7, -13, -19$; $\Delta^2 y: -6, -6, -6$

Second Difference = $2a$

Using this method to find the value of "a", and what you know about finding equations based on data tables see if you can figure out how to come up with a quadratic equation from a data table. Practice with the data tables above.

$$y = x^2 + bx - 1$$

$$3 = (1)^2 + b(1) - 1$$

$$3 = b$$

$$y = 2x^2 + bx + 5$$

$$b = 2(1)^2 + b(1) + 5$$

$$b = b + 7$$

$$\frac{-7}{-7} = \frac{-7}{-7}$$

$$-1 = b$$

$$y = -3x^2 + bx + 10$$

$$9 = -3(1)^2 + b(1) + 10$$

$$9 = -3 + b$$

$$\frac{-7}{-7} = \frac{-7}{-7}$$

$$2 = b$$

✓ $y = x^2 + 3x - 1$

✓ $y = 2x^2 - x + 5$

✓ $y = -3x^2 + 2x + 10$

Apply what you discover to come up with equations for the data tables below:

1.

x	y
0	-7
1	0
2	9
3	20
4	33

Handwritten differences: $\Delta y: +7, +9, +11, +13$; $\Delta^2 y: +2, +2, +2$

2.

x	y
2	6
3	13
4	24
5	39
6	58

Handwritten differences: $\Delta y: +7, +11, +15, +19$; $\Delta^2 y: +4, +4, +4$

3.

x	y
0	36
1	26
2	18
3	12
4	8
5	6

Handwritten differences: $\Delta y: -10, -8, -6, -4, -2$; $\Delta^2 y: +2, +2, +2, +2$

4.

x	y
2	536
3	456
4	344
5	200
6	24

Handwritten differences: $\Delta y: -80, -112, -144, -176$; $\Delta^2 y: -32, -32, -32$

5.

x	y
3	0
4	16
5	38
6	66
7	100

Handwritten differences: $\Delta y: +16, +22, +28, +34$; $\Delta^2 y: +6, +6, +6$

$$1. y = x^2 + bx - 7$$

$$0 = (1)^2 + b(1) - 7$$

$$0 = 1 + b - 7$$

$$0 = -b + 6$$

$$\begin{array}{r} +b \quad +6 \\ \hline b = 6 \end{array}$$

$$\underline{y = x^2 + 6x - 7}$$

$$2. 2x^2 + bx + 4$$

$$2(1)^2 + b(1) + 4 = 3$$

$$2 + b + 4 = 3$$

$$b + 6 = 3$$

$$\begin{array}{r} -b \quad -6 \\ \hline b = -3 \end{array}$$

$$\underline{y = 2x^2 - 3x + 4}$$

0	4	>-1	>+4
1	3	>+3	>+4
2	6	>+7	>+4
3	13	>+11	>+4
4	24	>+15	>+4
5	39	>+19	>+4
6	58		

$$3. y = x^2 + bx + 36$$

$$26 = (1)^2 + (1)b + 36$$

$$26 = 1 + b + 36$$

$$26 = 37 + b$$

$$\begin{array}{r} -37 \quad -37 \\ \hline -11 = b \end{array}$$

$$\underline{y = x^2 - 11x + 36}$$

$$4. y = -16x^2 + bx + 600$$

$$584 = -16(1)^2 + b(1) + 600$$

$$584 = 584 + b$$

$$\begin{array}{r} -584 \quad -584 \\ \hline 0 = b \end{array}$$

$$\underline{y = -16x^2 + 600}$$

0	600	>-16	>-32
1	584	>-48	>-32
2	536	>-80	>-32
3	456	>-112	>-32
4	344	>-144	>-32
5	200	>-176	>-32
6	24		

$$5. \quad 3x^2 + bx - 12 = y$$

$$3(1)^2 + b(1) - 12 = -14$$

$$3 + b - 12 = -14$$

$$b - 9 = -14$$

$$\begin{array}{r} +9 \quad +9 \\ \hline \end{array}$$

$$b = -5$$

$$\underline{y = 3x^2 - 5x - 12}$$

0	-12	> -2	> +6
1	-14	> +4	
2	-10	> +10	> +6
3	0	> +16	> +6
4	16	> +12	> +6
5	38	> +28	> +6
6	66	> +34	
7	100		