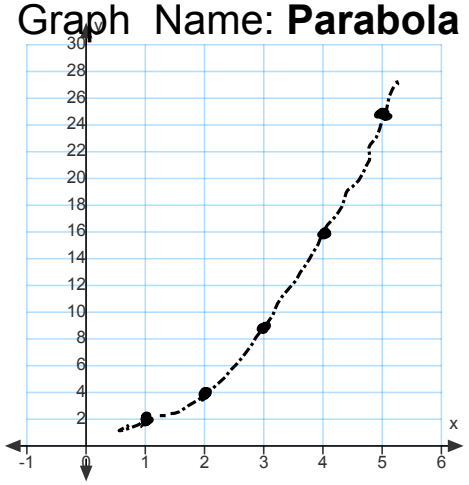
A Special Type of Non-linear Relationship:**Quadratic Relationships**

Δx (1st Diff. in *x*)	X	Y	Δy (1st Diff. in *y*)	Δ$_2$y (2nd Diff. in *y*)
	1	1		
1			3	
	2	4		2
1			5	
	3	9		2
1			7	
	4	16		2
1			9	
	5	25		

Graph Name: **Parabola**



The relationship is *non-linear* since ...

the 1st differences in *y* (i.e., Δy) are not equal).

It is also quadratic since the 2nd differences in y (i.e., Δ$_2$y) are equal.

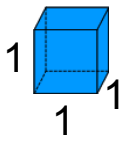
Next

Exit Problem

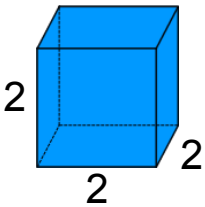
Complete the following table of values and form a conclusion based on the differences in your table--i.e., Is the relationship between *Volume* and *Side Length* **linear**, **quadratic** or **other**? Explain your choice.

Δs	Side length of Cube, *s*	Volume of Cube, *V* (units^3)	ΔV	Δ$_2$V	Δ$_3$V
	0	0			
1			1		
	1	1		6	
1			7		6
	2	8		12	
1			19		6
	3	27		18	
1			37		
	4	64			

V = 1 unit^3



V = 2 x 2 x 2 units^3



Next

Is the relationship between *Volume* and *Side Length* **linear**, **quadratic** or **other?** Explain your choice.

Next

Not linear:

- 1st differences are not equal

Not quadratic:

- 2nd differences are not equal

Conclusion:

- "other" (In fact, the 3rd differences are equal making this a *cubic* relationship.)

A Summary: Linear vs. Non-linear Relationships

The following summarizes the findings regarding ***linear*** *and* ***non-linear relationships.*** *Record in your notebook.*

1 Pull

2 Pull

3 Pull

4 Pull

5 Pull

Next

Quadratic Relationships

Next

Here are a few terms that relate to quadratic relationships-- relationships where the 2nd differences in y are equal for every equal increment in x.

How can/could we incorporate these key terms into our work?

Key Terms

symmetry

parabola

vertex

axis of symmetry

minimum value

Next

Consider the next slide and how we could label the sample graph with these terms.

Key Terms for Quadratics

Label the graph and then 'check' (see below)

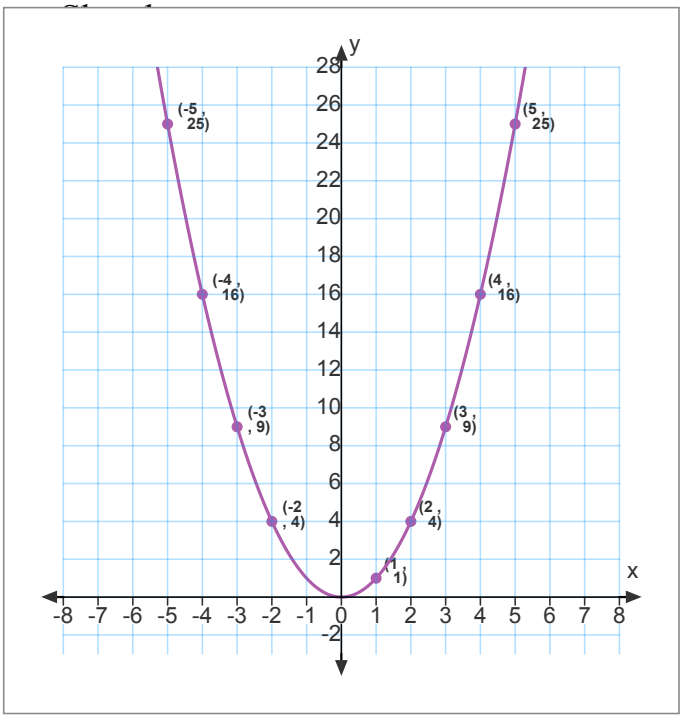
parabola

vertex

axis of symmetry

minimum value

Check Next



Let's put our 'visual' summary into a few words! Record in your notebook.

parabola

1

vertex

2

axis of symmetry

3

minimum value

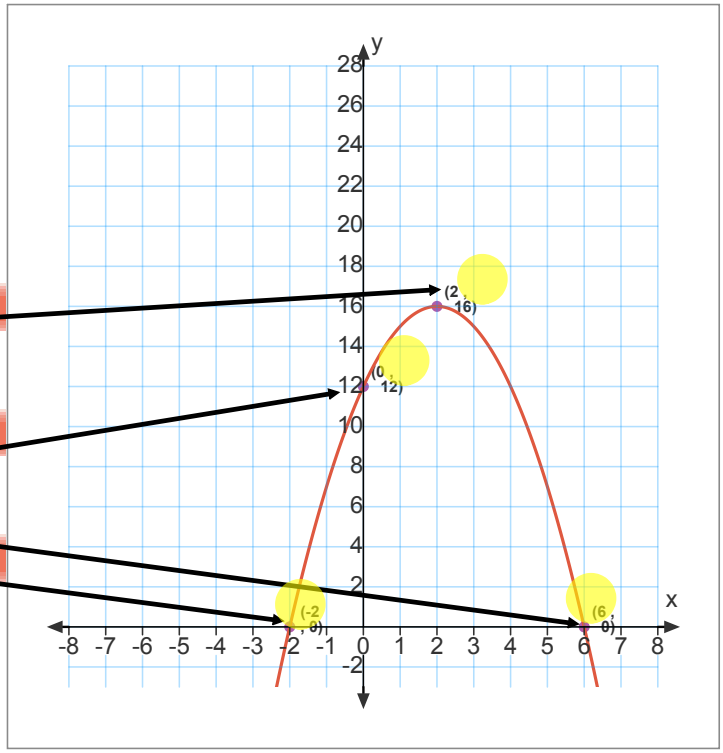
4

Next

Key Terms for Quadratics (contd.)

y-intercept

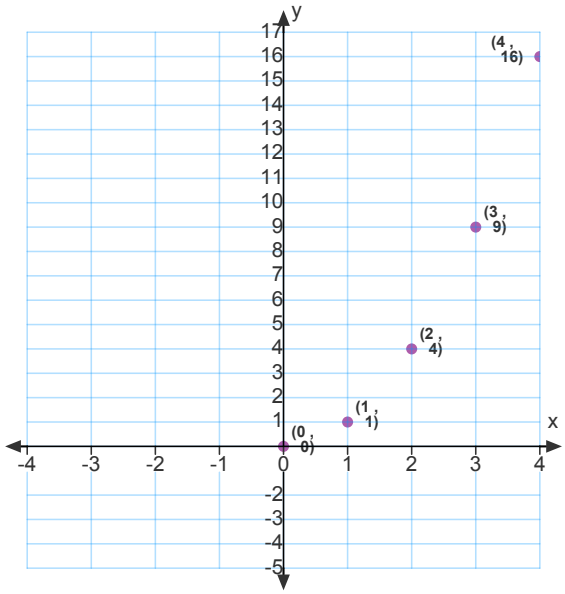
x-intercept



Next

Exercise: Putting Key Terms into Practice

1. Complete the following table and graph the data on the grid provided.
Some points have already been plotted. Join your plotted values using a smooth cu
2. Label your graph and/or table with the new, key terms being used.



X	Y	Δy	$\Delta_2 y$
-4			
-3			
-2			
-1			
0			
1	1	3	
2	4	5	2
3	9	7	2
4	16		

Check

Next

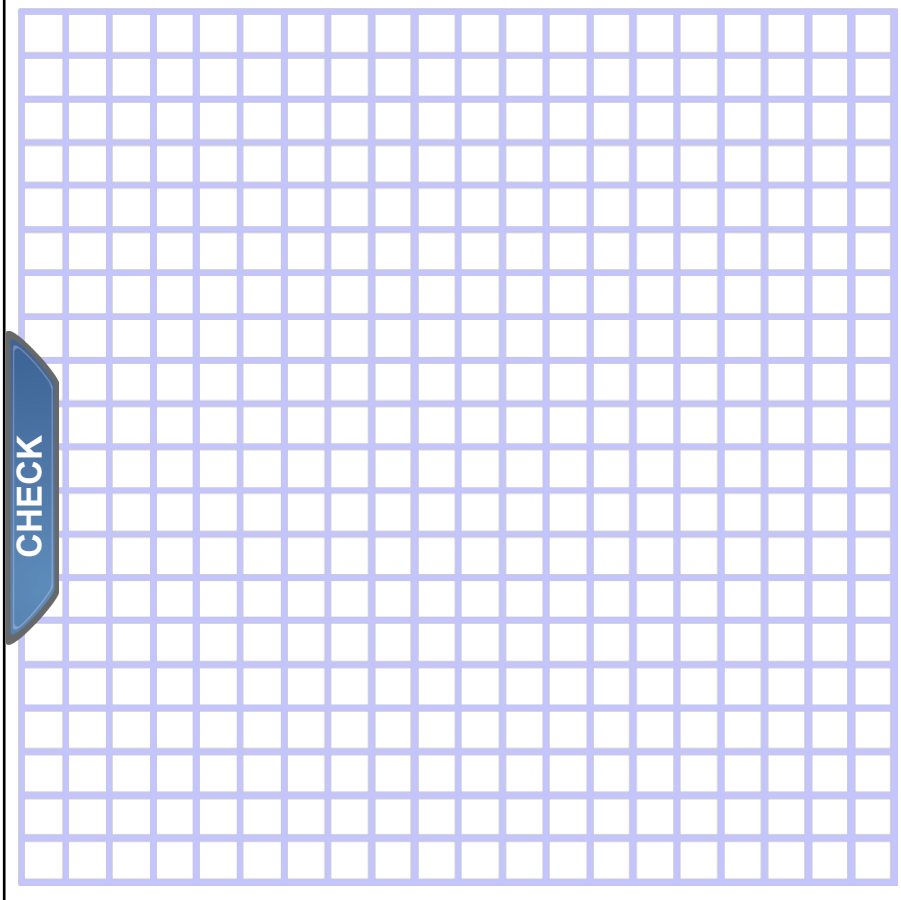
p244, #8:

Sandy has 42 m of edging to create a garden. Using the grid paper provided on this and the next slide, draw all possible rectangles with perimeter 42 units. Change the length and the width by 1 m each time. Record your dimensions in the table on the third slide. Once you've sketched some rectangles, 'check' your work.

CHECK

Table

Next



CHECK

Table

Next

Numeric Model for Your Rectangles

Complete the following table. Start by listing the length. Next, determine the area of each rectangle (in square units), and then complete the ΔA and $\Delta_2 A$ columns.

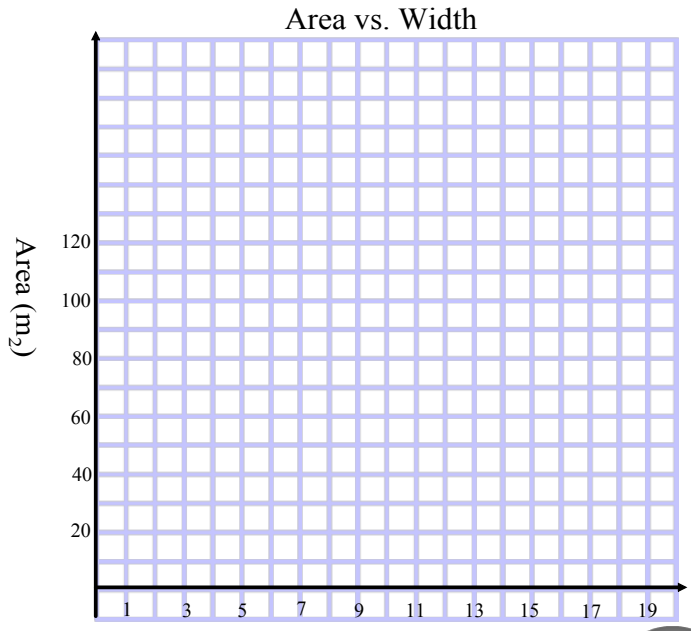
Width	Length	Area	ΔA	$\Delta_2 A$
1	20	20	18	-2
2	19	38	16	
3	18	54		
4				
5				
6				
7				
8				
9				
10				
11				

What does the table 'tell' you about the relationship between *Area* and *Width*?

BACK Next Check

A Graphical Model for Your Data

On the grid below, create a graph for Area vs. Width. Use the data from your table. Draw a smooth curve through the data. Label your diagram with the key terms to the right of the grid.



axis of symmetry

x-intercept

vertex

minimum value

maximum value

y-intercept

Table Check Next

Key Terms for Quadratics

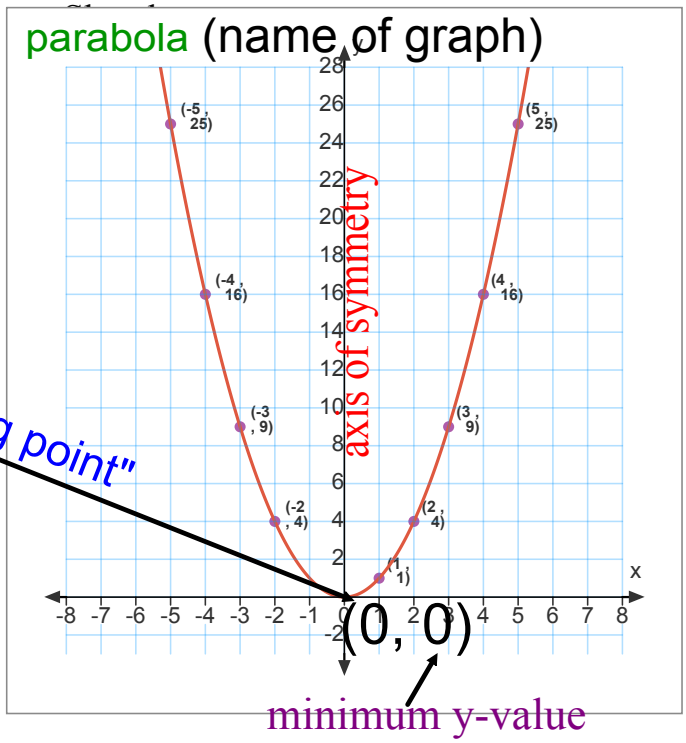
parabola

vertex

axis of symmetry

minimum value

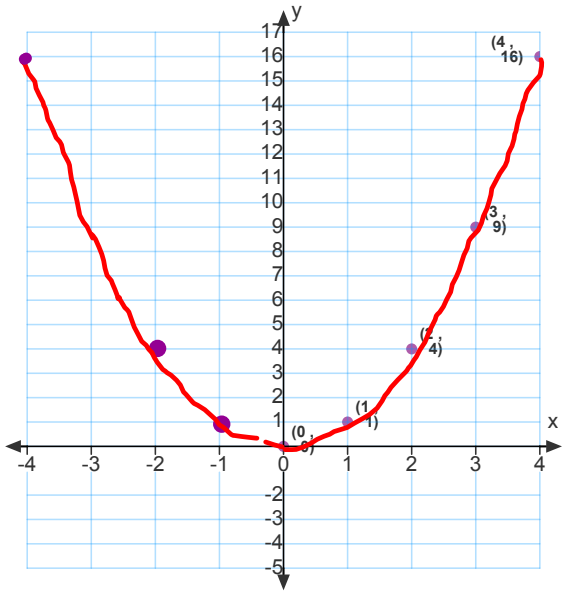
"turning point"



BACK

Exercise: Putting Key Terms into Practice Name: _____

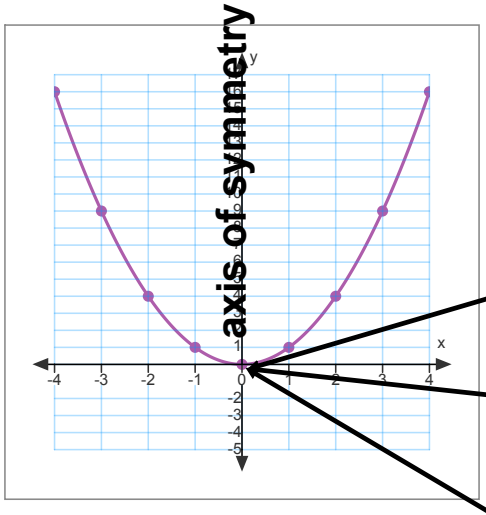
1. Complete the following table and graph the data on the grid provided.
Some points have already been plotted. Join your plotted values using a smooth cu
2. Label your graph and/or table with the new, key terms being used.



X	Y	Δy	$\Delta_2 y$
-4	16		
		-7	
-3	9		2
		-5	
-2	4		2
		-3	
-1	1		2
		-1	
0	0		2
		1	
1	1		2
		3	
2	4		2
		5	
3	9		2
		7	
4	16		

BACK

Terms



Graph name: **Parabola**

Name of relationship between y and x: **Quadratic**

minimum, y-value is zero

both **x-** and **y-intercepts** are zero

vertex is at (0, 0)

BACK

Numeric Model for Your Rectangles

Complete the following table. Start by listing the length. Next, determine the area of each rectangle (in square units), and then complete the ΔA and Δ_2A columns.

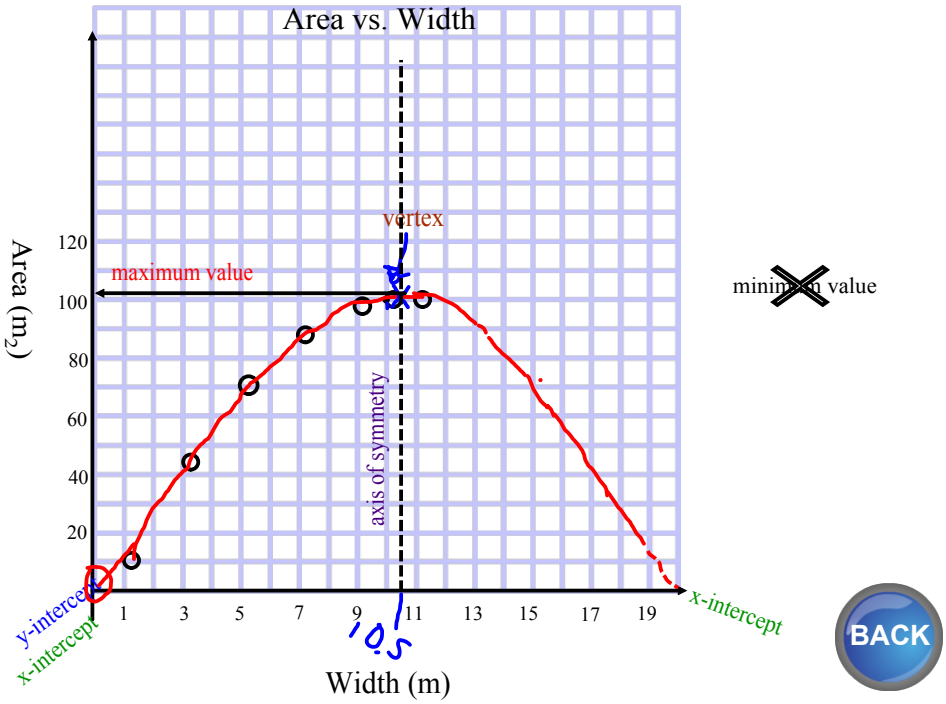
Width	Length	Area	ΔA	Δ_2A
1	20	20	18	-2
2	19	38	16	-2
3	18	54	14	-2
4	17	68	12	-2
5	16	80	10	-2
6	15	90	8	-2
7	14	98	6	-2
8	13	104	4	-2
9	12	108	2	-2
10	11	110	0	
11	10	110		

What does the table 'tell' you about the relationship between *Area* and *Width*?

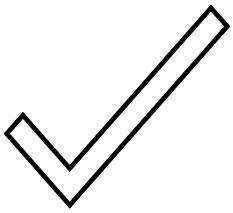
BACK

A Graphical Model for Your Data

On the grid below, create a graph for Area vs. Width. Draw a smooth curve through the data. Label your diagram with the key terms to the right of the grid.



Mission Complete!



Attachments

Gallery Recording Sheet for Day 1 Intro to Quadratics.doc

Key Terms for Word Wall.doc