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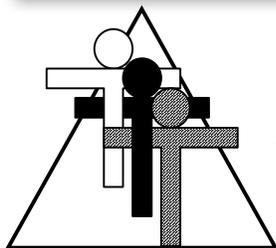
# Function Fun

## Unit 4: Quadratic and Cubic Functions



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By Brad Fulton  
Educator of the Year, 2005  
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# Brad Fulton

## Educator of the Year



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- ◆ Consultant
- ◆ Educator
- ◆ Author
- ◆ Keynote presenter
- ◆ Teacher trainer
- ◆ Conference speaker

Known throughout the country for motivating and engaging teachers and students, Brad has co-authored over a dozen books that provide easy-to-teach yet mathematically rich activities for busy teachers while teaching full time for over 30 years. In addition, he has co-authored over 40 teacher training manuals full of activities and ideas that help teachers who believe mathematics must be both meaningful and powerful.

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# Function Fun

## Part 4: Quadratic and Cubic Functions

### Overview:

**This activity is part 4** in a five-part series on developing an understanding of and proficiency with functions. Part 1 offered an introduction helping students to understand slope and y-intercept when integrated across a multi-representational approach that included visual, graphical, tabular, linguistic, and equation models.

In part 2, the student develops even greater proficiency as negative and fractional slopes and y-intercepts are encountered.

Part 3 allows students to apply their understanding of functions in tackling three realistic problems: “Banking on Functions”, “The Great Yo-yo Festival”, and “A Nutty Function.”

**Part 4, *Quadratic and Cubic Functions*, focuses on these two types of non-linear relationships: quadratic ( $ax^2+bx+c$ ) and cubic ( $ax^3+bx^2+cx+d$ ). This section is geared toward an algebra 1 course and is appropriate for high school or advanced middle school students.**

Part 5, *The King’s Pathway*, provides an engaging project your students can do to create their own beautiful functions based on their work with the previous sections.

### Procedure:

1. Students should have some familiarity with linear functions from the previous three units in this series: Function Fun, parts 1, 2, and 3 described above. Now they are ready to use the same tools: t-tables, graphs, and mathematical reasoning to learn how to derive quadratic and cubic functions. This can be done through direct instruction, but I prefer to show students samples and watch them derive the strategies themselves.

#### Required Materials:

Function Cards

#### Optional Materials:

Calculators

Snap Cubes

2. Begin by reviewing the general form of a linear equation:  $y = mx + b$ . This has a constant and a first degree term as shown. Since linear functions only grow in one dimension, length, they only need a first degree term.

$$y = mx + b$$

3. Quadratic functions introduce a second degree term. This is because they grow in two dimensions. The general form for a quadratic function is  $y=ax^2+bx+c$ . In a linear function, we needed to know the slope ( $m$ ) and y-intercept ( $b$ ) to write the rule. Now we must find the  $a$ ,  $b$ , and  $c$  terms to

$$y = ax^2 + bx + c$$

write the rule for a quadratic function.

4. Pass out Function A. Have the students begin by filling in lines 1, 2, and 3 of the t-table and graphing those points. (You may wish to display a copy of the pattern and have students construct a t-table and graph on their own paper.) They will see that term 1 has 1 happy face, term 2 has four, and term 3 has nine. When they graph these points, they will see that they are not collinear. They may notice this from looking at the t-table. Then have them write the amount of increase between terms on the t-table as they did with linear functions.
5. Now ask them how many happy faces would be in term 4? You may wish to have them add this into their table. They will see that term 4 would have four rows of four or 16 faces. When they write in the growth, they will see that it increases by odd numbers. Taking this pattern backwards allows them to fill in the remaining lines of the table. These points should be graphed.

6. In a linear table, the difference between terms was constant, but here it increases by odd numbers. However, if they look at the **differences between the differences** of the table, they notice that it is constant, and all the numbers increase by 2. This is shown here.

x	y		
-3	9	)	-5
-2	4	)	-3
-1	1	)	-1
0	0	)	+1
1	1	)	+3
2	4	)	+5
3	9	)	
:			
100			

7. They will also notice that the graph forms a modified U shape. This is called a **parabola**. If you turned it upside down, it's the path a ball travels when thrown in the air. They may also notice that the terms have twins. For example, both +3 and -3 in the x-column correspond to 9 in the y-column. The exception is at step zero. This point that is the minimum value of the parabola is called a **vertex**.

8. Some students may realize that the formula for this function is  $y=x^2$ . If not, you may have to tell them this. Thus the 100<sup>th</sup> term would have 100<sup>2</sup> or 10,000 happy faces. That's pretty happy!

9. Written in the general form, the equation is  $y = 1x^2 + 0x + 0$ , where the *a* term is 1, the *b* term is zero, and the *c* term is also zero. They will not yet know how these three terms are revealed in the table or graph, but as they do more examples, it will become more obvious.

10. Now have them repeat the process on Function B. The completed table is here. They will notice that there are some familiar numbers in this sequence. The differences of the terms again increase by odd numbers, but it starts with different values. Some students may notice that the formula could be written as  $y = (x + 2)^2$ . They will have seen that the dimensions of term one are 3x3. Term two measures 4x4, and term three measures 5x5. Thus the dimensions of the term are always two more than the term or  $x + 2$ . However, written in this factored form, we cannot see the *a*, *b*, and *c* terms. Squaring the binomial gives us

x	y		
-3	1	)	-1
-2	0	)	+1
-1	1	)	+3
0	4	)	+5
1	9	)	+7
2	16	)	+9
3	25	)	
:			
100			

$y=x^2+4x+4$ . Now we see that the  $a$  term is still 1, the  $b$  term is now 4, and the  $c$  term is also 4.

11. You may wish to look at Function B in a different way. Some students may notice that the inner pink region is the same as Function A. If they analyze the yellow region along the edges, they will see that it is a linear function,  $y=4x$ . The four blue tiles in the corners never change. Thus their formula is  $y=4$ . Adding these three functions gives us the rule for the total function.

$$\begin{array}{l} \text{Pink: } y = x^2 \\ \text{Yellow: } y = 4x \\ \text{Blue: } y = 4 \\ \hline \text{Total: } y = x^2 + 4x + 4 \end{array}$$

x	y
-3	8
-2	2
-1	0
0	2
1	8
2	18
3	32
:	
100	20,402

Diagram illustrating the differences between consecutive y-values in the table above:

- Between x=-3 and x=-2: difference is -6
- Between x=-2 and x=-1: difference is -2
- Between x=-1 and x=0: difference is +2
- Between x=0 and x=1: difference is +6
- Between x=1 and x=2: difference is +10
- Between x=2 and x=3: difference is +14

12. The completed table for Function C is shown. The new formula is  $y = 2x^2 + 4x + 2$ . The  $a$  term is 2, the  $b$  term is 4, and the  $c$  term is 2.
13. As the students compare the three tables some patterns start to emerge. First of all, the  $c$  term always showed up on line zero of the table. In Function A we have the point (0, 0) and the  $c$  term was zero. In Function B, the y-intercept of (0, 4) resulted in a  $c$  term of 4, and in this function, the intercept is (0, 2) and the  $c$  term was 2. This will be confirmed in subsequent functions.
14. Secondly, in the first two functions the  $a$  term was 1, but in this one it is 2. What changed was the second difference of the growth. In the first two tables, that second difference was 2; now it is four. The  $a$  term turns out to be half of that number. This also will be confirmed by future induction.
15. The  $b$  term is the most elusive. Students may notice that when  $x$  is 1, the corresponding  $y$  value is the sum of  $a + b + c$ . For example, in Function C, we have the point (1, 8), and the  $a$ ,  $b$ , and  $c$  terms are 2, 4, and 2 respectively which add up to 8. This is rarely obvious to students, but it can be confirmed through other examples. It will also be proven in the step below.
16. Since all quadratic equations are of the form  $ax^2+bx+c$ , we can create a generalized table to show how the terms behave in all instances as shown here:

The  $c$  term shows up on line 0.

x	y		
0	$a(0)^2 + b(0) + c = c$		
1	$a(1)^2 + b(1) + c = a+b+c$	) $a+b$	) $2a$
2	$a(2)^2 + b(2) + c = 4a+2b+c$	) $3a+b$	) $2a$
3	$a(3)^2 + b(3) + c = 9a+3b+c$	) $5a+b$	) $2a$
4	$a(4)^2 + b(4) + c = 16a+4b+c$	) $7a+b$	

Line 1 is the sum of all three terms.

This is twice the  $a$  term.

17. Students should begin by finding the  $c$  term on line zero. Then they can divide the second difference of the terms by 2 to get the  $a$  term. Finally they can substitute these values of find the  $b$  term. We will demonstrate this on Function C, for which we already know the formula.

18. On line zero, we see a 2. Thus the  $c$  term is 2. This is circled in red. Dividing the +4 (the second difference) by 2 gives us the  $a$  term which is 2. This is circled in blue. Lastly, we know that the 8, circled in green is  $a+b+c$ . By substitution we get:

$$8 = 2 + b + 2$$

$$b = 4$$

x	y		
-3	8	) -4	
-2	2	) -2	) (+4)
-1	0	) +2	) +4
0	2	) +6	) +4
1	8	) +10	) +4
2	18	) +14	) +4
3	32		
:			
100	20,404		

19. Thus the formula is  $y = 2x^2 + 4x + 2$ .

20. Students should now practice this on subsequent patterns. You will likely have to make this a smooth transition as they will not have mastery of these skills until they have more practice. An answer key is provided for all functions.

21. The process for a cubic equation is similar. The general form of a cubic is

$$y = ax^3 + bx^2 + cx + d$$

You can have students explore some of these or go directly to the proof shown here.

4. Line 1 is the sum of all four terms. Substitute  $a, b,$  and  $c.$

x	y			
0	$a(0)^3 + b(0)^2 + c(0) + d = d$			
1	$a(1)^3 + b(1)^2 + c(1) + d = a + b + c + d$	) $a + b + c$		
2	$a(2)^3 + b(2)^2 + c(2) + d = 8a + 4b + 2c + d$	) $7a + 3b + c$	) $6a + 2b$	
3	$a(3)^3 + b(3)^2 + c(3) + d = 27a + 9b + 3c + d$	) $19a + 5b + c$	) $12a + 2b$	) $6a$
4	$a(4)^3 + b(4)^2 + c(4) + d = 64a + 16b + 4c + d$	) $37a + 7b + c$	) $18a + 2b$	) $6a$

1. The  $d$  term shows up on line 0.

2. This is six times the  $a$  term.

3. After finding  $a,$  get  $b$  here.

22. For example, using Function M we get this t-table. The  $d$  term is circled in red; it has a value of 0. The  $a$  term is one sixth of the number in the blue circle; it has a value of 1. From the number in the green circle, we have  $6a + 2b$ . Thus,  $6(1) + 2b = 8$ . Therefore,  $b = 1$ . Lastly, the yellow circle is the sum of  $a + b + c + d$ . By substitution we get  $(1) + (1) + c + (0) = 3$ , and  $c = 1$ . Thus our formula is  $y = x^3 + x^2 + x$ .

x	y			
-3	-21			
-2	-6	) +15		
-1	-1	) +5	) -10	) +6
0	0	) +1	) -4	) +6
1	3	) +3	) +2	) +6
2	14	) +11	) +8	) +6
3	39	) +25	) +14	
:				
100	1,010,100			

**Great Tip!**

Students can create their own quadratic and cubic patterns using snap cubes as shown in some of the included patterns. Quadratic relationships result when a pattern grows in two dimensions such as length and width. That is, its *area* increases. Cubic functions result from growth in three dimensions: length, width, and height. Thus their *volume* increases. By comparison, linear functions grown in only one dimension.

# Quadratic Equations

Name \_\_\_\_\_

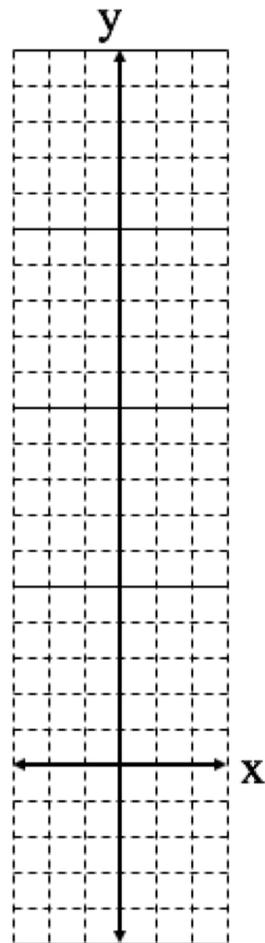
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function A



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

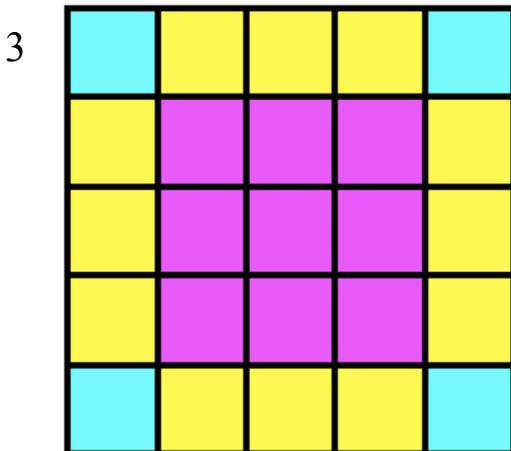
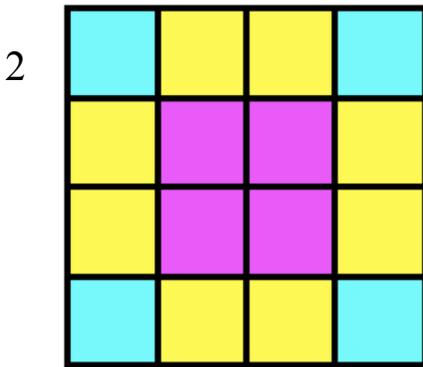
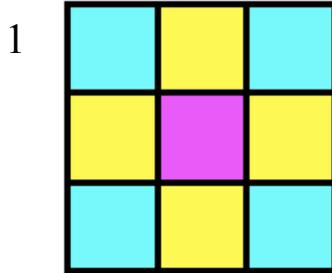
# Quadratic Equations

Name \_\_\_\_\_

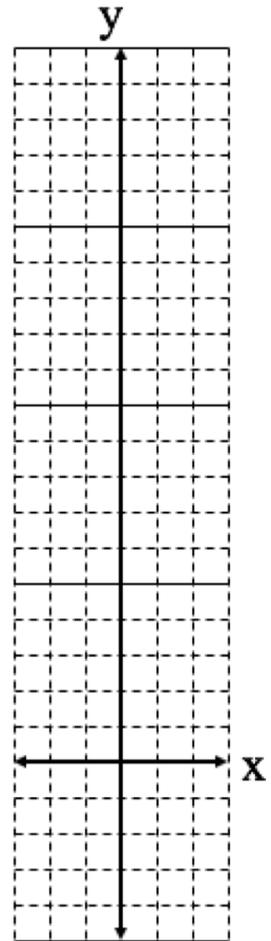
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function B



x	y
	-3
	-2
	-1
	0
	1
	2
	3
	:
100	



Rule \_\_\_\_\_

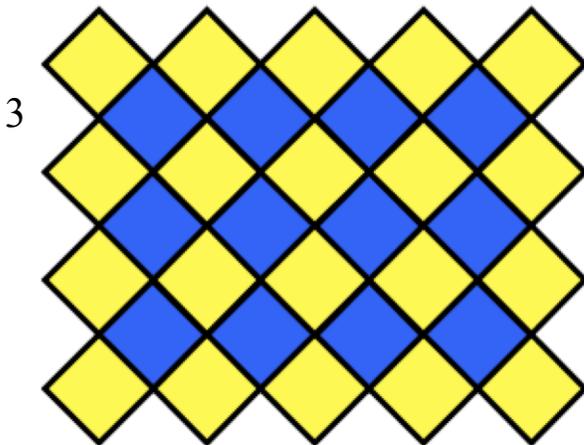
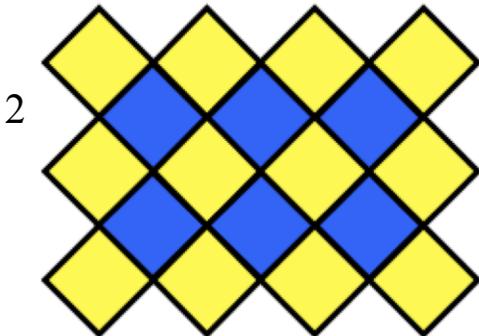
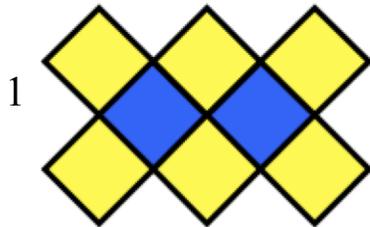
# Quadratic Equations

Name \_\_\_\_\_

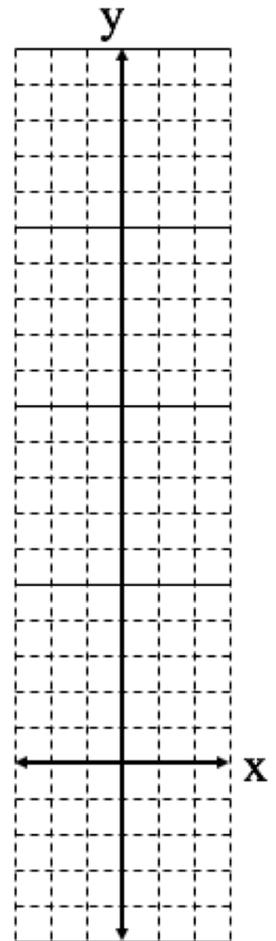
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

Function C



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

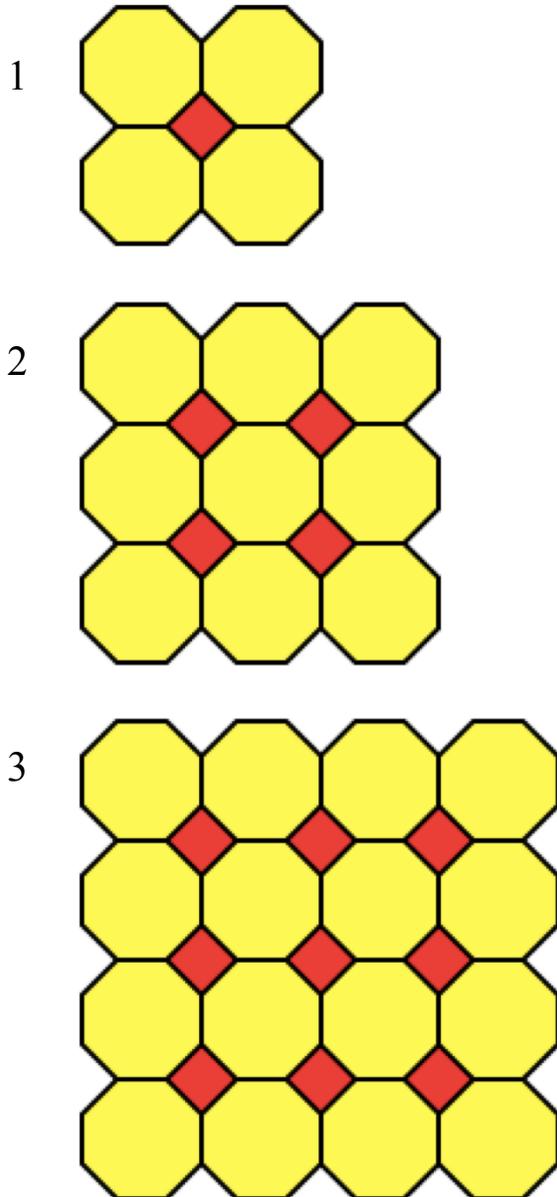
# Quadratic Equations

Name \_\_\_\_\_

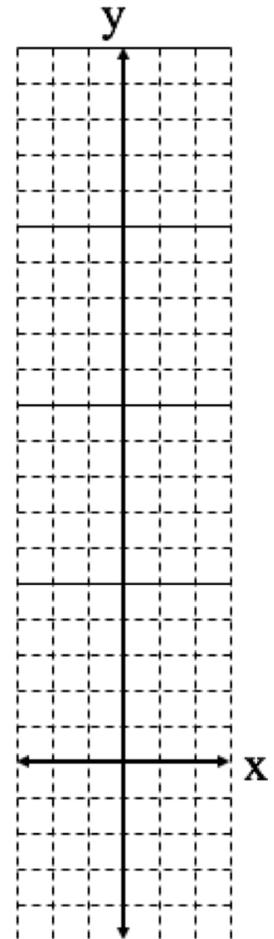
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function D



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

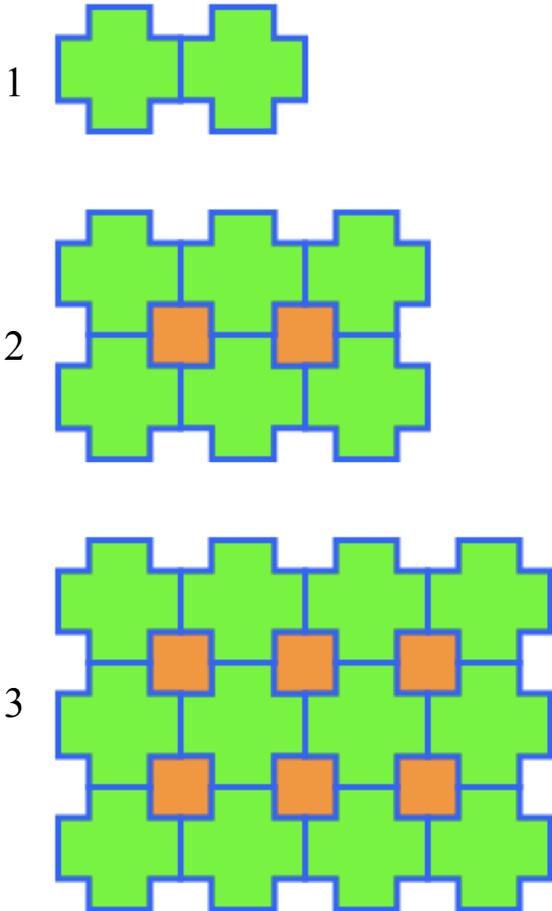
# Quadratic Equations

Name \_\_\_\_\_

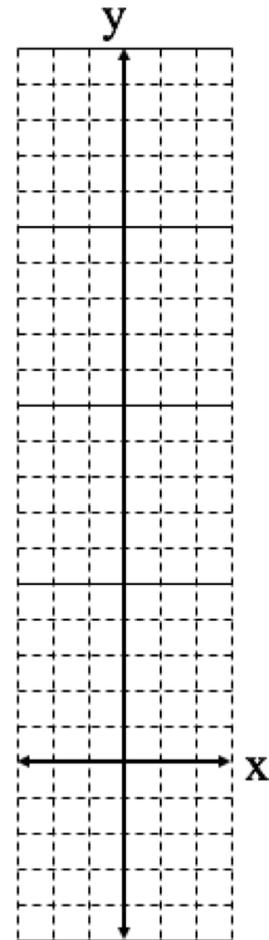
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function E



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

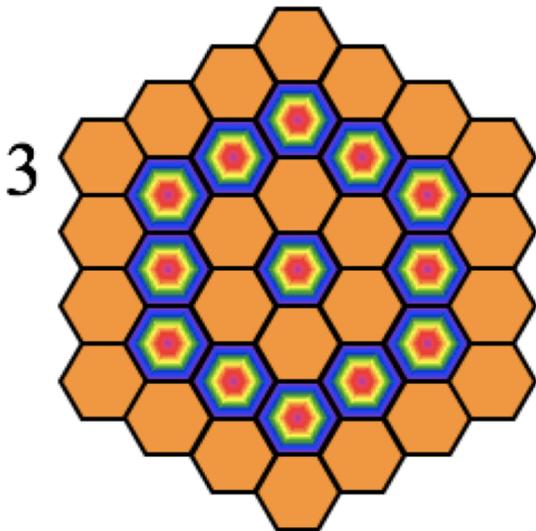
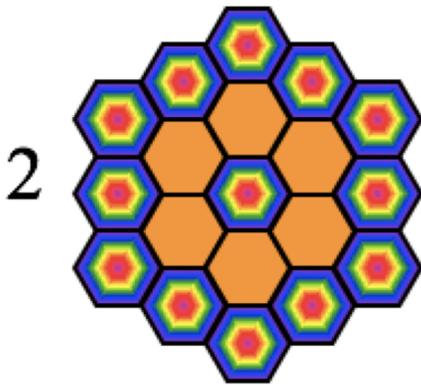
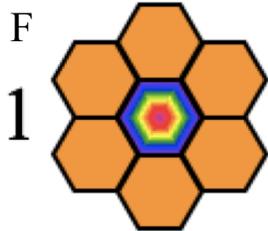
# Quadratic Equations

Name \_\_\_\_\_

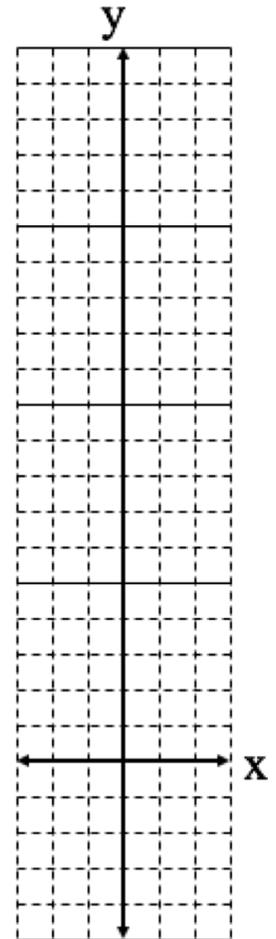
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

Function F



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

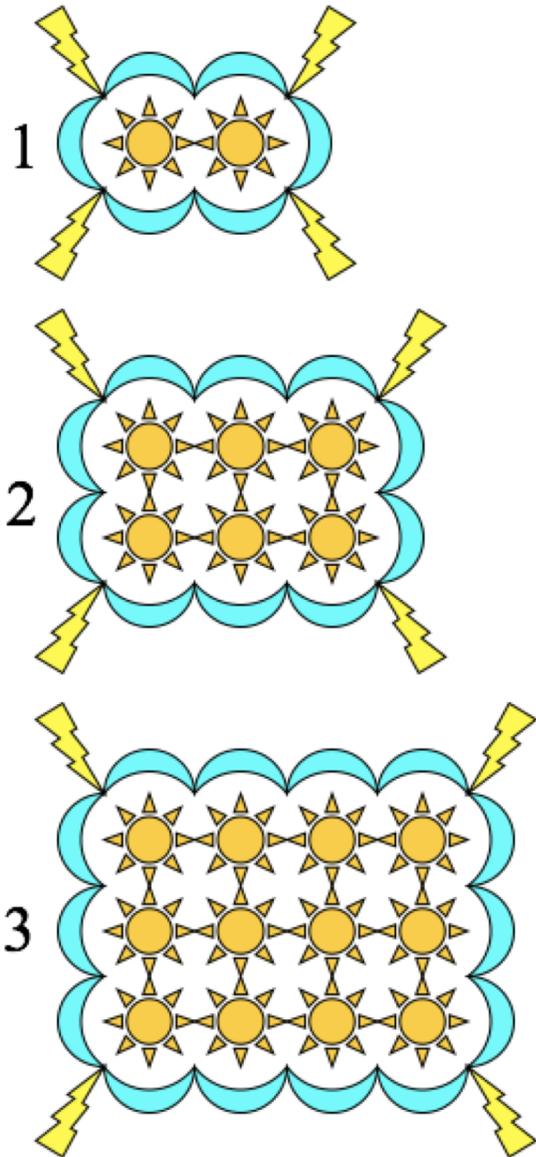
# Quadratic Equations

Name \_\_\_\_\_

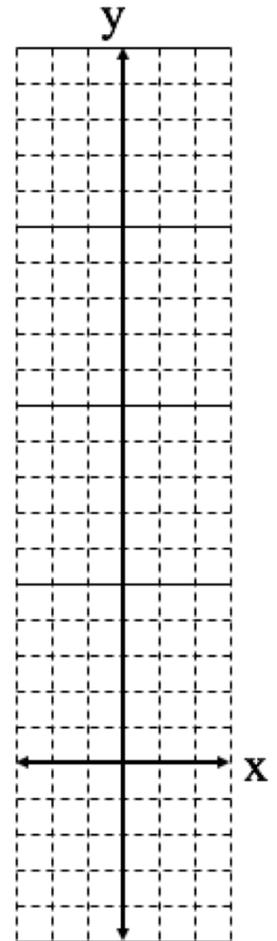
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function G



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

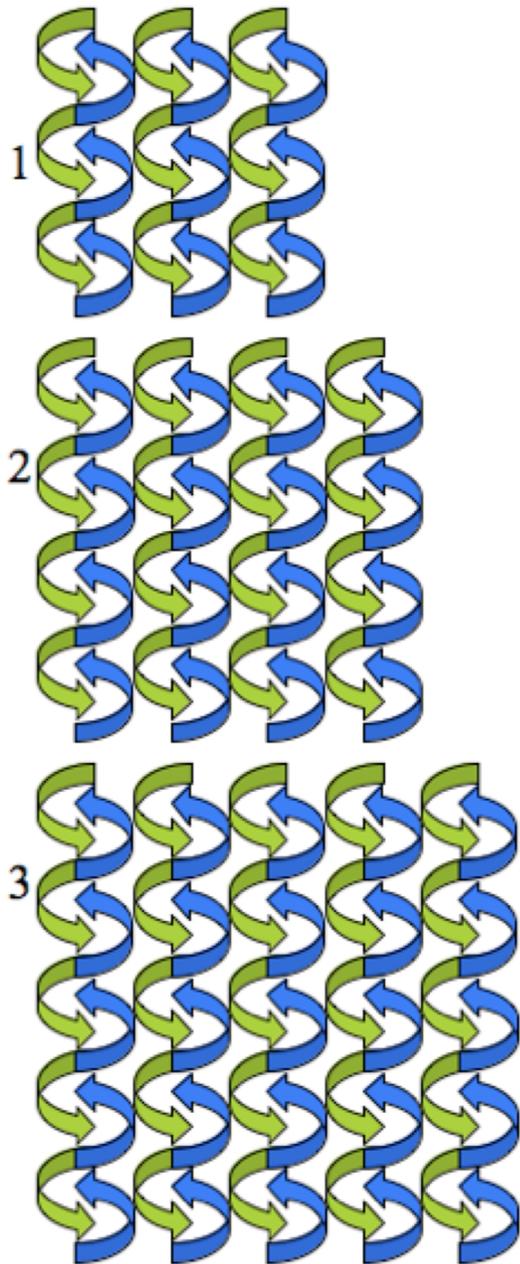
# Quadratic Equations

Name \_\_\_\_\_

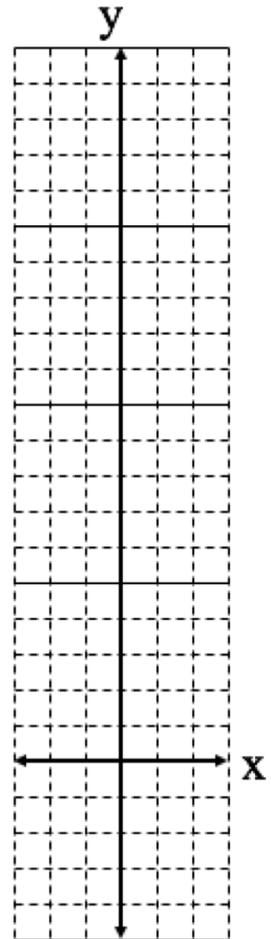
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

Function H



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

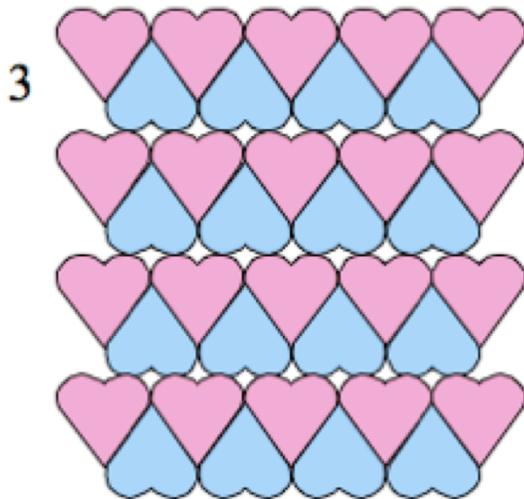
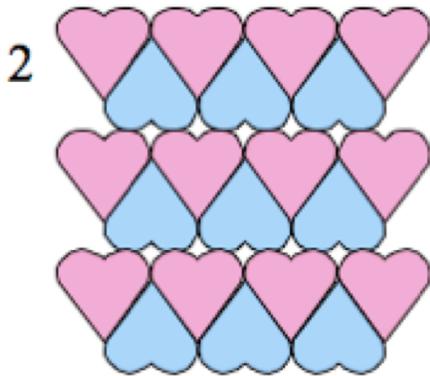
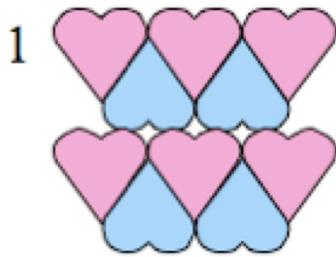
# Quadratic Equations

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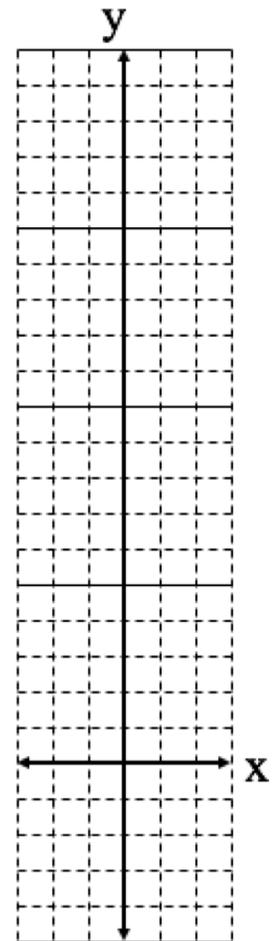
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function I



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

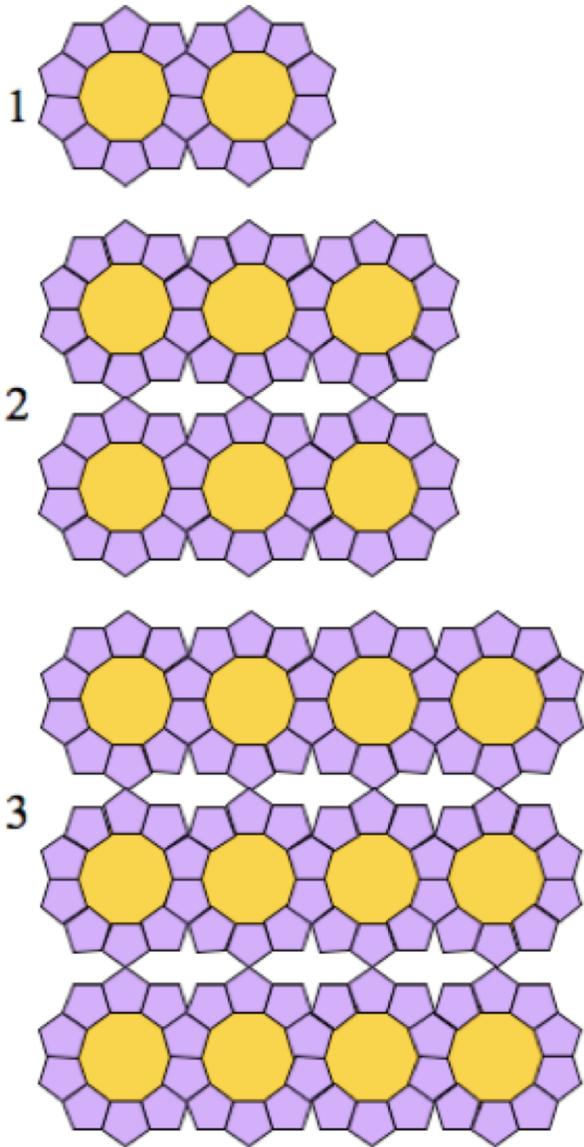
# Quadratic Equations

Name \_\_\_\_\_

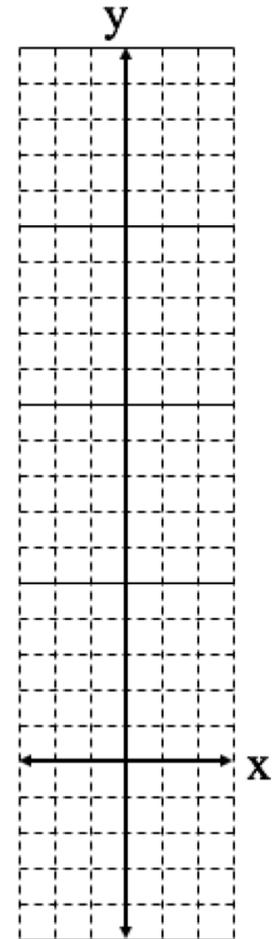
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function J



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

# Quadratic Equations

Name \_\_\_\_\_

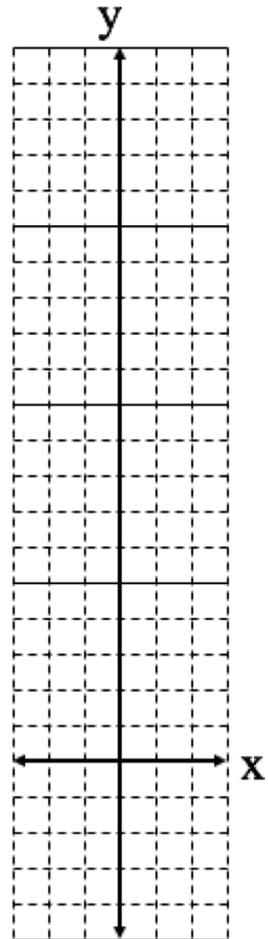
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function A



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

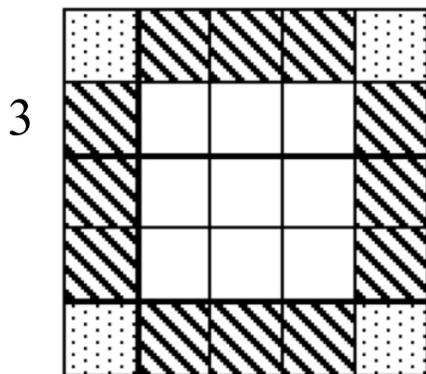
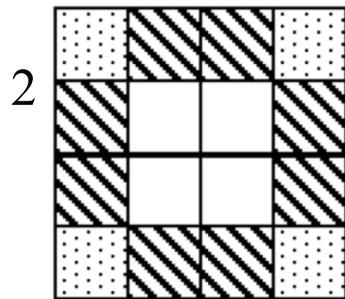
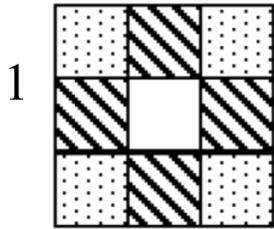
# Quadratic Equations

Name \_\_\_\_\_

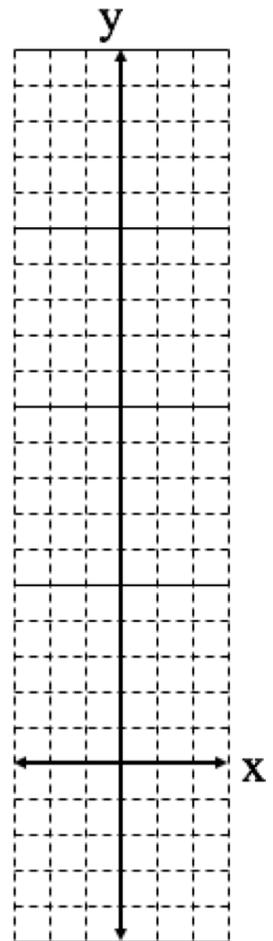
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

Function B



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

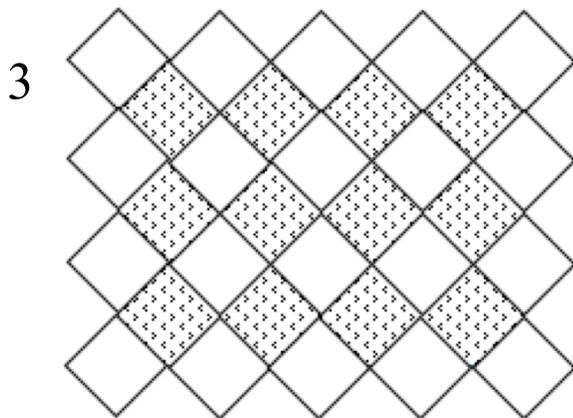
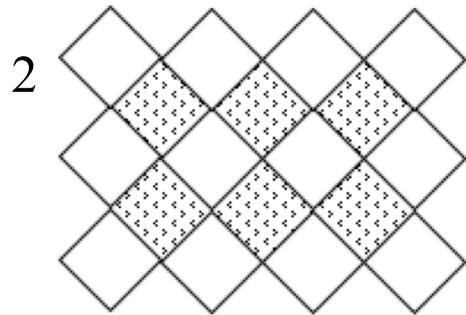
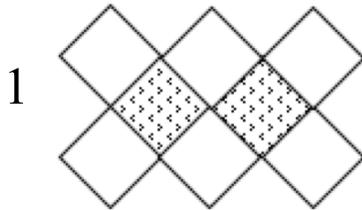
# Quadratic Equations

Name \_\_\_\_\_

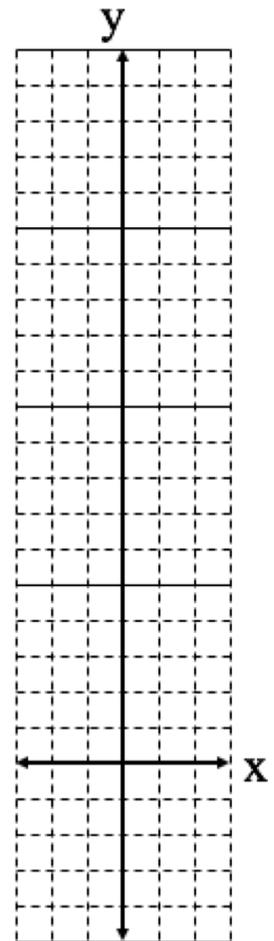
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function C



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

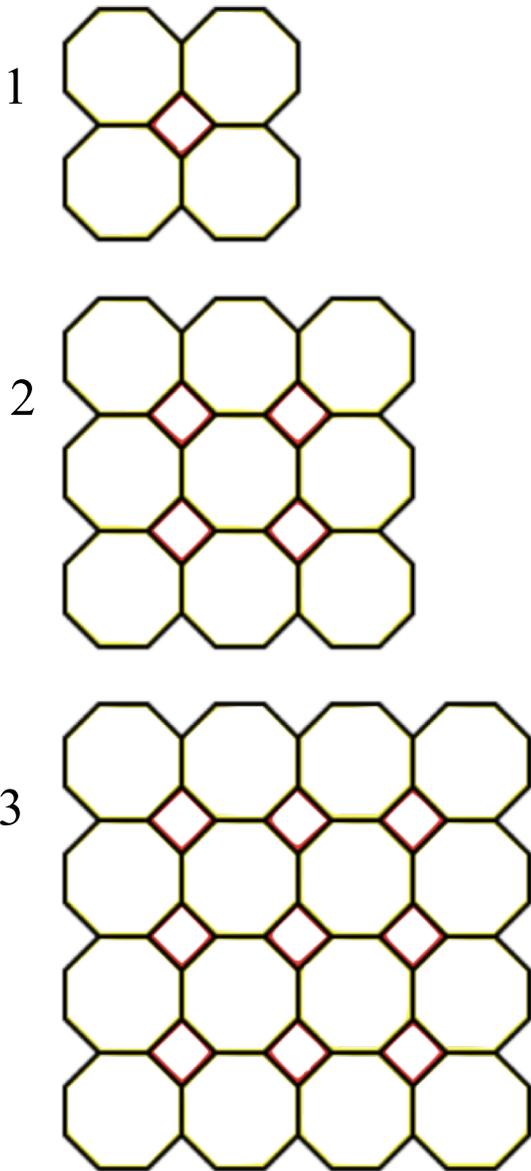
# Quadratic Equations

Name \_\_\_\_\_

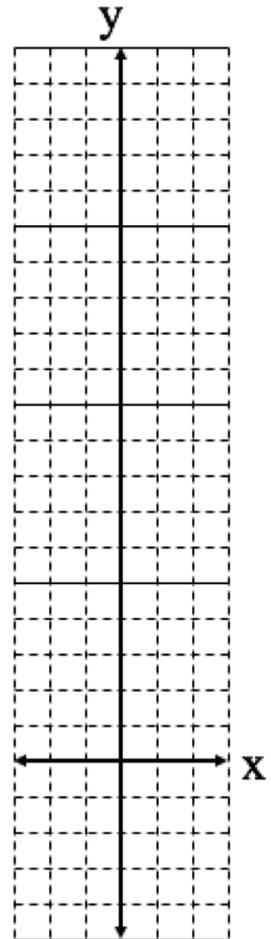
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function D



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

# Quadratic Equations

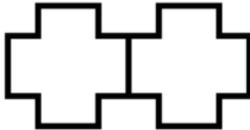
Name \_\_\_\_\_

Date \_\_\_\_\_ Class \_\_\_\_\_

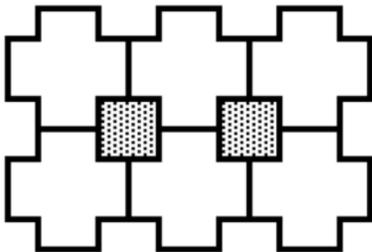
Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function E

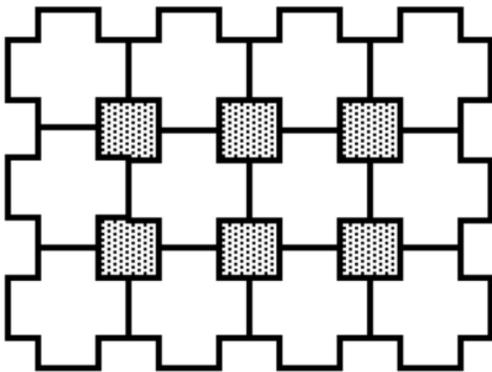
1



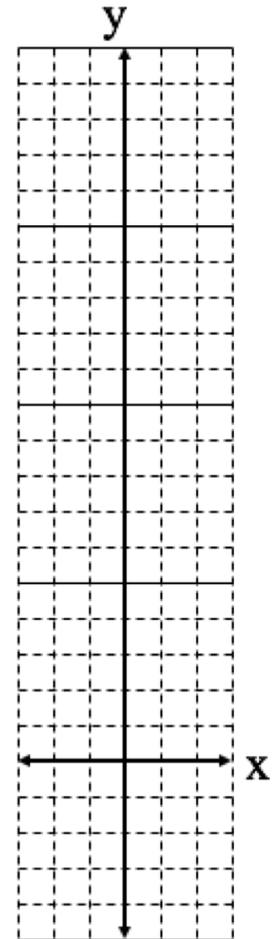
2



3



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

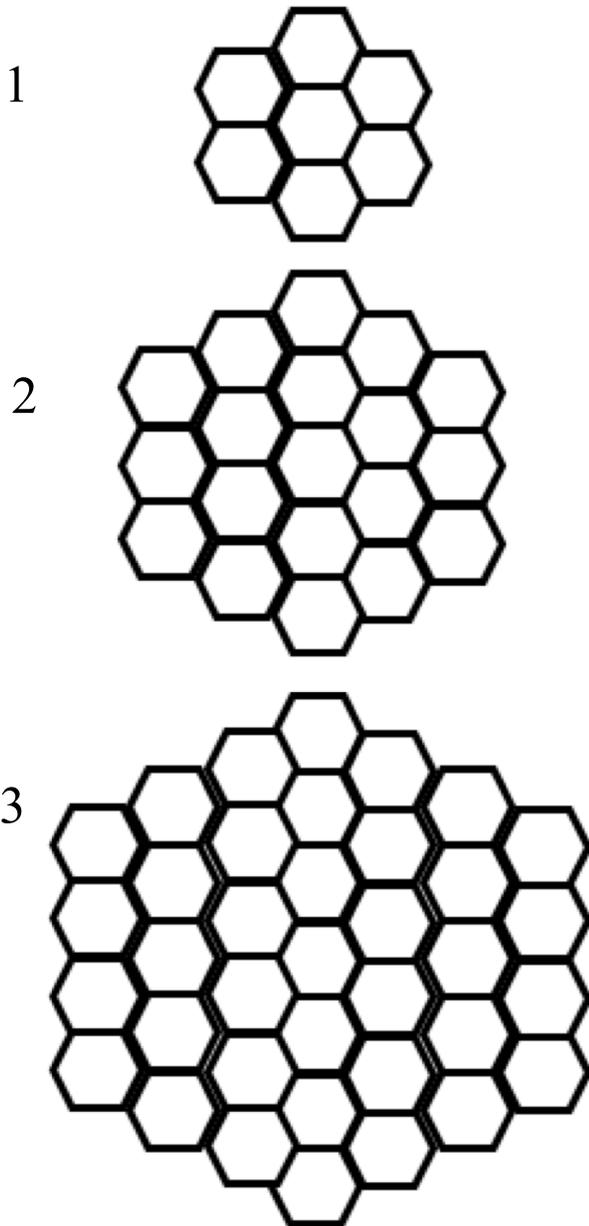
# Quadratic Equations

Name \_\_\_\_\_

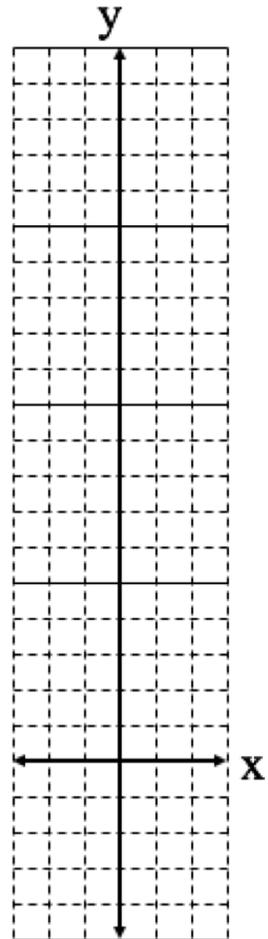
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

Function F



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

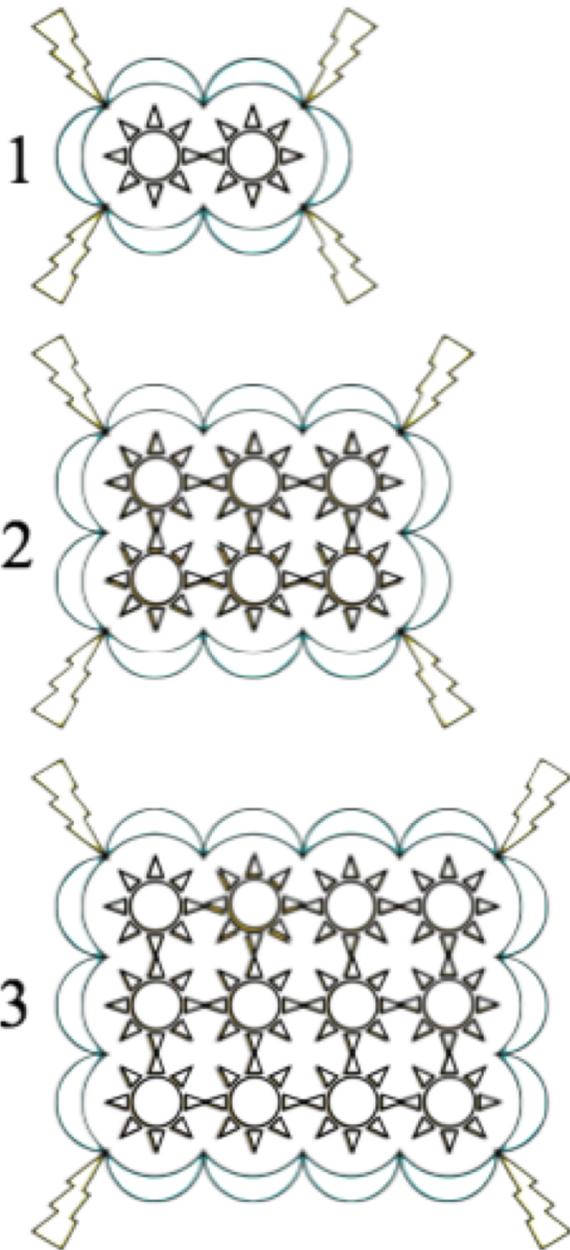
# Quadratic Equations

Name \_\_\_\_\_

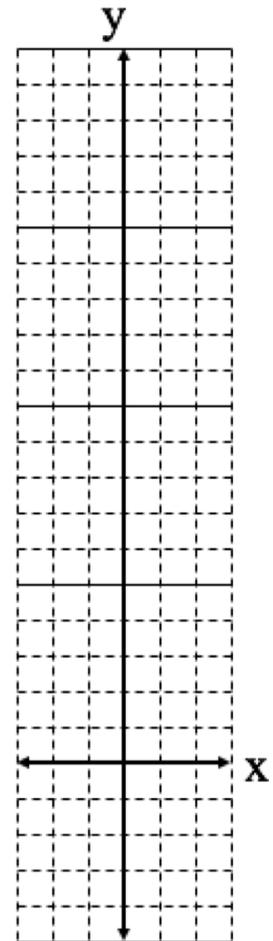
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

Function G



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

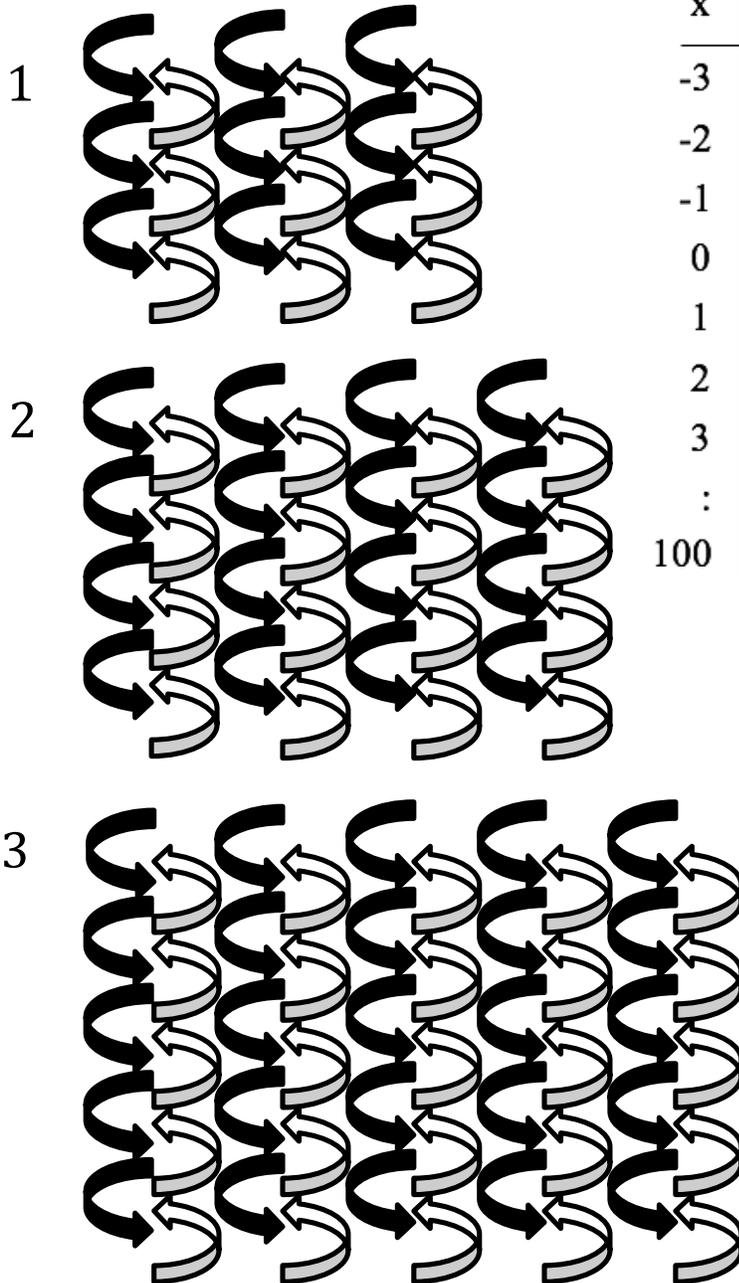
# Quadratic Equations

Name \_\_\_\_\_

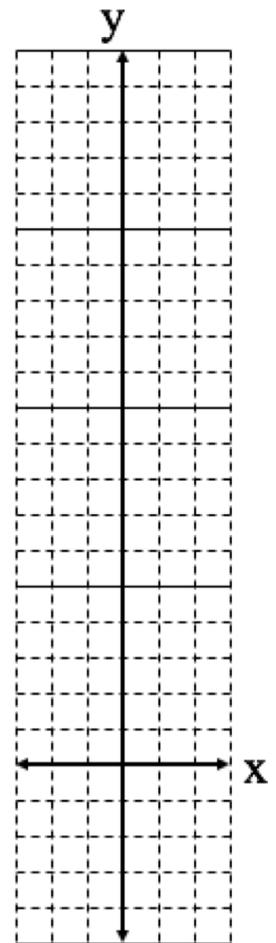
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

Function H



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

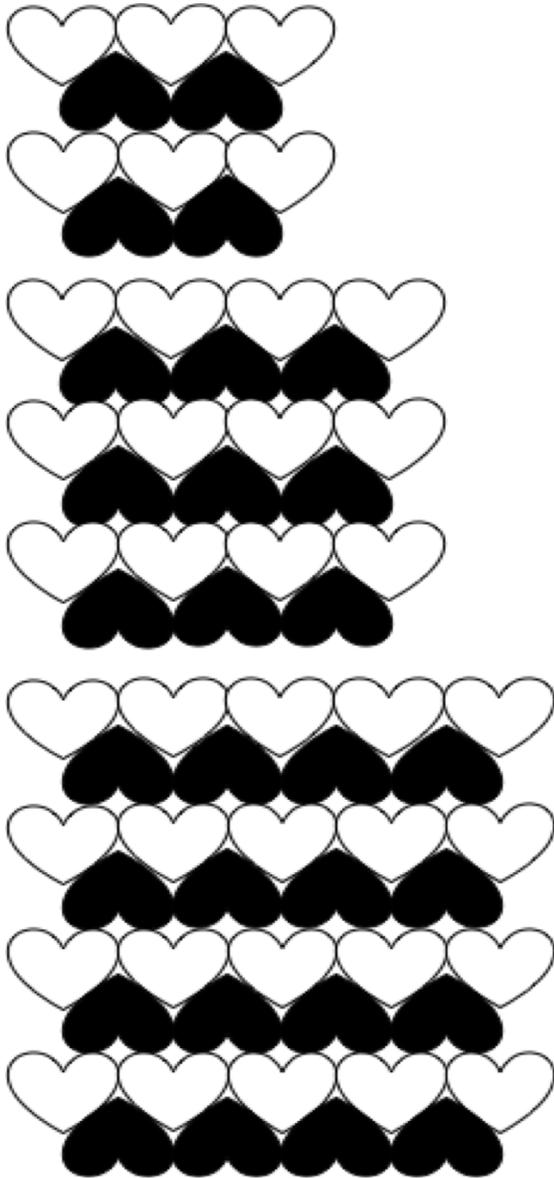
# Quadratic Equations

Name \_\_\_\_\_

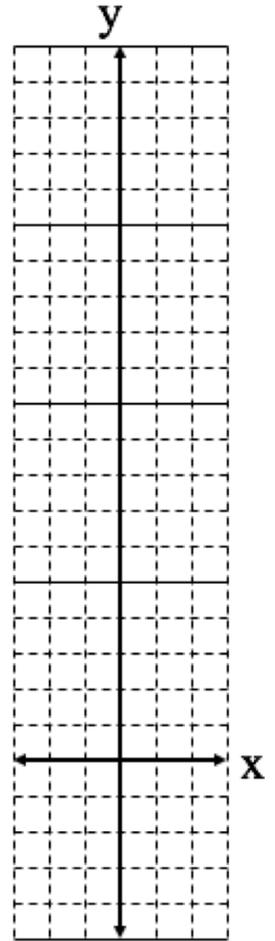
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function I



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

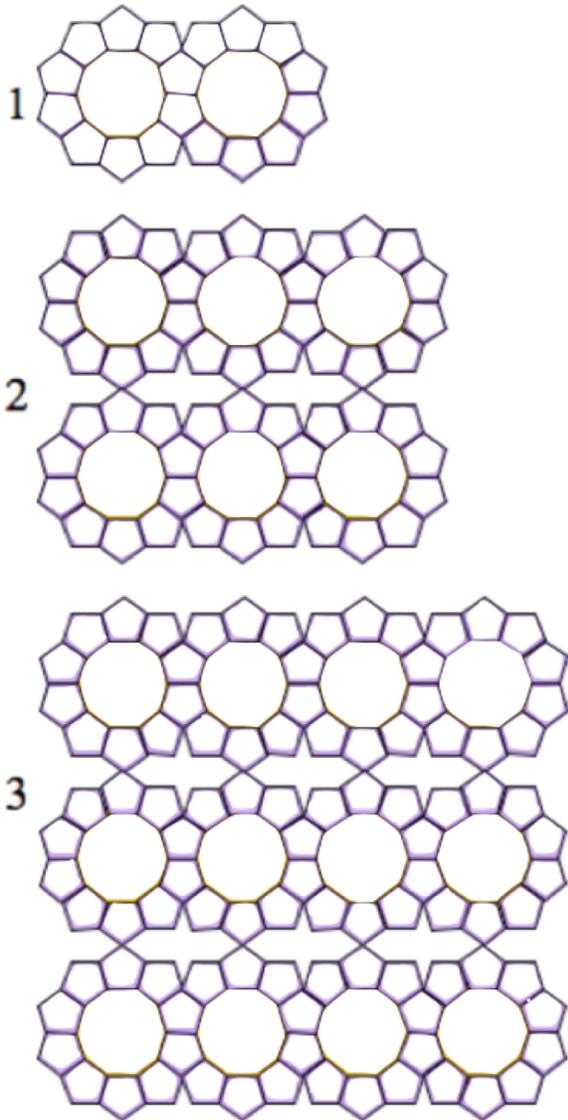
# Quadratic Equations

Name \_\_\_\_\_

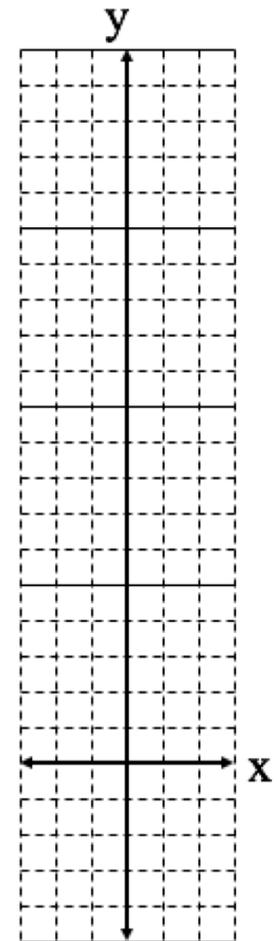
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function J



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

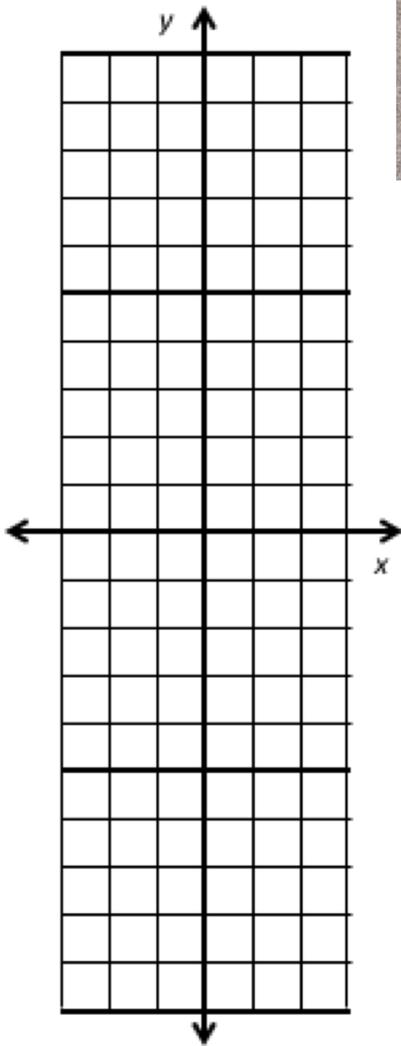
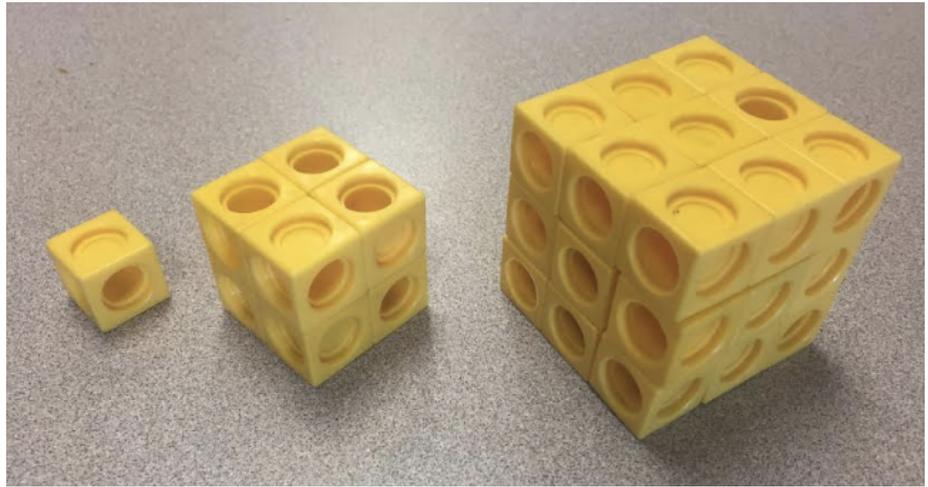
# Cubic Equations

Name \_\_\_\_\_

Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function K



Rule \_\_\_\_\_

x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	

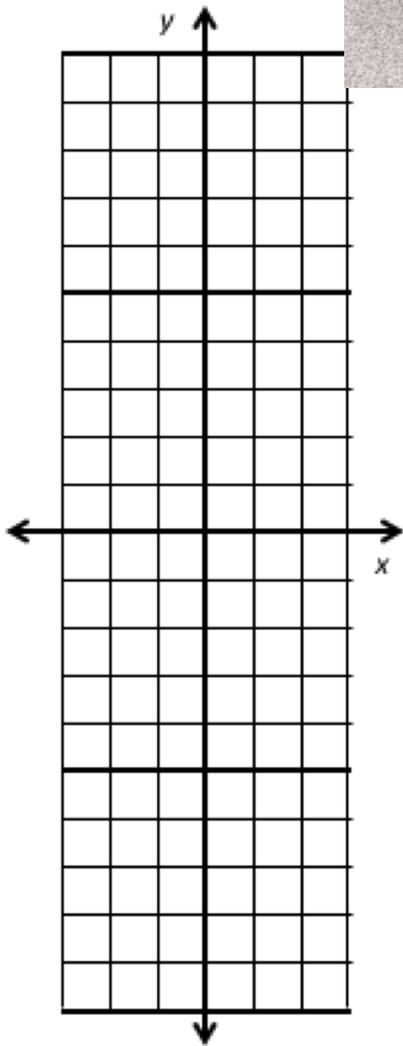
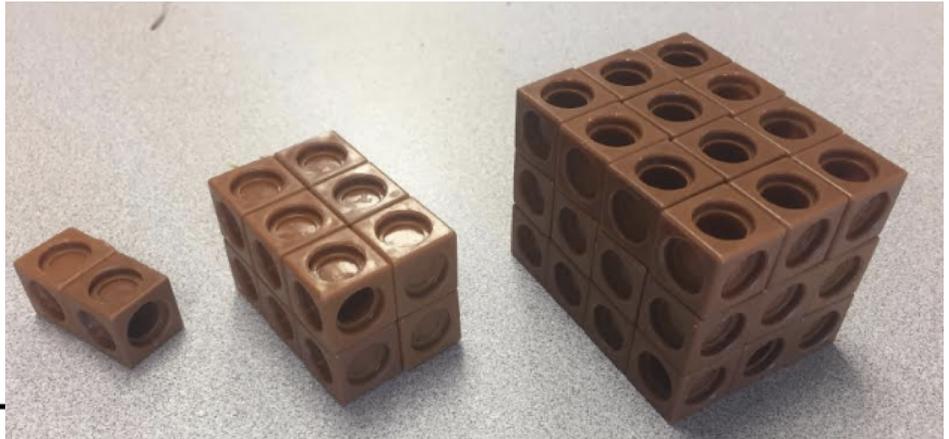
# Cubic Equations

Name \_\_\_\_\_

Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function L



Rule \_\_\_\_\_

x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	

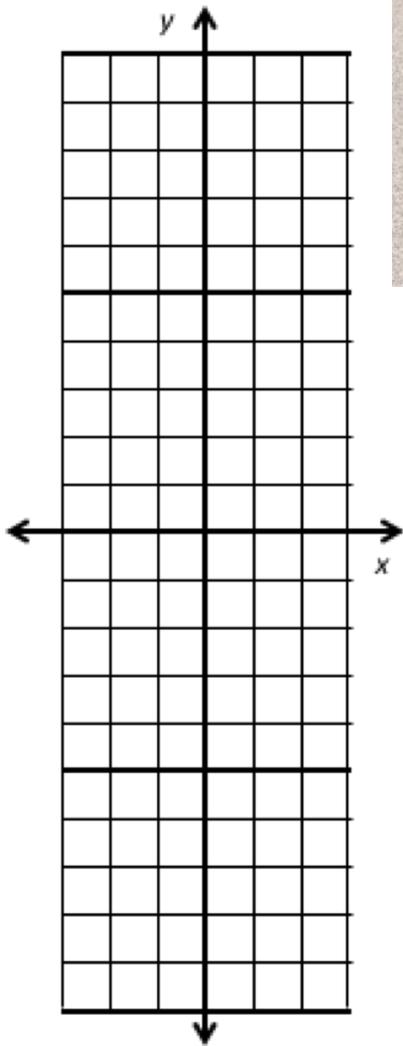
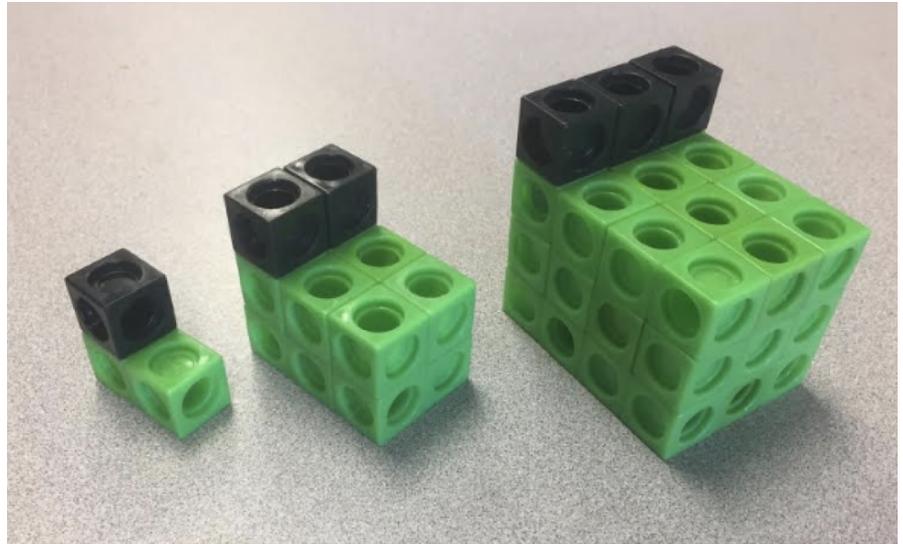
# Cubic Equations

Name \_\_\_\_\_

Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function M



Rule \_\_\_\_\_

x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	

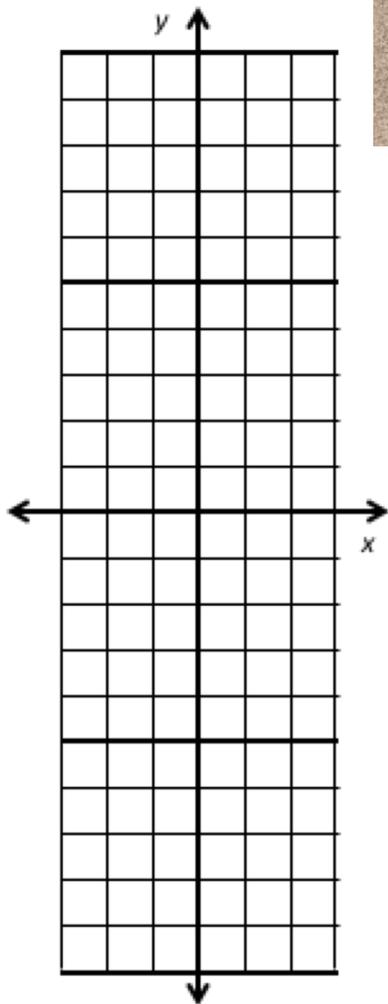
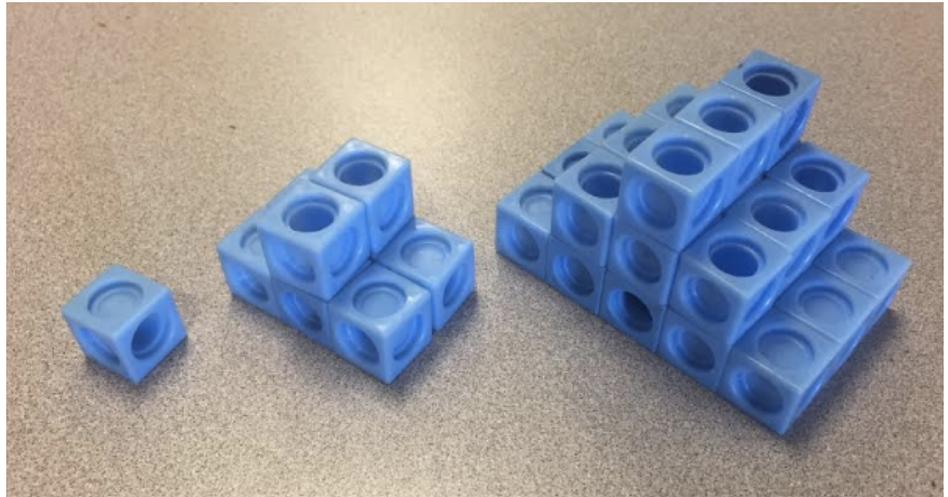
# Cubic Equations

Name \_\_\_\_\_

Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function N



Rule \_\_\_\_\_

x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	

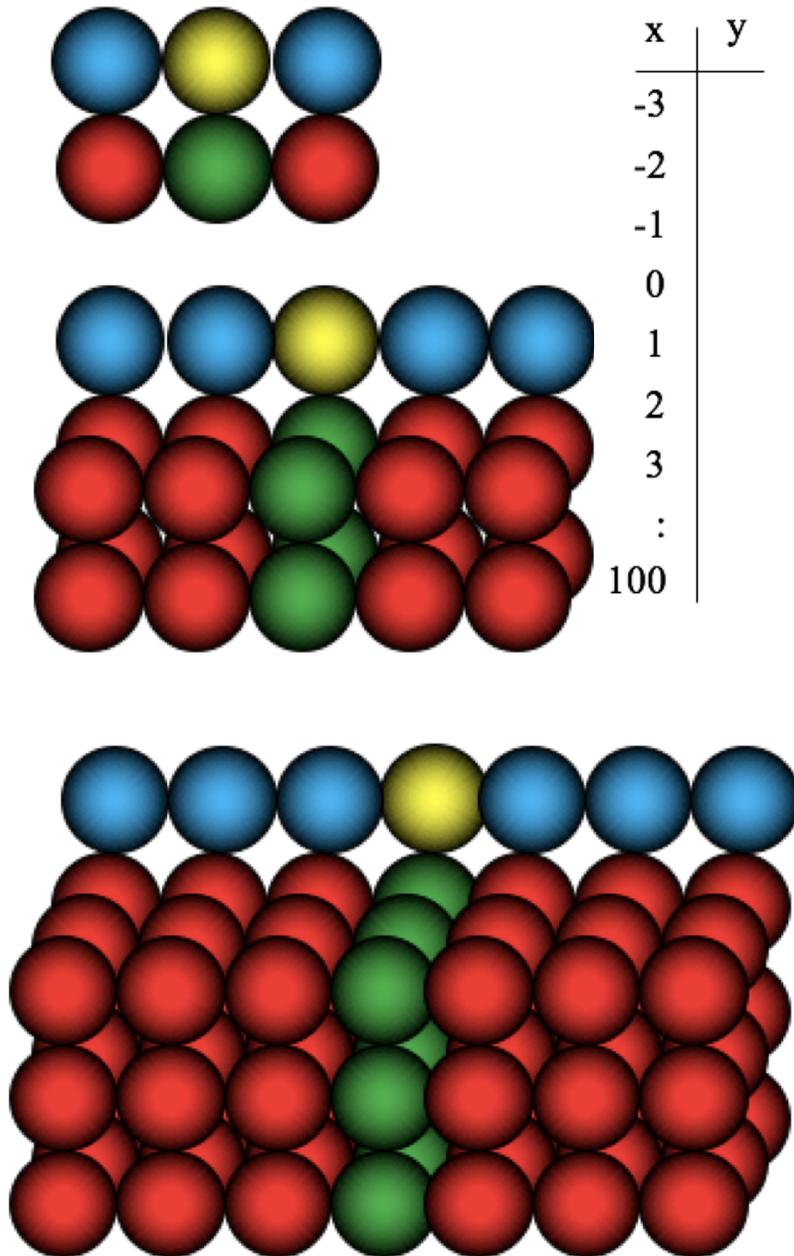
# Cubic Equations

Name \_\_\_\_\_

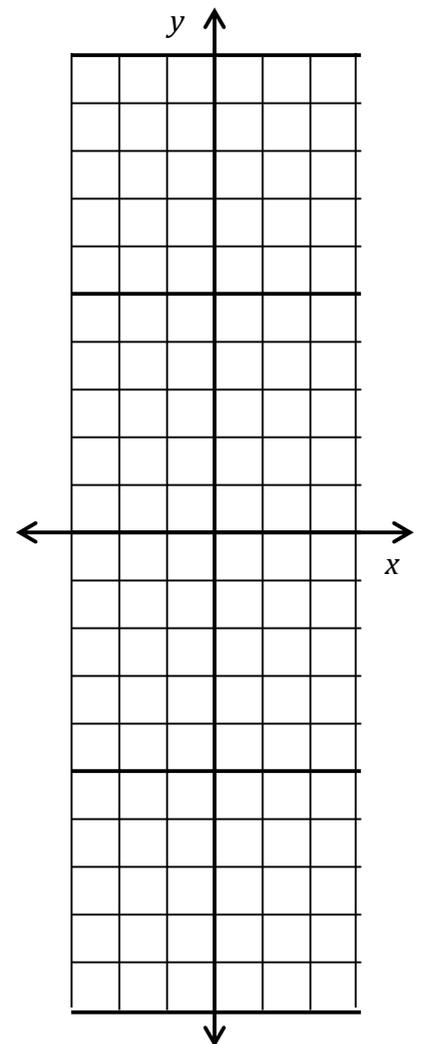
Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function O



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	



Rule \_\_\_\_\_

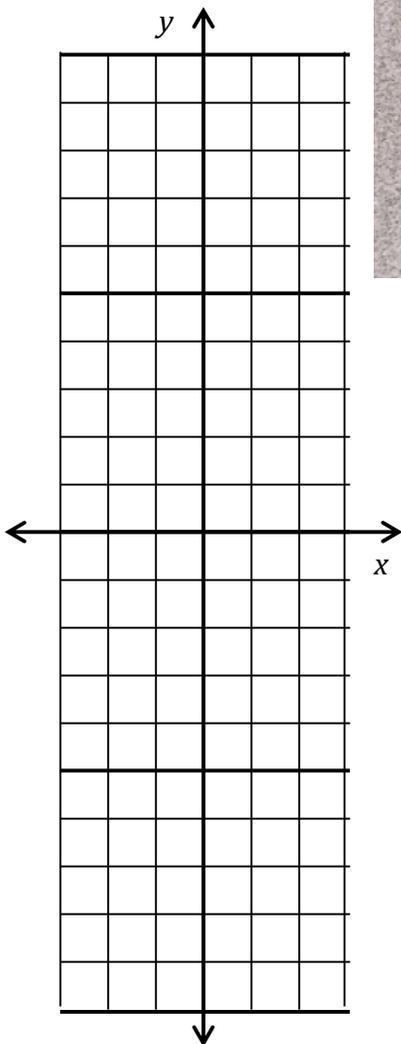
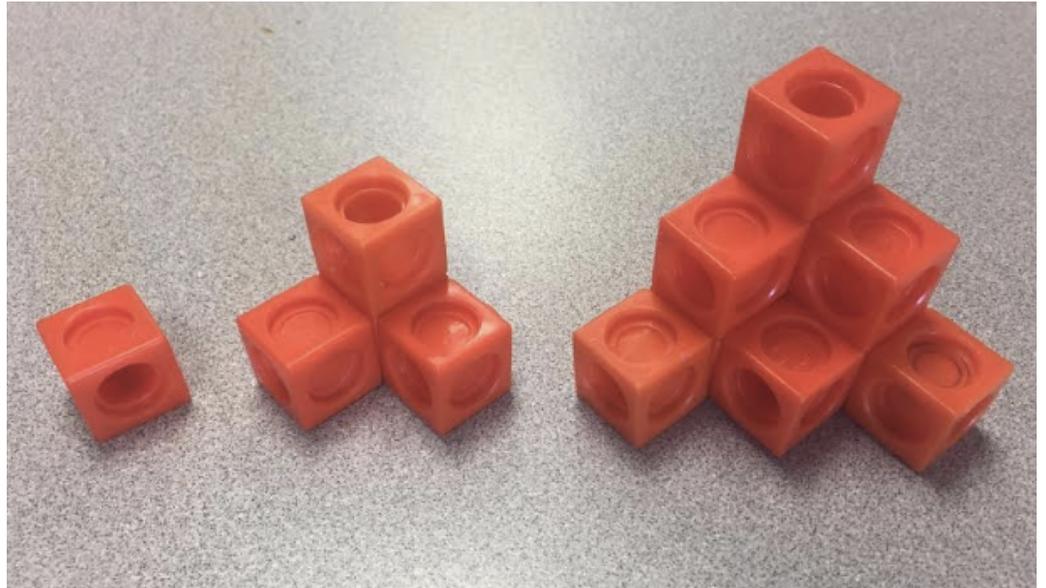
# Cubic Equations

Name \_\_\_\_\_

Date \_\_\_\_\_ Class \_\_\_\_\_

Study the pattern and see how it grows. Complete the t-table and graph the function. Then analyze the table and graph to find the rule.

## Function P



x	y
-3	
-2	
-1	
0	
1	
2	
3	
:	
100	

Rule \_\_\_\_\_

## Answer Key

Function      Rule    Step 100

### Quadratic Functions

A		$y = x^2$	10,000
B	Pink:	$y = x^2$	10,000
	Yellow:	$y = 4x$	400
	Blue:	$y = 4$	4
	Total:	$y = x^2 + 4x + 4$	10,404
C	Yellow:	$y = x^2 + 3x + 2$	10,302
	Blue:	$y = x^2 + x$	10,100
	Total:	$y = 2x^2 + 4x + 2$	20,402
D	Yellow:	$y = x^2 + 2x + 1$	10,201
	Red:	$y = x^2$	10,000
	Total:	$y = 2x^2 + 2x + 1$	20,201
E	Green:	$y = x^2 + x$	10,100
	Orange:	$y = x^2 - x$	9,900
	Total:	$y = x^2$	10,000
F		$y = 3x^2 + 3x + 1$	30,301
G	Sun:	$y = x^2 + x$	10,100
	Moon:	$y = 4x + 2$	402
	Bolts:	$y = 4$	4
	Total:	$y = x^2 + 5x + 6$	10,506
H	Green:	$y = x^2 + 4x + 4$	10,404
	Blue:	$y = x^2 + 4x + 4$	10,404
	Total:	$y = 2x^2 + 8x + 8$	20,808
I	Blue:	$y = x^2 + 3x + 2$	10,302
	Pink:	$y = x^2 + 2x + 1$	10,201
	Total:	$y = 2x^2 + 5x + 3$	20,503
J	Purple:	$y = 8x^2 + 10x$	81,000
	Yellow:	$y = x^2 + x$	10,100
	Total:	$y = 9x^2 + 11x$	91,100

Function	Rule	Step 100
<b>Cubic Functions</b>		
K	$y = x^3$	1,000,000
L	$y = x^3 + x^2$ or $y = x^2(x + 1)$	1,010,000
M	$y = x^3 + x^2 + x$ or $y = x(x^2 + x + 1)$	1,010,100
N	$y = x^3$	1,000,000
O	Red: $y = 2x^3$	2,000,000
	Green: $y = x^2$	10,000
	Blue: $y = 2x$	200
	Yellow: $y = 1$	1
	Total: $y = 2x^3 + x^2 + 2x + 1$	2,010,201
P	$y = \frac{1}{6}x^3 + \frac{1}{2}x^2 + \frac{1}{3}x$	171,700

If you liked this activity, you might also like some of the other lessons available in my TeachersPayTeachers store. Simply search for "**Teacher to Teacher Press**".

You can also find many free and inexpensive resources on my personal website, [www.tttpress.com](http://www.tttpress.com). Be sure to subscribe to receive monthly newsletters, blogs, and activities.

Similar activities include:

- *Losing Your Marbles* - A linear functions activity that helps students see slope, y-intercept, domain, range, and more!
- *Milk Carton Apartments* - Linear functions made simple for younger and struggling students.
- *Sounds of Summer* - Even the chirping of a cricket can be expressed as a linear function that relates to temperature in this fun and scientific activity.
- *Function Fun, Parts, 1, 2, and 3* - Students as young as 4<sup>th</sup> grade have learned and understood linear functions when presented in this multi-representational approach.

Feel free to contact me if you have questions or comments or would like to discuss a staff development training or keynote address at your site.

Happy teaching,

*Brad*