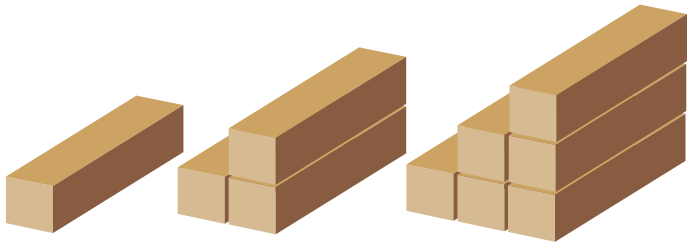
Name _____

4-2 Patterns and Non-Linear

OBJECTIVE: **I can identify and represent patterns that describe nonlinear functions**

Warm-Up

The table shows the relationship between the number of steps in the staircase below and the number of blocks needed to build the staircase. Copy and complete the table. Is the relationship a function? If so, is it a linear function? Explain.



Number of Steps	Number of Blocks	Ordered Pairs
1	1	(1, 1)
2	3	(2, 3)
3	6	(3, 6)
4		
5		

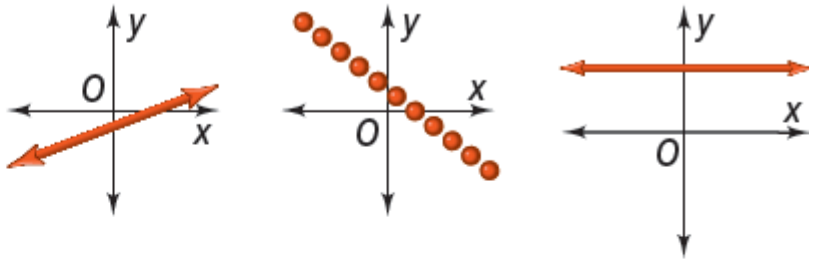
Essential Understanding

Essnetial Undertanding Just like linear functions, nonlinear functions can be represented using words, tables, equations, sets of ordered pairs, and graphs.

Key Concept:

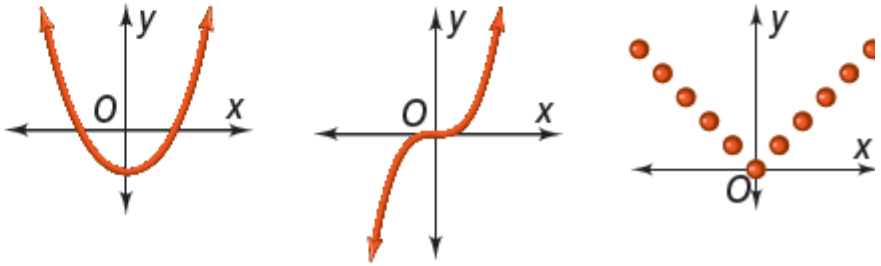
Linear Function

A linear function is a function whose graph is a nonvertical line or part of a nonvertical line.



Nonlinear Function

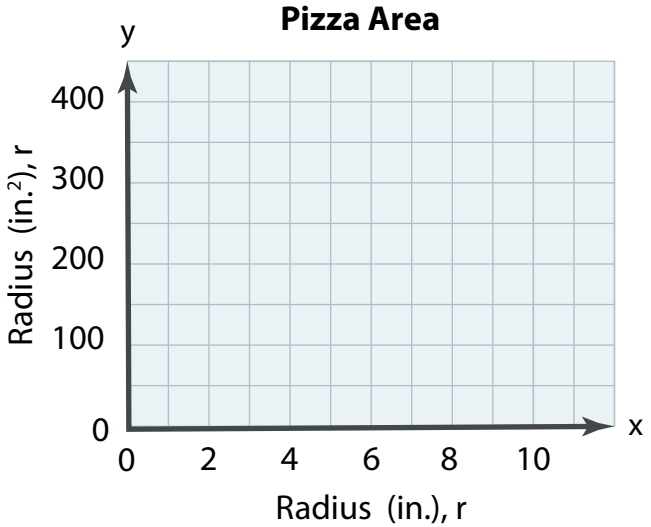
A nonlinear function is a function whose graph is not a line or part of a line.



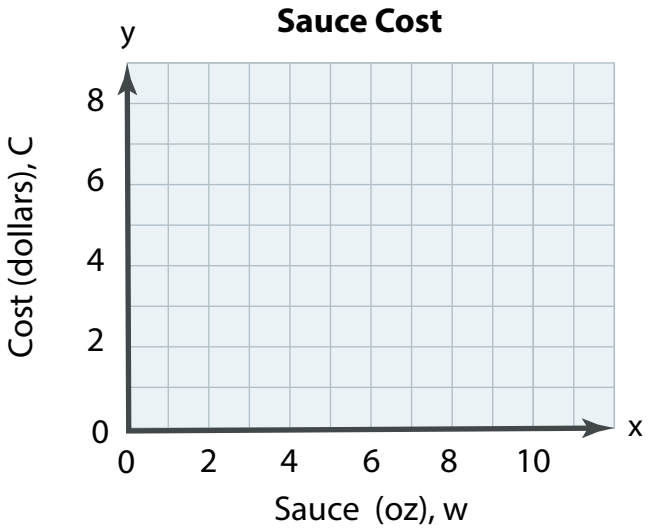
Example #1 Classifying Functions as Linear or Nonlinear

Pizza The area A, in square inches, of a pizza is a function of its radius r, in inches. The cost C, in dollars, of the sauce for a pizza is a function of the weight w, in ounces, of sauce used. Graph these functions shown by the tables below. Is each function linear or nonlinear?

Radius (in.), r	Area (in.2), A
2	12.57
4	50.27
6	113.10
8	201.06
10	314.16



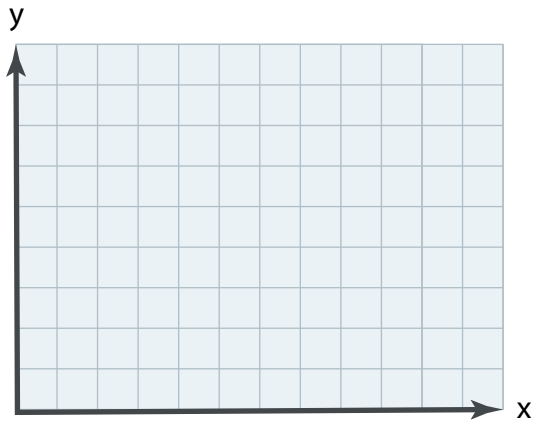
Weight (oz.), W	Cost, C
2	$.80
4	$1.60
6	$2.40
8	$3.20
10	$4.00



Your Turn to Work it Out

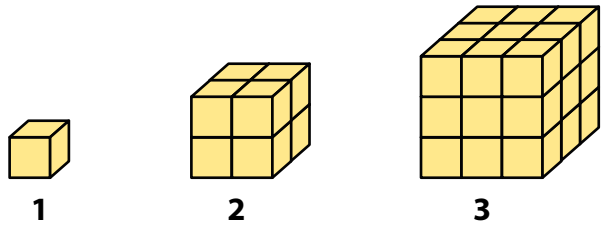
1. The table below shows the fraction A of the original area of a piece of paper that remains after the paper has been cut in half n times. Graph the function represented by the table.
Is the function linear or nonlinear?

Cutting Paper				
Number of Cuts, n	1	2	3	4
Fraction of Original Area Remaining, A	$^1/_2$	$^1/_4$	$^1/_8$	$^1/_{16}$



Example #2 Representing Patterns and Nonlinear Functions

The table shows the total number of blocks in each figure below as a function of the number of blocks on one edge.



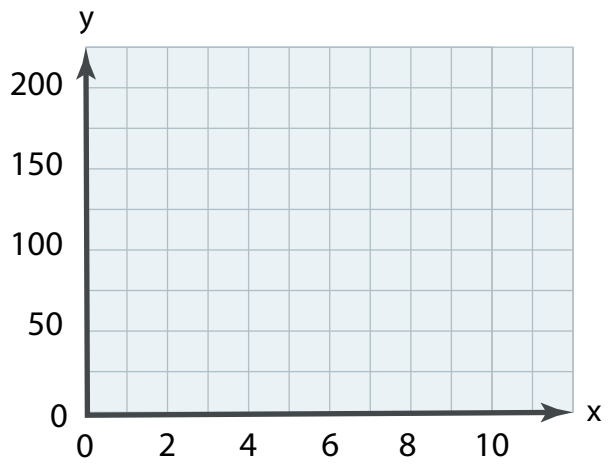
Number of Blocks on Edge, x	Total Number of Blocks, y	Ordered Pair (x, y)
1	1	(1 , 1)
2	8	(2 , 8)
3	27	(3 , 27)
4		
5		

What is a pattern you can use to complete the table? Represent the relationship using words, an equation, and a graph.

Words

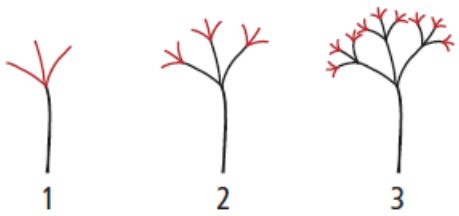
Equations

Graph

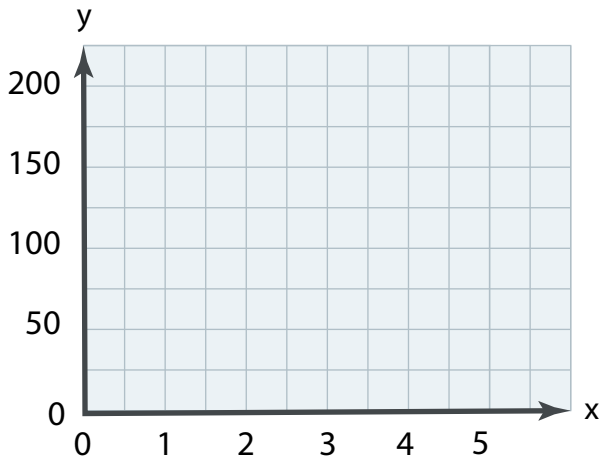


Your Turn to Work it Out

2. The table shows the number of new branches in each figure of the pattern below. What is a pattern you can use to complete the table? Represent the relationship using words, an equation, and a graph.



Number of Figure, x	1	2	3	4	5
Number of New Branches, y	3	9	27		



Example #3 Writing a Rule to Describe a Nonlinear Function

The ordered pairs (1, 2), (2, 4), (3, 8), (4, 16), and (5, 32) represent a function. What is a rule that represents this function?

Your Turn to Work it Out

3. What is a rule for the function represented by the ordered pairs (1, 1), (2, 4), (3, 9), (4, 16), and (5, 25)?