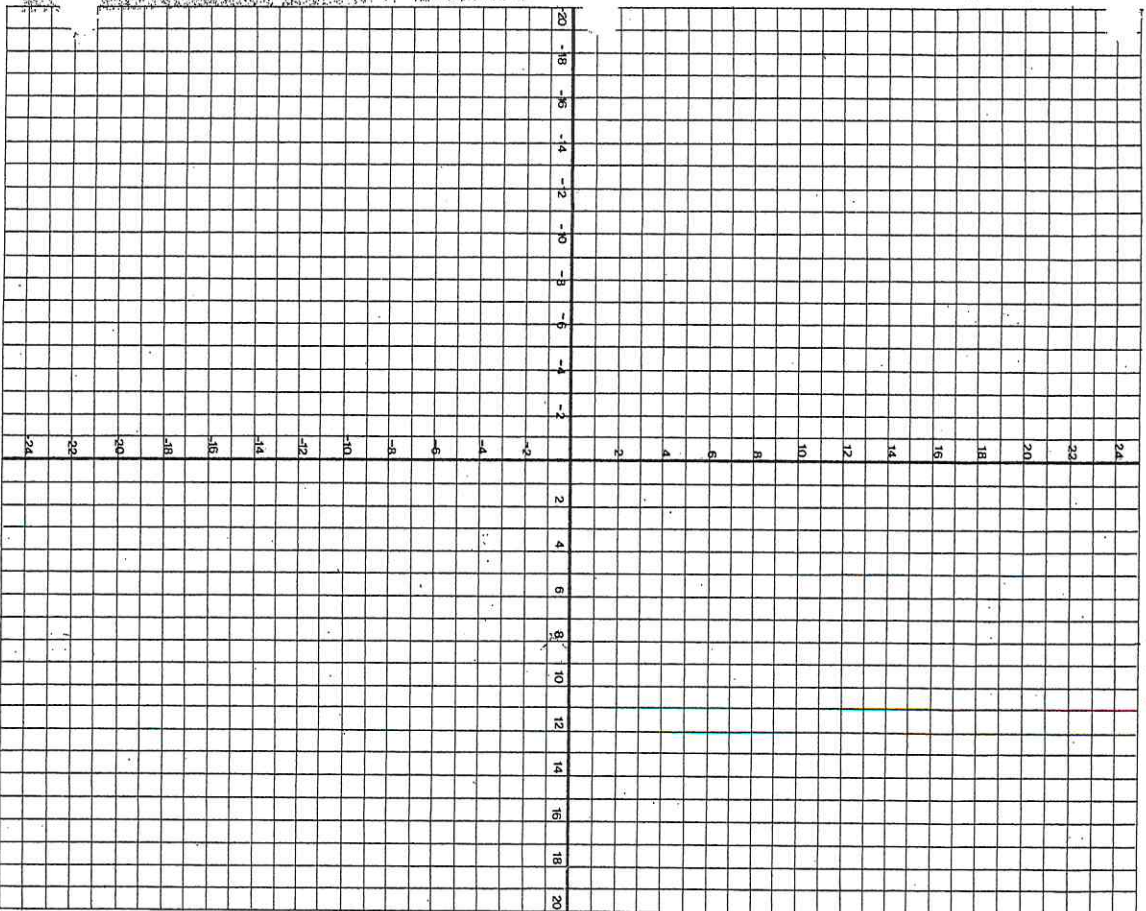


Rule	Mug/Wump	Zug	Lug	Bug	Thug
Point	$(x, y)$	$(2x, 2y)$	$(-2x, y)$	$(-2x, -2y)$	$(x, -2y)$
A	Set 1 (2, 0)	Set 1 (4, 0)	Set 1	Set 1	Set 1
B	(2, 4)	(4, 8)			
C	(0, 4)				
D	(0, 5)				
E	(2, 5)				
F	(0, 7)				
G	(0, 10)				
H	(1, 12)				
I	(2, 10)				
J	(5, 10)				
K	(6, 12)				
L	(7, 10)				
M	(7, 7)				
N	(5, 5)				
O	(7, 5)				
P	(7, 4)				
Q	(5, 4)				
R	(5, 0)				
S	(4, 0)				
T	(4, 3)				
U	(3, 3)				
V	(3, 0) (connect V to A)				
W	Set 2 (start over) (2, 7)	Set 2	Set 2	Set 2	Set 2
X	(3, 6)				
Y	(4, 6)				
Z	(5, 7)				
AA	Set 3 (start over) (3, 7)	Set 3	Set 3	Set 3	Set 3
BB	(4, 7)				
CC	(4, 9)				
DD	(3, 9) DD to AA				
EE	Set 4 (start over) (2, 9) make dot	Set 4	Set 4	Set 4	Set 4
FF	(5, 9) make dot				

Name \_\_\_\_\_

General directions for Picture Graphing puzzles: Plot each ordered pair on this grid. Draw line segments to connect the points in the order listed. Stop connecting points when you see "line ends." Start a new line with the next group of points.



# Identify the Wumps

Your task...

Lurking among the members of the Wump family are some imposters who, at first glance, look like the Wumps but are actually quite different.

- Use the instructions to draw Mug Wump on graph paper. Outline Mug in purple when you are done. Describe Mug's shape.
- On the same graph paper, make Bug, Lug, Thug and Zug (label them as you go). After drawing the characters, compare them to Mug. Which characters are imposters (not Wumps). Compare all of the characters. What things are the same about Mug and Zug? Mug and Lug? Mug and Bug? Mug and Thug? What things are different? Think about the general shape, lengths of sides, and the angles of each figure.

Name \_\_\_\_\_ Date \_\_\_\_\_

Zack and Marta wrote a computer game involving a family called the Wumps. The members of the Wump family are various sizes, but they all have the same shape. Mug Wump is the game's main character. By enlarging or reducing Mug, a player can transform him into other Wump family members.

Zack and Marta experimented on paper with enlarging and reducing figures on a coordinate grid. First, Zack drew Mug Wump on dot paper, then he labeled the key points from A to Z and from AA to FF and listed the coordinates for each point. Marta described the rules that would transform Mug into different sizes to create other members of the Wump family.

### Instructions for drawing Wumps

- To draw Mug, use the sets of coordinate pairs given in the chart on the next page. Plot the points from the "Mug Wump" column on your graph paper. Connect the points in order if no other instruction is given.
  - To draw Zug, Lug, Bug, and Thug, use the given rule to find the coordinates of each point. For example, the rule for finding the points for Zug is  $(2x, 2y)$ . This means that you multiply each of Mug's coordinates by 2. Point A on Mug is  $(2,0)$  so the corresponding A on Zug is  $(4,0)$ .
  - Plot the points for Zug, Lug, Bug, and Thug, and connect them according to the directions in step 2.

Name \_\_\_\_\_ Date \_\_\_\_\_

Sophia has a worm farm. She recently noticed an unusual growth pattern with her worms and has modeled it with triangles in the space below. Draw what her worms look like on Day 4 and then fill out the table to determine the number of triangles in 2, 3, 4, 5, 6 days. Look for a pattern that you can apply to  $n$  days.

### Worm Growth

Day 1:  Day 2:  Day 3:  Day 4: \_\_\_\_\_

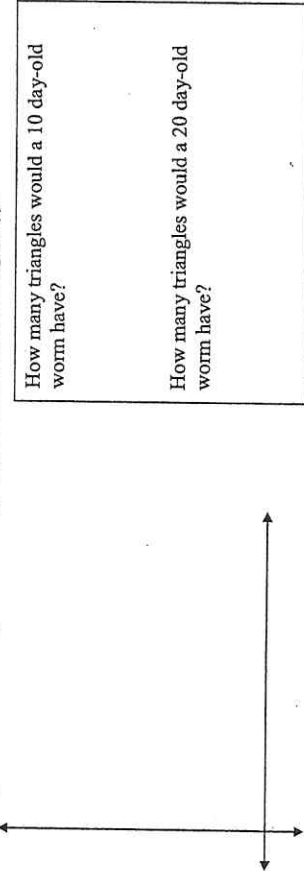
Table:

Days (d)	Number of Triangles (t)
1	4
2	
3	
4	
5	
6	
$n$	

Days (d)	Triangles in Body	Triangles at Ends	Total # of Triangles (t)
1	2	2	$2(1) + 2 = 4$
2			
3			
4			
$n$			

Write an Equation:

Graph the relationship between days (d) and number of triangles (t):



How many days old would a worm be if it had 18 triangles?