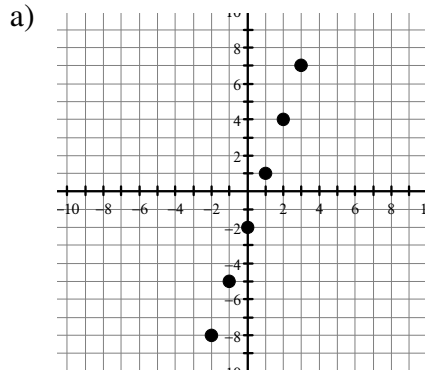


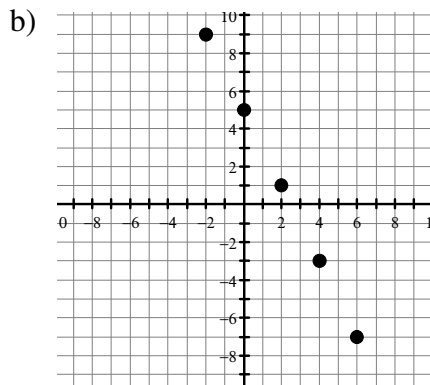
# Linear and Non-Linear Relations

Complete the tables of values for the following graphs and determine whether you think each graph is linear or non-linear.



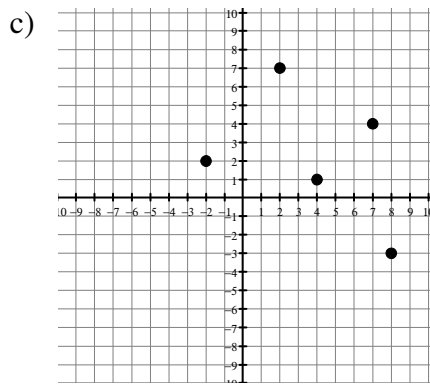
X	Y
-2	
-1	
0	
1	
2	
3	

Linear / Non-Linear



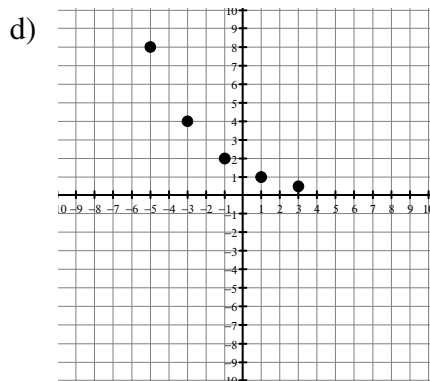
X	Y
-2	
0	
2	
4	
6	

Linear / Non-Linear



X	Y
-2	
2	
4	
7	
8	

Linear / Non-Linear



X	Y
-5	
-3	
-1	
1	
3	

Linear / Non-Linear

# First Differences

First differences are the differences between the y-values in a table of values.  
The x-values must go up the same amount each time.

2 Use First Differences to determine whether the function represented by each table of values is linear or non-linear.

a)

x	y
-3	13
-2	10
-1	7
0	4
1	1
2	-2
3	-5

b)

x	y
-3	-27
-2	-8
-1	-1
0	0
1	1
2	8
3	27

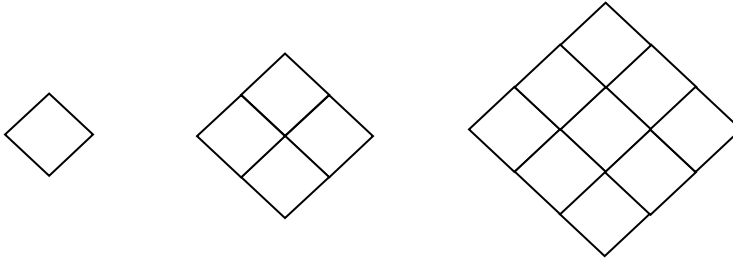
c)

x	y
5	7
4	8
3	9
2	10
1	12
0	13
-1	14

d)

x	y
2	4
3	10
4	12
5	15
6	18
7	22
8	25

3 Use first differences to determine whether the function is linear or non-linear. Extrapolate to predict what the values will be for the 8<sup>th</sup> diagram.

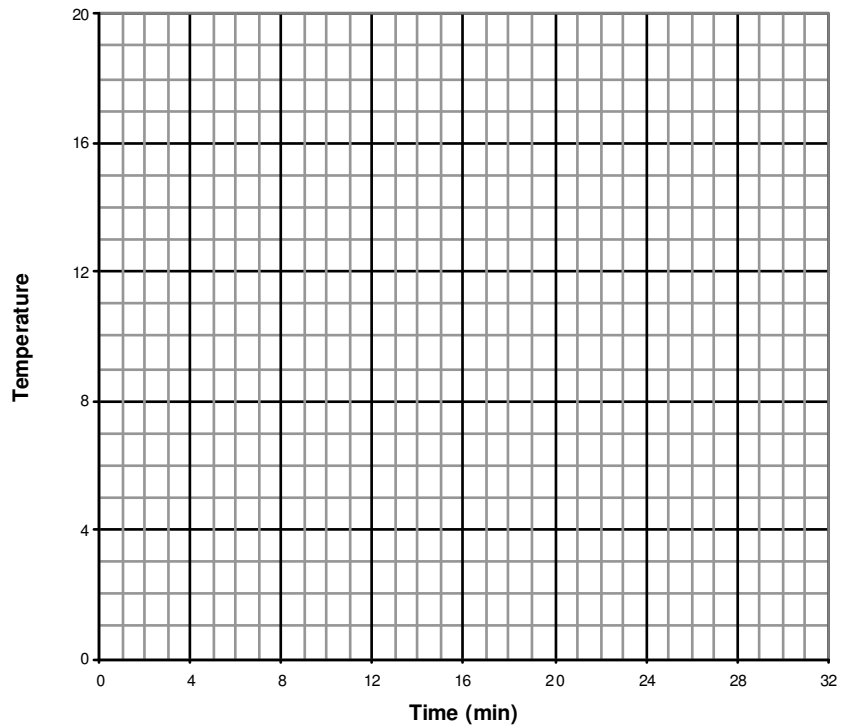


Length of the base	Total number of tiles
1	
2	
3	
4	

4 Joelle places a glass of water in the freezer and records the temperature of the water at various times, as shown in the table of values below. She notices that the relation is linear. Complete the table and determine how long it will take for the temperature of the water to drop to 0°C, using 2 different methods.

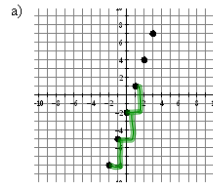
Time (min)	Temperature (°C)
4	13
6	12
8	11
12	
	6
	3

Temperature of water left in the freezer



Linear and Non-Linear Relations

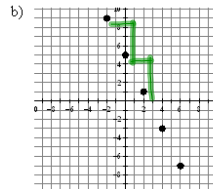
Complete the tables of values for the following graphs and determine whether you think each graph is linear or non-linear.



X	Y
-2	-8
-1	-5
0	-2
1	1
2	4
3	7

Linear / Non-Linear

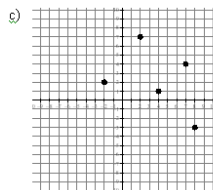
As x increases by 1, y increases by 3!



X	Y
-2	9
0	5
2	1
4	-3
6	-7

Linear / Non-Linear

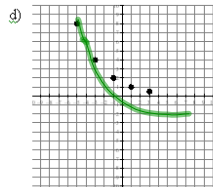
As x increases by 2, y decreases by 4



X	Y
-2	
2	
4	
7	
8	

Linear / Non-Linear

No relation



X	Y
-5	8
-3	4
-1	2
1	1
3	0.5

Linear / Non-Linear

As x increases by 2, y is divided by 2!

First Differences

First differences are the differences between the y-values in a table of values. The x-values must go up the same amount each time.

Use First Differences to determine whether the function represented by each table of values is linear or non-linear.

x	y
-3	13
-2	10
-1	7
0	4
1	1
2	-2
3	-5

As x increases by 1, y decreases by 3  
Linear because first differences are all the same!

x	y
-3	-27
-2	-8
-1	-1
0	0
1	1
2	8
3	27

Non-linear  
There is a pattern to the first diff. but it's not the same!

x	y
5	7
4	8
3	9
2	10
1	12
0	13
-1	14

Non-Linear  
Because all the f.d. are the same

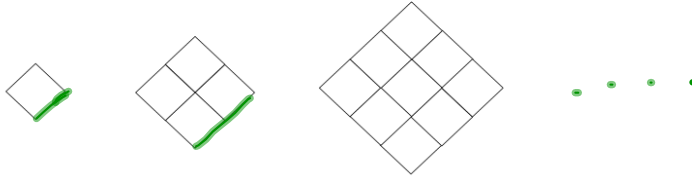
x	y
2	4
3	10
4	12
5	15
6	18
7	22
8	25

Non-linear  
Too much variation in the f.d.'s!

# 1.5 Linear or Non-Linear

February 10, 2014

3 Use first differences to determine whether the function is linear or non-linear. Extrapolate to predict what the values will be for the 8<sup>th</sup> diagram.



Length of the base	Total number of tiles
1	1
2	4
3	9
4	16

⋮  
8      64

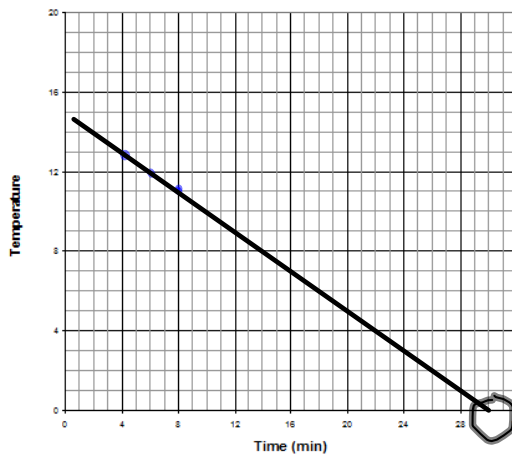
Non-linear

4 Joelle places a glass of water in the freezer and records the temperature of the water at various times, as shown in the table of values below. She notices that the relation is linear. Complete the table and determine how long it will take for the temperature of the water to drop to 0°C, using 2 different methods.

Time (min)	Temperature (°C)
4	13
6	12
8	11
12	9
18	6
24	3

Method 1  
 13 - 12 = -1  
 12 - 11 = -1  
 9 - 6 = -3  
 6 - 3 = -3  
 3 - 0 = -3

Temperature of water left in the freezer



Therefore, it would take 30 mins for the temperature to reach zero degrees!

Method 1: Use the table to count, for every drop of one degree, the time increases by 2 minutes.

Method 2: Draw a line of best fit through the 3 points that were given (at 4, 6, and 8 seconds) then extrapolate down until the line hits the x-axis (zero degrees!)