

CHAPTER 5 Modelling With Graphs

5.5. First Differences

Finding First Differences, Linear and Non-Linear Relations

Example:

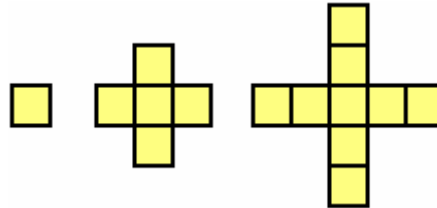
a) Calculate the first differences for the relation shown. Then, classify the relation as linear or non-linear.

x	y	First Differences
0	-3	
1	-1	
2	1	
3	3	

b) Calculate the first differences for the relation shown. Then, classify the relation as linear or non-linear.

x	y	First Differences
3	-4	
4	-1	
5	3	
6	8	

c) The first few figures in a pattern are shown. Construct a table with the figure number in the first column and the number of squares in the second column.



d) Calculate the first differences, and determine whether the relation is linear or non-linear.

Solution:

a) The first differences are shown. Since the first differences are constant, the relation is linear.

x	y	First Differences
0	-3	
1	-1	2
2	1	2
3	3	2

b) The first differences are shown. Since the first differences are not constant, the relation is non-linear.

x	y	First Differences
3	-4	
4	-1	3
5	3	4
6	8	5

c) The table is shown.

Figure Number	Number of Squares	First Differences
1	1	
2	5	4
3	9	4
4	13	4

d) The first differences are shown. Since the first differences are constant, the relation is linear.

Practice:

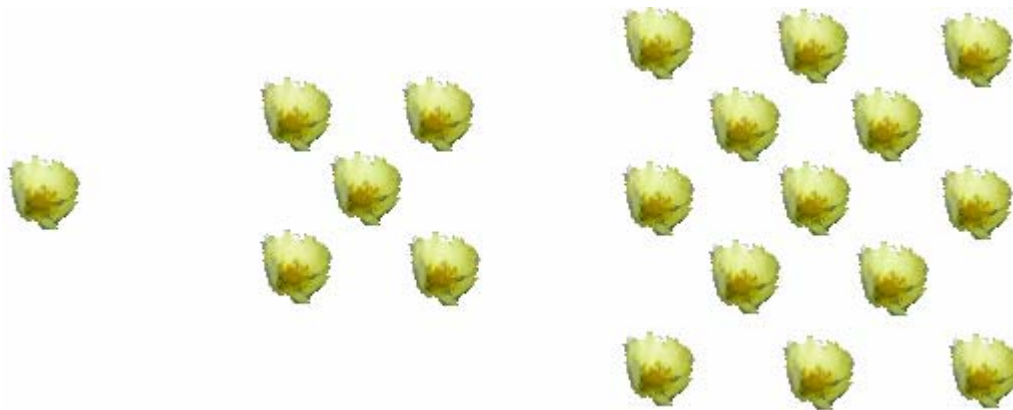
1. a) Calculate the first differences for the relation shown. Then, classify the relation as linear or non-linear.

x	y	First Differences
-2	-5	
-1	-2	
0	1	
1	4	

b) Calculate the first differences for the relation shown. Then, classify the relation as linear or non-linear.

x	y	First Differences
2	10	
4	5	
6	2	
8	1	

c) While on a garden tour, Cynthia noticed an interesting pattern in the flowers planted in one particular garden. The first three figures are shown.



Construct a table with the figure number in the first column and the number of flowers in the second column. Calculate the first differences, and determine whether the relation is linear or non-linear.

Answers:

1. a)

x	y	First Differences
-2	-5	
-1	-2	3
0	1	3
1	4	3

b)

x	y	First Differences
2	10	
4	5	-5
6	2	-3
8	1	-1

c) The table is shown. The first differences are shown. Since the first differences are not constant, the relation is non-linear.

Figure Number	Number of Flowers	First Differences
1	1	
2	5	4
3	13	8
4	25	12