A. Exploration 1 – Number Patterns

Given the number pattern .....2,4,8,14,22,32,44, ...

(a) How do you know the pattern is NOT linear?

(b) How do you know the pattern is NOT exponential?

(c) What are the next three terms of the sequence?

(d) What are the 3 terms that came before 2?

Given the number pattern .....16,15,12,7,0,-9,-20 .....

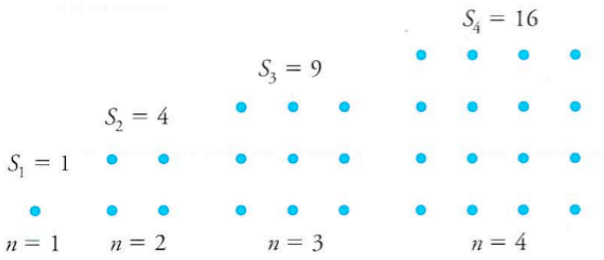
(a) How do you know the pattern is NOT linear?

(b) How do you know the pattern is NOT exponential?

(c) What are the next three terms of the sequence?

(d) What are the 3 terms that came before 16?

Figurate numbers refer to a sequence of numbers that represent the number of "markers" needed to construct common geometric shapes. Consider the square numbers of 1,4,9,16,25,.....



Complete this table of square numbers.

n	1	2	3	4	5	6	7	8
S_n	1	4	9	16				

(a) Explain how you know the data is NOT linear.

(b) Explain how you know the data is NOT exponential

(c) Predict the next 4 terms.

SUMMARY: KEY TO DATA ANALYSIS:

Pentagonal numbers are another group of figurate numbers, which are based on pentagons rather than squares.

Draw the diagram for the first four pentagonal numbers.

The diagram shows that

$P_1 = 1$

$P_2 = 5$

$P_3 = 12$

$P_4 = 22$

(a) Calculate the next 4 pentagonal numbers. Explain your thinking.

(b) Explain how you know the data is NOT linear.

(c) Explain how you know the data is NOT exponential

B. Exploration 1 – Number Patterns

Data Sets in Context:

Below is a data set that measures the Profit P(c) in Millions of Euros as a function of Cars c, that are produced per year.

c	0	1	2	3	4	5	6	7	8	9	10	11
P(c)	-40	-18	0	14	24	30	32	30	24	14	0	-18

(a) Describe the pattern in the data set

(a) What are the next three terms of the sequence?

(b) What are the 3 terms that came before 2?

Data Sets in Context

Below is a data set that measures the Cost C(m) in Millions for a Large Diary Producing Company as a function of the month of the year since January.

m	0	1	2	3	4	5	6	7	8	9	10	11	12
C(m)	150	117	90	69	54	45	42	45	54	69	90	117	150

(a) Describe the pattern in the data set

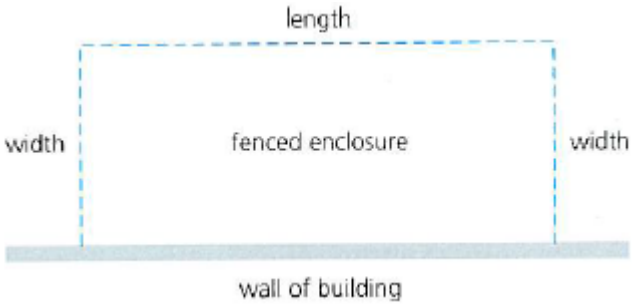
(c) What are the next three terms of the sequence?

(d) What are the 3 terms that came before 2?

SUMMARY: KEY TO DATA ANALYSIS:

(e) Geometry Problems – Maximum Area

Mr. Smith enjoys vegetable gardening and is digging a garden this weekend. He plans to dig his garden this weekend. He has a total of 12 m of fencing to enclose the rectangular garden to keep his dog from eating the vegetables. He is able to use the wall of the garage for one side of the garden.

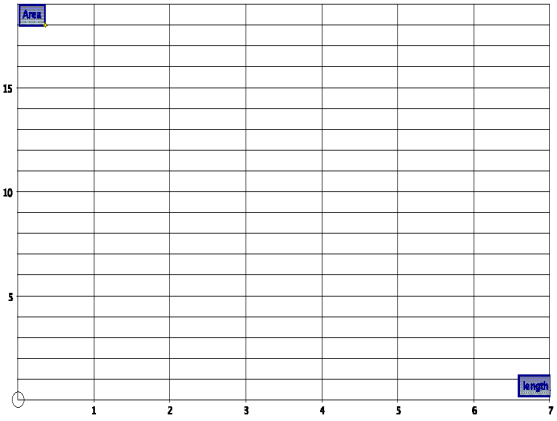


Data

Explore the different lengths, widths and areas he could have for his garden.

Length										
Width										
Area										

Graph



Problem: If Mr. Smith wanted to *maximize* the area of his garden, what would he choose for the dimensions of his garden? Explain your choice.

Algebra - Could we write an equation for the area ***A*** in terms of the length ***L***?

What does the solution look like on your graph?

A. Exploration #3

The Paymore Show company introduced a new line of neon green high heel running shoes. The table below shows the number of pairs of shoes sold at one store over an 11 month period.

Month	1	2	3	4	5	6	7	8	9	10	11
Shoes sold	56	60	62	62	60	56	50	42	32	20	6

(a) Show that the data is quadratic

(b) State the domain and range for this model, given the context for the data.

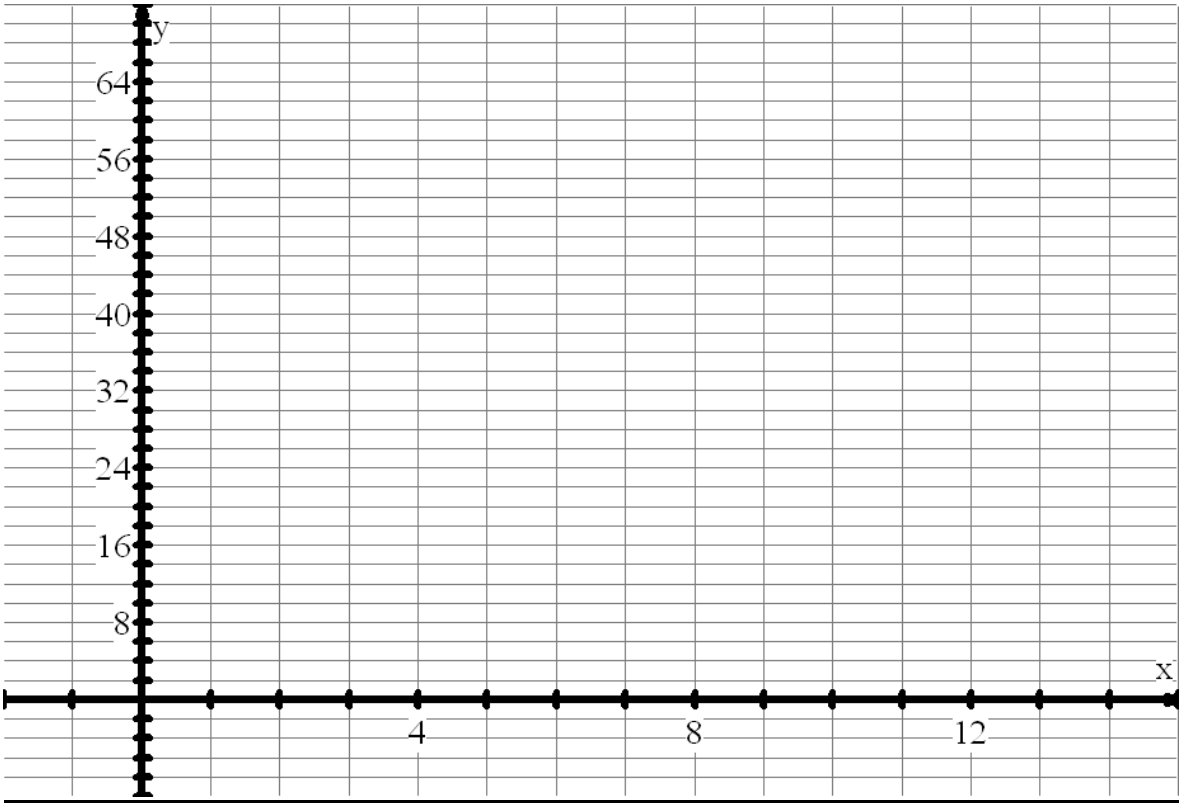
(c) At what rate are shoe sales are changing between months 1 & 2? What does this mean?

(d) At what rate are shoe sales are changing between months 6 & 7? What does this mean?

(e) Explain why a quadratic model would be suitable for the fashion business.

(f) Explain why a quadratic model would NOT be suitable for the fashion business.

(g) Draw a scatter-plot of the data.



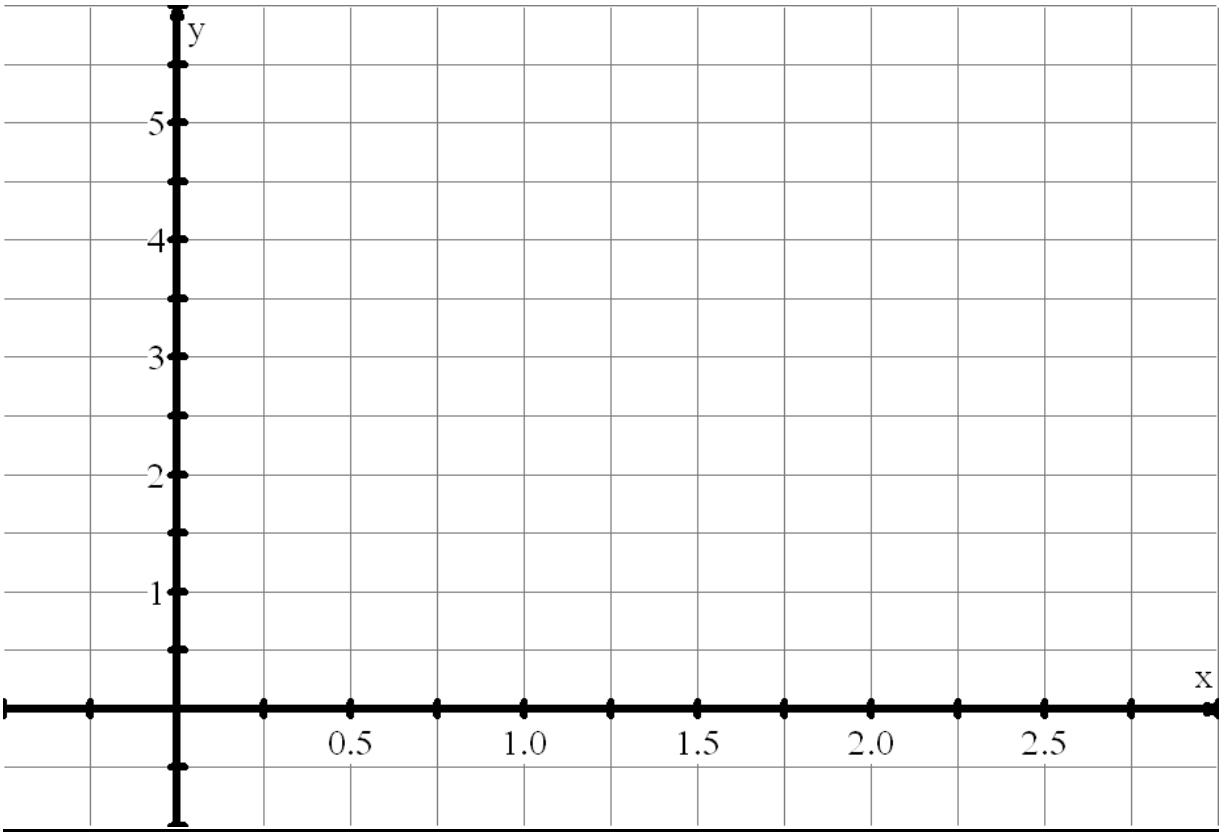
B. Exploration #4

12. A ball is tossed straight up in the air. Its height is recorded every quarter second.

Time (s)	0	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00
Height (m)	1.5	3.5	4.9	5.7	5.7	5.2	4.1	2.4	0.1

(a) Draw a scatter plot.
(b) What type of model is a reasonable representation of the relationship between the height of the ball and the time in the air? Explain
(c) Draw the graph that best fits the data.
(d) When does the ball reach its highest point above the ground? What is the ball's height at this point? Be as precise as you can, using your graphical model.
(e) About how long is the ball in the air? Explain.

C.



Exploration #5

Mr Santowski & Mr Smith are on the roof of an apartment building and Mr S kicks a soccer ball. The height of the soccer ball is, H, measured in meters above the ground and the time of flight of the ball is measured in seconds and the flight of the ball can be modeled by the equation $H = -5t^2 + 30t + 80$. You will analyze the trajectory of the ball by answering the following questions.

(A) Graph the relation on the calculator and use the data table on the GDC to complete the data table on this sheet and then graph the data points to make a diagram here.

(B) How high was the building from which we kicked the ball?

(C) How long did it take for the ball to reach its maximum height? What was its maximum height?

(D) When did the ball hit the ground?

(E) For how long was the ball in flight?

(F) What is the domain for this relation, given the context of the equation?

(G) What is the range?

(H) What is the height of the ball at t = 5.5 seconds?

(I) At what time(s) is the height of the ball 100 m?