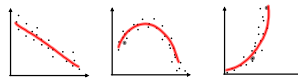


3.1 Investigating Non-Linear Relationships

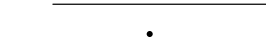
Line of Best Fit: a line drawn through a scatter plot when the data appears to follow a linear relation.

Curve of Best Fit: a smooth curve that represents the "shape" of the data. Non-linear data will have a non-linear curve of best fit.

Ex. 1 Determine whether the data represents a linear or non-linear relation, then draw the line or curve of best fit.

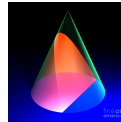


Geometric definition of a parabola...



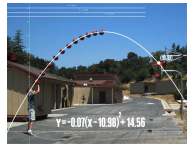
Bayonne Bridge, NY

Slice a cone at an angle



Parabolic reflectors

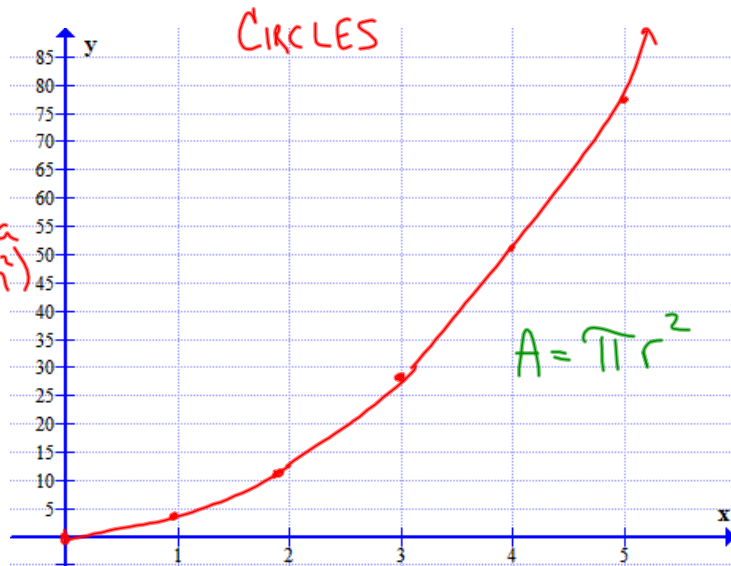
Basketball



Ex. 2 What is the relationship between the radius of a circle and its area?

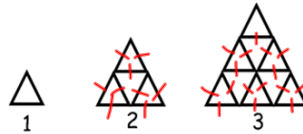
radius	area
0	0
1	3.14
2	12.56
3	28.27
4	50.26
5	78.5

Area (cm<sup>2</sup>)

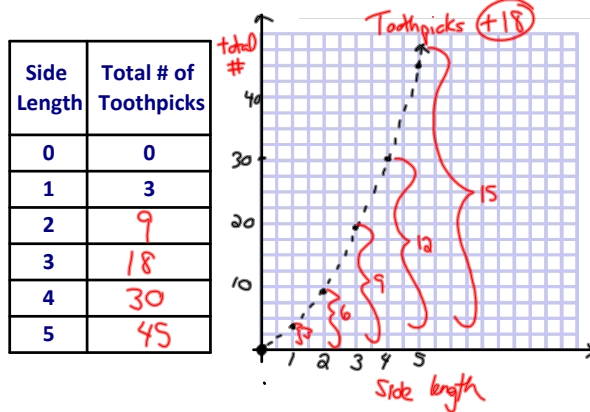


Radius (cm)

Ex. 3 Toothpicks can be arranged to create equilateral triangles as shown.



a) Complete the table and create a scaer plot for the data.



b) Describe the relaon. c) Draw a curve of best fit.

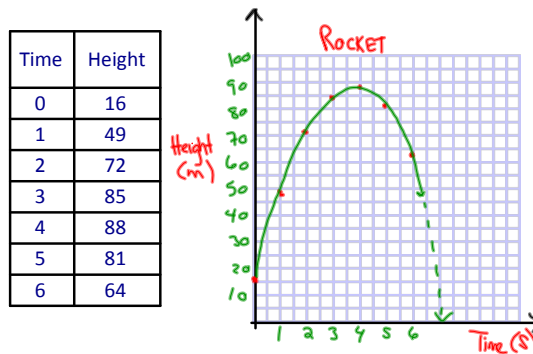
non-linear  
strong positive correlation  
increasingly  
parabola  
dashed - data is DISCRETE

d) Use your model to predict the number of toothpicks needed to build a triangle with a side length of 6 toothpicks.

63 toothpicks

Ex. 4 A toy rocket is launched straight up. The table shows its height, h, in metres above the ground aer t seconds.

a) Create a scaer plot of the data.



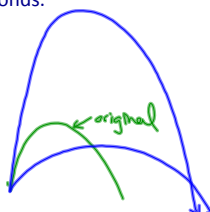
b) Describe the relaon. c) Draw a curve of best fit.

non-linear  
strong correlation  
parabola

d) Use your model to predict the height of the rocket at 8 seconds.

on the ground

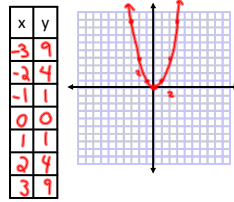
e) Describe how the graph would change if the rocket stayed in the air for 15 seconds.



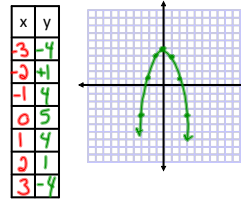
Graphs of Quadratic Relations

Ex. 5 Complete the table of values and graph each relation.

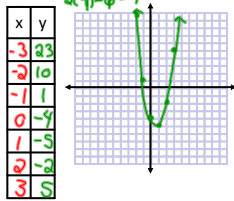
a)  $y = x^2$



b)  $y = 5 - x^2$



c)  $y = 2x^2 - 3x - 4$



Describe what these graphs have in common.

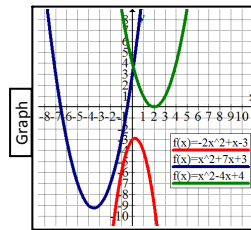
they are all parabolas

Ex. 6 Use graphing technology to graph each of the following.

a)  $y = -2x^2 + x - 3$

b)  $y = x^2 + 7x + 3$

c)  $y = x^2 - 4x + 4$



These are the graphs of **QUADRATIC** relations.  
The graph is called a **PARABOLA**.

# Your Turn

