**Activity 2.5.1c Quadratic Regression**

1. In **Activity 2.5.1 – Home Run Ball** you formulated a model for the flight of a home run ball at Fenway Park by choosing three data points and solving a system of 3 equations in 3 variables algebraically.

a. We will now use your calculator and the same set of data to make a scatter plot for these data points. Enter the height above ground in L1 and the horizontal distance from home plate in L2.

Graph these points by turning on a STAT PLOT, choosing scatter plot, and using L1 and L2 for the lists. Be sure to change your window for the data points you choose. Hit the GRAPH button to see the scatter plot.

Your calculator can find the quadratic equation: This is a statistical calculation, so the command is found in the STAT ► CALC menu ▼ 5:QuadReg.

Hit ENTER to bring the command to the home screen and ENTER again to run the QuadReg command.

b. Compare your regression equation with the one obtained using 3 data points you obtained in Activity 2.5.1. If they are a little different, why do you think they do not agree?

c. Lastly estimate the coordinates of the vertex by examining your scatter plot if you did not do so in activity 2.5.1and write here \_\_\_\_\_\_\_\_\_\_\_\_\_ . (If you used this method in Activity 2.5.1 copy your equation from that activity here.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) Then using one other point’s coordinates find an equation for the data using the vertex form and then change to standard form.

d.Why is this equation different from the other two above?

2. Given the following data:

|  |  |
| --- | --- |
| **Height above ground** | **Horizontal distance from home plate** |
| 0 | 4 |
| 20 | 34 |
| 100 | 123 |
| 160 | 155 |
| 200 | 159 |
| 300 | 111 |

1. Sketch the graph of the data.
2. What type of graph is formed if you “connect” the points?

Horizontal distance from home plate

Height above ground

c. Algebraically develop a model for the height of the baseball (*y*) as a function of the baseball’s horizontal distance from home plate (*x*) using the following data points:

 (0, 4), (100, 123) (300, 111).

d. Use your calculator to find the quadratic regression using **all the data.**

e. On your grapher, plot the data points, the regression equation from part d and your equation from part c.

d. Explain why your quadratic regression is a little different from the quadratic equation you found algebraically.

f. Use the quadratic equation you found in part 2d to explain why or why not your model corresponds to a home run ball through Center Field at Fenway Park.

3. The data below shows the speed of a certain car and its average miles per gallon while travelling on a flat surface.

 Use a graphing calculator to draw a scatter plot of the data.

|  |  |  |  |
| --- | --- | --- | --- |
| Speed | 30 | 45 | 70 |
| Ave. Miles per Gallon | 18 | 25 | 24 |

**Window:** a) Find the quadratic function that models the relation between speed and mpg.

 Xmin = 0

 Xmax = 110 b) Find the x-intercepts and interpret their meaning.

 Xscl = 5

Ymin = 0 c) Do they have real world meaning?

 Ymax = 35

 Ymax = 35

Yscl = 1

 d) Find the y-intercept and interpret.