

Quadratic Regression (QR)

Data: On a particular day in April, the outdoor temperature was recorded at 8 times of the day, and the following table was compiled.

Time of day (hour)	Temperature (degrees F.)
x	y
7	35
9	50
11	56
13	59
14	61
17	62
20	59
23	44

INSTRUCTIONS:

- 1. Please pick the appropriate parameters from the table below for this assignment
- 2. The Quadratic model is to be used by the first 14 set of students given in the table below.
- 3. The Exponential model is to be used by the the remaining students

Nonlinear Model Project - Parameters

Quadratic Model			
Last Name	First Name	Your Assignment	QR-4:
			Input Time of Day (hour)
f	m	Quadratic	7.0
		Quadratic	45.5

REMARKS: The times are the hours since midnight. For instance, 7 means 7 am, and 13 means 1 pm.

The temperature is low in the morning, reaches a peak in the afternoon, and then decreases.

Tasks for Quadratic Regression Model (QR)

(QR-1) Plot the points (x, y) to obtain a scatterplot. Note that the trend is definitely non-linear. Use an appropriate scale on the horizontal and vertical axes and be sure to label carefully.

(QR-2) Find the quadratic polynomial of best fit and graph it on the scatterplot. State the formula for the quadratic polynomial.

(QR-3) Find and state the value of r^2, the coefficient of determination. Discuss your findings. (r^2 is calculated using a different formula than for linear regression. However, just as in the linear case, the closer r^2 is to 1, the better the fit. Just work with r^2, not r.) Is a parabola a good curve to fit to this data?

(QR-4) Use the quadratic polynomial to make an outdoor temperature estimate. Each class member will compute a temperature estimate for a different time of day assigned by your instructor. Be sure to use the quadratic regression model to make the estimate (not the values in the data table). State your results clearly -- the time of day and the corresponding outdoor temperature estimate.

(QR-5) Using algebraic techniques we have learned, find the maximum temperature predicted by the quadratic model and find the time when it occurred. Report the time to the nearest quarter hour (i.e., __:00 or __:15 or __:30 or __:45). (For instance, a time of 18.25 hours is reported as 6:15 pm.) Report the maximum temperature to the nearest tenth of a degree. Show work.

(QR-6) Use the quadratic polynomial together with algebra to estimate the time(s) of day when the outdoor temperature is a specific target temperature. Each class member will work with a different target temperature, assigned by your instructor. Report the time(s) to the nearest quarter hour. Be sure to use the quadratic model to make the time estimates (not values in the data table). Show work. State your results clearly -- the target temperature and the associated time(s). Show work.

Please see the Technology Tips topic for additional information about generating the scatterplot and quadratic polynomial.