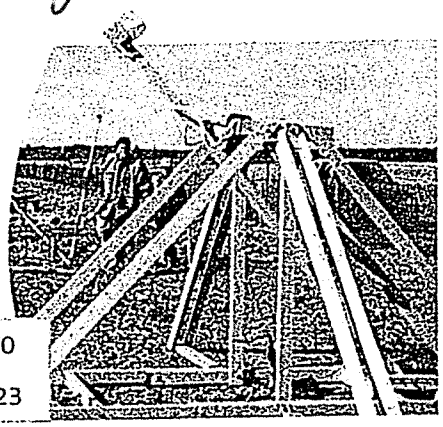
Alg 2 5.1 Quadratic Regression Applications Name Key

1.) **PUMPKIN TOSSING** A pumpkin tossing contest is held each year in Morton, Illinois, where people compete to see whose catapult will send pumpkins the farthest. One catapult launches pumpkins from 25 feet above the ground at a speed of 125 feet per second. The table shows the horizontal distances (in feet) the pumpkins travel when launched at different angles. Use a graphing calculator to find the best-fitting quadratic model for the data.



Angle (degrees)	20	30	40	50	60	70
Distance (feet)	372	462	509	501	437	323

Define variables. x = angle (deg) y = distance (ft)

a) Write quadratic model for the data.

$y = -.261x^2 + 22.591x + 23.029$

b) Find the distance that a 35^0 angle would produce.

$y = -.261(35)^2 + 22.591(35) + 23.029 \approx 493.99$

A 35° would throw a pumpkin about 493.99 ft

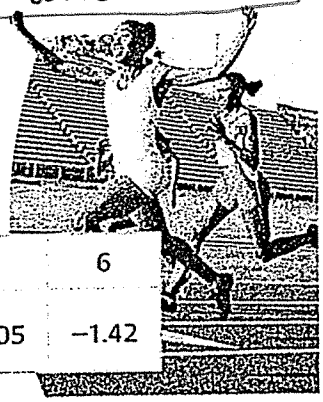
Window Used
[-10, 100] by [-10, 700]

c) Find the angle that would produce a distance of 450 ft.

(27.9, 450) (58.7, 450)

The angles that would throw a pumpkin 450 ft are 27.9° and 58.7°

2.) **RUNNING** The table shows how wind affects a runner's performance in the 200 meter dash. Positive wind speeds correspond to tailwinds, and negative wind speeds correspond to headwinds. The change t in finishing time is the difference beween the runner's time when the wind speed is s and the runner's time when there is no wind.



Wind speed (m/sec), s	−6	−4	−2	0	2	4	6
Change in finishing time (sec), t	2.28	1.42	0.67	0	−0.57	−1.05	−1.42

Define variables. x = wind speed (m/sec) y = finishing time (sec)

a) Write quadratic model for the data.

$y = .012x^2 - .309x - .0005$

b) Find the change in finishing time when the wind speed is 10 m/sec.

$y = .012(10)^2 - .309(10) - .0005 \approx -1.89$

With a wind speed of 10 m/sec, the runner would finish 1.89 sec sooner

Window Used
[-50, 50] by [-7, -7]

c) Find the wind speed if the change in finishing time is 1.3

(-3.68, 1.3) (29.4, 1.3)

The change in time is 1.3 sec when wind speed is at -3.68 m/sec and 29.4 m/sec

Key

3.) Using a graphing calculator and quadratic regression to find a model:
A study compared the speed x, in miles per hour and the average fuel economy y (in miles per gallon) for cars. The results are shown in the table. Find a quadratic model in standard form for the data.

Speed x	15	20	25	30	35	40	45	50	55	60	65	70
Fuel Economy y	22.3	25.5	27.5	29	28.8	30	29.9	30.2	30.4	28.8	27.4	25.3

Define variables. x = speed (mph) y = fuel economy (m/g)

a) Write a quadratic model for the data.

$y = -.008x^2 + .746x + 13.472$

Window used [-2, 120] by [-2, 50]

b) Find the speed to travel to obtain 24 mpg.

(17.3, 24) (75.9, 24)

You would have to drive either 17.3 mph or 75.9 mph to get 24 miles per gallon

c) Find the fuel economy if the speed is 42 mph

$y = -.008(42)^2 + .746(42) + 13.472 \approx 30.692$

If you go 42 mph, you'll get about 30.7 mpg

4.) The table shows how wind affects a runner's performance in the 200meter dash. Positive wind speeds correspond to tailwinds and negative winds corresponds to headwinds. Positive changes in finishing time mean worsened performance (your time is slower) and negative changes mean improve performance (your time got faster).

same as #2

Wind Speed (m/sec) s	-6	-4	-2	0	2	4	6
Change in finishing time t	2.28	1.42	0.67	0	-0.57	-1.05	-1.42

Define variables. x = y =

a) Find the quadratic model for the data.

b) Find change in finishing time when wind speed is -1.

c) Find wind speed when change in finishing time is 1.