

1) A jewelry maker would like to increase his profit by raising the price of his jade earrings. However, he knows that if he raises the price too high, he won't sell as many earrings and his profit will decrease.

The jewelry maker's business consultant develops the equation $P = 50s - s^2$ to predict the monthly profit, P, for a sales price, s. A table of a few data points are shown below.

s (\$)	0	10	20	30	40	50	60
P (\$)	0	400	600	600	400	0	-600

↑
LOS

a) When the jewelry maker charges \$10 for his earrings, how much profit does he make?

\$400

b) When the jewelry maker charges \$15 for his earrings, how much profit does he make? Hint: use the equation.

$$P = 50(15) - 15^2 = 525$$

His profit will be \$525

c) What price will bring the maximum profit? How do you know?

The maximum profit is represented by the vertex. The price to charge is the x-variable of the vertex which is the LOS. You can see the symmetry in the table to identify where the LOS is.

Price to make max profit = \$25

d) What is the maximum profit? Hint: use your answer from question c and the equation.

$$P = 50(25) - 25^2 = 625$$

Max profit: \$625

e) When the jewelry maker charges \$60 for his earrings, how much profit does he make? Explain what this means in the context of the problem.

His profit is -600. This means he would lose \$600 if he charged \$60 for the earrings. He is still manufacturing and paying employees which cost \$600.

f) If you were looking at the parabola, what graph key feature would have answered question c? (circle one)

y – intercept

x – intercepts

Line of Symmetry

y value of Vertex

g) If you were looking at the parabola, what graph key feature would have answered question d? (circle one)

y – intercept

x – intercepts

Line of Symmetry

y value of Vertex

2) The highest dive in the Olympic Games is from a 10-meter platform. The height above water, h (meters), of a diver t seconds after leaving the platform can be estimated by the equation $h = 10 + 4.9t - 4.9t^2$. A table with some of their data points is shown below.

Time (t)	Height (h)
0	10
0.2	10.784
0.4	11.176
0.6	11.176
0.8	10.784
1.0	10
1.2	8.824
1.4	7.256
1.6	5.296
1.8	2.944
2.0	0.2
2.2	-2.936

a) Approximately when will the diver hit the water's surface? How did you find this answer by using your table?

At 2 sec. the diver is at 0.2 m above the water, and at 2.2 seconds the diver is 2.936 m below the surface of the water so it has to be between 2 and 2.2 sec.

Approx.
2.1 sec.

b) How could you find the answer to question a by using a graph? What key feature would help you?

Find the 2nd x-intercept. It will be the x-int. with a positive value.

c) After how many seconds will the diver be at their max height? How do you know?

You can see that the line of symmetry (LOS) is between 0.4 and 0.6 sec. We know this because the heights on either side mirror each other.

0.5 seconds

d) What is the maximum height reached by the diver? Hint: Use your answer to question c and the equation.

$$10 + 4.9t - 4.9t^2 = h$$

$$10 + 4.9(0.5) - 4.9(0.5)^2 = h$$

$$11.225 = h$$

The maximum height the diver can reach is 11.225 meters.

e) After 2.2 seconds, the height is negative. Why would that make sense in the context of this problem?

0 m in height is the surface of the water. A negative height in this case would mean that the diver is under water.