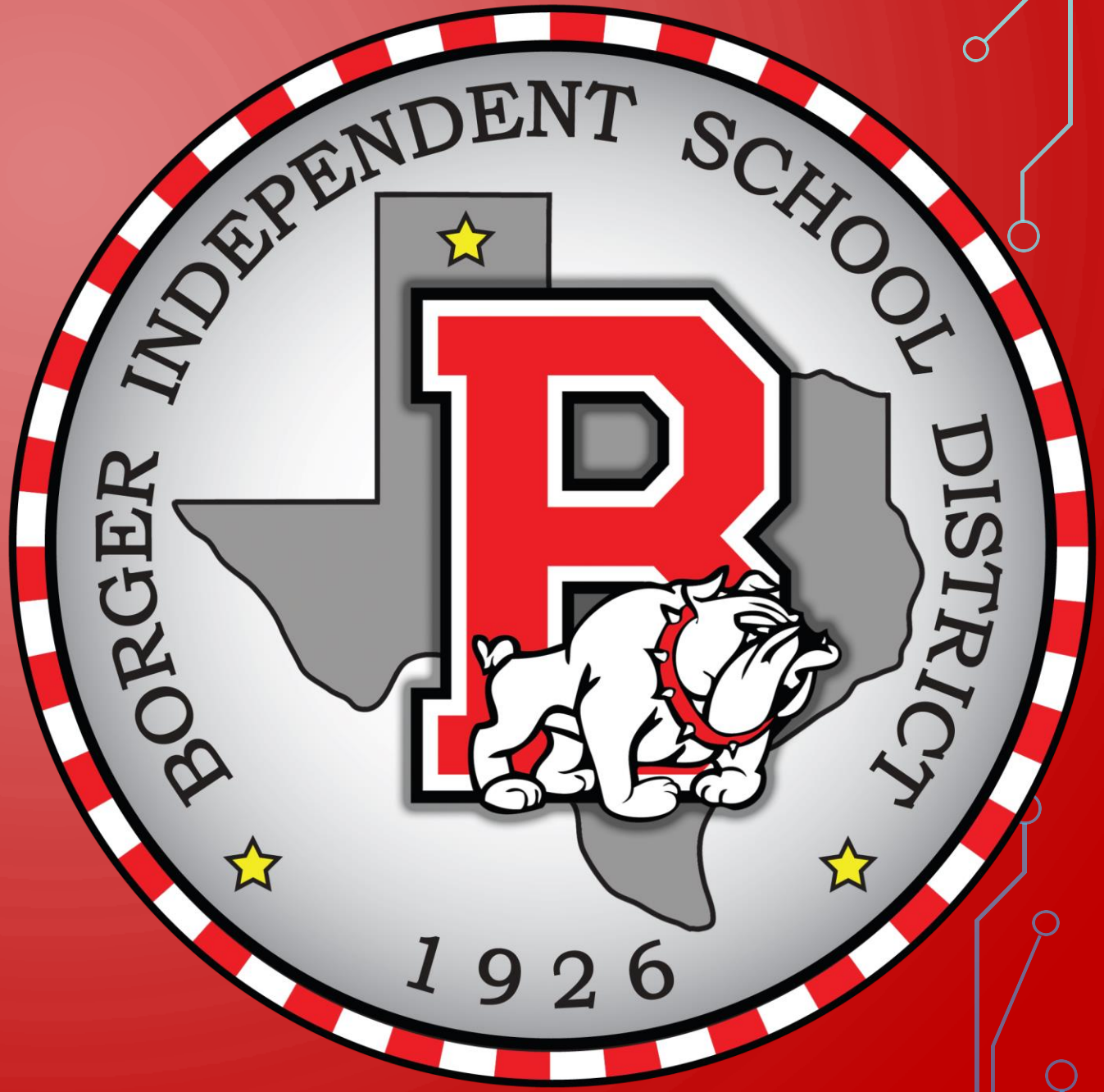
BOARD NOTES

27 SEPTEMBER 2018



CC PRECALCULUS CHAPTER 3 – LINEAR AND QUADRATIC FUNCTIONS

- SECTION 3.4 - BUILD QUADRATIC MODELS FROM VERBAL DESCRIPTIONS AND FROM DATA

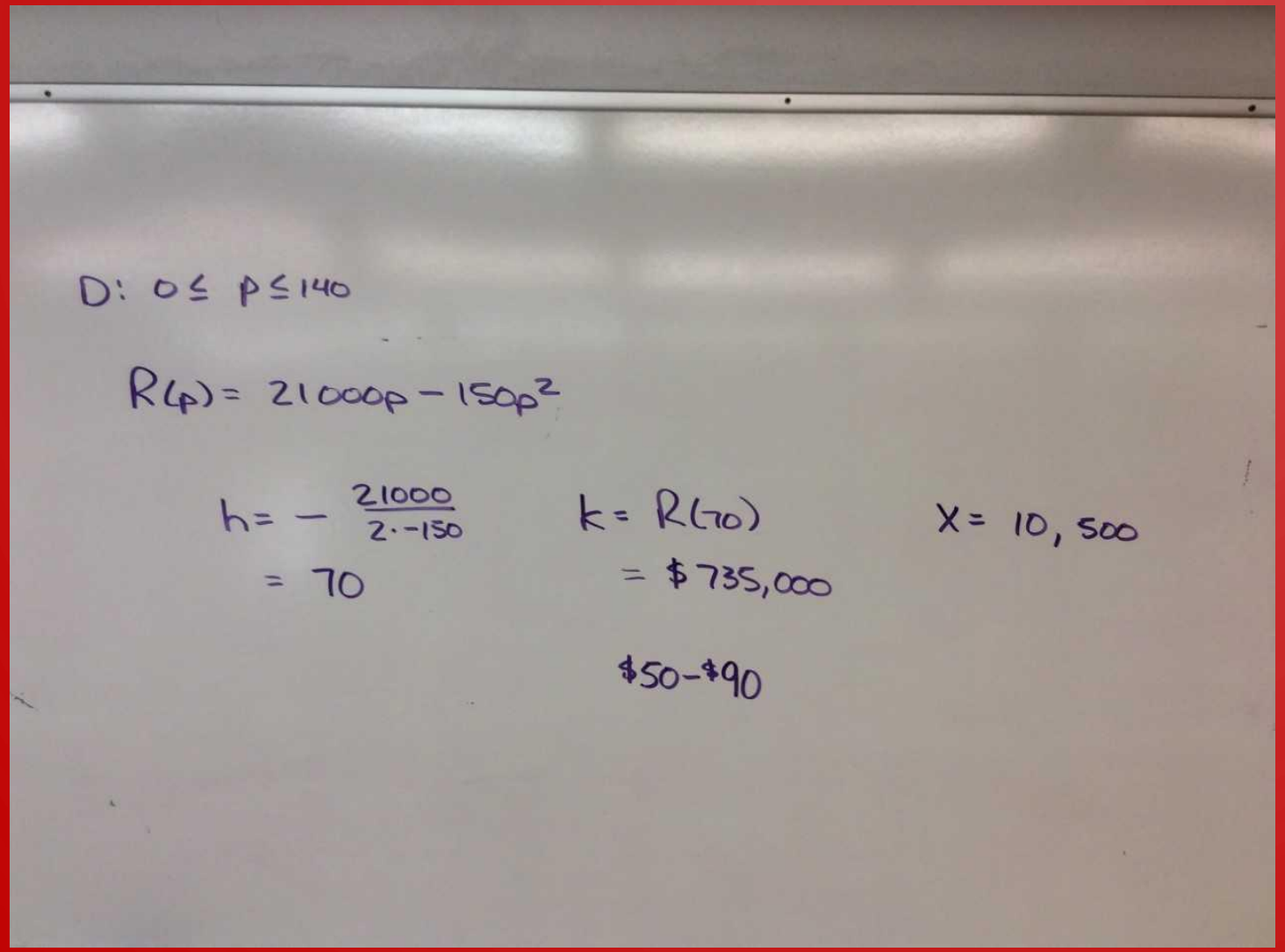
Objectives:

- Build quadratic models from verbal descriptions
- Build quadratic models from data

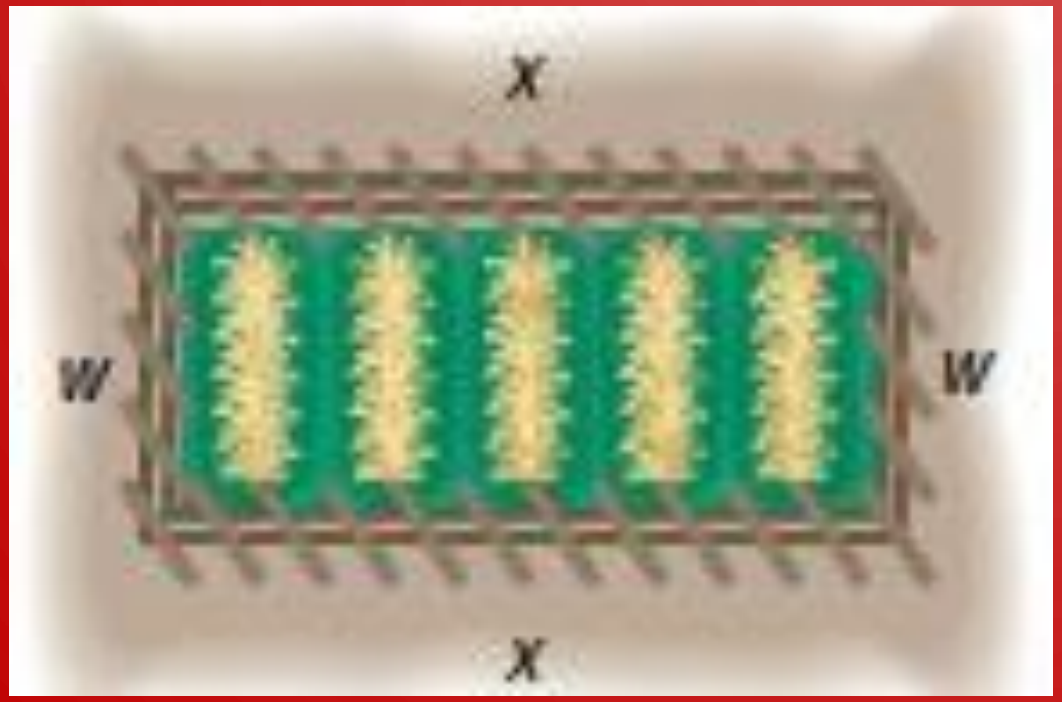
The marketing department at Texas Instruments has found that when certain calculators are sold at a price of p dollars per unit, the number x of calculators sold is given by the demand equation

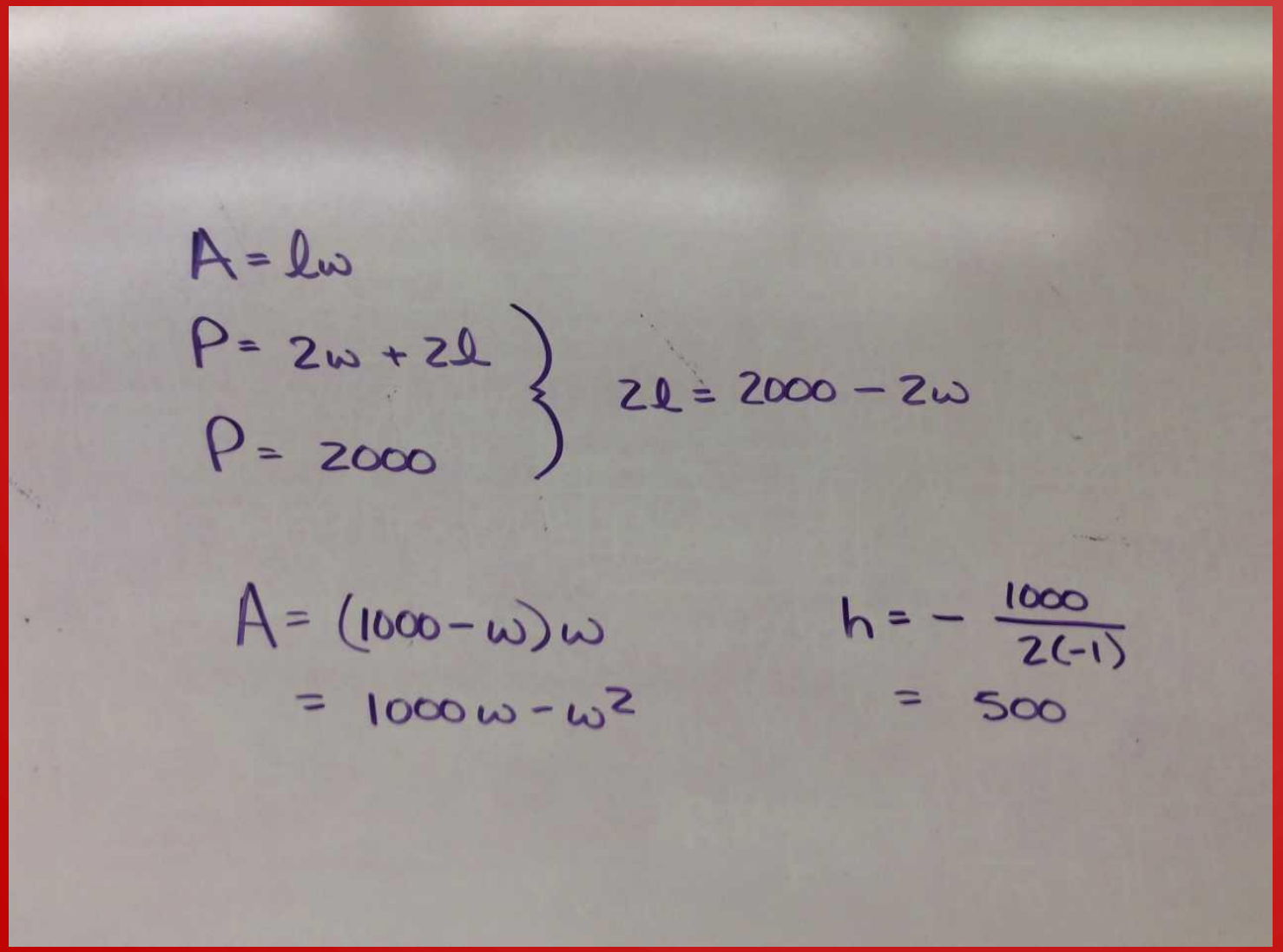
$$x = 21{,}000 - 150p$$

a) Find a model that expresses the revenue R as a function of the price p.
b) What is the domain of R?
c) What unit price should be used to maximize revenue?
d) If this price is charged, what is the maximum revenue?
e) How many units are sold at this price?
f) Graph R.
g) What price should TI charge to collect at least $675,000 in revenue?


D: $0 \le p \le 140$
$R(p) = 21000p - 150p^2$
$h = -\frac{21000}{2 \cdot -150}$
$= 70$
$k = R(70)$
$= \$735,000$
$X = 10,500$
$\$50 - \$90$

A farmer has 2000 yards of fence to enclose a rectangular field. What are the dimensions of the rectangle that encloses the most area?

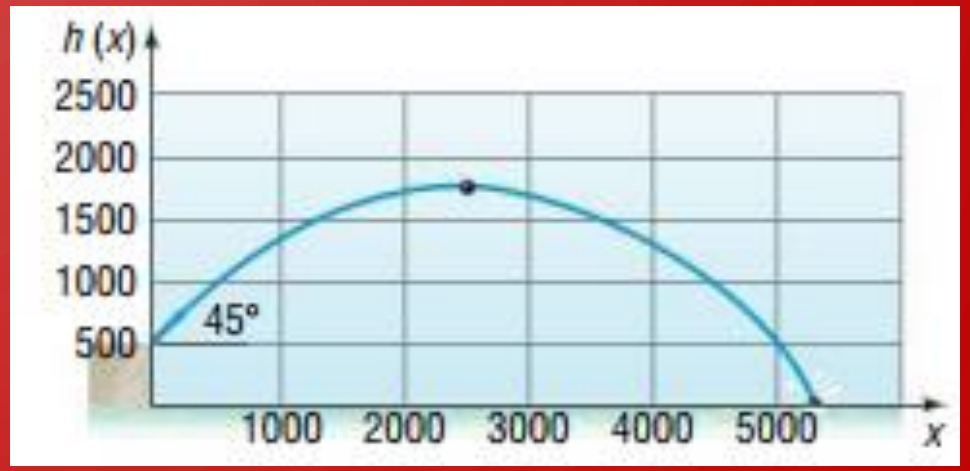



A = lw
P = 2w + 2l
P = 2000
2l = 2000 − 2w
A = (1000 − w)w
= 1000w − w²
h = − 1000 / 2(−1)
= 500

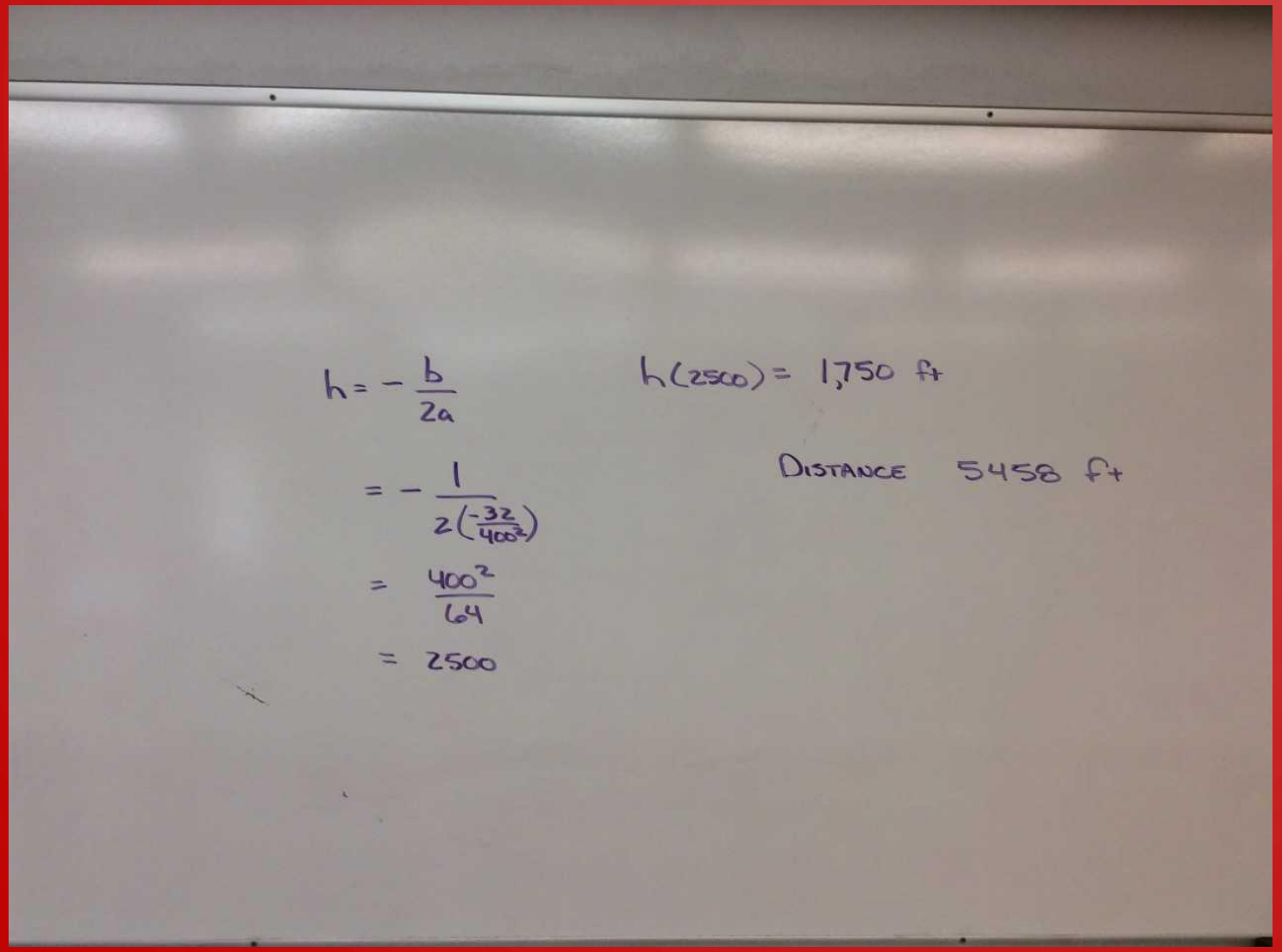
A projectile is fired from a cliff 500 feet above the water at an indicated inclination of 45° to the horizontal, with a muzzle velocity of 400 feet per second. From physics, the height h of the projectile above the water can be modeled by

$$h(x) = \frac{-32x^2}{(400)^2} + x + 500$$

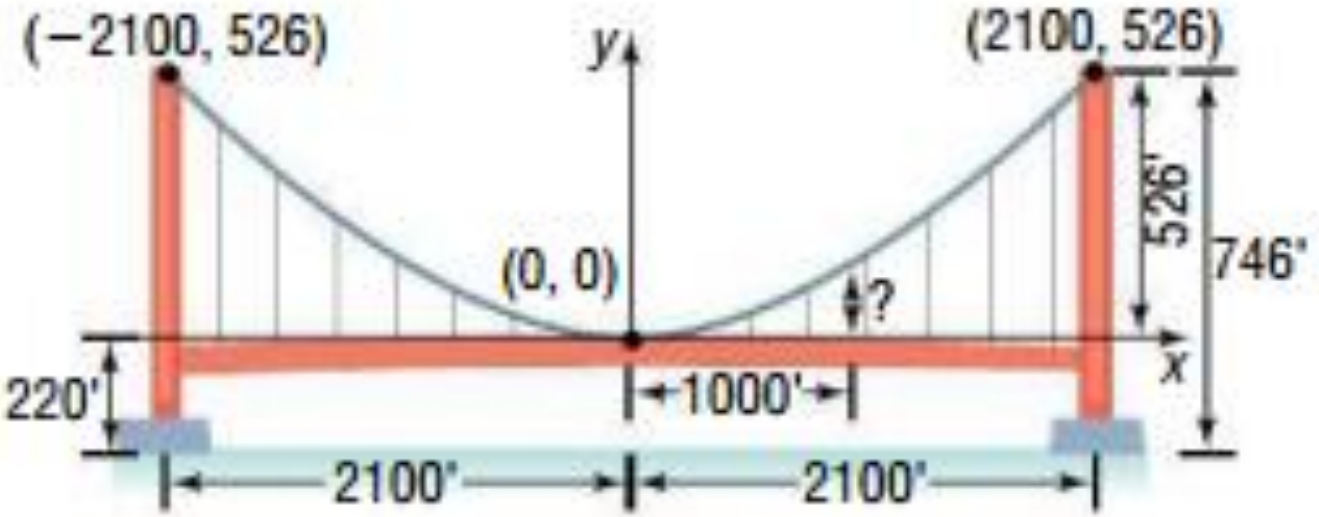
where x is the horizontal distance of the projectile from the base of the cliff.



a) Find the maximum height of the projectile.
b) How far from the base of the cliff will the projectile strike the water?


$h = -\frac{b}{2a}$
$= -\frac{1}{2\left(\frac{-32}{400^2}\right)}$
$= \frac{400^2}{64}$
$= 2500$
$h(2500) = 1{,}750$ ft
Distance 5458 ft

The Golden Gate Bridge spans the entrance to San Francisco Bay. Its 746-foot tall towers are 4200 feet apart. The bridge is suspended from two huge cables more than 3 feet in diameter; the 90-foot wide roadway is 220 feet above the water. The cables are parabolic in shape and touch the road surface at the center of the bridge. Find the height of the cable above the road at a distance 1000 feet from the center. Begin by choosing the placement of the coordinate axes so that the x-axis coordinates with the road surface and the origin coincides with the center of the bridge



Use these facts to find the value of a in $y = ax^2$.

Age, x	Percentage Divorced, D
22	0.9
27	3.6
32	7.4
37	10.4
42	12.7
50	15.7
60	16.2
70	13.1
80	6.5

Source: United States Statistical Abstract, 2012

The data in the table represents the percentage D of the population that are divorced for various ages x in 2012.

a) Draw a scatter diagram
b) Find an equation for the model that best fits the data
c) What age is divorce the highest?
d) What is the highest divorce rate?
e) Graph the equation of best fit.