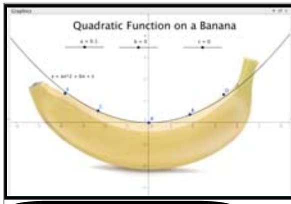
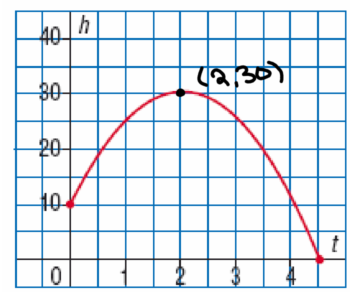


2.9 Problem Solving

Some engineering students constructed a potato cannon on the roof of a building. The height above the ground, *h* meters, of a potato *t* seconds after it is shot from the cannon is modelled by this equation:

$h = -4.9t^2 + 20t + 10$



$h = -4.9t^2 + 20t + 10$

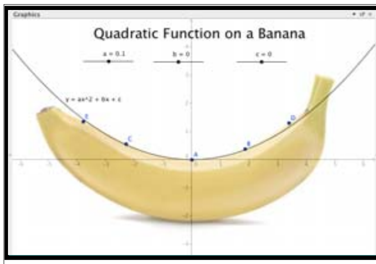
What do you know from the equation?

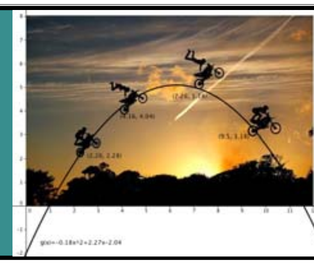
h-int : height initially of launched projectile

From the graph, what was the maximum height of the potato and how long was it in the air?

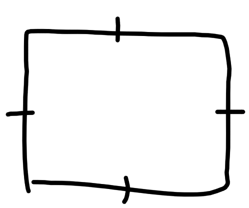
max height : 30 m

time in air : 4.5 s





Ex.) A person has 100 m of fencing to enclose a rectangular garden. What are the dimensions of the largest possible garden?

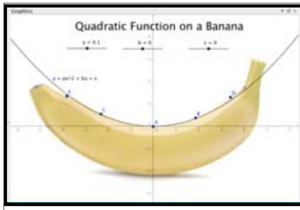


$P = 2l + 2w$

$100 = 2l + 2w$

$100 = 4s$

$\boxed{25m = s}$



Ex.) A student parking pass costs \$20. At this price, 150 students will purchase passes. For every \$5 increase in price, 20 fewer students will purchase passes.

$x = \#$ increases

a) What is the price of a parking pass that will maximize the revenue?
b) What is the maximum revenue?

$R(x) = (\text{cost})(\text{sales})$

$R(x) = (20+5x)(150-20x)$

what used to happen

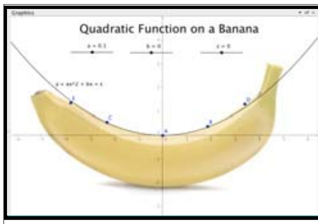
Max: $(1.7, 3306)$

$x = 2$

Cost $= 20 + 5(2) = \$30$ Sales: $150 - 20(2)$

$= 110$ people

Max Revenue: \$3300.



Ex.) Every week, a take-out restaurant sells approximately 2000 chicken wraps for \$1.50 each. Through market research the manager determines that for every \$0.05 increase in price, she will sell 50 fewer wraps.

a) What is the price of a wrap that will maximize the revenue?
b) What is the maximum revenue?

$R(x) = (\text{cost})(\text{sales})$

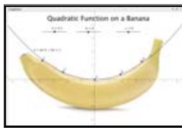
$R(x) = (1.50 + 0.05x)(2000 - 50x)$

$(5, 3062.5)$

a) Cost: $1.50 + 0.05(5)$

$= \boxed{\$1.75}$

b) $\boxed{\$3062.50}$



Math 20-1

Bentley Fitness Bar and Grill has 160 members. Management would like to increase membership by lowering the price. They are afraid that if they lower the price too much, they'll lose money. Currently the 160 members are paying $400 per year; statistics show that for every $25 drop in price 20 more people will join. [redacted] what price [redacted] should management use to earn the most revenue?

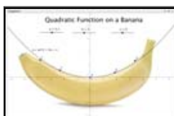
$R(x) = (\text{cost})(\text{sales})$

$R(x) = (400-25x)(160+20x)$

Max: $(4, 72000)$

Cost: $(400-25(4)) = \boxed{\$300}$

Specific Outcome: Solve problems that involve quadratic equations



Math 20-1

Determine the largest area that 40m of fence can surround if one side is bordered by a barn. What are the dimensions of the area? What is the maximum area?

l & w

barn

w w

l

$A = lw$

$P = l + 2w$

$40 = l + 2w$

$-2w \quad -2w$

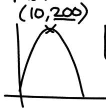
$(40-2w) = l$

$40 - 2(10) = l$

Max: $(10, 200)$

$A = (40-2w) \cdot w$

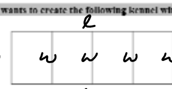
$Y = (40-2x) \cdot x$



$\boxed{A = 200\,m^2}$

Dimensions: $\boxed{\begin{array}{l} w = 10m \\ l = 20m \end{array}}$

A dog breeder wants to create the following kennel with 300 m of fencing.



What dimensions would create the maximum fenced area?

$A = lw$

$P = 5w + 2l$

$A = (150 - 5/2\,w) \cdot w$

$Y = (150 - (5/2)x) \cdot x$

$300 = 5w + 2l$

$-5w \quad -5w$

$\frac{300}{2} - \frac{5w}{2} = \frac{2l}{2}$

$l = (150 - 5/2\,w)$

$= 150 - 5/2 \cdot 30$

$= 75$

Max: $(30, 2250)$
w, A

$\boxed{\begin{array}{l} l: 75m \\ w: 30m \end{array}}$

Specific Outcome: Solve problems that involve quadratic equations

Pg. 195 # 18-22.

Pg. 203 # 14-16.