Welcome Back to MYP Math 9!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 3/20 Topic: Nothing due - Quiz 6.1 was Friday	0 1 2	
Tuesday Date: 3/20 Topic: Solving with Quadratic Formula	0 1 2	
Wednesday Date: _____ Topic: _____	0 1 2	
Thursday Date: _____ Topic: _____	0 1 2	
Friday Date: _____ Topic: _____	0 1 2	

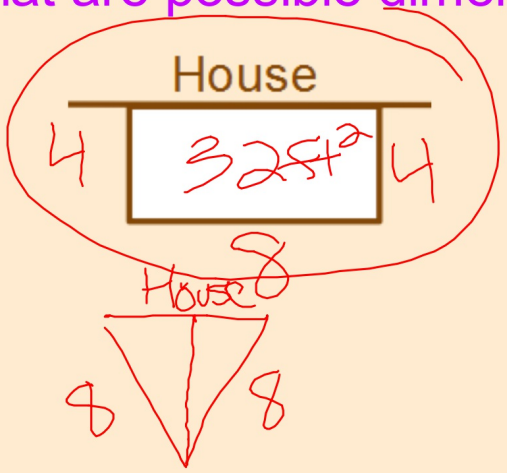
Class Plan:

1. Warm-up -
Introduction to optimization
2. Application:
Quadratic Optimization
3. Practice - choose partners!

Warm-up: Optimizing Space to Play!

(Ms. Berg is nannying this summer)

She bought 16 feet of fencing for a play pen (genius!). A wall will be one side of the pen. What are possible dimensions for the pen?

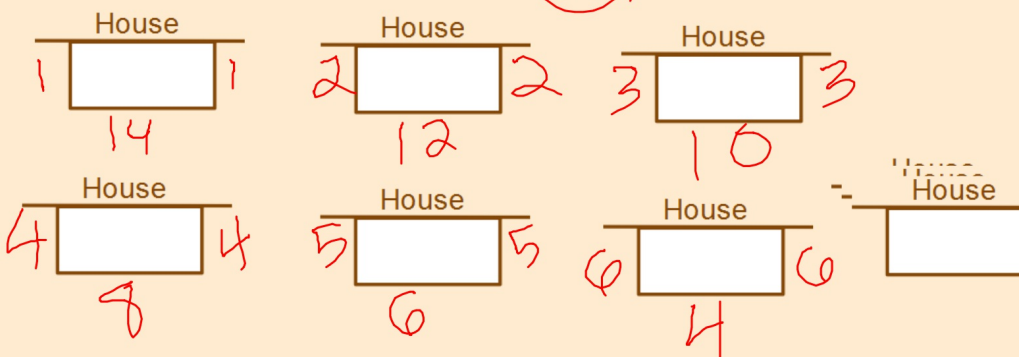


Let's list possibilities!

16 feet of plastic fencing to create a rectangle space with three sides.

What is the largest area these kiddos can get?!

Width (ft)	1	2	3	4	5	6
Area (ft^2)	14	24	30	32	30	24



Steps to solve:

Diagram Area(rectangle)= (length)(width)

Area and perimeter equations

Create one quadratic equation for Area.

Solve for the roots/x-intercepts

Solve for the vertex (maximum)

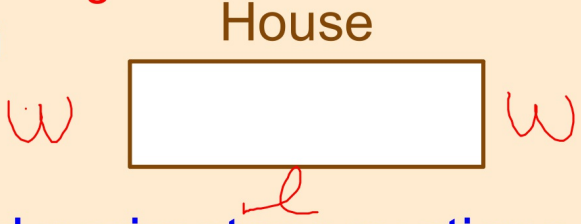
Calculate the maximum area.

Let's use an Area Equation.

16 feet of plastic fencing to create a rectangle space with three sides.

What is the largest area these kiddos can get?!

Diagram



Area and perimeter equations

Create one quadratic equation for Area.

$A = l \cdot w$

$P = 16$

$16 = 2w + l$

$l = 16 - 2w$

$A = w(16 - 2w)$

Let's use an Area Equation.

16 feet of plastic fencing to create a rectangle space with three sides.

What is the largest area these kiddos can get?!

Solve for the roots/x-intercepts $(A=0)$

$0 = w(16-2w)$ [Solve from factored form]

$w = 0$, $0 = 16-2w$

$2w = 16$

$w = 0$ ft

$w = 8$ ft

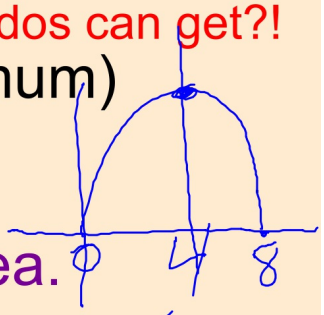
Let's use an Area Equation.

16 feet of plastic fencing to create a rectangle space with three sides.

What is the largest area these kiddos can get?!

Solve for the vertex (maximum)

$$\frac{0+8}{2} = 4$$



Calculate the maximum area.

$A = w(16 - 2w)$

$w = 4$

$A = 4(16 - 2(4))$

$A = 4(8)$

$A = 32 ft^2$

Let's use an Area Equation.

16 feet of plastic fencing to create a rectangle space with three sides.

What is the largest area these kiddos can get?!

Solve for the vertex (maximum)

Using roots! $w = \frac{0+8}{2} = 4ft$

Calculate the maximum area.

$A = w(16-2w)$

$A = 4(16-2(4))$

$A = 4(16-8)$

$A = 4(8)$

$A = 32ft^2$

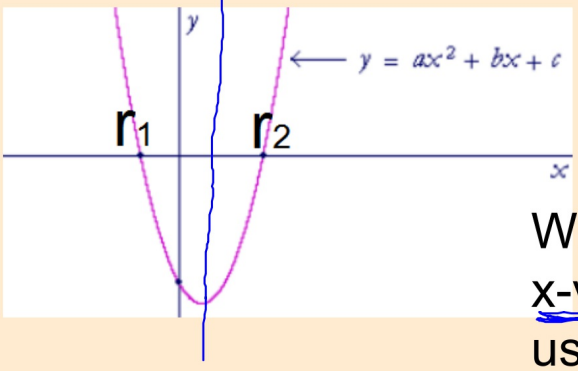
$32ft^2$ Largest possible area for Bo & Lawson

Optimization: To **maximize** or **minimize** a specific characteristic.

(Get the most out of limited resources)

What will we be solving for...?

The vertex (maximum/minimum)



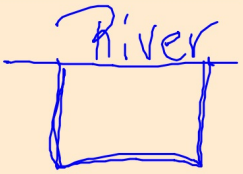
$h = \frac{r_1 + r_2}{2}$

Write a formula for the x-value of the vertex, using the roots.

Area of the Farmer's Pen

A farmer has 2400 feet of fencing and wants to fence off a rectangular pen that borders a straight river. They need no fencing along the river.

What are the dimensions of the pen that has the largest area? Reflect on the realism of your method and solution.

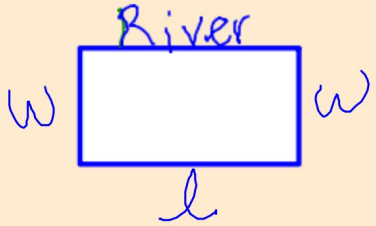


Steps to solve:

Diagram
Area and perimeter equations
Create one quadratic equation for Area.
Solve for the roots/x-intercepts (factor first)
Solve for the vertex (maximum)
Calculate the maximum area.

Diagram

$P = 2400\text{ft}$



Area and perimeter equations

$2400 = 2w + l$

$l = 2400 - 2w$

$A = lw$

$A = w(2400 - 2w)$

Create one quadratic equation for Area.

Solve for the roots/x-intercepts (factored form)

$A = w(2400 - 2w)$

$0 = w(2400 - 2w)$

$w = 0$ ft

$2400 - 2w = 0$

$2400 = 2w$

$w = 1200$ ft

Solve for the vertex (maximum)

$$x = \frac{0 + 1200}{2}$$

$$\boxed{x = 600 \text{ ft}}$$

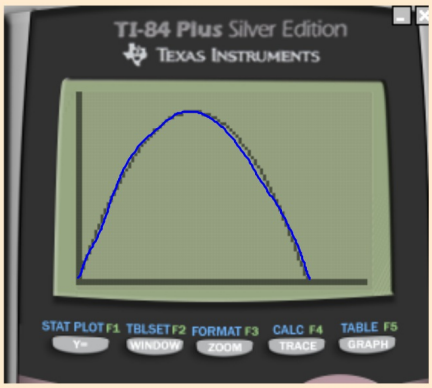
$$y = 2400 - 2(600)$$

$$\boxed{y = 1200 \text{ ft}}$$

Calculate the maximum area.

This gives a maximum area of $2400(600) - 2(600)^2 = \boxed{720{,}000 \text{ ft.}^2}$

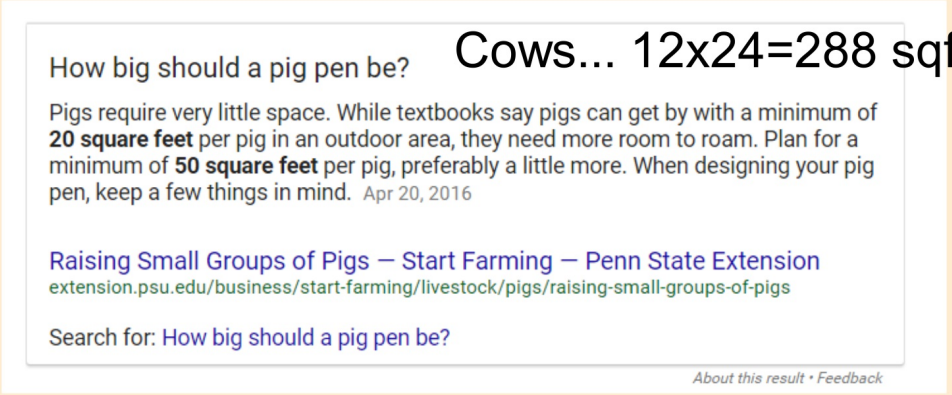
$600 \times 1200 \Rightarrow$



At x = 600 ft, the
Area is 720,000 sq feet

Refect on the realism of your method and solution.

Is it an animal pen?!

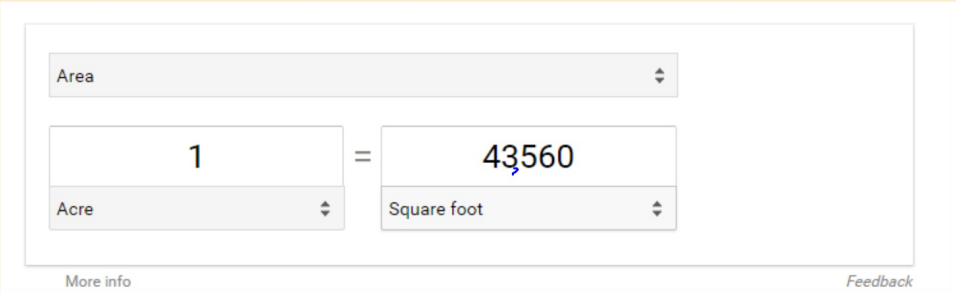


Cows... 12x24=288 sqft

The 720,000 square feet will perfectly fit my bunch of 14,400 pigs...! or 2500 cows!

Refect on the realism of your method and solution.

Could you pen plants?!



16.5 Acres is approximately 720,000 square ft

Exercises...

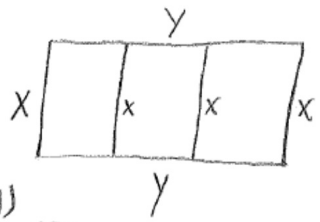
Optimization Practice

1. Three adjacent holding pens are being built with a total of 120 meters of fencing. What overall dimensions will maximize the area? What is the maximum overall area?

2. Two adjacent fenced in areas are being placed against a long building. Write a function to model the area of the total enclosure in terms of its wide if 150 meters of fencing is used.

Solution

1. Three adjacent holding pens are being built with a total of 120 meters of fencing. What overall dimensions will maximize the area? What is the maximum overall area?



Fencing: $4x+2y=120$

Area: $A=x\cdot y$

$30 \times 15 = 150 + 300 = 450$

$15(60-2(15)) = 15(30) = 450$

$\frac{2y}{2}=\frac{120}{2}-\frac{4x}{2} \Rightarrow y=60-2x$

$A=x(60-2x)$

Vertex at $x=\frac{30-0}{2} \Rightarrow x=15$ meters

$y=60-2(15)=60-30=30 \Rightarrow y=30$ meters

$x=0$

$60-2x=0 \Rightarrow 60=2x \Rightarrow x=30$

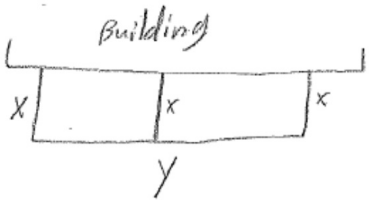
15 meters by 30 meters

Area $=450\ m^2$

2. Two adjacent fenced in areas are being placed against a long building. Write a function to

Solution

2. Two adjacent fenced in areas are being placed against a long building. Write a function to model the area of the total enclosure in terms of its wide if 150 meters of fencing is used.



$$x+x+x+y=150$$

$$3x+y=150$$

$$-3x \qquad -3x$$

$$y=150-3x$$

$$A=x(150-3x)$$