Welcome Back to MYP Math 9!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 3/19 Topic: Nothing due - Quiz 6.1 Friday	0 1 2	
Tuesday Date: 3/20 Topic: Quadratic Formula	0 1 2	
Wednesday Date: 3/21 Topic: Optimization Applications	0 1 2	
Thursday Date: ______ Topic: ____________	0 1 2	
Friday Date: ______ Topic: ____________	0 1 2	

Warm-up: Solve the quadratic.

$$8p^2 - 8p + 4 = 0$$

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$$8p^2 - 8p + 4 = 0$$

$$\frac{8p^2}{4} - \frac{8p}{4} + \frac{4}{4} = \frac{0}{4}$$

$$2p^2 - 2p + 1 = 0$$

$a = 2,\ b = -2,\ c = 1$

$$p = \frac{2 \pm \sqrt{(-2)^2 - 4(2)(1)}}{2(2)}$$

$$p = \frac{2 \pm \sqrt{4 - 8}}{4}$$

$$p = \frac{2 \pm \sqrt{-4}}{4}$$

$$p = \frac{2 \pm \sqrt{4}\sqrt{-1}}{4}$$

$$p = \frac{2 \pm 2i}{4}$$

$$\boxed{p = \frac{1 \pm i}{2}}$$

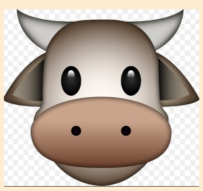
Class Plan:

1. Warm-up
2. Application: We're farmers again!
3. More Optimizaion Practice

Criterion D - Real Life Application

Farmer's Fencing... He's got a Budget!

Create the largest pen possible for the herd... with $900!



When done:1) *(Analysis on backside)*

"**justify** whether the solution makes sense in the context of the authentic real-life situation"

"**Verify** the degree of accuracy of the solution"

2) Check solutions via weebly (3-21)

Criterion D - Real Life Application

Area of Fencing

A farmer wants to build a rectangular enclosure for their herd. They only have $900 to spend on the fence and want the largest size pen for their money. The pen will be built along a (straight) river, and fencing will not need to be built along the river.

The side of the fence parallel to the river will cost $5 per foot to build. The other two sides, which are perpendicular to the river, will be made of cheaper material and will cost $3 per foot.

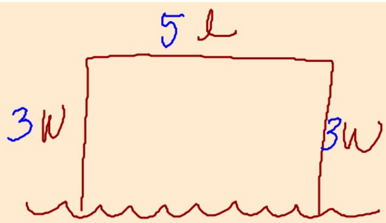
What dimensions should the farmer build the pen so that the area is maximized and the fencing meets the required $900 budget?

Diagram

Area and perimeter(with cost) equations

Create one quadratic equation for Area.

Diagram



Area and perimeter(with cost) equations

$\$900 = \$5l + \$3w + \$3w$

$900 = 5l + 6w$

$900 - 6w = 5l$

$180 - \frac{6}{5}w = l$

$A = l \cdot w$

$A = w\left(180 - \frac{6}{5}w\right)$

Create one quadratic equation for Area.

(in terms of width)

Solve for the roots/x-intercepts

Solve for the vertex

State dimensions and maximum area

Solve for the roots/x-intercepts

$$0 = w\left(180 - \frac{6}{5}w\right)$$

$$0 = w \qquad 0 = 180 - \frac{6}{5}w$$

$$\text{ft} \qquad -180 = -\frac{6}{5}w$$

$$150\text{ ft} = w$$

x-intercepts: (0 ft, 0 ft^2) and (150 ft, 0 ft^2)

The area of the pen is zero when the width is 0 ft, or 150 ft. This makes sense because if there is no width, we cannot create a pen. Then, if we use 150 ft for \$3 per foot, we use \$450 for each side of the pen. All of the money is used on the width, and there is no money left for the length.

Solve for the vertex

$W = \frac{0+150}{2}$

$W = 75$ ft

at max Area

$A = 75(180 - \frac{6}{5}(75))$

$A = 75(180 - 90)$

$A = 6750$ ft^2

$A = lw$

$6750 = l \cdot 75$

90 ft $= l$

Optimal dimensions are 75 ft x 90 ft. This results in a pen area of 6750 square feet with a budget of $900.

From the MYP (Criterion D Real Life) RUBRIC:

"**justify** whether the solution makes sense in the context of the authentic real-life situation"

1) Is your solution is realistic?

From the MYP (Criterion D Real Life) RUBRIC:

"**justify** whether the solution makes sense in the context of the authentic real-life situation"

The realism of the solution of 6,750 square feet would depend on the purpose of the pen.

I found that 400 square feet is needed approximately per horse... so if I had about 16 horses... it would be great!

From the MYP (Criterion D Real Life) RUBRIC:

"**Verify** the degree of accuracy of the solution"

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"**Verify** the degree of accuracy of the solution"

There may be human error in the measurements during construction of the pen.

If I were making this fence, I would likely fumble a bit, and end up spending more than my allotted money...or hire someone...

DO: Banana & Airplane Problems!

When done:

Complete Quadratic Formula WS

1) A banana grower needs to ship early when prices are high and spoilage is low. She now has 20 tons on hand and can add two tons a week by waiting. The current profit is $250 per ton, but it will reduce by $20 per ton for each week she delays.

How can she optimize her profit?

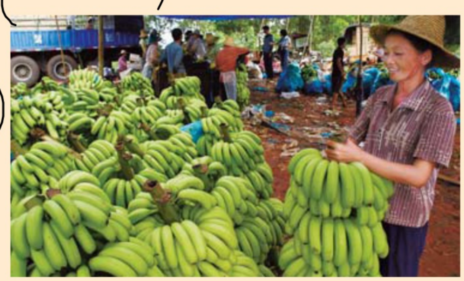
1) A banana grower needs to ship early when prices are high and spoilage is low. She now has 20 tons on hand and can add two tons a week by waiting. The current profit is $250 per ton, but it will reduce by $20 per ton for each week she delays.

How can she optimize her profit?

$MADE = (TONS OF NANNERS)(COST)

$\$ = (20+2W)(250-20W)$

W: number of weeks she waits to ship :)'s



Solution

Profit = (Tons of bananas)(cost)
w: Number of weeks she **waits** to ship the bananas.

Tons = 20 + 2w
Price = 250 − 20w

$$P = (20+2w)(250-20w)$$

$$0 = (20+2w)(250-20w)$$

$$w = -10,\ w = 12.5$$

$$\frac{12.5 + (-10)}{2} = 1.25$$

She should ship in 1.25 weeks.

The profit will be $225 and she will ship 22.5 tons of bananas.

2) An airplane company charges $225 per ticket and currently averages 200,000 flyers per day. The company needs to optimize revenue but found that for each $50 increase in ticket price the company would lose 10000 flyers.

How can the transit company optimize their revenue?

Solution

x - # of $50 ticket price increases

Y-int: $R=(225)(200{,}000)=\$45{,}000{,}000$

$R=(225+50x)(200{,}000-10{,}000x)$

$0=225+50x$

$-225=50x$

$-4.5=x$

Four and a half ticket price decreases will allow flyers to fly for FREE

$0=200{,}000-10{,}000x$

$10{,}000x=200{,}000$

$x=20$

20 ticket price increases of $50 will make all 200,000 flyers go away, likely due to prices being too high $1,225

This make not be realistic. Some millionaire would still pay this much.

$\frac{-4.5+20}{2}=7.75$

vertex/max = 7.75

7.75 price increases of $50 would optimize revenue

$R=[225+50(7.75)]\cdot[200{,}000-10{,}000(7.75)]$

$R=\$75{,}031{,}250$

Exercises....

Optimization Practice