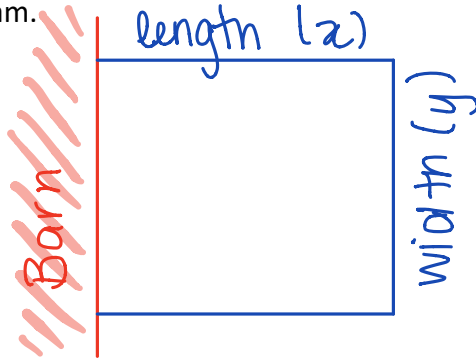


Name: _____

Date: _____

Example Sam wants to make a chicken pen and he has 150 m. of fencing. He will use one wall of the barn as one side of the pen and he wants to calculate the dimensions that will maximize the area of the pen.

a) Draw a diagram.



b) Make a function to model the situation.

$$\text{Perimeter} = 150\text{m} = 2x + y$$

-2x -2x

$$y = 150 - 2x$$

quantity to maximize.

$$\text{Area} = A = xy$$

$$A = x(150 - 2x)$$

↳ factored form

$$= 150x - 2x^2$$

$$= -2x^2 + 150x$$

↳ general form

c) Factor the function and find the zeros; what do the zeros represent?

→ solutions / x-int

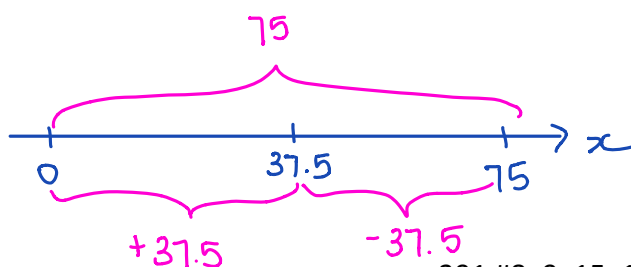
$$A = x(150 - 2x) = 0$$

$x = 0$
↑
 no length

$150 - 2x = 0$
+2x +2x
 $2x = 150$
 $x = 75$ *↳ no width*

There's no area

d) Find the vertex of the function you made in part b). What does this represent?



$$A = x(150 - 2x)$$

$$= 37.5(150 - 2(37.5))$$

$$= 37.5(150 - 75)$$

$$= 37.5(75)$$

$$= 2812.5$$

This is the maximum area that can be made with 150 m of fencing.

Example The members of a Ukrainian church hold a fundraiser every Friday night in the summer. They usually charge \$6 for a plate of perogies. At that price, experience tells them they will sell 120 plates. If they increase the price of a plate by \$1, they know that they will sell 10 fewer plates. What price will give them the maximum revenue?

- a) Make a function to model the situation.

↑ how much money they will make = cost × quantity

$$R = \text{revenue} = (6 + x)(120 - 10x)$$

x = the number of times the price changes by \$1

- b) Factor the function and find the zeros; what do the zeros represent?

$$R = (6 + x)(120 - 10x) = 0$$

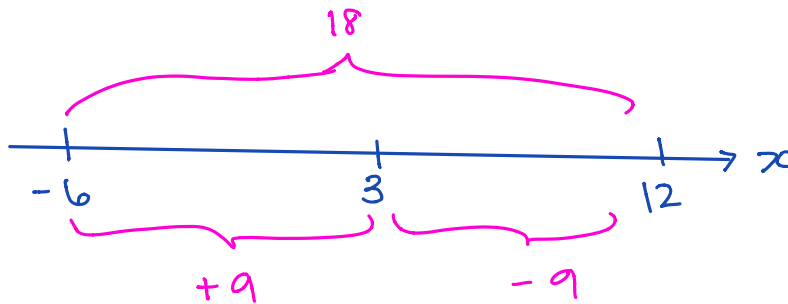
$$\begin{array}{l} \downarrow \\ 6 + x = 0 \\ -6 \quad -6 \\ x = -6 \end{array}$$

giving away food

$$\begin{array}{l} \downarrow \\ 120 - 10x = 0 \\ +10x \quad +10x \\ \hline 10x = 120 \\ \frac{10x}{10} = \frac{120}{10} \\ x = 12 \end{array}$$

too expensive - no one's buying

- c) Find the vertex of the function you made in part a). What does this represent?



$$\begin{aligned} R &= (6 + 3)(120 - 10(3)) \\ &= (9)(120 - 30) \\ &= (9)(90) \\ &= \$810 \end{aligned}$$

$$6 \times 120 = \$720$$

$$10 \times 80 = \$800$$