Math-2

Lesson 5-6

Modeling with Quadratic Equations

Area problems

Quantity	Unit of Measure
Height	Inches, feet, miles, etc.
Weight	Pounds, ounces, kilograms, grams
Temperature	Degrees F, Degrees C, Degrees K

Sometimes ratios of quantities become new quantities

Quantity	Ratio of:	Unit of Measure
Speed	Distance/time	Mile/hr, ft/sec, km/hr
“unit price”	Cost/weight	$/lbm, $/ounce
Efficiency	Distance/volume used	Miles/gallon, Km/liter

Vocabulary

Mathematical Modeling: representing a real-world phenomenon or quantity with an equation or inequality.

Formula: an equation that shows the relationship between two or more quantities.

Examples of formulas you've seen are:

$$A_{circle} = \pi r^2 \qquad V_{box} = L * w * h$$

$$A_{\text{rectangle}} = L * W \qquad A = \frac{1}{2}(b_1 + b_2)h$$

Expressions from Phrases

What mathematical expression represents the following?

Three more than twice a number $2x+3$

Five less than three times a number $3x-5$

The width is 4 times the length. $w=4L$

The area of a rectangle whose width is 4 times its length.

$A=Lw$

$A=L(4L)$

Write a mathematical expression that represent each statement:

1. The number of girls is three less than twice the number of boys. $g = 2\mathrm{b} - 3$

2. The salary after a 4% increase $S_f = S_i + 0.04 * S_i$

3. Area of a rectangle whose length is 2 more than twice its width. $A = (2w + 2) * w$ $A = 2w^2 + 2w$

4. The area of a rectangle with the same size square cut out of each corner. $A = Lw - 4x^2$

Area of a Rectangle

The length of a rectangle is 4 more than 3 times its width.

The area of the rectangle is 200 square inches.

What is the length and width of the rectangle?

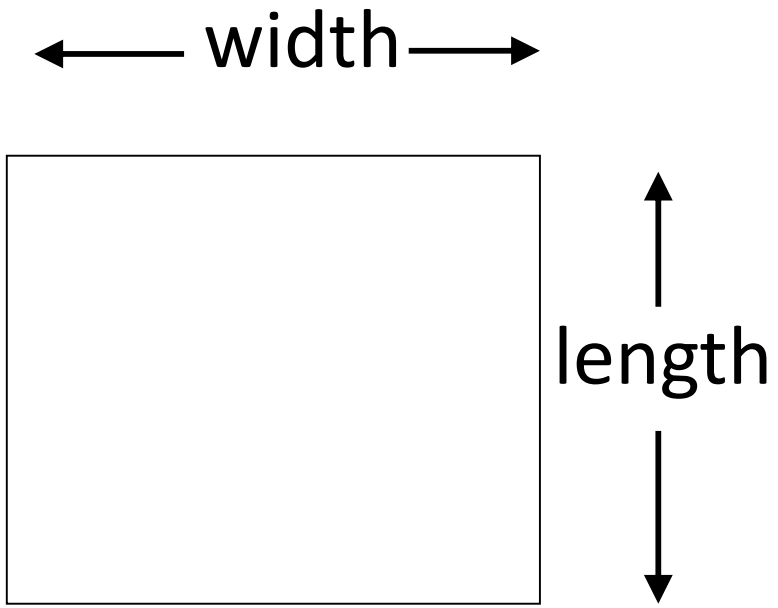
Area = L * W

L = 3W + 4 A = 200

Using substitution:

200 = (3W + 4) * W

Solve by graphing.



Area of a Rectangle

Area = L * W

L = 3W + 4 A = 200

Using substitution:

200 = (3W + 4) * W

Solve by graphing.

Get into "zero equals form"

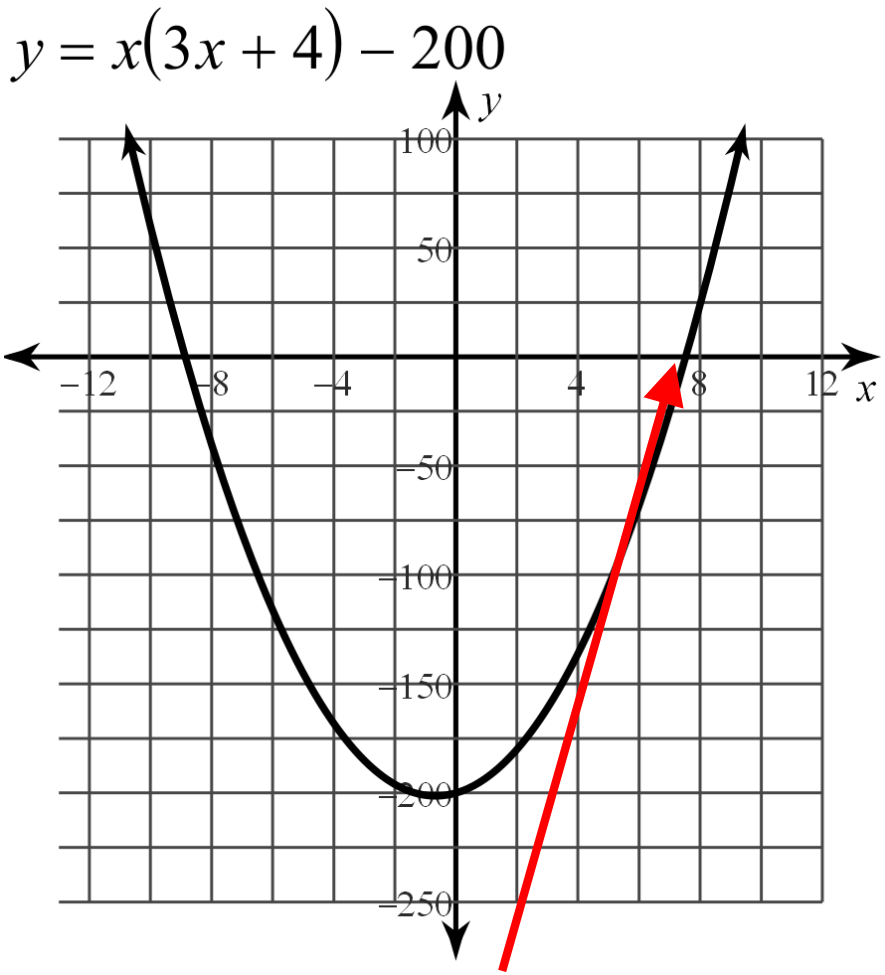
0 = W(3W + 4) – 200

Let 'x' = width

$$0 = x(3x+4) - 200$$

$$y = x(3x+4) - 200$$

Find the "zero" of the equation.



'x' = width = 7.53 inches

Area of a Rectangle

Area = L * W

L = 3W + 4 A = 200

Using substitution:

200 = (3W + 4) * W

$$y = x(3x+4) - 200$$

Using substitution:

L = 3W + 4

L = 3(7.53) + 4

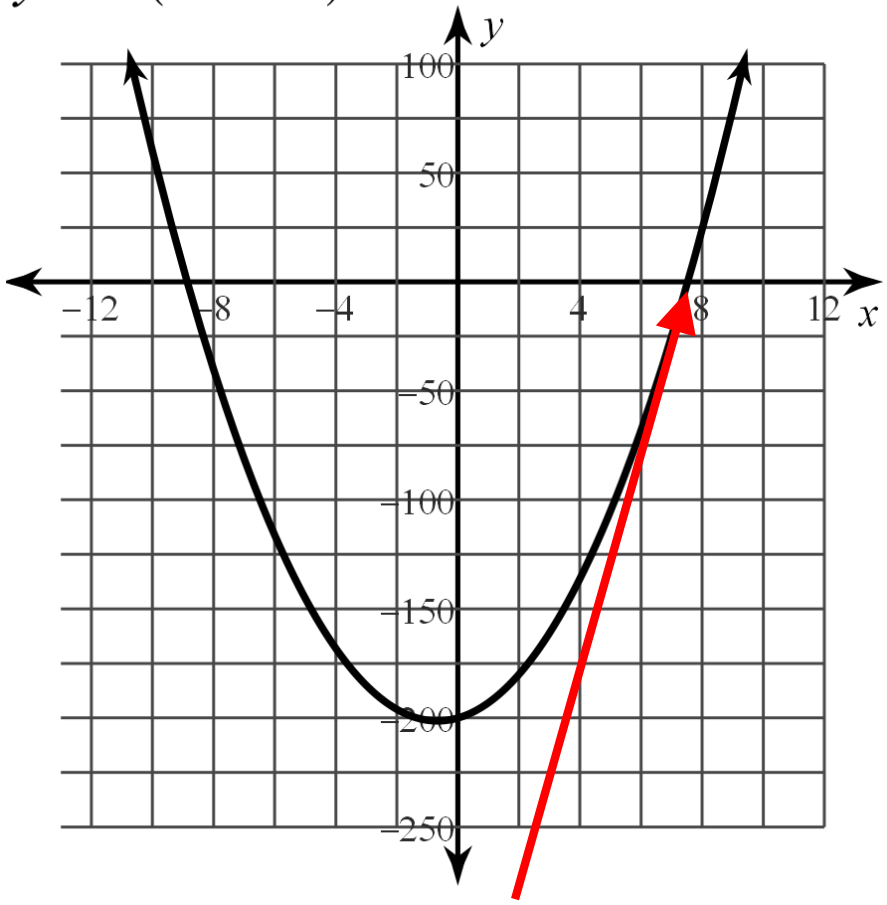
L = 26.59 inches

Check:
200 = L*W

Check:
200 = (26.59)(7.53)

Find the "zero" of the equation.

$$y = x(3x+4) - 200$$



'x' = width = 7.53 inches

Area of a Rectangle

The length of a rectangle is 7 less than 4 times its width.

The area of the rectangle is 6600 square inches.

What is the length and width of the rectangle?

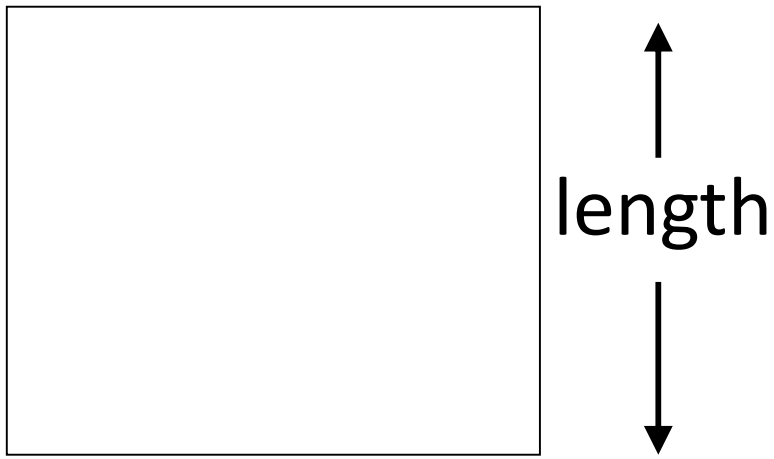
Area = _____ * _____

L = _____ A = _____

Using substitution:

_____ = (_____) * _____

Solve by graphing.

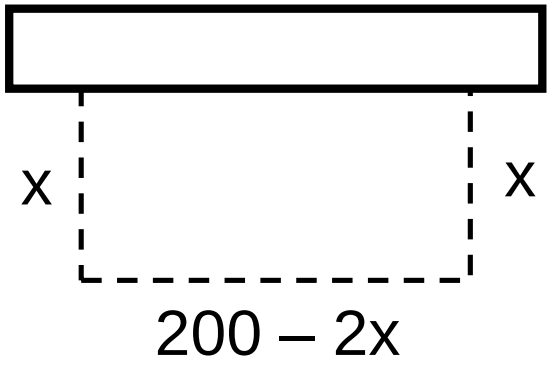


Area of a Rectangle

200 feet of fence is used to build a rectangular horse corral.

One side of the corral is next to a large barn and does not need to be fence.

a) Draw a top-view picture of the corral and barn.



b) Label the length of each side of a fenced corral using only one variable.

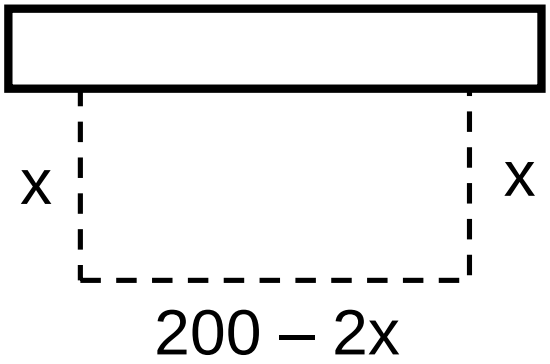
c) Using the rectangle area formula, write an equation that has only one variable.

$$A(x) = x(200 - 2x)$$

d) What are the x-intercepts?

$$A(x) = x(200 - 2x)$$

$$(0, 0)\ and\ (100, 0)$$



e) What is the vertex?

$$(50, f(50) \rightarrow (50, 5000)$$

f) Hand-draw a graph of the equation with the axes correctly labeled.

g) Graph the equation on your calculator, and find the vertex using "2nd" + "calc" + "maximum"

$$(50, 5000)$$