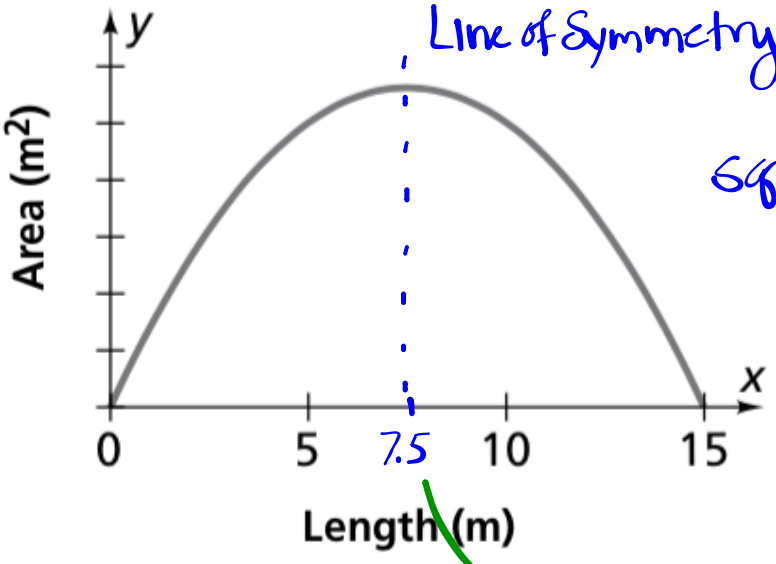
5/18

Warm Up

Can you figure out the maximum area from this graph?



Line of Symmetry

square will give greatest area

these would represent 2 sides 7.5 · 7.5

Area = 7.5 · 7.5

= 56.25 m²

Homework Questions?

Page 14 #'s 3, 5, 6

3. The graph shows the length and area of rectangles with a fixed perimeter. Use the graph for parts (a)–(e).

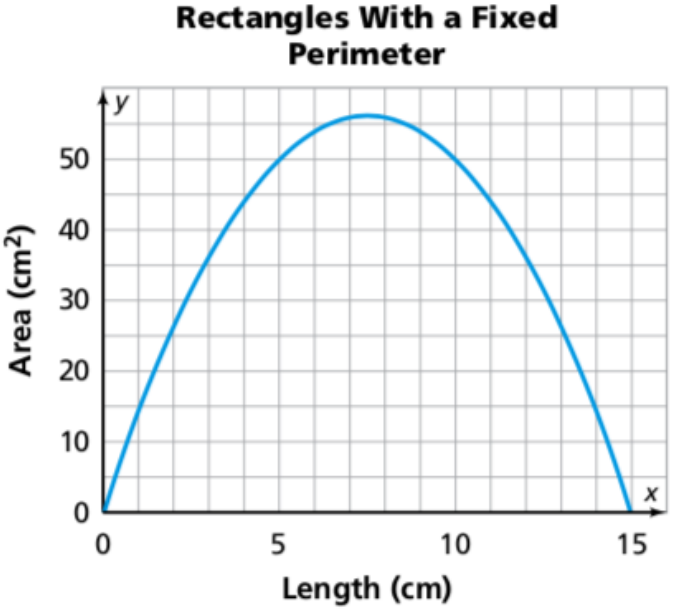
a. Describe the shape of the graph and any special features.

b. What is the maximum area for a rectangle with this fixed perimeter? What are the dimensions of this rectangle?

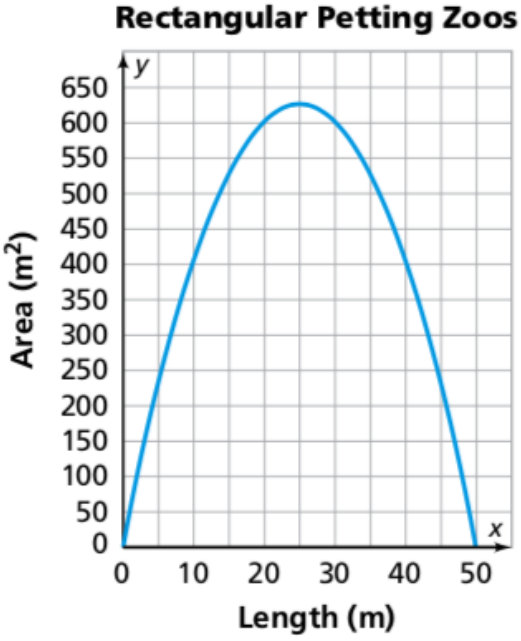
c. Is there a rectangle with the least possible area? Explain.

d. What is the area of a rectangle with a length of 3 centimeters?

e. Describe two ways to find the fixed perimeter for the rectangles represented by the graph.



5. Hillsdale Farms wants to add a small, rectangular petting zoo for the public. They have a fixed amount of fencing to use for the zoo. This graph shows the lengths and areas of the rectangles they can make.



a. Describe the shape of the graph and any special features you observe.

b. What is the greatest area possible for a rectangle with this perimeter? What are the dimensions of this rectangle?

c. What is the area of the rectangle with a length of 10 meters? What is the area of the rectangle with a length of 40 meters? How are these rectangles related?

d. What are the dimensions of the rectangle with an area of 600 square meters?

e. What is the fixed amount of fencing available for the petting zoo? Explain.

6. The lifeguards at a beach want to place a rectangular boundary around the swimming area that can be used for water basketball. They have a fixed amount of rope to make the boundary. They use the table at the right to look at possible arrangements.

a. What patterns do you observe in the table?

b. What is the fixed perimeter for the possible swimming areas?

c. Sketch a graph of the data (*length, area*). Describe the shape of the graph.

d. Suppose the lifeguards make a rectangle with an area of 11.5 square meters. What are the dimensions of the rectangle?

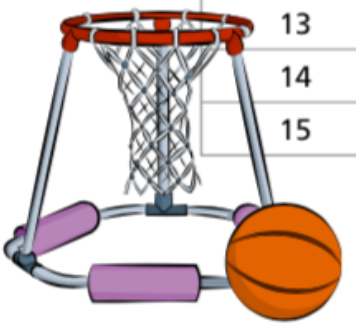
e. The lifeguards want to enclose the greatest area possible. What should be the dimensions of the swimming area?

Rectangular Swimming Area

Length (m)	Area (m^2)
1	15
2	28
3	39
4	48
5	55
6	60
7	63
8	64
9	63
10	60
11	55
12	48
13	39
14	28
15	15

11.5

11.5



2.2 Changing Dimensions

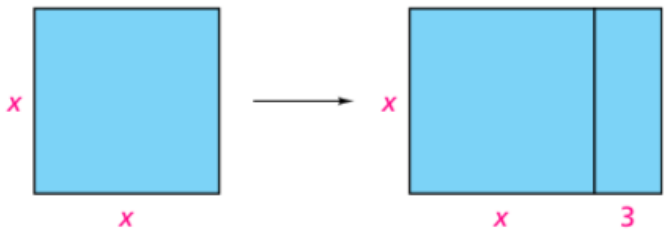
The Distributive Property

binomial binomial

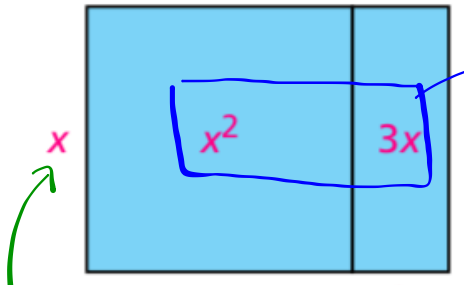
In the last Problem, you looked at two expressions for the area of a rectangle: $(n-2)(n+2)$ and n^2-4. Because these two expressions describe the same area, they are equivalent. This means that $(n-2)(n+2) = n^2-4$ is true for every value of n.

Here is another example of equivalent expressions:

Suppose a square has sides of length x centimeters. One dimension of the square is increased by 3 centimeters to make a new rectangle.



- How do the areas of the square and the new rectangle compare?
- Write two expressions for the area of the new rectangle. How do you know that the expressions are equivalent?



answer to a multiplication problem

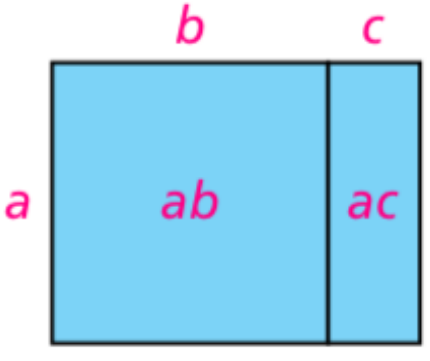
$x(x+3) = x^2+3x$

Factored Form

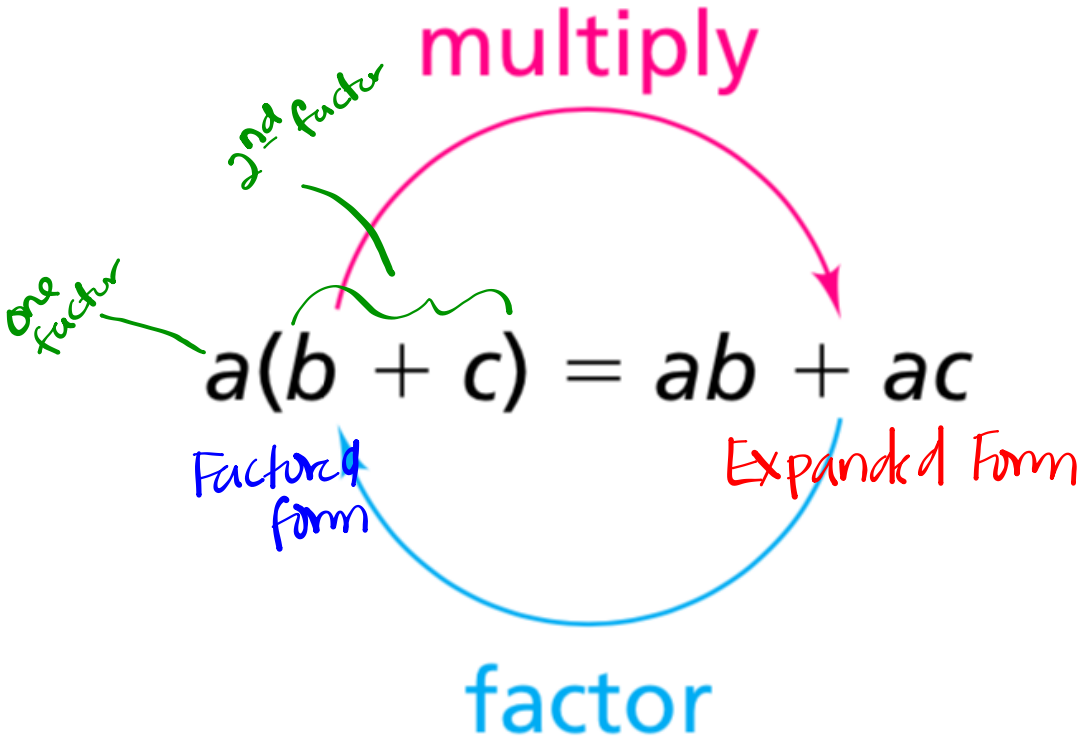
Expanded Form (no parentheses)

The expressions $x(x + 3)$ and $x^2 + 3x$ are examples of **quadratic expressions.** An expression in **factored form** is quadratic if it has exactly two *linear factors*, each with the variable raised to the first power. An expression in **expanded form** is quadratic if the highest power of the variable is 2. The expression $x(x + 3)$ is in factored form. The expression $x^2 + 3x$ is in expanded form.

It helps us remember to multiply everything!

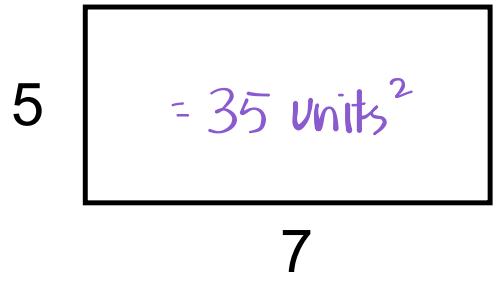


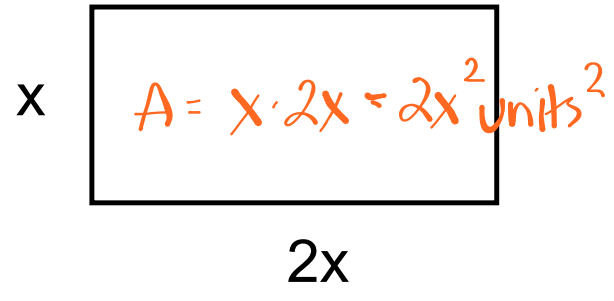
Area:
$a(b + c)$ or $ab + ac$


multiply
2nd factor
one factor
a(b + c) = ab + ac
Factored form
Expanded Form
factor

Using an Area Model (Box Method)
to expand a factored form.

Remember finding the area of a rectangle?
All we needed to do was multiply length and width.



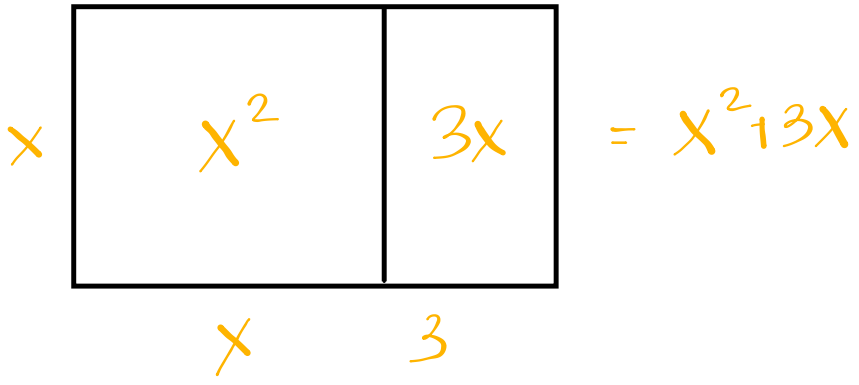


The length and width are FACTORS.

What if our factors become more complicated?

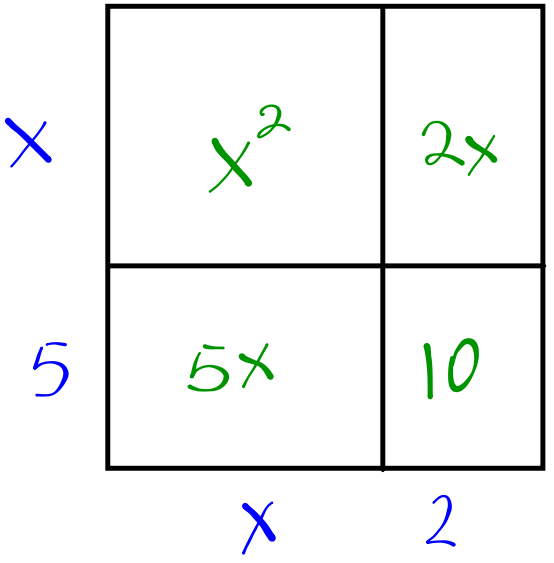
$x(x+3) = ?$

Factors are: x, $x+3$



L w

$(x+5)(x+2) = ?$ x^2+10? No. see below



Add up all pieces

$x^2+2x+5x+10$

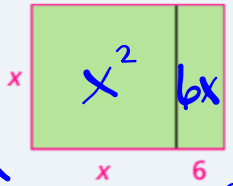
like terms

$x^2+7x+10$

Problem 2.2

A Each rectangle is the result of changing one or more dimensions of a square. Each rectangle has been subdivided into two or four smaller rectangles. Write two expressions for the area of the rectangle outlined in red, one in factored form and one in expanded form.

1.



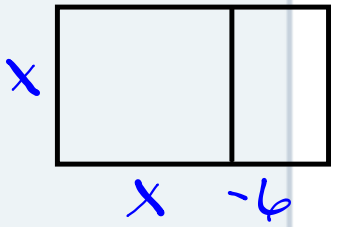
Factored form

Expanded Form

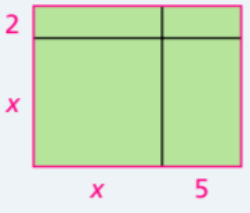
$x(x+6) = x^2+6x$

2.

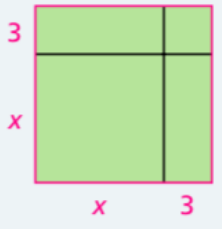
Rewrite



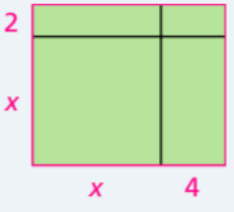
3.



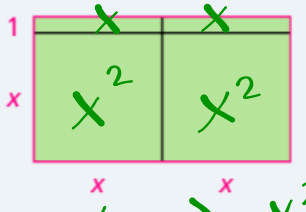
4.



5.



6.



$2x(x+1) = x^2+x^2+x+x$

B Use a rectangle model to write each expression in expanded form.

1. $(x+3)(x+5)$
2. $(4+x)(4+x)$
3. $3x(x+1)$

$2x^2+2x$

C Carminda says she does not need a rectangle model to multiply $(x + 3)$ by $(x + 5)$. She uses the Distributive Property.

$$\begin{aligned}(x+3)(x+5) &= (x+3)x + (x+3)5 && (1)\\ &= x^2 + 3x + 5x + 15 && (2)\\ &= x^2 + 8x + 15 && (3)\end{aligned}$$

1. Is Carminda correct? Explain what she did at each step.
2. Show how using the Distributive Property to multiply $(x + 3)$ and $(x + 5)$ is the same as using a rectangle model.

$(x+3)(x+5) = x^2 + 5x + 3x + 15$

$x^2 + 8x + 15$

Just making sure every term in one binomial is multiplied by every term in the other.

This is the distributive property!!

D Use the Distributive Property to write each expression in expanded form.

1. $(x + 5)(x + 5)$
2. $(x - 4)(x + 3)$
3. $2x(5 - x)$
4. $(2x + 1)(5 - x)$
5. $(n - 2)(n + 2)$