

4.3 Common Factoring

To factor:

- to rewrite a number or expression as a product of two or more factors  
 ➡ ADD BRACKETS
- opposite of expanding/multiplying

$$2a(a^2 - 3b + c) = 2a^3 - 6ab + 2ac$$

EXPAND  
 ➡  
 FACTOR  
 ⬅

Common factoring is the opposite of the distributive property.

Why factor?

- You can graph a parabola if its equation is in factored form because you know the zeros AND you can find its vertex.

Factoring Numbers

$$12 = (3)(4)$$

↑ ↑  
factors



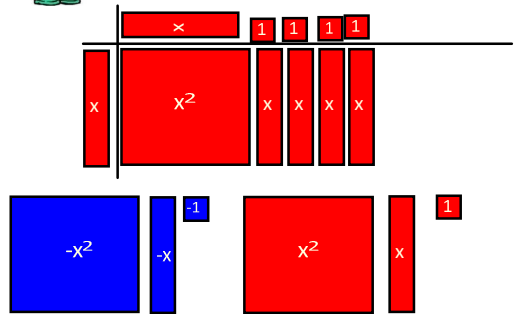
12 represents the area so 3 is the width and 4 is the length

Factoring Expressions

$$x^2 + 4x = x(x + 4)$$



Make a rectangle.  
The length and width are the factors.



Try to factor:

a)  $x^2 + 3x$

$$= x(x + 3)$$

b)  $2x^2 - 4x$

$$= 2x(x - 2)$$

Recall:  $\frac{x^m}{x^n} = x^{m-n}$

To divide monomials, divide the coefficients and use exponent laws to simplify the variables.

Ex. 1 Simplify

$$\begin{array}{lll} \text{a) } \frac{8x^4}{2x^2} = 4x^2 & \text{b) } \frac{6x^2y}{2xy^5} = 3xy^{-4} & \text{c) } \frac{-20a^3bc^5}{4b^2ac^8} = -5a^2b^{-1}c^{-3} \\ = & = \frac{3x}{y^4} & = -\frac{5a^2}{bc^3} \end{array}$$

In order to factor you must first find the common factor of your polynomial  
 GCF of all the terms.

Ex. 2 Find the GCF of:

a)  $6x - 3x^2 + 18$

GCF = 3

b)  $2a^4 + 3a^3 + 4a^2 + a$

GCF = a

c)  $15b^2 - 30b^3 + 10b^5$

GCF =  $5b^2$

d)  $14c^7 + 21c^6 - 35c^3$

GCF =  $7c^3$

e)  $16d^8e^4 - 20e^5d^4 + 8de^6$

GCF =  $4de^4$

f)  $8x^2yz - 6xy^3 + 10x^3y^2z^4$

GCF =  $2xy$



### Common Factoring Algebraically

Once you have found the GCF take it out of the polynomial (factor it) by dividing each term by the GCF.



Factoring (put brackets IN)

$$x^2 + 4x = x(x+4)$$

Expanding (take brackets OUT)

Common factoring is the opposite of the distributive property.

∴ You can always check your answer by expanding!

Ex. 3: Common Factor

a)  $12k - 36m$

$$= 12(k - 3m)$$

b)  $9x^2y - 3x^3y^2 - 6x^4y$

$$= 3x^2y(3 - xy - 2x^2)$$

c)  $6x^2 - 9x - 12$

$$= 3(2x^2 - 3x - 4)$$

d)  $8x^2y - 24xy + 12y$

$$= 4y(2x^2 - 6x + 3)$$

e)  $4a^2 + 6ab + 12abc$

$$= 2a(2a + 3b + 6bc)$$

f)  $6x^2y - 4xy - 2y$

$$= 2y(3x^2 - 2x - 1)$$

**FBUHL**  
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