

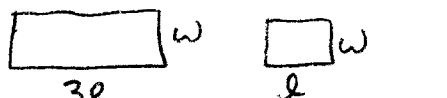
$$\textcircled{1} -4x^3y^{-2}(5x^5 + 3xy - 2x^{-1}y^2)$$

$$\textcircled{2} \frac{5x^2y - 15xy^3 + 10x^3y^4}{5xy}$$

$$\textcircled{3} (6x-1)(6x+1)$$

ACT $\textcircled{4}$ The length of A rectangle is 3 times the length of a smaller rectangle. The 2 rectangles have the same width. The area of the smaller rectangle is A square units. The area of the larger rectangle is kA square units. What is the value of k ?

Ans



$$3lw = kA \quad (lw) = A$$

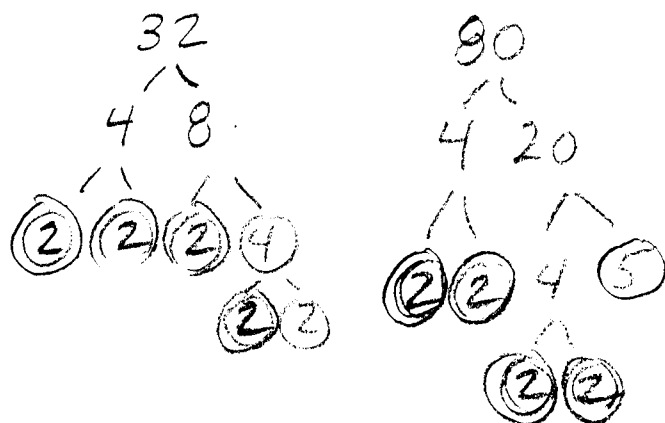
$$3A = kA \quad \therefore \boxed{k=3}$$

GCF Greatest Common Factor

Ⓔ 12, 18 GCF = 6

Ⓔ 25, 35 GCF = 5

Ⓔ 32, 80 GCF = ?



Multiply the common prime factors
 $2 \cdot 2 \cdot 2 \cdot 2 = \boxed{16} = \text{GCF}$

Ⓔ x^2, x^5 GCF = ?

xx, xxxxx
GCF = x^2

Factoring a polynomial by "undoing" the distributive property.

Ⓔ $32x^2 + 80x^5$

$\boxed{\frac{?}{\text{GCF}}} (\quad + \quad) \Rightarrow \boxed{16x^2(2 + 5x^3)}$

DOES IT WORK?

CH. 5-4 FACTORING POLYNOMIALS

ⓔx Factor $8x^3 + 12x^{10}$

$$4x^3(? + ?) \Rightarrow 4x^3(2 + 3x^7)$$

ⓔx Factor $15x^3 + 5x^2 + 10x$

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

DID you check it?

EX 1
pg 239 Factor $6x^2y^2 - 2xy^2 + 6x^3y$

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

💡 Get in the habit of Always checking a polynomial to see if it has a GCF - if so, "pull" it out. It will often either be the key to solving a problem or a way to make solving it easier. THINK GCF!!

Any ideas on a GCF for this 4-term polynomial?

$$x^3 - 4x^2 + 3x - 12$$

A useful technique for ≥ 4 -term polynomials is to use FBG

factoring by grouping

It won't always work, sometimes if it doesn't work you can get it to work by rearranging terms. Here is an FBG example:

$$x^3 - 4x^2 + 3x - 12$$

$$\Rightarrow (x^3 - 4x^2) + (3x - 12)$$

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

$$\underbrace{\hspace{1.5cm}} \quad \underbrace{\hspace{1.5cm}}$$

$$\underbrace{\hspace{1.5cm}}_{\text{GCF}} \quad (x^2 + 3)$$

$$x^2 \underline{a} + 3 \underline{a}$$

$$\underbrace{\hspace{1.5cm}}_{\text{GCF}} \quad (\quad + \quad)$$

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

$$\boxed{(x - 4)(x^2 + 3)}$$

Check: $x^3 + 3x - 4x^2 - 12$
 (FOIL) $\checkmark \quad \checkmark \quad \checkmark \quad \checkmark$

TIP: if FBG works, it works for 2 of the 3 ways you can arrange the terms, so if you try it twice and it doesn't work, don't bother trying it the 3rd way.

Lets see if Rearranging works:

$$x^3 - 4x^2 + 3x - 12 \quad \text{original}$$

$$(x^3 + 3x) \{-4x^2 - 12\} \quad \text{NOT } -(4x^2 - 12)$$



↑
WATCH OUT IF THIS 3rd term is negative, change
 $-4x^2$ to $+(-4x^2)$

PUT
PARENTHESES here

$$(x^3 + 3x) + (-4x^2 - 12)$$

$$\underline{x(x^2 + 3)} + \underline{-4(x^2 + 3)}$$

↑
💡 FACTOR -4 to change $-x^2 - 3$
to $x^2 + 3$

$$\boxed{(x^2 + 3)(x - 4)} \quad \text{STILL WORKED!}$$

PRIME POLYNOMIAL A POLYNOMIAL WITH NO FACTORS
(OTHER THAN itself AND ONE)

Factoring Trinomials of the form:

$ax^2 + bx + c \Rightarrow$ if they are not prime polynomial of course.

MUST BE IN THIS FORM, IF NOT, PUT IN THIS FORM!

"Magic Number" Method

- Find 2 numbers that sum to "b" and multiply to "ac"
- SPLIT "MIDDLE" term into these two "magic terms"
- Factor By Grouping

(EX)

$$5x^2 - 13x + 6$$

$$\text{sum} = b = -13$$

$$\text{prod} = ac = +30$$

$$(5x^2 - 3x) + (-10x + 6)$$

CHANGE $+6$ to $+(-10x)$

$$x(5x - 3) + -2(5x - 3)$$

$$(5x - 3)(x - 2)$$

NOTES

Find magic numbers, get signs correct

$$\text{NOTE: } -15 + 2 = -13$$

$$-15(2) \neq 30$$

$$\text{Try } -10 - 3 = -13$$

$$-10(-3) = +30 \checkmark$$

Check: $(5x - 3)(x - 2)$
(FOIL)

$$5x^2 - 10x - 3x + 6$$

$$5x^2 - 13x + 6 \checkmark$$

Factor:

$$\textcircled{\text{ex}} \quad y^2 + 2y^2 - y - y - 5$$

$$3y^2 - 2y - 5$$

Standard Form:
 $ax^2 + bx + c$

$$\text{sum} = b = -2$$

$$\text{prod} = ac = -15$$

$$\begin{array}{c} \swarrow \quad \searrow \\ \textcircled{+3} \quad \textcircled{-5} \end{array}$$

SPLIT MIDDLE TERM

$$3y^2 + \textcircled{+3y} - \textcircled{5y} - 5 \quad \text{FBG}$$

$$(3y^2 + 3y) + (-5y - 5)$$

$$\underline{3y(y + 1)} + \underline{-5(y + 1)}$$

TAKE OUT GCF
OF $(y + 1)$

$$\boxed{\underline{(y + 1)}(3y - 5)}$$

Check:
(FOIL)

$$(y + 1)(3y - 5)$$

$$3y^2 - 5y + 3y - 5$$

$$3y^2 - 2y - 5 \checkmark$$

Ex Factor

$$2x^2 + 7x + 3$$

$$\text{Sum} \Rightarrow 7$$

$$\text{prod} \Rightarrow 6$$
$$\begin{array}{c} \diagup \quad \diagdown \\ +1 \quad +6 \end{array}$$

$$(2x^2 + 1x) + (6x + 3)$$

$$x(2x + 1) + 3(2x + 1)$$

$$\boxed{(2x+1)(x+3)} \quad \text{Check w/ FOIL} \Rightarrow \checkmark$$

A very useful shortcut:

Iff the leading coefficient is +1, that is, if $a = +1$, then no factoring by grouping is needed, as soon as you find the magic numbers you have the factors.

Ex $x^2 + 5x - 6$

$$\text{Sum} \Rightarrow 5$$

$$\text{prod} \Rightarrow -6$$

$$\begin{array}{c} \diagup \quad \diagdown \\ -1 \quad +6 \end{array}$$

$$\therefore \boxed{(x-1)(x+6)}$$

Check w/ FOIL? $\checkmark$

• Homework: Pg. 242 # 20 to 27, 5, 6, 15.