$x(a+b)(a-b)$

$= xa^2 - xb^2$

*FOIL

Simplify the following.

148. $3(b-7)(b+7)$

$(3b-21)(b+7)$

$3b^2 + 21b - 21b - 147$

$3b^2 - 147$

149. $-2(c-5)(c+5)$

$(-2c+10)(c+5)$

$-2c^2 - 10c + 10c + 50$

$-2c + 50$

$(-a)a^2 - (-a)(5^2)$

$-2a^2 - (-a)(25)$

$-2a^2 + 50$

150. $(x+6)(x+4) + (x+2)(x+3)$

$(x^2+4x+6x+24) + (x^2+3x+2x+6)$

$(x^2+10x+24) + (x^2+5x+6)$

*collect like terms (+)

$2x^2 + 15x + 30$

151. $3(x-4)(x+3) - 2(4x+1)$

$(3x-12)(x+3) - (8x+2)$

$3x^2 + 9x - 12x - 36 - 8x - 2$

$3x^2 - 11x - 38$

152. $5(3t-4)(2t-1) - (6t-5)$

$(15t-20)(2t-1) - (6t-5)$

$(30t^2 - 15t - 40t + 20) - (6t-5)$

*drop brackets and collect like terms.

$30t^2 - 61t + 25$

153. $10 - 2(2y+1)(2y+1) - (2y+3)(2y+3)$

$10 - (4y+2)(2y+1) - (4y^2+6y+6y+9)$

$10 - (8y^2+4y+4y+2) - (4y^2+12y+9)$

$10 - 8y^2 - 8y - 2 - 4y^2 - 12y - 9$

$-12y^2 - 20y - 1$

Some key points to master about the Distributive Property...

FOIL

$(a+b)(a-b)$

$a^2 - ab + ab - b^2$

$(a^2 - b^2)$

*difference of squares

$(a+b)^2$

$(a+b)(a+b)$

$a^2 + ab + ab + b^2$

$a^2 + 2ab + b^2$

$(a+b)^3$

$(a+b)(a+b)(a+b)$

$(a^2 + 2ab + b^2)(a+b)$

$a^3 + a^2b + 2a^2b + 2ab^2 + ab^2 + b^3$

$a^3 + 3a^2b + 3ab^2 + b^3$

should use "·" instead of "x" } To show multiplication.

Factoring:

When a number is written as a product of two other numbers, we say it is factored.

"Factor Fully" means to write as a product of **prime factors**.

Eg.1.
Write 15 as a product of its prime factors.

$15 = 5 \times 3$

5 and 3 are the prime factors.

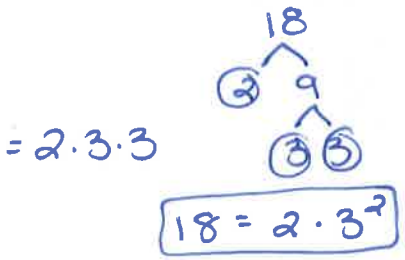
Eg.2.
Write 48 as a product of its prime factors.

$48 = 8 \times 6$
$48 = 2 \times 2 \times 2 \times 3 \times 2$
$48 = 2^4 \times 3$

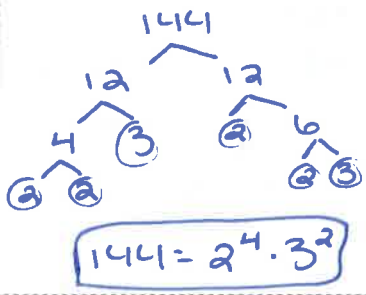
Eg.3.
Write 120 as a product of its prime factors.

$120 = 10 \times 12$
$120 = 2 \times 5 \times 2 \times 2 \times 3$
$120 = 2^3 \times 3 \times 5$

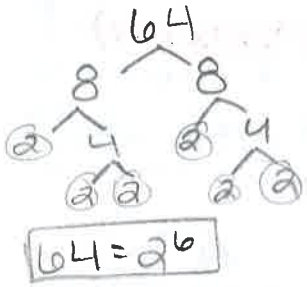
154. Write 18 as a product of its prime factors.



155. Write 144 as a product of its prime factors.



156. Write 64 as a product of its prime factors.



157. Find the greatest common factor (GCF) of 48 and 120.

Look at each factored form.

$48 = 2^4 \times 3$
$120 = 2^3 \times 3 \times 5$

Both contain $2 \times 2 \times 2 \times 3$, therefore this is the GCF,

GCF is 24.

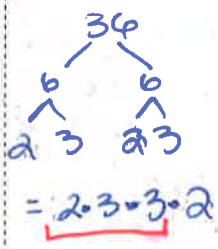
158. Find the greatest common factor (GCF) of 144 and 64.

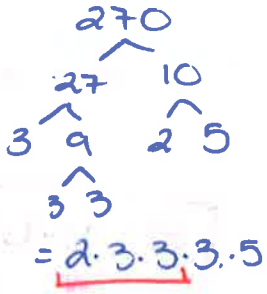
144: 2·2·2·2·3·3
64: 2·2·2·2·2·2

GCF = 2^4

GCF = 16

159. Find the greatest common factor (GCF) of 36 and 270.





common: 2·3·3
= 2·3²

GCF = 18

We can also write algebraic expressions in factored from.

Eg.4. Write $36x^2y^3$ as a product of its factors.

$36x^2y^3 = 9\times4\times x\times x\times x\times y\times y\times y$

$36x^2y^3 = 3^2\times2^2\times x^2\times y^3$

36 → 6, 6 → 2, 3, 2, 3

$=2^2\cdot3^2$

160. Write $10a^2b$ as a product of its factors.

10 → 2, 5

$10a^2b = 2\cdot5\cdot a\cdot a\cdot b$

$=2\cdot5\cdot a^2\cdot b$

161. Write $18ab^2c^3$ as a product of its factors.

18 → 2, 9 → 3, 3

$=2\cdot3^2a^1b^2c^3$

162. Write $12b^3c^2$ as a product of its factors.

12 → 2, 6 → 2, 3

$=2^2\cdot3^1\cdot b^3\cdot c^2$

163. Find the greatest common factor (GCF) of $10a^2b$ and $18ab^2c^3$.

18 → 2, 9 → 3, 3

$18ab^2c^3 = 2\cdot3\cdot3\cdot a\cdot b\cdot b\cdot c\cdot c\cdot c$

$10a^2b = 2\cdot5\cdot a\cdot a\cdot b$

*find the "common factors"

GCF = $2ab$

164. Find the greatest common factor (GCF) of $12b^3c^2$ and $18ab^2c^3$.

$12b^3c^2$: $2\cdot2\cdot3\cdot b\cdot b\cdot b\cdot c\cdot c$

$18ab^2c^3$: $2\cdot3\cdot3\cdot a\cdot b\cdot b\cdot c\cdot c\cdot c$

GCF: $2\cdot3\cdot b\cdot b\cdot c\cdot c$

GCF = $6b^2c^2$

165. Find the greatest common factor (GCF) of $10a^2b$, $18ab^2c^3$, and $12b^3c^2$.

$10a^2b$: $2\cdot5\cdot a\cdot a\cdot b$

$12b^3c^2$: $2\cdot2\cdot3\cdot b\cdot b\cdot b\cdot c\cdot c$

$18ab^2c^3$: $2\cdot3\cdot3\cdot a\cdot b\cdot b\cdot c\cdot c\cdot c$

GCF = $2b$

Factoring Polynomials:

The process of factoring "undoes" the process of expanding, and vice versa.

They are opposites.

You must be able to interchange a polynomial - between these two forms.

Factoring means "*write as a product of factors.*"

The method you use depends on the type of polynomial you are factoring.

Challenge Question:

Write a multiplication that would be equal to $5x + 10$.

$5(x+2)$

check: $5x+10$ ✓

Challenge Question:

Write a multiplication that would be equal to $3x^3 + 6x^2 - 12x$.

$*3x(x+2x-4)$ *Factored Fully

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

The answers to the above questions are called the "FACTORED FORM".

Factoring: Look for a Greatest Common Factor

Hint: Always look for a GCF first.

Ask yourself: "Do all terms have a common integral or variable factor?"

=> do all terms have the same variable?

Eg.1. Factor the expression.

$5x + 10$

Think...what factor do 5x and 10 have in common?

Both are divisible by 5...that is the GCF. "pull out 5"

$= 5(x) + 5(2)$ Write each term as a product using the GCF.

$= 5(x + 2)$ Write the GCF outside the brackets, remaining factors inside.

You should check your answer by expanding. This will get you back to the original polynomial.

Eg.2.

Factor the expression

$3ax^3+6ax^2-12ax$

GCF = 3ax

+all divisible by 3 => "pull out ax"

$=3ax(x^2)+3ax(2x)+3ax(-4)$ => "pull out 3"

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

Eg.3. Factor the expression $4x + 4$ using algebra tiles.

I draw the expression as a rectangle using algebra tiles. Find length and width

(x+1)

	1	1	1	1
x +	x	x	x	x
1	1	1	1	1

$4(x + 1) = 4x + 4$

not "factorable"

Factor the following polynomials.

166. $5x + 25$

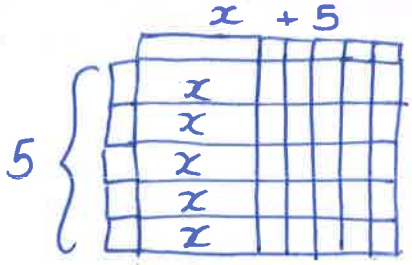
$5(x+5)$

167. $4x + 13$

168. $8x + 8$

$8(x+1)$

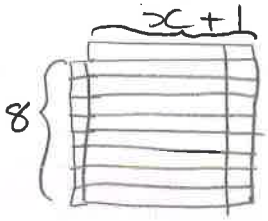
169. Model the expression above using algebra tiles.



170. Model the expression above using algebra tiles.

not factorable

171. Model the expression above using algebra tiles.



172. $4ax + 8ay - 6az$

2a 2a 2a

- all #'s are divisible by 2.
- variable "a" is in all terms.

$2a(2x+4y-3z)$

↑ divide all terms by 2a

173. $24w^5 - 6w^3$

÷6

$6(4w^5 - w^3)$

$6w^3(4w^2 - 1)$

174. $3w^3xy + 12wxy^2 - wxy$

$wxy(3w^2 + 12y - 1)$

175. $27a^2b^3 + 9a^2b^2 - 18a^3b^2$

$9a^2b^2(3b + 1 - 2a)$

176. $6m^3n^2 + 18m^2n^3 - 12mn^2 + 24mn^3$

$6mn^2(m^2 + 3n - 2 + 4n)$