PRINCIPLES - LESSON 12C
FACTORING BY DIFFERENCE OF TWO SQUARES

Recall: Factoring by GCF

Factor.

ex1) $16m^3n^4 - 12m^4n^3 + 20m^5n^2 + 4m^2n$

$= \underbrace{4m^2n}_{\text{GCF}}\left(\underbrace{4mn^3 - 3m^2n^2 + 5m^3n + 1}_{\text{leftovers}}\right)$

Note: The GCF method can be used to factor a polynomial of any size.

CAN THIS BINOMIAL BE FACTORED?

Factor.

ex2) $x^2 - 16$

This polynomial <u>can be factored</u>, but not by the GCF method.

PERFECT SQUARES

Be sure to know all perfect squares from 1 to 400 at least.

$1 \cdot 1 = 1^2 = 1$	$11 \cdot 11 = 11^2 = 121$
$2 \cdot 2 = 2^2 = 4$	$12 \cdot 12 = 12^2 = 144$
$3 \cdot 3 = 3^2 = 9$	$13 \cdot 13 = 13^2 = 169$
$4 \cdot 4 = 4^2 = 16$	$14 \cdot 14 = 14^2 = 196$
$5 \cdot 5 = 5^2 = 25$	$15 \cdot 15 = 15^2 = 225$
$6 \cdot 6 = 6^2 = 36$	$16 \cdot 16 = 16^2 = 256$
$7 \cdot 7 = 7^2 = 49$	$17 \cdot 17 = 17^2 = 289$
$8 \cdot 8 = 8^2 = 64$	$18 \cdot 18 = 18^2 = 324$
$9 \cdot 9 = 9^2 = 81$	$19 \cdot 19 = 19^2 = 361$
$10 \cdot 10 = 10^2 = 100$	$20 \cdot 20 = 20^2 = 400$

MEMORIZE this list! I promise it will save you time later.

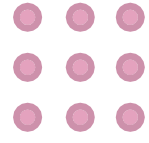
A **square root** is the number that is multiplied by itself to produce each perfect square.

WHY DO WE CALL THEM PERFECT SQUARES?

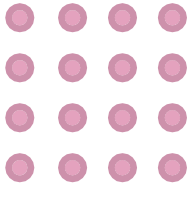
1

4

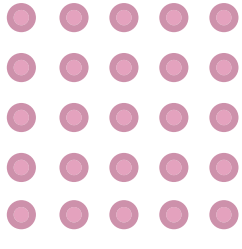
9



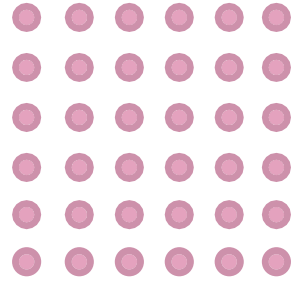
16



25



36



OTHER PERFECT SQUARES

ex3) Why is x^2 a perfect square?

because
$x^2 = x \cdot x$

---

ex4) Why is n^2 a perfect square?

because
$n^2 = n \cdot n$

---

ex5) Why is r^6 a perfect square?

because
$r^6 = r^3 \cdot r^3$

---

ex6) Why is m^{20} a perfect square?

because
$m^{20} = m^{10} \cdot m^{10}$

All EVEN exponents are perfect squares.

FACTORING BY DIFFERENCE OF TWO SQUARES

Factor.

ex7) $x^2 - 16$

$x \quad x \quad 4 \quad 4$

$= (x+4)(x-4)$

Factoring Method: Difference of Two Squares

$$a^2 - b^2 = (a+b)(a-b)$$

FACTORING BY DIFFERENCE OF TWO SQUARES

Factor.

Remember that all EVEN exponents are perfect squares.

ex8) $a^2 - b^6$

$a \quad a \quad b^3 \quad b^3$

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

ex9) $36m^{36} - 25n^{10}$

$6m^{18} \quad 6m^{18} \quad 5n^5 \quad 5n^5$

$= (6m^{18}+5n^5)(6m^{18}-5n^5)$

ex10) $j^2 + k^2$

This is a sum of squares, not a difference of squares.

Not factorable

ex11) $16p^{16} - 9q^9$

odd exponent

$9q^9$ is not a perfect square.

Not factorable