

**Objective: Factor a variety of polynomial expressions and solve equations by factoring.**

Identify and factor out the greatest common factor (GCF) from each expression below:

Foundation:

1)  $8x^2 + 10x$

$2x(4x + 5)$

2)  $-15d^5 + 45d^3$

$-15d^3(d^2 - 3)$

3)  $c^3 + c^2 - c$

$c(c^2 + c - 1)$

4)  $-7m^2 - 10m + 17$

$-(7m^2 + 10m - 17)$

5)  $18x^2 - 50y^2$

$2(9x^2 - 25y^2)$

6)  $36rs^2 - 108r^2s^3$

$36rs^2(1 - 3rs)$

7)  $a^7b - a^{10}$

$a^7(b - a^3)$

8)  $18x^5 - 48x^4 + 56x^3 - 86x$

$2x(9x^4 - 24x^3 + 28x^2 - 43)$

9)  $23y^{10} - 46y^7 + 68y^2 + 10y$

$y(23y^9 - 46y^6 + 68y + 10)$

Notes:

How to factor quadratic trinomial expressions ( $ax^2 + bx + c$ ):

Step 1: Factor out any GCFs or leading negative "a" values from the trinomial before beginning.

Step 2: Draw a large X.

Step 3: Put ac in the top and b in the bottom

Step 4: Fill in the sides with two numbers that multiply to the top and add to the bottom. If none exist, the expression is not factorable, or "prime".

Step 5: Draw a box with 4 squares and put the first term in the top left, the last term in the bottom right. To fill the remaining boxes, split the middle term into two terms with the numbers from the sides of the X as coefficients.

Step 6: Factor out the GCF's from each row and column.

Step 7: Write the GCFs on the outside of the box as binomials.

How to solve equations by factoring:

Step 8: Set each factor equal to 0.

Step 9: Solve each equation from Step 8.

Examples:

1)  $16x^2y + 48x^3y^2$

$16x^2y(1 + 3xy)$

2)  $-x^2 - 19x + 20 = 0$

$-(x^2 + 19x - 20) = 0$

$x$	$20x$
$x^2$	$-20$

~~$\frac{-20}{19} - 1$~~

$-(x + 20)(x - 1) = 0$

$x + 20 = 0 \quad x - 1 = 0$

$x = -20 \quad x = 1$

3)  $4a^2 - 100b^2$

$4(a^2 - 25b^2)$

$4(a^2 + 0ab - 25b^2)$

~~$\frac{-25}{5} - 5$~~

$a$	$5b$
$a^2$	$5ab$
$-5b$	$-25b^2$

$4(a + 5b)(a - 5b)$

4)  $-3x^4 + 30x^3 - 75x^2 = 0$

$-3x^2(x^2 - 10x + 25) = 0$

~~$\frac{25}{-5} - 5$~~

$x$	$-5$
$x^2$	$-5x$
$-5$	$25$

$-3x^2(x - 5)^2 = 0$

$-3x^2 = 0 \quad x - 5 = 0$

$x = 0 \quad x = 5$

Factor the expression.

1)  $12a^2b^2 - 3ab$

$3ab(4ab-1)$

3)  $x^2 + 3x - 28$

	x	7
x	$x^2$	$7x$
-4	$-4x$	$-28$

~~$\frac{-28}{3} - 4$~~

$(x+7)(x-4)$

5)  $x^2 - 16y^2$

$x^2 + 0xy - 16y^2$

	x	-4y
x	$x^2$	$-4xy$
4y	$4xy$	$-16y^2$

~~$\frac{-16}{0} + 4$~~

$(x-4y)(x+4y)$

7)  $4x^2 - 7xy + 3y^2$

	x	y
4x	$4x^2$	$-4xy$
-3y	$-3xy$	$3y^2$

~~$\frac{12}{-7} - 3$~~

$(x+y)(4x-3y)$

9)  $x^2 + 49$

$x^2 + 0x + 49$

~~$\frac{49}{0}$~~

Prime

Solve by factoring.

2)  $x^2 - 9x + 20 = 0$

	x	-4
x	$x^2$	$-4x$
-5	$-5x$	$20$

~~$\frac{20}{-4} - 5$~~

$(x-4)(x-5) = 0$

$x-4=0$     $x-5=0$

$x=4$     $x=5$

4)  $5x^2 - 22x - 15 = 0$

	x	-5
5x	$5x^2$	$-25x$
3	$3x$	$-15$

~~$\frac{-75}{-22} - 3$~~

$(x-5)(5x+3) = 0$

$x-5=0$     $5x+3=0$

$x=5$     $x=-3/5$

6)  $9x^2 - 12x + 4 = 0$

	3x	-2
3x	$9x^2$	$-6x$
-2	$-6x$	$4$

~~$\frac{36}{-12} - 6$~~

$(3x-2)(3x-2) = 0$

$3x-2=0$

$x=2/3$

8)  $x^4 - 11x^3 + 24x^2 = 0$

$x^2(x^2 - 11x + 24) = 0$

	x	-8
x	$x^2$	$-8x$
-3	$-3x$	$24$

~~$\frac{24}{-11} - 3$~~

$x^2(x-8)(x-3) = 0$

$x^2=0$     $x-8=0$     $x-3=0$

$x=0$     $x=8$     $x=3$

10)  $8x^2 - 6x - 2 = 0$

$2(4x^2 - 3x - 1)$

	x	-1
4x	$4x^2$	$-4x$
1	$x$	$-1$

~~$\frac{-4}{-3} - 1$~~

$2(x-1)(4x+1) = 0$

$x-1=0$     $4x+1=0$

$x=1$     $x=-1/4$

Practice:

Homework: