Bellwork

Factor each of the following expressions:

1. $x^2 + 2x - 15$

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

$(x^2 + 5x) - (3x - 15)$

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

$\boxed{(x - 3)(x + 5)}$

Factor 15
1 and 15
3 and 5

Using:
$5x - 3x = 2x$

2. $3x^2 - 16x - 12$

$3x^2 - 18x + 2x - 12$

$(3x^2 - 18x) + (2x - 12)$

$3x(x - 6) + 2(x - 6)$

$\boxed{(3x + 2)(x - 6)}$

Factor 36
1 and 36
2 and 18
3 and 12
4 and 9
6 and 6

Using:
$2x - 18x = -16x$

3. $4x^2 - 9$

$4x^2 + 0x - 9$

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

$(4x^2 + 6x) - (6x - 9)$

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

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

Factor 36
1 and 36
2 and 18
3 and 12
4 and 9
6 and 6

Using:
$6x - 6x = 0x$

Solving Quadratic Equations:

By Factoring

Factoring techniques are the same as before:

If a = 1

1. List all the factors of the constant c
2. Identify the set that combine by the 2nd sign to get the middle #.
3. Rewrite breaking the middle term up.
4. Factor by Grouping.

If $a \neq 1$

1. Multiply a times c.
2. Factor ac
3. Follow steps 2 - 4 of when a = 1

Procedure

Step 1: Set the equation equal to 0.
Move **EVERYTHING** to one side!
NOTE: Be sure the squared term is positive!

Step 2: Factor the expression.

Step 3: Using the Zero Product Property set each of the factors equal to zero.

Step 4: Solve each of these for the variable.

Step 5: Check your answers by plugging them into the original equation and work them out.

Examples

Solve each of the following quadratics by factoring:

1. $9 = -x^2 + 6x$

$+x^2 - 6x \quad +x^2 \quad - 6x$

$x^2 - 6x + 9 = 0$

$x^2 - 3x - 3x + 9 = 0$

$(x^2 - 3x) - (3x + 9) = 0$

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

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

Factor 9
1 and 9
3 and 3

Using:
$-3x - 3x = -6x$

So then we have...

$x - 3 = 0$ and $x - 3 = 0$

$+3 \quad +3$ $\quad$ $+3 \quad +3$

$x = 3$ $\quad$ $x = 3$

2. $6x^2 - 17x = -12$

$+12 \quad +12$

$6x^2 - 17x + 12 = 0$

$6x^2 - 8x - 9x + 12 = 0$

$(6x^2 - 8x) - (9x + 12) = 0$

$(6x^2 - 8x) - (9x - 12) = 0$

$2x(3x - 4) - 3(3x - 4) = 0$

$(2x - 3)(3x - 4) = 0$

6(12)
Factor 72
1 and 72
2 and 36
3 and 24
4 and 18
6 and 12
8 and 9

Using:
$-8x - 9x = -17x$

So then we have...

$2x - 3 = 0$ and $3x - 4 = 0$

$+3 \quad +3$ $\quad$ $+4 \quad +4$

$\frac{2x}{2} = \frac{3}{2}$ $\quad$ $\frac{3x}{3} = \frac{4}{3}$

$x = \frac{3}{2}$ $\quad$ $x = \frac{4}{3}$

More Examples

Solve each of the following quadratics by factoring:

3. $-x^2 + 56 = -10x$

$+ 10x \quad + 10x$

$-x^2 + 10x + 56 = 0$

$-1\,[-x^2 + 10x + 56 = 0]\,-1$

$x^2 - 10x - 56 = 0$

$x^2 - 14x + 4x - 56 = 0$

$(x^2 - 14x) + (4x - 56) = 0$

$x(x - 14) + 4(x - 14) = 0$

$(x + 4)(x - 14) = 0$

Factor 56
1 and 56
2 and 28
4 and 14
7 and 8

Using:
$4x - 14x = -10x$

So then we have...

$x + 4 = 0$ and $x - 14 = 0$

$-4 \quad -4 \qquad +14 \quad +14$

$\boxed{x = -4} \qquad \boxed{x = 14}$

4. $2x^2 + 5x = -2$

$+2 \quad +2$

$2x^2 + 5x + 2 = 0$

$2x^2 + 1x + 4x + 2 = 0$

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

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

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

Factor 4
1 and 4
2 and 2

Using:
$1x + 4x = 5x$

So then we have...

$x + 2 = 0$ and $2x + 1 = 0$

$-2 \quad -2 \qquad -1 \quad -1$

$\boxed{x = -2} \qquad \frac{2x}{2} = \frac{-1}{2}$

$\boxed{x = \frac{-1}{2}}$

More Examples

Solve each of the following quadratics by factoring:

5. $x - x^2 = -30$

$-x^2 + x = -30$

$+30 \quad +30$

$-x^2 + x + 30 = 0$

$-1\,[-x^2 + x + 30 = 0]\,-1$

$x^2 - x - 30 = 0$

$x^2 - 6x + 5x - 30 = 0$

$(x^2 - 6x) + (5x - 30) = 0$

$x(x - 6) + 5(x - 6) = 0$

$(x + 5)(x - 6) = 0$

Factor 30
1 and 30
2 and 15
3 and 10
5 and 6

Using:
$-6x + 5x = -1x$

So then we have...

$x + 5 = 0$ and $x - 6 = 0$

$-5 \quad -5$ $\qquad$ $+6 \quad +6$

$\boxed{x = -5}$ $\qquad$ $\boxed{x = 6}$

6. $x^2 = -8x - 16$

$+8x + 16 \quad +8x + 16$

$x^2 + 8x + 16 = 0$

$x^2 + 4x + 4x + 16 = 0$

$(x^2 + 4x) + (4x + 16) = 0$

$x(x + 4) + 4(x + 4) = 0$

$(x + 4)(x + 4) = 0$

Factor 16
1 and 16
2 and 8
4 and 4

Using:
$4x + 4x = 8x$

So then we have...

$x + 4 = 0$ and $x + 4 = 0$

$-4 \quad -4$ $\qquad$ $-4 \quad -4$

$\boxed{x = -4}$ $\qquad$ $\boxed{x = -4}$