www.MathWorksheetsGo.com
On Twitter: twitter.com/engagingmath

I. Model Problems.
II. Practice
III. Challenge Problems
VI. Answer Key

**Web Resources**

YouTube How To Factor Trinomials (step by step)
www.mathwarehouse.com/algebra/factor/how-to-factor-trinomials-step-by-step.php

Methods of Factoring
http://www.mathwarehouse.com/algebra/factor/methods-of-factoring.php



Graph Paper Maker (free): www.mathworksheetsgo.com/paper/

Online Calculator : www.mathworksheetsgo.com/calculator/

# Factoring Trinomials (including difference of squares)

## I. Model Problems

In the following examples you will factor a quadratic trinomial.

***Example 1:*** **Factor $x^2 + 3x - 10$**

Factor the trinomial as a product of two binomials by undoing FOIL.

For $(x + p)(x + q)$, we want to find $p$ and $q$ such that $p + q = 3$ and $pq = -10$.

$x^2 + 3x - 10$

List the factors of $-10$. $1, -10; -1, 10; -2, 5; 2, -5$

Find the sum of the factors. We are looking for 3.

~~$1 + -10 = -9$~~

~~$-1 + 10 = 9$~~

$-2 + 5 = 3$

~~$2 + -5 = -3$~~

Substitute factors of $-10$ with a sum of 3. $(x + (-2))(x + 5)$

or… $(x - 2)(x + 5)$

Check with FOIL. $x^2 + 5x - 2x - 10$

$x^2 + 3x - 10$

**Answer:** $(x - 2)(x + 5)$

***Example 2:*** **Factor $3x^2 + 13x + 14$**

In this case the outside and inside term will be multiplied before we find the sum

The factors of 3 are 3 and 1. The first terms of the binomials are 3*x* and 1*x*. $(3x + \ )(x + \ )$

List the factors of $14$. $1, 14; 2, 7$

If a factor is in the 'outside' slot it is multiplied by 3 before we find the sum. If a factor is in the 'inside' slot it is multiplied by 1.

| I × 1 | O × 3 | Sum |
|---|---|---|
| 14 × 1 | 1 × 3 | 17 |
| 1 × 1 | 14 × 3 | 43 |
| 7 × 1 | 2 × 3 | 13 |
| 2 × 1 | 7 × 3 | 23 |

Substitute factors into the correct slot. $(3x + 7)(x + 2)$

Check with FOIL. $x^2 + 6x + 7x + 14$

$x^2 + 13x + 14$

**Answer:** $(3x + 7)(x + 2)$

In the following examples you will factor a difference of squares.

***Example 3:*** **Factor $x^2 - 25$**

Rewrite as trinomial. $x^2 + 0x - 25$

We are looking for the factors of $-25$ that have a sum of 0. $-1, 25; 1, -25; -5, 5$

**Answer:** $(x + 5)(x - 5)$

For difference of squares: $a^2 - b^2 = (a + b)(a - b)$.

**II. Practice Problems**

Factor.

1. $x^2 + 9x + 18$
2. $x^2 + 7x + 12$
3. $x^2 + 11x + 18$
4. $x^2 + 14x + 24$
5. $x^2 + 17x + 30$
6. $x^2 - 2x - 15$
7. $x^2 + 3x - 18$
8. $x^2 - 64$
9. $x^2 - 7x + 12$
10. $x^2 - 17x + 72$
11. $121x^2 - 225y^4$
12. $x^2 - 8x + 16$
13. $16x^2 - 25$
14. $2x^2 + 11x + 12$
15. $3x^2 + 13x - 10$
16. $2x^2 + 7x + 6$
17. $4x^2 + 49$
18. $5x^2 + 9x - 2$
19. $121x^2 - 36y^2$
20. $4x^2 + 4x + 1$

**III. Challenge Problems**

**Factor completely.**

21. $16x^2 + 56xy + 49y^2$
22. $8x^4 + 44x^3 + 56x^2$
23. $6x^3y^2 + 54x^2y^2 - 312xy^2$
24. $5x^5 + 40x^3 - 165x^4$

25. Find the mistake in the following.

$$x^2 + 2x - 48$$
$$(x + 6)(x - 8)$$

**IV. Answer Key**

1. $(x+6)(x+3)$
2. $(x+4)(x+3)$
3. $(x+2)(x+9)$
4. $(x+2)(x+12)$
5. $(x+15)(x+2)$
6. $(x-5)(x+3)$
7. $(x-3)(x+6)$
8. $(x+8)(x-8)$
9. $(x-4)(x-3)$
10. $(x-8)(x-9)$
11. $(11x-15y^2)(11x+15y^2)$
12. $(x-4)^2$
13. $(4x-5)(4x+5)$
14. $(2x+3)(x+4)$
15. $(3x-2)(x+5)$
16. $(2x+3)(x+2)$
17. not factorable
18. $(5x-1)(x+2)$
19. $(11x-6y)(11x+6y)$
20. $(2x+1)^2$
21. $(4x+7y)^2$
22. $4x^2(2x+7)(x+2)$
23. $6xy^2(x+13)(x-4)$
24. $5x(x^2-3)(x^2+11)$
25. Right magnitude of factors, but the signs are switched.

    Should be (x − 6)(x + 8)