

NAME: _____

DATE: _____

FACTORIZING TRINOMIALS  **3**

So far we have two factoring techniques: (1) Factoring out a **g.c.f.** and (2) Factoring based on **conjugate pairs** (factoring the difference of perfect squares). Today we will tackle the most difficult of the factoring techniques, and that is of factoring trinomials. First, let's make sure we can multiply binomials.

Warm Up: Write each of the following products in equivalent trinomial form.

(a) $(x+5)(x+3)$

$x^2 + 3x + 5x + 15$
 $x^2 + 8x + 15$

(b) $(x-2)(x+7)$

$x^2 + 7x - 2x - 14$
 $x^2 + 5x - 14$

(c) $(x-5)(x-10)$

$x^2 - 10x - 5x + 50$
 $x^2 - 15x + 50$

THE AM METHOD of FACTORING!

Factoring a trinomial whose leading coefficient is 1 ($ax^2 + bx + c$, where $a = 1$)

- Step 1: Start with 2 sets of parentheses whose first term is x .
- Step 2: Identify all pairs of factors that multiply to the c value (last term).
- Step 3: Determine which pair adds to the b value (middle term).
- Step 4: Place the factors in the parentheses to create the binomials.
- Step 5: Check by multiplying the factors (double distribute).

AM \rightarrow Add, Multiply
Add Mult.
 $x^2 + 8x + 15$
 $(x+5)(x+3)$

Factor the polynomials below.

Ask yourself, "What numbers **MULTIPLY** to the last term (c) and **ADD** to the middle term (b)?"

a) $x^2 + 6x + 8$

$(x+2)(x+4)$
 $x^2 + 4(x+2x) + 8$
 $x^2 + 6x + 8$

b) $x^2 - 2x - 8$

$(x-4)(x+2)$

c) $x^2 + 2x - 8$

$(x+4)(x-2)$

d) $x^2 - 6x + 8$

$(x-2)(x-4)$

One other method: **THE CALCULATOR CAN HELP!**

Factor each trinomial.

1) $x^2 + 7x + 10$

2) $x^2 + 6x + 9$

3) $x^2 + x - 6$

4) $x^2 - 7x + 12$

5) $x^2 - 9x + 18$

6) $x^2 + 7x + 6$

7) $x^2 - 3x - 10$

8) $x^2 + 12x + 35$

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

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POLYNOMIALS!
REVIEW QUESTIONS

Part I Questions:

1. Which of the following is the value of the polynomial $4x^3 + 2x^2 + 3x + 7$ when $x = 10$?

- (1) 3,782
- (2) 1,298
- (3) 4,237
- (4) 743

2. Which of the following is a polynomial expression?

- (1) $2^x + x + 3$
- (2) $x^2 + 2x + 7$
- (3) $\frac{1}{x} + \frac{1}{x^2} + \frac{1}{x^3}$
- (4) $\sqrt{x} + 10$

3. What is the sum of the polynomials $8x^2 - 7x + 3$ and $2x^2 + 10x - 5$?

- (1) $10x^2 + 3x - 2$
- (2) $16x^2 - 70x - 15$
- (3) $6x^2 + 17x - 8$
- (4) $10x^4 + 3x^2 - 2$

4. The product of the monomial $-2x^3$ with the binomial $4x^2 - 2$ is equivalent to

- (1) $-6x^6 - 4x^3$
- (2) $-8x^6 + 4x^3$
- (3) $2x^5 - 4x^3$
- (4) $-8x^5 + 4x^3$

$$\begin{aligned}
 & -2x^3(4x^2 - 2) \\
 & -8x^5 + 4x^3
 \end{aligned}$$

5. If the length of a rectangle is represented by $x + 8$ and its width is represented by $2x + 3$ then its area could be expressed as which of the following polynomials?

- (1) $2x^2 + 24$
- (2) $2x + 11$
- (3) $2x^2 + 19x + 24$
- (4) $2x^2 + 11x + 16$

$$\begin{aligned}
 & (x+8)(2x+3) \\
 & 2x^2 + 3x + 16x + 24 \\
 & 2x^2 + 19x + 24
 \end{aligned}$$

6. Which of the polynomials results from squaring the binomial $x - 4$?

- (1) $x^2 + 16$
- (2) $x^2 - 16$
- (3) $x^2 - 8x - 16$
- (4) $x^2 - 8x + 16$

$$\begin{aligned}
 & (x-4)^2 \\
 & (x-4)(x-4) \\
 & x^2 - 4x - 4x + 16 \\
 & x^2 - 8x + 16
 \end{aligned}$$

7. Which of the following expressions is equivalent to

$$(x+5)(x-5) + (x+2)(x-2)$$

- (1) $2x^2 - 29$
- (2) $x^2 + 50$
- (3) $x^2 - 3x - 50$
- (4) $2x^2 - 13x + 29$

8. Which of the following is the greatest common factor of the monomials $10x^2y^5$ and $15xy^3$?

- (1) $5xy$
- (2) $25x^2y^{15}$
- (3) $25x^3y^8$
- (4) $5xy^3$

9. Which of the following shows the binomial $10x^3 + 40x$ factored incorrectly?

- (1) $10(x^3 + 4x)$
- (2) $5x^2(2x + 8)$
- (3) $10x(x^2 + 4)$
- (4) $5x(2x^2 + 8)$

$10x^3 + 40x^2$

10. Which of the following is not a factor of the binomial $7x^2 - 28x$?

- (1) $x - 4$ ✓
- (2) x ✓
- (3) 7 ✓
- (4) -4

$7x(x - 4)$

11. The binomial $x^2 - 64$ can be written equivalently as

- (1) $(x-8)(x-8)$
- (2) $(x+8)(x-8)$
- (3) $(x-4)(x+16)$
- (4) $(x+4)(x-16)$

$x^2 - 64$
 $(x+8)(x-8)$ DOTS

12. The trinomial $2x^2 - 3x - 20$ can be factored as the product of $x - 4$ and which of the following binomials?

- (1) $2x + 5$
- (2) $2x - 7$
- (3) $x - 5$
- (4) $x + 5$

$(x-4)(2x+5)$

$2x^2 + 5x - 8x - 20$

$2x^2 - 3x - 20$

Free Response Questions

13. Find the difference when the polynomial $-5x^2 + 3x + 8$ is subtracted from the polynomial $2x^2 + 4x + 1$.

4 subtracted from 10

$$(2x^2 + 4x + 1) - (-5x^2 + 3x + 8)$$

$$2x^2 + 4x + 1 + 5x^2 - 3x - 8$$

10 - 4

14. Consider the product of $(x+2)(x+3)$

$$7x^2 + x - 7$$

(a) Write this product in simplest trinomial form.

(b) Test the equivalency of your expression in part (a) with the value $x = 4$.

15. Write the product below in standard polynomial form. Show the steps that you use in simplifying the product.

We use later ☺

~~xxxx~~ $(x-3)(2x+1)$

$$2x^2 + x - 6x - 3$$

$$(x+8) (2x^2 - 5x - 3)$$

16. Completely factor each of the following expressions.

(a) $x^2 - 16$

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

(b) $3x^3 - 75x$

$$3x(x^2 - 25)$$

$A M$
(c) $x^2 + 8x + 16$

$$(x+4)(x+4)$$

(d) $9x^2 - 64$

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

(e) $x^2 - 12x - 28$

(f) $x^2 - 10x + 25$

① GCF
② DOTS
③ AM
METHOD