

SECTION 4.5 - FACTORING TRINOMIALS

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F2017

REVIEW.

① SIMPLIFY:

(A) $(ab^4)(ab^2) = a^2b^6$

(B) $(3ab^2)^3 = 27a^3b^6$

(C) $n(n^2 - 4n + 3) = n^3 - 4n^2 + 3n$

(D) $\sqrt{45} = 3\sqrt{5}$

② FIND EACH PRODUCT:

(A) $(a+2)(a+5) = a^2 + 5a + 2a + 10 = a^2 + 7a + 10$

(B) $(d+4)(d+10) = d^2 + 10d + 4d + 40 = d^2 + 14d + 40$

(C) $(x-1)(x+4) = x^2 + 4x - x - 4 = x^2 + 3x - 4$

PART 1. FACTORING $x^2 + bx + c$

WE HAVE LEARNED TO MULTIPLY TWO BINOMIALS USING THE "FOIL" METHOD. FOR EXAMPLE,

$$(x+3)(x+4) = x^2 + 4x + 3x + (3 \cdot 4) \\ = x^2 + (4+3)x + (3 \cdot 4) = x^2 + 7x + 12$$

NOTICE THAT THE COEFFICIENT OF THE MIDDLE TERM, $7x$, IS THE SUM OF 3 AND 4, AND THE LAST TERM, 12, IS THE PRODUCT OF 3 AND 4.

WE WILL USE THIS FACT TO FACTOR TRINOMIAL, QUADRATIC EXPRESSIONS WITH A LEADING COEFFICIENT OF 1

EXAMPLE 1. FACTOR $x^2 + 9x + 20$.

WE ASK THE QUESTION, "WHAT 2 NUMBERS MULTIPLY TO 20 AND ADD TO 9?"

FACTORS OF 20	SUM OF FACTORS
1, 20	21
2, 10	12
$\star \rightarrow$ 4, 5	9

$x^2 + 9x + 20 = (x+4)(x+5)$

CK: $x^2 + 5x + 4x + 20$

$x^2 + 9x + 20 \checkmark$

①

EXAMPLE 2. FACTOR $x^2 + 8x + 15$

FACTORS	SUM
1, 15	16
3, 5	8 ← *

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

$$\text{CK: } x^2 + 5x + 3x + 15 = x^2 + 8x + 15 \checkmark$$

APPLICATION 1. FACTOR:

(A) $x^2 + 11x + 24$
 $(x+8)(x+3)$

(B) $9 + 10x + x^2$
 $x^2 + 10x + 9$
 $(x+1)(x+9)$

EXAMPLE 3. FACTOR $x^2 - 8x + 12$

FACTORS	SUM
-1, -12	-13
-2, -6	-8 ← *
-3, -4	-7

$$(x-2)(x-6)$$

$$\text{CK: } x^2 - 6x - 2x + 12 = x^2 - 8x + 12 \checkmark$$

APPLICATION 2. FACTOR:

(A) $x^2 - 22x + 21$
 $(x-21)(x-1)$

(B) $w^2 - 11w + 28$
 $(w-4)(w-7)$

EXAMPLE 4. FACTOR $x^2 + 2x - 15$

FACTORS	SUM
-1, 15	14
-3, 5	2 ← *
1, -15	-14
3, -5	-2

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

$$\text{CK: } x^2 + 5x - 3x - 15$$
$$x^2 + 2x - 15 \checkmark$$

EXAMPLE 5. FACTOR $x^2 - 7x - 18$

FACTORS	SUM
1, -18	-17
2, -9	-7 ← *
3, -6	-3

$$(x+2)(x-9)$$

$$\text{CK: } x^2 - 9x + 2x - 18$$

$$x^2 - 7x - 18 \checkmark$$

(2)

APPLICATION 3. FACTOR:

(A) $y^2 + 13y - 48$
 $(y + 16)(y - 3)$

(B) $r^2 - 2r - 24$
 $(r - 6)(r + 4)$

EXAMPLE 6. QUADRATIC EQUATIONS ARE WRITTEN IN THE FORM:

$$ax^2 + bx + c = 0.$$

WE WILL SOLVE EQUATIONS SUCH AS THESE BY FACTORING.

SOLVE: $x^2 + 6x = 27$

(1) REWRITE WITH ALL TERMS ON LEFT AND ZERO ON RIGHT:

$$x^2 + 6x - 27 = 0$$

$$\begin{array}{l|l} x + 9 = 0 & x - 3 = 0 \\ x = -9 & x = 3 \end{array}$$

(2) FACTOR: $(x + 9)(x - 3) = 0$

$$\{-9, 3\}$$

APPLICATION 4. SOLVE.

(A) $x^2 - 3x = 70$
 $x^2 - 3x - 70 = 0$
 $(x - 10)(x + 7) = 0$
 $x = 10 \mid x = -7$
 $\{-7, 10\}$

(B) $x^2 + 3x - 18 = 0$
 ~~$x^2 + 3x - 18 = 0$~~
 $(x - 3)(x + 6) = 0$
 $x = 3 \mid x = -6$
 $\{-6, 3\}$

TYPD.

PRACTICE

(1) FACTOR:

(A) $x^2 + 14x + 24$
 $(x + 2)(x + 12)$

(B) $y^2 - 7y - 30$
 $(y - 10)(y + 3)$

(C) $n^2 + 4n - 21$
 $(n + 7)(n - 3)$

$$\textcircled{1} m^2 - 15m + 50$$

$$(m-10)(m-5)$$

② SOLVE EACH EQUATION:

$$\textcircled{A} x^2 - 4x - 21 = 0$$

$$(x-7)(x+3) = 0 \quad \{-3, 7\}$$

$$x=7 \quad | \quad x=-3$$

$$\textcircled{B} n^2 - 3n + 2 = 0$$

$$(n-2)(n-1) = 0 \quad \{1, 2\}$$

$$n-2=0 \quad | \quad n-1=0$$

$$n=2 \quad | \quad n=1$$

$$\textcircled{C} x^2 - 15x + 54 = 0$$

$$(x-6)(x-9) = 0 \quad \{6, 9\}$$

$$x-6=0 \quad | \quad x-9=0$$

$$x=6 \quad | \quad x=9$$

$$\textcircled{D} x^2 + 12x = -32$$

$$x^2 + 12x + 32 = 0$$

$$(x+4)(x+8) = 0$$

$$x+4=0 \quad | \quad x+8=0$$

$$x=-4 \quad | \quad x=-8$$

$$\{-4, -8\}$$

$$\textcircled{E} x^2 - x - 72 = 0$$

$$(x-9)(x+8) = 0 \quad \{-8, 9\}$$

$$x-9=0 \quad | \quad x+8=0$$

$$x=9 \quad | \quad x=-8$$

$$\textcircled{F} x^2 - 10x = -24$$

$$x^2 - 10x + 24 = 0$$

$$(x-12)(x+2) = 0 \quad \{-2, 12\}$$

$$x-12=0 \quad | \quad x+2=0$$

$$x=12 \quad | \quad x=-2$$

$$\textcircled{G} x^2 - 7x + 12 = 0$$

$$(x-4)(x-3) = 0 \quad x = \{3, 4\}$$

$$\textcircled{H} x^2 - 6x = 27$$

$$x^2 - 6x - 27 = 0 \quad \{-3, 9\}$$

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

$$x-9=0 \quad | \quad x+3=0$$

$$x=9 \quad | \quad x=-3$$

④

Factoring Trinomials

Name: _____

Date: _____

1. What is the solution set of the equation $x^2 - 3x - 10 = 0$?

- A. (5, -2) B. (-5, -2)
C. (5, 2) D. (-5, 2)

$$(x-5)(x+2) = 0$$

$$x = 5 \quad | \quad x = -2$$

2. The solution set of $x^2 - 2x - 8 = 0$ is

- A. {4, -2} B. {-4, 2}
C. {-2, 8} D. {6, 2}

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

$$x = 4 \quad | \quad x = -2$$

3. What is the solution set of the equation $x^2 - 2x - 3 = 0$?

- A. {2, 1} B. {2, -1}
C. {-3, 0} D. {3, -1}

$$(x-3)(x+1) = 0$$

$$x = 3 \quad | \quad x = -1$$

4. The solution set of the equation $x^2 - x - 6 = 0$ is

- A. {6, -1} B. {3, -2}
C. {2, -3} D. {-6, 1}

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

$$x = 3 \quad | \quad x = -2$$

5. What is the solution set of $x^2 - x - 20 = 0$?

- A. {5, -4} B. {-5, 4}
C. {-10, 2} D. {10, -2}

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

$$x = 5, \quad x = -4$$

6. What is the solution set of the equation $x^2 - 3x - 4 = 0$?

- A. {-3, 1} B. {4, -1}
C. {-4, 1} D. {3, -1}

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

$$x = 4 \quad | \quad x = -1$$

7. Solve for the positive value of x : $x^2 + 4x - 21 = 0$

$$(x+7)(x-3) = 0$$

$$x = -7 \quad | \quad x = 3$$

(3)

8. The solution set of $x^2 - 5x + 6 = 0$ is

- A. {1, 5} B. {-1, -5}
C. {2, 3} D. {-2, -3}

~~$$(x-6)(x+1) = 0$$~~

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

$$x = 2, 3$$

9. What is the solution set of the equation $x^2 + 2x - 15 = 0$?

- A. (3, -5) B. (-3, 5)
C. (-3, -5) D. (3, 5)

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

$$x = -5, 3$$

10. What is the positive value of x in the equation $x^2 - x - 6 = 0$?

- A. 1 B. 2 C. 3 D. 6

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

$$x = 3 \quad | \quad x = -2$$

11. What is the solution set of the equation $x^2 - 7x - 18 = 0$?

- A. (9, -2) B. (-9, 2)
C. (-6, 3) D. (6, -3)

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

$$x = 9 \quad | \quad x = -2$$

12. What is the solution set of $y^2 - y - 12 = 0$?

- A. {3, 4} B. {3, -4}
C. {-12, 1} D. (-3, 4)

$$(y-4)(y+3) = 0$$

$$y = 4 \quad | \quad y = -3$$

13. What is the solution set for the equation $x^2 + 2x - 15 = 0$?

- A. {3, 5} B. {-3, 5}
C. (3, -5) D. {-3, -5}

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

$$x = -5 \quad | \quad x = 3$$

14. What is the solution set of the equation $x^2 - x - 6 = 0$?

- A. (3, -2) B. (-3, -2)
C. (-6, 1) D. (3, 2)

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

$$x = 3 \quad | \quad x = -2$$

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