

Factoring Polynomials Practice

Name: _____

Date: _____

Question 1

Factor

I. $2y^4 + 2y^3 - 4y^2 - 4y$

II. $5z^5 - 5z^4 + z^3 - z^2 + 3z - 3$

III. $x^5y^5 + x^4y^3 + x^3y^3 - x^2y^2$

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IV. $10z + 50$

V. $2x^3 - 12x^2 - x + 6$

VI. $y^3 + 8y^2 - 2y - 16$

VII. $7x^3 + 5x^2 - 21x - 15$

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VIII. $x^2 + 11x + 10$

IX. $x^2 - 9x + 14$

X. $y^2 + 2y - 15$

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XI. $2z^2 - 14z - 36$

XII. $6y^{10} + 30y^9 - 84y^8$

XIII. $2y^2 + 7y - 4$

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XIV. $2y^2 - 7y - 4$

XV. $5z^2 - 19z - 4$

XVI. $6x^2 + 17x + 12$

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XVII. $20x^2 - 25x + 5$

XVIII. $2x^2 - 18x + 36$

XIX. $27x^2 - 72xy + 48y^2$

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XX. $144y^5 - 168y^4 + 48y^3$

XXI. $35x^2 - 40x + 21x - 24$

XXII. $10x^2 - 4x - 5x + 2$

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XXIII. $18y^2z^2 - 3yz - 10$

XXIV. $4x^2 - 12xy + 9y^2$

XXV. $1 - 9x^2$

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XXVI. $y^3 + 27$

XXVII. $y^3 - 27$

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Question 2

Solve

I. $y^2 - 36 = 0$

II. $(x + 3)(2x - 1) = 9$

III. $18x^2 + 48x = 0$

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IV. $36x^2 - 9 = 40$

V. $12x^2 - 5x = 2$

VI. $x^2 - 7x + 6 = 0$

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Name: _____ **Key** _____

Date: _____

Question 1

Factor

I.

Common Factor

$$2y^4 + 2y^3 - 4y^2 - 4y$$

$$2y^4 \rightarrow 2 \cdot y \cdot y \cdot y \cdot y$$

$$2y^3 \rightarrow 2 \cdot y \cdot y \cdot y$$

$$-4y^2 \rightarrow -2 \cdot 2 \cdot y \cdot y$$

$$-4y \rightarrow -2 \cdot 2 \cdot y$$

$$2y(y^3 + y^2 - 2y - 2)$$

Grouping

$$y^3 + y^2 - 2y - 2$$

$$(y^3 + y^2) - 2y - 2$$

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

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

Combine

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

II.

Grouping

$$5z^5 - 5z^4 + z^3 - z^2 + 3z - 3$$

$$(5z^5 - 5z^4) + (z^3 - z^2) + (3z - 3)$$

$$5z^4(z - 1) + z^2(z - 1) + 3(z - 1)$$

$$(z - 1)(5z^4 + z^2 + 3)$$

III.

Common Factor

$$x^5y^5 + x^4y^3 + x^3y^3 - x^2y^2$$

$$x^5y^5 \rightarrow x \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y$$

$$x^4y^3 \rightarrow x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y$$

$$x^3y^3 \rightarrow x \cdot x \cdot x \cdot y \cdot y \cdot y$$

$$x^2y^2 \rightarrow x \cdot x \cdot y \cdot y$$

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

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Common Factor

IV.

$$10z + 50$$

$$10z \rightarrow 2 \cdot 5 \cdot z$$

$$50 \rightarrow 2 \cdot 5 \cdot 5$$

$$10(z + 5)$$

Grouping

V.

$$2x^3 - 12x^2 - x + 6$$

$$(2x^3 - 12x^2) - x + 6$$

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

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

$$(x - 6)(2x^2 - 1)$$

Grouping

VI.

$$y^3 + 8y^2 - 2y - 16$$

$$(y^3 + 8y^2) - 2y - 16$$

$$y^2(y + 8) - 2y - 16$$

$$y^2(y + 8) - 2(y + 8)$$

$$(y + 8)(y^2 - 2)$$

Grouping

VII.

$$7x^3 + 5x^2 - 21x - 15 \quad (7x + 5)(x^2 - 3)$$

$$7x^3 + 5x^2 + -21x + -15$$

$$7x^3 + -21x + 5x^2 + -15$$

$$7x^3 - 21x + 5x^2 - 15$$

$$7x(x^2 - 3) + 5x^2 - 15$$

$$7x(x^2 - 3) + 5(x^2 - 3)$$

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VIII.

Trinomial

$$x^2 + 11x + 10$$

↓

$$(x + a)(x + b)$$

↓

$$x^2 + \underline{11}x + \underline{10}$$

↓

$$10 + 1 = \underline{11}$$

$$10 \cdot 1 = \underline{10}$$

↓

$$(x + 10)(x + 1)$$

IX.

Trinomial

$$x^2 - 9x + 14$$

↓

$$(x - a)(x - b)$$

↓

$$x^2 - \underline{9}x + \underline{14}$$

↓

$$-7 + -2 = \underline{-9}$$

$$-7 \cdot -2 = \underline{14}$$

↓

$$(x - 7)(x - 2)$$

X.

Trinomial

$$y^2 + 2y - 15$$

↓

$$(y - a)(y + b)$$

↓

$$y^2 + \underline{2}y - \underline{15}$$

↓

$$5 + -3 = \underline{2}$$

$$5 \cdot -3 = \underline{-15}$$

↓

$$(y - 3)(y + 5)$$

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XI.

Common Factor

$$2z^2 - 14z - 36$$

$$2z^2 \rightarrow 2 \cdot z \cdot z$$

$$-14z \rightarrow -7 \cdot 2 \cdot z$$

$$-36 \rightarrow -2 \cdot 2 \cdot 3 \cdot 3$$

$$2(z^2 - 7z - 18)$$

Trinomial

$$z^2 - 7z - 18$$

$$\downarrow$$

$$(z + a)(z - b)$$

$$\downarrow$$

$$z^2 - 7z - 18$$

$$\downarrow$$

$$-9 + 2 = -7$$

$$-9 \cdot 2 = -18$$

$$\downarrow$$

$$(z + 2)(z - 9)$$

Combine

$$2(z + 2)(z - 9)$$

XII.

Common Factor

$$6y^{10} + 30y^9 - 84y^8$$

$$6y^{10} \rightarrow 2 \cdot 3 \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y$$

$$30y^9 \rightarrow 2 \cdot 3 \cdot 5 \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y$$

$$-84y^8 \rightarrow -2 \cdot 2 \cdot 3 \cdot 7 \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y$$

$$6y^8(y^2 + 5y - 14)$$

Trinomial

$$y^2 + 5y - 14$$

$$\downarrow$$

$$(y + a)(y - b)$$

$$\downarrow$$

$$y^2 + 5y - 14$$

$$\downarrow$$

$$7 + -2 = 5$$

$$7 \cdot -2 = -14$$

$$\downarrow$$

$$(y + 7)(y - 2)$$

Combine

$$6y^8(y + 7)(y - 2)$$

FOIL

XIII.

$$2y^2 + 7y - 4$$

$$(2y + \quad)(1y + \quad) \quad 2y \cdot 1y = 2y^2$$

$$(2y - 1)(1y + 4) \quad -1 \cdot 4 = -4$$

$$(2y - 1)(1y + 4) \quad (2y \cdot 4) + (-1 \cdot 1y) = 8y - 1y = 7y$$

$$(2y - 1)(1y + 4)$$

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FOIL

XIV.

$$2y^2 - 7y - 4$$

$$(2y + \quad)(1y + \quad)$$

$$2y \cdot 1y = 2y^2$$

$$(2y + 1)(1y - 4)$$

$$1 \cdot -4 = -4$$

$$(2y + 1)(1y - 4)$$

$$(2y \cdot -4) + (1 \cdot 1y) = -8y + 1y = -7y$$

$$(2y + 1)(1y - 4)$$

FOIL

XV.

$$5z^2 - 19z - 4$$

$$(5z + \quad)(1z + \quad)$$

$$5z \cdot 1z = 5z^2$$

$$(5z + 1)(1z - 4)$$

$$1 \cdot -4 = -4$$

$$(5z + 1)(1z - 4)$$

$$(5z \cdot -4) + (1 \cdot 1z) = -20z + 1z = -19z$$

$$(5z + 1)(1z - 4)$$

FOIL

XVI.

$$6x^2 + 17x + 12$$

$$(3x + \quad)(2x + \quad)$$

$$3x \cdot 2x = 6x^2$$

$$(3x + 4)(2x + 3)$$

$$4 \cdot 3 = 12$$

$$(3x + 4)(2x + 3)$$

$$(3x \cdot 3) + (4 \cdot 2x) = 9x + 8x = 17x$$

$$(3x + 4)(2x + 3)$$

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XVII.

Common Factor	FOIL
$20x^2 - 25x + 5$	$4x^2 - 5x + 1$
$20x^2 \rightarrow 2 \cdot 2 \cdot 5 \cdot x \cdot x$	$(4x +)(1x +)$ $4x \cdot 1x = 4x^2$
$-25x \rightarrow -5 \cdot 5 \cdot x$	$(4x - 1)(1x - 1)$ $-1 \cdot -1 = 1$
$5 \rightarrow 5$	$(4x - 1)(1x - 1)$ $(4x \cdot -1) + (-1 \cdot 1x) = -4x + -1x = -5x$
$5(4x^2 - 5x + 1)$	$(4x - 1)(1x - 1)$

Combine

$$5(4x - 1)(1x - 1)$$

XVIII.

Common Factor	Trinomial	Combine
$2x^2 - 18x + 36$	$x^2 - 9x + 18$	$2(x - 6)(x - 3)$
$2x^2 \rightarrow 2 \cdot x \cdot x$	$\downarrow$ $(x - a)(x - b)$	
$-18x \rightarrow -3 \cdot 2 \cdot 3 \cdot x$	$\downarrow$ $x^2 - 9x + 18$	
$36 \rightarrow 2 \cdot 2 \cdot 3 \cdot 3$	$\downarrow$ $-6 + -3 = -9$	
$2(x^2 - 9x + 18)$	$\downarrow$ $-6 \cdot -3 = 18$	
	$\downarrow$ $(x - 6)(x - 3)$	

XIX.

Common Factor	Perfect-Square Trinomial
$27x^2 - 72xy + 48y^2$	$9x^2 - 24xy + 16y^2$
$27x^2 \rightarrow 3 \cdot 3 \cdot 3 \cdot x \cdot x$	$A = 3x$
$-72xy \rightarrow -2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot x \cdot y$	$B = 4y$
$48y^2 \rightarrow 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot y \cdot y$	$-2 \cdot 3x \cdot 4y = -24xy$
$3(9x^2 - 24xy + 16y^2)$	$(3x - 4y)^2$

Combine

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

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Common Factor

XX.

$$144y^5 - 168y^4 + 48y^3$$

$$144y^5 \rightarrow 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot y \cdot y \cdot y \cdot y \cdot y$$

$$-168y^4 \rightarrow -7 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot y \cdot y \cdot y \cdot y$$

$$48y^3 \rightarrow 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot y \cdot y \cdot y$$

$$24y^3(6y^2 - 7y + 2)$$

FOIL

$$6y^2 - 7y + 2$$

$$(2y +)(3y +) \quad 2y \cdot 3y = 6y^2$$

$$(2y - 1)(3y - 2) \quad -1 \cdot -2 = 2$$

$$(2y - 1)(3y - 2) \quad (2y \cdot -2) + (-1 \cdot 3y) = -4y + -3y = -7y$$

$$(2y - 1)(3y - 2)$$

Combine

$$24y^3(2y - 1)(3y - 2)$$

Grouping

XXI.

$$35x^2 - 40x + 21x - 24$$

$$5x(7x - 8) + 21x - 24$$

$$5x(7x - 8) + 3(7x - 8)$$

$$(5x + 3)(7x - 8)$$

Grouping

XXII.

$$10x^2 - 4x - 5x + 2$$

$$10x^2 + -4x + -5x + 2$$

$$10x^2 + -5x + -4x + 2$$

$$10x^2 - 5x - 4x + 2$$

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

$$5x(2x - 1) - 2(2x - 1)$$

$$(5x - 2)(2x - 1)$$

Factoring Polynomials Practice

FOIL

XXIII.

$$18y^2z^2 - 3yz - 10$$

$$(3yz + \quad)(6yz + \quad) \quad 3yz \cdot 6yz = 18y^2z^2$$

$$(3yz + 2)(6yz - 5) \quad 2 \cdot -5 = -10$$

$$(3yz + 2)(6yz - 5) \quad (3yz \cdot -5) + (2 \cdot 6yz) = -15yz + 12yz = -3yz$$

$$(3yz + 2)(6yz - 5)$$

Perfect-Square Trinomial

XXIV.

$$4x^2 - 12xy + 9y^2$$

$$A = 2x$$

$$B = 3y$$

$$-2 \cdot 2x \cdot 3y = -12xy$$

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

Difference of Squares

XXV.

$$1 - 9x^2$$

$$A = 1$$

$$B = 3x$$

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

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

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Sum of Cubes

XXVI.

$$y^3 + 27$$

$$A = y$$

$$B = 3$$

$$(y + 3)(y^2 - 3y + 9)$$

Difference of Cubes

XXVII.

$$y^3 - 27$$

$$A = y$$

$$B = 3$$

$$(y - 3)(y^2 + 3y + 9)$$

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Question 2

Solve

Isolate Variable

I.

$$y^2 - 36 = 0$$

$$y^2 = 36$$

$$y = \pm \sqrt{36}$$

$$y = 6 \text{ or } -6$$

II.

Equal to Zero (FOIL)

$$(x + 3)(2x - 1) = 9$$

$$2x^2 - 1x + 6x - 3 = 9$$

$$2x^2 - 1x + 6x - 12 = 0$$

$$2x^2 + 5x - 12 = 0$$

FOIL

$$2x^2 + 5x - 12$$

$$(2x + \quad)(x + \quad)$$

$$(2x - 3)(x + 4)$$

$$(2x - 3)(x + 4)$$

$$(2x - 3)(x + 4)$$

$$2x \cdot x = 2x^2$$

$$-3 \cdot 4 = -12$$

$$(2x \cdot 4) + (-3 \cdot x) = 8x + -3x = 5x$$

Solve

$$x + 4 = 0$$

$$x = -4$$

$$2x - 3 = 0$$

$$2x = 3$$

$$x = 3/2$$

$$x = 3/2 \text{ or } -4$$

Common Factor

III.

$$18x^2 + 48x = 0$$

$$x = 0$$

$$18x^2 \rightarrow 2 \cdot 3 \cdot 3 \cdot x \cdot x$$

$$48x \rightarrow 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot x$$

$$6x(3x + 8)$$

Solve

$$6x(3x + 8) = 0$$

$$x = 0$$

$$6x(3x + 8) = 0$$

$$3x + 8 = 0 / 6x$$

$$3x + 8 = 0$$

$$3x = -8$$

$$x = -8/3$$

$$x = 0 \text{ or } -8/3$$

Factoring Polynomials Practice

Isolate Variable

IV.

$$36x^2 - 9 = 40$$

$$36x^2 = 49$$

$$x^2 = 49/36$$

$$x^2 = 49/36$$

$$x = \pm \sqrt{49/36}$$

$$x = \pm \sqrt{49} / \sqrt{36}$$

$$x = 7/6 \text{ or } -7/6$$

Equal to Zero

V.

$$12x^2 - 5x = 2$$

$$12x^2 - 5x - 2 = 0$$

FOIL

$$12x^2 - 5x - 2$$

$$(4x +)(3x +)$$

$$4x \cdot 3x = 12x^2$$

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

$$1 \cdot -2 = -2$$

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

$$(4x \cdot -2) + (1 \cdot 3x) = -8x + 3x = -5x$$

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

Solve

$$4x + 1 = 0 \quad 3x - 2 = 0 \quad x = -1/4 \text{ or } 2/3$$

$$4x = -1 \quad 3x = 2$$

$$x = -1/4 \quad x = 2/3$$

VI.

Trinomial

$$x^2 - 7x + 6 = 0$$

↓

$$(x - a)(x - b)$$

↓

$$x^2 - 7x + 6$$

↓

$$-6 + -1 = -7$$

$$-6 \cdot -1 = 6$$

↓

$$(x - 1)(x - 6)$$

Solve

$$x - 1 = 0 \quad x - 6 = 0 \quad x = 1 \text{ or } 6$$

$$x = 1$$

$$x = 6$$