

Algebra 2 - Polynomial Operations and Identities

- Answer Key

Common Core A-APR.A.1, A-APR.C.4 · maths-pdf.fr/en/

Every worksheet problem on polynomial operations and identities is solved here, one step at a time. Compare your method as well as your final answer, because the steps show where forgetting the middle term of a squared binomial can go wrong. Final answers appear in bold so you can find them quickly when you only need a check.

Algebra 2 · Common Core State Standards: **A-APR.A.1, A-APR.C.4**

Exercise 1 - Add polynomials

Combine like terms: $(3+1)x^2+(2-4)x+(-5+9)$.

$$4x^2-2x+4$$

Exercise 2 - Subtract polynomials

Change every sign in the second polynomial: $5x^3-x+2-2x^3-3x^2+7$.

Combine like terms.

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

Exercise 3 - Degree and leading coefficient

Standard form lists powers from highest to lowest: $-3x^4+7x^2+5x-1$.

Degree 4, leading coefficient -3

Exercise 4 - Monomial times polynomial

$$3x \cdot 2x^2 = 6x^3, 3x \cdot (-x) = -3x^2, 3x \cdot 4 = 12x.$$

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

Exercise 5 - Two binomials

	x	-7
x	x^2	$-7x$
4	$4x$	-28

Cells: x^2 , $-7x$, $4x$, -28 .

$$x^2 - 7x + 4x - 28.$$

$$x^2 - 3x - 28$$

Exercise 6 - Binomials with coefficients

$$6x^2 + 10x - 9x - 15.$$

$$6x^2 + x - 15$$

Exercise 7 - Binomial times trinomial

$$x^3 - 3x^2 + 4x + 2x^2 - 6x + 8.$$

$$x^3 - x^2 - 2x + 8$$

Exercise 8 - Square of a difference

$$(a-b)^2 = a^2 - 2ab + b^2 \text{ with } a = x, b = 5.$$

$$x^2 - 10x + 25$$

Exercise 9 - Difference of squares

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

$$9x^2 - 4$$

Exercise 10 - Two variables

$$(2x)^2 + 2(2x)(3y) + (3y)^2.$$

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

Exercise 11 - Cube of a binomial

$$x^3 + 3x^2(1) + 3x(1)^2 + 1^3.$$

$$x^3 + 3x^2 + 3x + 1$$

Exercise 12 - Mental math: a square

$$47^2 = (50 - 3)^2 = 2500 - 300 + 9.$$

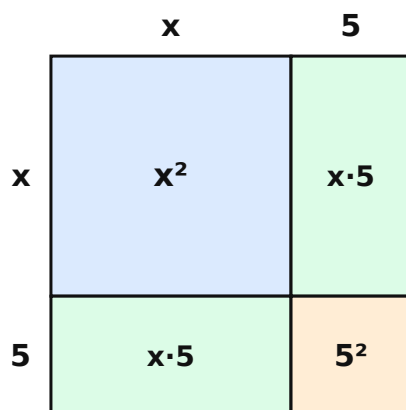
$$2,209$$

Exercise 13 - Mental math: product

$$53 \cdot 47 = (50 + 3)(50 - 3) = 50^2 - 3^2 = 2500 - 9.$$

$$2,491$$

Exercise 14 - Area of a square



$$x^2 + 5x + 5x + 25.$$

$$(x+5)^2 = x^2 + 2(5)x + 25.$$

$$x^2 + 10x + 25 \text{ square feet}$$

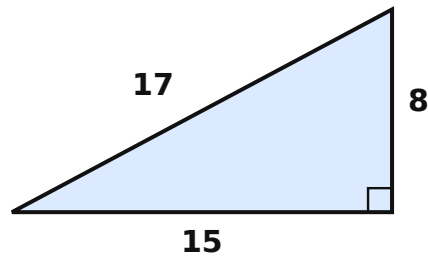
Exercise 15 - Verify an identity

$$(x+y)^2 = x^2 + 2xy + y^2 \text{ and } (x-y)^2 = x^2 - 2xy + y^2.$$

$$\text{Subtract: } x^2 + 2xy + y^2 - x^2 + 2xy - y^2 = 4xy.$$

Verified: both sides equal $4xy$

Exercise 16 - Pythagorean triple



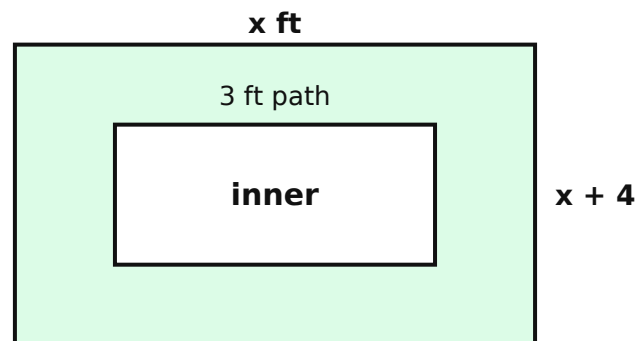
15, 8, 17 is a Pythagorean triple.

$$x^2 - y^2 = 16 - 1 = 15, \quad 2xy = 8, \quad x^2 + y^2 = 17.$$

$$15^2 + 8^2 = 225 + 64 = 289 = 17^2.$$

15, 8, 17

Exercise 17 - Garden path



Outer dimensions are $x + 6$ by $x + 10$.

$$\text{Outer rectangle: } (x+6)(x+10) = x^2 + 16x + 60.$$

Garden: $x(x+4) = x^2 + 4x$.

Subtract: $x^2 + 16x + 60 - (x^2 + 4x)$.

$12x + 60$ **square feet**

Exercise 18 - Ticket revenue

$$R = (40 - 2x)(120 + 10x) = 4800 + 400x - 240x - 20x^2.$$

$$R = -20x^2 + 160x + 4800$$

Exercise 19 - Difference of cubes of binomials

$$(x+2)^3 = x^3 + 6x^2 + 12x + 8 \text{ and } (x-2)^3 = x^3 - 6x^2 + 12x - 8.$$

Subtract term by term.

$$12x^2 + 16$$

Exercise 20 - Find the error

Squaring a binomial is not squaring each term. The middle term $2(x)(6) = 12x$ is missing.

$$x^2 + 12x + 36$$

Exercise 21 - Prove a pattern

$$2n(2n+2)+1 = 4n^2+4n+1.$$

This equals $(2n+1)^2$, a perfect square. Example: $4 \cdot 6 + 1 = 25 = 5^2$.

$$(2n+1)^2$$