Mathematics 10C

Unit AN: Algebra and number

Multiplying polynomials

A rectangle with algebra sides

- The width is $x + 3$.
- The height is $x + 2$.
- The area splits into four regions.

Terms and products

- The expression $x + 3$ has two terms.
- The product $(x + 2)(x + 3)$ multiplies every term by every term.

Key terms

monomial

A polynomial with one term, a coefficient times powers of the variables. ($3x^2$)

binomial

A polynomial with two terms. ($x + 4$)

trinomial

A polynomial with three terms. ($x^2 + 5x + 6$)

like terms

Terms whose variable parts match, so their coefficients can be added. ($5x$ and $2x$)

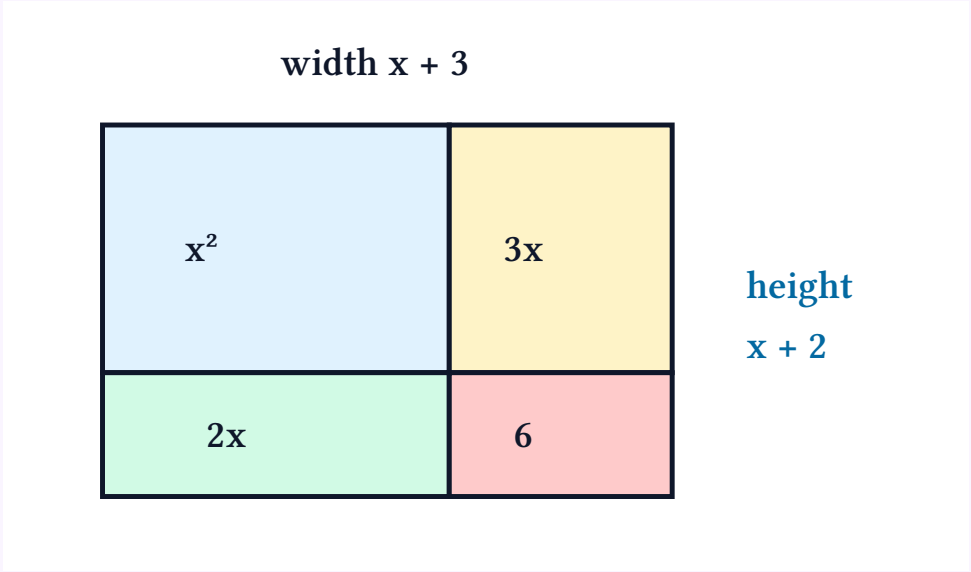
Key terms

area model

A rectangle whose side lengths are the factors and whose inner rectangles are the terms of the product. ((x + 2)(x + 3))

Four cells for (x + 2)(x + 3)

- The x by x cell is x^2.
- The x by 3 cell is 3x, and the 2 by x cell is 2x.
- The 2 by 3 cell is 6.



Combine the like terms

- The products are x^2, 3x, 2x, and 6.
- The sum 3x + 2x is 5x.
- The product is $x^2 + 5x + 6$.

Products x^2, 3x, 2x, 6

$x^2 + 5x + 6$

3x + 2x = 5x

The number cousin 23 × 14

- Write 23 as 20 + 3 and 14 as 10 + 4.
- The four products are 200, 80, 30, and 12.
- The sum is 322.

Every pair in $(2x + 1)$(x + 4)

- The four products are $2x^2$, 8x, x, and 4.
- The like terms 8x and x make 9x.
- The product is $2x^2 + 9x + 4$.

(2x+1)(x+4)

$2x^2$, 8x, x, 4

$2x^2 + 9x + 4$

Checking by substituting 3

- The factors at x = 3 are 7 and 7, and 7 × 7 = 49.
- The expanded form 2(9) + 9(3) + 4 = 18 + 27 + 4 = 49.

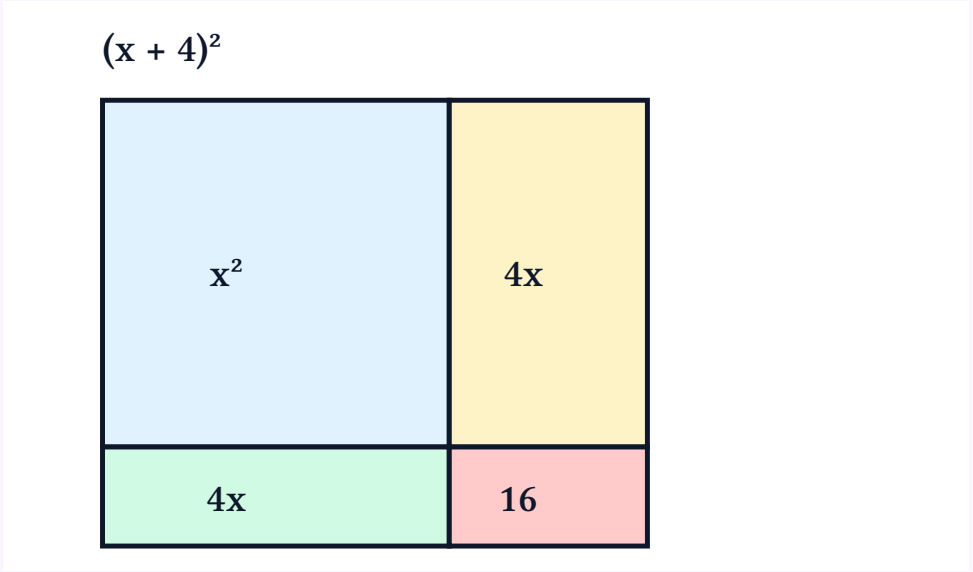
Substitute x = 3

(7)(7) = 49

Expanded form also 49

The square $(x + 4)^2$

- The four products are x^2, 4x, 4x, and 16.
- The like terms make 8x.
- The product is $x^2 + 8x + 16$.



A longer product

- Multiply $(x + 1)$ by x^2, by $2x$, and by 3.
- The products are x^3, $2x^2$, $3x$, x^2, $2x$, and 3.
- The sum is $x^3 + 3x^2 + 5x + 3$.

Quick check

- The product $(3x + 2)(x + 5)$ is $3x^2 + 17x + 10$.
- The slip $x^2 + 16$ for $(x + 4)^2$ drops the cross terms $4x$ and $4x$.

Checking a product

- The product $(x + 2)(x + 3)$ is $x^2 + 5x + 6$.
- Factoring will look for the sides that rebuild that trinomial.