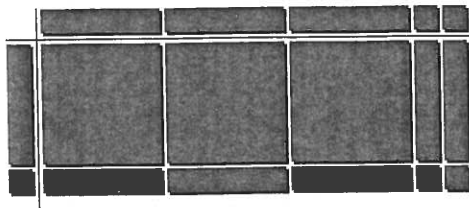


Communicate Your Understanding

- C1** Explain how the algebra tiles illustrate the product $(x + 1)(3x + 2)$.



- C2** Jason expands and simplifies $(x + 3)(x + 7)$ in his head. He adds 3 and 7 to get $10x$, and multiplies 3 and 7 to get 21. His final answer is $x^2 + 10x + 21$.

- Explain Jason's logic.
- Would Jason's method work when expanding $(2x + 3)(5x + 6)$? If yes, explain why. If no, how should he adapt his method?
- Would this method work for negative constant terms? Explain.

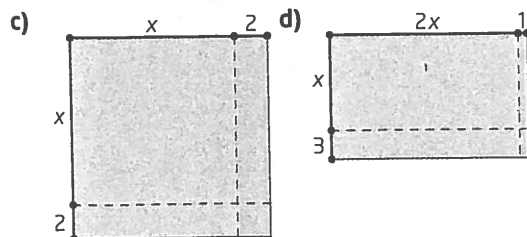
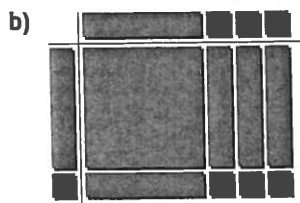
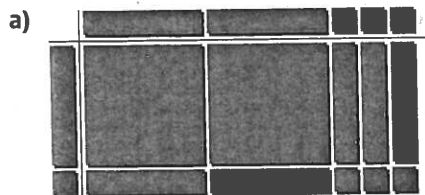
- C3** Describe the steps you would use to expand $(3x + 5)(2x - 9)$.

- C4** Rolly uses an acronym to help him remember how to expand two binomials. It is called the FOIL method, for *First, Outside, Inside, Last*. What does this mean?

Practise

For help with questions 1 and 2, see Example 1.

1. What binomial product does each model illustrate?



2. Model each binomial product using algebra tiles, virtual algebra tiles, or a diagram.

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

For help with questions 3 to 6, see Example 2.

3. Use the distributive property to find each binomial product.

- $(x + 3)(x + 5)$
- $(x + 3)(x + 4)$
- $(y + 2)(y + 4)$
- $(r + 4)(r + 2)$
- $(n + 7)(n + 1)$
- $(p + 9)(p + 9)$
- $(w + 7)(w + 8)$
- $(d + 3)(d + 11)$

4. Use the distributive property to find each binomial product.

- $(k - 3)(k - 5)$
- $(y - 3)(y - 4)$
- $(x - 2)(x - 4)$
- $(q - 4)(q - 2)$
- $(j - 7)(j - 1)$
- $(p - 9)(p - 3)$
- $(z - 7x)(z - 8x)$
- $(b - 3c)(b - 11c)$

5. Use the distributive property to find each binomial product.

- a) $(x + 3)(x - 5)$ b) $(y + 3)(y - 4)$
 c) $(c - 2)(c + 4)$ d) $(w - 4)(w + 2)$
 e) $(m + 7)(m - 1)$ f) $(y - 9)(y + 3)$
 g) $(x + 7y)(x - 8y)$ h) $(a + 6b)(a - 10b)$

6. Find each binomial product.

- a) $(2x + 3)(x + 4)$ b) $(y - 3)(5y - 7)$
 c) $(6c - 1)(3c + 5)$ d) $(7w - 2)(2w + 1)$
 e) $(5m + 6)(5m - 6)$
 f) $(9y - 2)(2y + 2)$
 g) $(7d + 5c)(8d - 6c)$
 h) $(6q + 5r)(7q - 12r)$

For help with questions 7 and 8, see Example 3.

7. Expand and simplify.

- a) $3(x - 5)(x + 6)$ b) $-2(x - 7)(x - 9)$
 c) $-(y + 2)(y - 8)$ d) $2(k + 3)(k + 7)$
 e) $m(m - 3n)(m - 5n)$
 f) $2a(3a + 4b)(6a + 7b)$

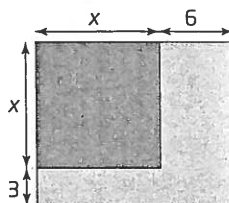
8. Expand and simplify.

- a) $(x + 4)(x + 6) + (x - 1)(x + 7)$
 b) $(2x + 5)(3x - 7) + 2(4x + 9)(2x - 11)$
 c) $3(6x - 2)(6x - 1) - (2x - 3)(5x + 6)$
 d) $-(x - 2)(x - 3) + 2(3x + 5)(x + 4)$
 e) $(x + 4)^2 - (x - 4)^2$
 f) $-5(3x - 1)(5x - 2) + 6(6x + 3)(5x - 2)$

Connect and Apply

9. The predicted flight path of a firework is defined by the relation $h = -2(d - 3)(d - 15)$, where d is the horizontal distance, in metres, from a safety wall, and h is the height, in metres.
- a) Expand and simplify the relation.
- b) Verify that the relation from part a) is equivalent to the original relation. Use both relations to determine the height of the firework if d represents 10 m.

10. A square garden has side length x . One dimension is increased by 6 m and the other is increased by 3 m.



- a) Write an algebraic expression for the area of the original garden.
- b) Write an algebraic expression for the area of the new garden.
- c) Expand and simplify your area expression from part b).
- d) Find an expression that represents the increase in area.
- e) If x represents 12 m, find the increase in area.

11. a) For each situation, begin with a square field, measuring x metres by x metres. Then, draw a diagram of the new field, write an algebraic expression for its area, and expand and simplify your area expression.

- i) The length of one side is increased by 10 m.
- ii) The length of one side is doubled.
- iii) The length is increased by 5 m and the width is increased by 6 m.

- b) **Use Technology** Use a CAS to verify your answers to part a).

12. A parabola has equation $y = (x + 3)(x - 1)$.

- a) Find the x -intercepts of $y = (x + 3)(x - 1)$.
- b) Expand and simplify the equation.
- c) Graph the result from part b). Verify that the x -intercepts are the same.

Making Connections

In Chapter 4, you worked with quadratic relations of the form $y = (x - r)(x - s)$.