

Two ways to find the area of a rectangle are: as a product of the (height) · (base) or as the sum of the areas of individual pieces of the rectangle. For a given rectangle these two areas must be the same, so **area as a product = area as a sum**. Algebra tiles, and later, generic rectangles, provide area models to help multiply expressions in a visual, concrete manner.

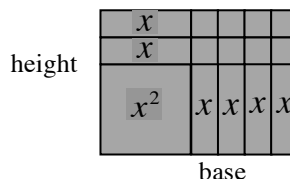
For additional information, see the Math Notes boxes in Lessons 3.2.2, 3.2.3, and 3.3.3. For additional examples and practice, see the Checkpoint 6B materials at the back of the textbook.

### Example 1: Using Algebra Tiles

The algebra tile pieces  $x^2 + 6x + 8$  are arranged into a rectangle as shown at right. The area of the rectangle can be written as the **product** of its base and height or as the **sum** of its parts.

$$\underbrace{(x+4)}_{\text{base}} \underbrace{(x+2)}_{\text{height}} = \underbrace{x^2 + 6x + 8}_{\text{area}}$$

area as a **product**      area as a **sum**



### Example 2: Using Generic Rectangles

A generic rectangle allows us to organize the problem in the same way as the first example without needing to draw the individual tiles. It does not have to be drawn accurately or to scale.

Multiply  $\underbrace{(2x+1)}_{\text{base}} \underbrace{(x-3)}_{\text{height}}$ .

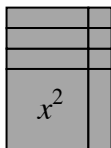
$$\begin{array}{|c|c|} \hline -3 & \\ \hline x & \\ \hline 2x & +1 \\ \hline \end{array} \Rightarrow \begin{array}{|c|c|} \hline -3 & -6x \\ \hline x & 2x^2 \\ \hline 2x & +1 \\ \hline \end{array} \Rightarrow (2x+1)(x-3) = 2x^2 - 5x - 3$$

area as a product      area as a sum

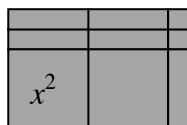
## Problems

Write a statement showing **area as a product** equals **area as a sum**.

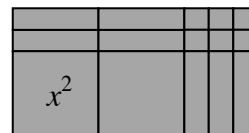
1.



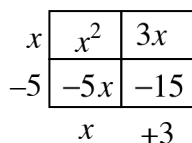
2.



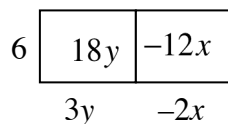
3.



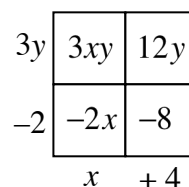
4.



5.



6.



Multiply.

- |                    |                    |                    |
|--------------------|--------------------|--------------------|
| 7. $(3x+2)(2x+7)$  | 8. $(2x-1)(3x+1)$  | 9. $(2x)(x-1)$     |
| 10. $(2y-1)(4y+7)$ | 11. $(y-4)(y+4)$   | 12. $(y)(x-1)$     |
| 13. $(3x-1)(x+2)$  | 14. $(2y-5)(y+4)$  | 15. $(3y)(x-y)$    |
| 16. $(3x-5)(3x+5)$ | 17. $(4x+1)^2$     | 18. $(x+y)(x+2)$   |
| 19. $(2y-3)^2$     | 20. $(x-1)(x+y+1)$ | 21. $(x+2)(x+y-2)$ |

## Answers

- |                                  |                                       |                          |
|----------------------------------|---------------------------------------|--------------------------|
| 1. $(x+1)(x+3) = x^2 + 4x + 3$   | 2. $(x+2)(2x+1) = 2x^2 + 5x + 2$      |                          |
| 3. $(x+2)(2x+3) = 2x^2 + 7x + 6$ | 4. $(x-5)(x+3) = x^2 - 2x - 15$       |                          |
| 5. $6(3y-2x) = 18y - 12x$        | 6. $(x+4)(3y-2) = 3xy - 2x + 12y - 8$ |                          |
| 7. $6x^2 + 25x + 14$             | 8. $6x^2 - x - 1$                     | 9. $2x^2 - 2x$           |
| 10. $8y^2 + 10y - 7$             | 11. $y^2 - 16$                        | 12. $xy - y$             |
| 13. $3x^2 + 5x - 2$              | 14. $2y^2 + 3y - 20$                  | 15. $3xy - 3y^2$         |
| 16. $9x^2 - 25$                  | 17. $16x^2 + 8x + 1$                  | 18. $x^2 + 2x + xy + 2y$ |
| 19. $4y^2 - 12y + 9$             | 20. $x^2 + xy - y - 1$                | 21. $x^2 + xy + 2y - 4$  |