

**EXAMPLE 1. FACTOR  $2x^2 + 15x + 18$ .**

In this example,  $a = 2$ ,  $b = 15$ , and  $c = 18$ . You need to find two numbers that have a sum of 15 and a product of  $2 \cdot 18$  or 36. Make a list of the factors of 36 and look for the pair of factors with a sum of 15.

Factors of 36	Sum of Factors
1, 36	37
2, 18	20
3, 12	15

Use the pattern  $ax^2 + mx + px + c$ , with  $a = 2$ ,  $m = 3$ ,  $p = 12$ , and  $c = 18$ .

$$\begin{aligned} 2x^2 + 15x + 18 &= 2x^2 + 3x + 12x + 18 \\ &= (2x^2 + 3x) + (12x + 18) \\ &= x(2x + 3) + 6(2x + 3) \\ &= (x + 6)(2x + 3) \end{aligned}$$

Therefore,  $2x^2 + 15x + 18 = (x + 6)(2x + 3)$ .

**Exercises**

Handwritten work for factoring  $3m^2 - 8m - 3$ . The number 2 is circled. The expression  $3m^2 - 8m - 3$  is written. An AC method attempt is shown with  $-8$  and  $-9$  crossed out. A box method is used with a  $2 \times 2$  grid containing  $3m^2$ ,  $-9m$ ,  $m$ , and  $-3$ . The final factored form is  $(3m+1)(m-3)$ .

①

$$\begin{array}{r} 1 \quad -3 \\ -4 \quad -4 \end{array}$$

$2x$

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

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

Factor each polynomial, if possible. If the polynomial cannot be factored using integers, write *prime*.

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$$\begin{array}{ccc} & 19 & \\ 12 & \times & 7 \\ & 84 & \end{array}$$

	$-4t$	$7$
$t$	$-4t^2$	$7t$
$-3$	$12t$	$-21$

$4 \cdot 21$

$12 \cdot 7$

$(t-3)(-4t+7)$

check:

$-4t^2 + 7t + 12t - 21$

$-4t^2 + 19t - 21$

3.  $16r^2 - 8r + 1$   
 $(4r-1)(4r-1)$

6.  $18x^2 - 27x - 5$

9.  $-4t^2 + 19t - 21$

12.  $48x^2 + 22x - 15$

15.  $8m^2 - 44m + 48$

18.  $18 + 11y + 2y^2$

nomial, if possible. If the polynomial cannot be factored using integers, write *prime*.

Handwritten work for factoring the polynomial  $6x^2 + 3x - 2$ .

The polynomial is written in a box with the following layout:

	$3x$	$-2$
$2x$	$6x^2$	$3x$
$3$	$3x$	$-6$

Annotations:

- A circled  $4$  is written above the box.
- The terms  $2x$  and  $3$  are circled together on the left side.
- The top row ( $3x$  and  $-2$ ) is circled together.

The factored form is written below the box:

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

To the right, a cross-multiplication check is shown:

$3$	$5$
$9$	$-4$
$-36$	

$$A = l \times w$$

$$24 = (8 - 2x)(6 - 2x)$$

$$24 = 48 - 16x - 12x + 4x^2$$

$$\begin{array}{r} 24 = 48 - 16x - 12x + 4x^2 \\ -24 \quad -24 \\ \hline 0 = 4x^2 - 28x + 24 \end{array}$$

$$0 = 4(x-1)(x-6)$$

$$x = 1 \quad x = 6$$

can't use

$l = 8 - 2x$

$w = 6 - 2x$

$6?$   $6?$

18. GEOMETRY A rectangle with an area of 24 square inches is formed by cutting strips of equal width from a rectangular piece of paper. Find the dimensions of the new rectangle if the original rectangle measures 8 inches by 6 inches.

