

You can also factor some trinomials that have more than one variable. Consider the product  $(p + 10q)(p + 3q)$ .

$$\begin{aligned}(p + 10q)(p + 3q) &= p^2 + 3pq + 10pq + 10q \cdot 3q \\ & \qquad \qquad \qquad (3 + 10)pq \\ &= p^2 + 13pq + 30q^2\end{aligned}$$

You can see that the first term is the square of the first variable, the middle term includes both variables, and the last term includes the square of the second variable.

#### 4 EXAMPLE Factoring Trinomials With Two Variables

Factor  $h^2 - 4hk - 77k^2$ .

Find the factors of  $-77$ . Identify the pair that has a sum of  $-4$ .

| Factors of $-77$ | Sum of Factors  |
|------------------|-----------------|
| 1 and $-77$      | $-76$           |
| $77$ and $-1$    | $76$            |
| $7$ and $-11$    | $-4 \checkmark$ |

•  $h^2 - 4hk - 77k^2 = (h + 7k)(h - 11k)$



4 Factor each expression.

a.  $x^2 + 11xy + 24y^2$

b.  $v^2 + 2vw - 48w^2$

c.  $m^2 - 17mn - 60n^2$

## EXERCISES

For more exercises, see *Extra Skill and Word Problem Practice*.

### Practice and Problem Solving

#### A Practice by Example

Examples 1, 2  
(pages 519, 520)



Complete.

1.  $t^2 + 7t + 10 = (t + 2)(t + \blacksquare)$

2.  $y^2 - 13y + 36 = (y - 4)(y - \blacksquare)$

3.  $x^2 - 8x + 7 = (x - 1)(x - \blacksquare)$

4.  $x^2 + 9x + 18 = (x + 3)(x + \blacksquare)$

Factor each expression. Check your answer.

5.  $r^2 + 4r + 3$

6.  $n^2 - 3n + 2$

7.  $k^2 + 5k + 6$

8.  $y^2 + 6y + 8$

9.  $x^2 - 2x + 1$

10.  $p^2 + 19p + 18$

11.  $k^2 - 16k + 28$

12.  $w^2 + 6w + 5$

13.  $m^2 - 9m + 8$

14.  $d^2 + 21d + 38$

15.  $t^2 - 13t + 42$

16.  $q^2 - 18q + 45$

Example 3  
(page 520)

Complete.

17.  $m^2 + 3m - 10 = (m - 2)(m + \blacksquare)$

18.  $v^2 - 2v - 24 = (v + 4)(v - \blacksquare)$

19.  $k^2 - 8k - 9 = (k + 1)(k - \blacksquare)$

20.  $q^2 + 3q - 18 = (q - 3)(q + \blacksquare)$

Factor each expression.

21.  $x^2 + 3x - 4$

22.  $q^2 - 2q - 8$

23.  $y^2 + y - 20$

24.  $h^2 + 16h - 17$

25.  $x^2 - 14x - 32$

26.  $d^2 + 6d - 40$

27.  $m^2 - 13m - 30$

28.  $p^2 + 3p - 54$

29.  $p^2 - 15p - 54$