

On a separate piece of paper factor completely #21-41.

### 7.5 Factoring $x^2 + bx + c$ (pp. 385–390)

Factor  $x^2 + 6x - 27$ .

Notice that  $b = 6$  and  $c = -27$ . Because  $c$  is negative, the factors  $p$  and  $q$  must have different signs so that  $pq$  is negative.

Find two integer factors of  $-27$  whose sum is 6.

<b>Factors of <math>-27</math></b>	$-27, 1$	$-1, 27$	$-9, 3$	$-3, 9$
<b>Sum of factors</b>	$-26$	$26$	$-6$	$6$

The values of  $p$  and  $q$  are  $-3$  and  $9$ .

▶ So,  $x^2 + 6x - 27 = (x - 3)(x + 9)$ .

**Factor the polynomial.**

21.  $p^2 + 2p - 35$       22.  $b^2 + 18b + 80$       23.  $z^2 - 4z - 21$       24.  $x^2 - 11x + 28$

### 7.6 Factoring $ax^2 + bx + c$ (pp. 391–396)

Factor  $5x^2 + 36x + 7$ .

There is no GCF, so you need to consider the possible factors of  $a$  and  $c$ . Because  $b$  and  $c$  are both positive, the factors of  $c$  must be positive. Use a table to organize information about the factors of  $a$  and  $c$ .

Factors of 5	Factors of 7	Possible factorization	Middle term	
1, 5	1, 7	$(x + 1)(5x + 7)$	$7x + 5x = 12x$	✗
1, 5	7, 1	$(x + 7)(5x + 1)$	$x + 35x = 36x$	✓

▶ So,  $5x^2 + 36x + 7 = (x + 7)(5x + 1)$ .

**Factor the polynomial.**

25.  $3t^2 + 16t - 12$       26.  $-5y^2 - 22y - 8$       27.  $6x^2 + 17x + 7$   
 28.  $-2y^2 + 7y - 6$       29.  $3z^2 + 26z - 9$       30.  $10a^2 - 13a - 3$

## 7.7 Factoring Special Products (pp. 397–402)

Factor each polynomial.

a.  $x^2 - 16$

$$\begin{aligned}x^2 - 16 &= x^2 - 4^2 \\ &= (x + 4)(x - 4)\end{aligned}$$

Write as  $a^2 - b^2$ .

Difference of two squares pattern

b.  $25x^2 - 30x + 9$

$$\begin{aligned}25x^2 - 30x + 9 &= (5x)^2 - 2(5x)(3) + 3^2 \\ &= (5x - 3)^2\end{aligned}$$

Write as  $a^2 - 2ab + b^2$ .

Perfect square trinomial pattern

Factor the polynomial.

31.  $x^2 - 9$

32.  $y^2 - 100$

33.  $z^2 - 6z + 9$

34.  $m^2 + 16m + 64$

## 7.8 Factoring Polynomials Completely (pp. 403–408)

Factor each polynomial completely.

a.  $x^3 + 4x^2 - 3x - 12$

$$\begin{aligned}x^3 + 4x^2 - 3x - 12 &= (x^3 + 4x^2) + (-3x - 12) \\ &= x^2(x + 4) + (-3)(x + 4) \\ &= (x + 4)(x^2 - 3)\end{aligned}$$

Group terms with common factors.

Factor out GCF of each pair of terms.

Factor out  $(x + 4)$ .

b.  $2x^4 - 8x^2$

$$\begin{aligned}2x^4 - 8x^2 &= 2x^2(x^2 - 4) \\ &= 2x^2(x^2 - 2^2) \\ &= 2x^2(x + 2)(x - 2)\end{aligned}$$

Factor out  $2x^2$ .

Write as  $a^2 - b^2$ .

Difference of two squares pattern

c.  $2x^3 + 18x^2 - 72x$

$$\begin{aligned}2x^3 + 18x^2 - 72x &= 2x(x^2 + 9x - 36) \\ &= 2x(x + 12)(x - 3)\end{aligned}$$

Factor out  $2x$ .

Factor  $x^2 + 9x - 36$ .

Factor the polynomial completely.

35.  $n^3 - 9n$

36.  $x^2 - 3x + 4ax - 12a$

37.  $2x^4 + 2x^3 - 20x^2$

Solve the equation.

38.  $3x^3 - 9x^2 - 54x = 0$

39.  $16x^2 - 36 = 0$

40.  $z^3 + 3z^2 - 25z - 75 = 0$

41. A box in the shape of a rectangular prism has a volume of 96 cubic feet. The box has a length of  $(x + 8)$  feet, a width of  $x$  feet, and a height of  $(x - 2)$  feet. Find the dimensions of the box.