

### To Factor a Four-Term Polynomial by Grouping

**STEP 1.** Group the terms in two groups of two terms so that each group has a common factor.

**STEP 2.** Factor out the GCF from each group.

**STEP 3.** If there is now a common binomial factor in the groups, factor it out.

**STEP 4.** If not, rearrange the terms and try these steps again.

Ex: (p 369)

$$26. 18a + 12 = 6(3a + 2)$$

$$28. 42x - 7 = 7(6x - 1)$$

$$30. y^5 + 6y^4 = y^4(y + 6)$$

$$32. 5x^2 + 10x^6 = 5x^2(1 + 2x^4)$$

$$34. 7x + 21y - 7 = 7(x + 3y - 1)$$

$$38. x^9y^6 + x^3y^5 - x^4y^3 + x^3y^3$$

$$x^3y^3 (x^6y^3 + y^2 - x + 1)$$

$$40. 9y^6 - 27y^4 + 18y^2 + 6$$

$$3(3y^6 - 9y^4 + 6y^2 + 2)$$

$$42. \frac{2}{5}y^7 - \frac{4}{5}y^5 + \frac{3}{5}y^2 - \frac{2}{5}y$$

$$\frac{1}{5}y (2y^6 - 4y^4 + 3y - 2)$$

$$xw - 3w$$

$$w(x-3)$$

$$44. x(y^2 + 1) - 3(y^2 + 1)$$

$$(y^2 + 1)(x - 3)$$

$$qz + z = z(q+1)$$

$$48. q(b^3 - 5) + (b^3 - 5)$$

$$(b^3 - 5)(q+1)$$

50.  $-7y - 21$

52.  $-5y^3 + y^6$

54.  $-5m^6 + 10m^5 - 5m^3$

56.  $x^3 + 4x^2 + 3x + 12$

$$x^2(\underline{x+4}) + 3(\underline{x+4})$$

$$(x+4)(x^2+3)$$

58.  $xy + y + 2x + 2$

$$y(\underline{x+1}) + 2(\underline{x+1})$$

$$(x+1)(y+2)$$

$$62. \quad \underline{8w^2 + 7wv} + \underline{8w + 7v}$$

$$w(\underline{8w + 7v}) + 1(\underline{8w + 7v})$$

$$(8w + 7v)(w + 1)$$

$$64. \quad \underline{6x - 42} + \underline{xy - 7y}$$

$$6(\underline{x - 7}) + y(\underline{x - 7})$$

$$(x - 7)(6 + y)$$

$$70. \underbrace{6m^2 - 5mn} - \underbrace{6m + 5n}$$

$$m(\underline{6m - 5n}) - 1(\underline{6m - 5n})$$

$$(6m - 5n)(m - 1)$$

$$74. \underbrace{90 + 15y^2} - \underbrace{18x - 3xy^2}$$

$$15(\underline{6 + y^2}) - 3x(\underline{6 + y^2})$$

$$(6 + y^2)(15 - 3x)$$

$$3(6 + y^2)(5 - x)$$





86.  $16x^2 + 4xy^2 + 8xy + 2y^3$

## 6.2: Factoring Trinomials of the Form $x^2 + bx + c$

Multiply out two binomials

**Factoring a Trinomial of the Form  $x^2 + bx + c$**

The factored form of  $x^2 + bx + c$  is

The product of these numbers is  $c$ .

$$x^2 + bx + c = (x + \square)(x + \square)$$

The sum of these numbers is  $b$ .

Ex: (p 376)

2.  $x^2 + 6x + 8$

4.  $y^2 - 12y + 11$

6.  $x^2 - 10x + 25$

8.  $x^2 - x - 30$

10.  $x^2 + 4x - 32$

12.  $x^2 - 7x + 5$

48.  $3x^3 + 3x^2 - 126x$

50.  $3x^2y - 9xy + 45y$

54.  $x^2 - 3xy - 4y^2$

62.  $7a^3b - 35a^2b^2 + 42ab^3$

66.  $-x^2 + 8x - 7$

68.  $\frac{1}{3}y^2 - \frac{5}{3}y - 8$

## 6.3: Factoring Trinomials of the Form $ax^2 + bx + c$ and Perfect Square Trinomials

Multiply two binomials

Two Strategies: guess & check  
key numbering (by grouping)

Ex: (p 384)

2.  $2y^2 + 27y + 25 = (2y + 25)( \quad )$

4.  $6y^2 + 11y - 10 = (2y + 5)( \quad )$

6.  $4y^2 - 20y + 25 = (2y - 5)( \quad )$

8.  $3x^2 + 8x + 4$

10.  $21x^2 - 31x + 10$

14.  $3x^2 + 20x - 63$

18.  $3n^2 + 20n + 5$

20.  $8x^2 - 14xy + 3y^2$

24.  $8a^3 + 14a^2 + 3a$

30.  $8x^2y + 34xy - 84y$

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

40.  $x^2 + 18x + 81$

42.  $x^2 - 12x + 36$

44.  $25x^2 - 20x + 4$

46.  $m^4 + 10m^2 + 25$

48.  $3y^2 - 6y + 3$

50.  $9y^2 + 48y + 64$

52.  $2x^2 + 7x - 72$

57.  $-9x + 20 + x^2$

60.  $m^2 + 20mn + 100n^2$

72.  $-15x^2 + 26x - 8$

68.  $12x^3 - 34x^2 + 24x$

74.  $9q^4 - 42q^3 + 49q^2$

80.  $1 + 16x^2 + x^4$

92.  $3a^2b^2 + 12ab + 1$

Ex: (p 390)

14.  $15x^2 + 11x + 2$

20.  $2x^2 - 7x + 3$

34.  $30a^2 + 38a - 20$

## 6.5: Factoring Binomials

Ex: (p 396)

2.  $x^2 - 36$

6.  $49a^2 - 16$

14.  $-9t^2 + 1$

20.  $n^4 - 16$

38.  $x^2 - 225y^2$

44.  $36x^2y - 25y$

56.  $100 - \frac{4}{81}n^2$

64.  $100x^3y - 49xy^3$

70.  $25y^4 - 100y^2$

## 6.6: Solving Quadratic Equations by Factoring

### Quadratic Equation

A quadratic equation is one that can be written in the form

$$ax^2 + bx + c = 0$$

where  $a, b,$  and  $c$  are real numbers and  $a \neq 0$ .

### Zero Factor Theorem

If  $a$  and  $b$  are real numbers and if  $ab = 0$ , then  $a = 0$  or  $b = 0$ .

Ex: (p 408)

2.  $(x + 4)(x - 10) = 0$

4.  $(x + 11)(x + 1) = 0$

6.  $x(x - 7) = 0$

20.  $x^2 + 2x - 63 = 0$

22.  $x^2 - 5x + 6 = 0$

24.  $x^2 - 3x = 0$

28.  $x^2 = 9$

30.  $(x + 3)(x + 8) = x$

32.  $x(4x - 11) = 3$

34.  $-2y^2 + 72 = 0$

36.  $6x^2 + 57x = 30$

42.  $4y^3 - 36y = 0$

44.  $15x^3 + 24x^2 - 63x = 0$

46.  $(x - 6)(x + 7) = 0$

48.  $x^2 + 15x = 0$

50.  $5(3 - 4x) = 9$

52.  $4y^2 - 81 = 0$

60.  $9x^2 + 7x = 2$

62.  $3x^2 - 6x - 9 = 0$

64.  $(y - 5)(y - 2) = 28$

74.  $2x^2 + 12x - 1 = 4 + 3x$

76.  $4x^2 - 20x = -5x^2 - 6x - 5$

