

What you will learn about:
Factoring Trinomials when
The leading coefficient is 1

$$ax^2 + bx + c$$

Factoring when $a = 1$

$$x^2 + bx + c$$

Write the factors as two
binomials with the first terms x .

$$(x \quad)(x \quad)$$

Find two number m and n that

$$\text{Multiply to } c, m \cdot n = c$$

$$\text{Add to } b, m + n = b$$

Use m and n as the last terms of
the factors.

$$(x + m)(x + n)$$

If c is positive then m and n will
have the same sign. The sign on
 b will determine the sign.

If c is negative then m and n will
have different signs.

$$\text{mult} \rightarrow 8$$

$$\text{Add/subt} \rightarrow 6$$

8.1
42

$$\text{Factor: } x^2 \oplus 6x \oplus 8$$

$$(x \pm 4)(x \pm 2)$$

$$\text{Factor: } y^2 + 8y + 15$$

$$(y + 3)(y + 5)$$

15

$$\text{Factor: } u^2 + 11u + 24$$

$$(u + 8)(u + 3)$$

$$\text{Factor: } t^2 - 11t + 28$$

$$(t - 4)(t - 7)$$

$$\text{Factor: } z^2 + 4z - 5$$

$$(z + 5)(z - 1)$$

$$\text{Factor: } h^2 + 4h - 12$$

$$(h - 2)(h + 6)$$

Factor: $x^2 - 4x - 12$

$$(x-6)(x+2)$$

Factor: $r^2 - 3r - 40$

$$(r+5)(r-8)$$

Factor: $2x + x^2 - 48$

$$x^2 + 2x - 48$$

$$(x+8)(x-6)$$

Factor: $-7n + 12 + n^2$

$$n^2 - 7n + 12$$

$$(n-4)(n-3)$$

Factor: $x^2 + 12xy + 36y^2$

$$(x + 6y)(x + 6y)$$

$$\begin{array}{r} 36 \\ \hline 6 \cdot 6 \\ 9 \cdot 4 \\ 12 \cdot 3 \\ 18 \cdot 2 \end{array}$$

~~Factor: $x^2 + 12xy + 36y^2$~~

Factor: $u^2 + 12uv + 28v^2$

Prime

$$\begin{array}{r} 28 \\ \hline 7 \cdot 4 \\ 14 \cdot 2 \\ 28 \cdot 1 \end{array}$$

Factor: $u^2 - 9uv - 12v^2$

$$(u - 4v)(u + 3v)$$

$$\begin{array}{r} -12 \\ \hline -4 \cdot 3 \\ -3 \cdot 4 \end{array}$$

Prime

$$\begin{array}{r} -6 \cdot 2 \\ -2 \cdot 6 \\ -12 \cdot 1 \\ -1 \cdot 12 \end{array}$$

What you will learn about:
Factoring Trinomials when
The leading coefficient is not 1

Factoring trinomials with a GCF

$$\begin{aligned}\text{Factor: } & 2x^2 - 8x - 42 \\ & 2(x^2 - 4x - 21) \\ & 2(x-7)(x+3)\end{aligned}$$

$$\begin{aligned}\text{Factor: } & 4m^2 - 4m - 8 \\ & 4(m^2 - m - 2) \\ & 4(m-2)(m+1)\end{aligned}$$

$$\begin{aligned}\text{Factor: } & 5k^2 - 15k - 50 \\ & 5(k^2 - 3k - 10) \\ & 5(k-5)(k+2)\end{aligned}$$

$$\begin{aligned}\text{Factor: } & 4y^2 - 36y + 56 \\ & 4(y^2 - 9y + 14) \\ & 4(y-6)(y-2)\end{aligned}$$

$$\begin{aligned}\text{Factor: } & 4u^3 + 16u^2 - 20u \\ & 4u(u^2 + 4u - 5) \\ & 4u(u+5)(u-1)\end{aligned}$$

$$\begin{aligned}\text{Factor: } & 6y^3 + 18y^2 - 60y \\ & 6y(y^2 + 3y - 10) \\ & 6y(y+5)(y-2)\end{aligned}$$

Factor by guess and check

Factor: $3x^2 + 5x + 2$

$$\begin{array}{r} (3x + 2)(x + 1) \\ + 2 \quad + 1 \\ + 1 \quad + 2 \end{array}$$

$$\begin{array}{l} 3x + 2x = 5x \\ 6x + x = 7x \end{array}$$

Factor: $3y^2 + 22y + 7$

$$\begin{array}{r} (3y + 1)(y + 7) \\ + 7 \quad + 1 \\ + 1 \quad + 7 \end{array}$$

$$\begin{array}{l} 3y + 7y = 10y \\ 21y + y = 22y \end{array}$$

Factor: $4b^2 + 5b + 1$

$$\begin{array}{r} (4b + 1)(b + 1) \\ 4b \quad + 1 \quad b + 1 \\ \cancel{2b} + 1 \quad \cancel{2b} + 1 \end{array}$$

Factor: $10y^4 + 55y^3 + 60y^2$

$$5y^2(2y^2 + 11y + 12)$$

$$(2y^2 + 8y + 3y + 12)$$

$$2y(y + 4) + 3(y + 4)$$

$$5y^2(2y + 3)(y + 4)$$

Factor: $15x^3 - 85x^2 + 100x$

$$5x(3x^2 - 17x + 20)$$

$$\frac{60}{-12 \cdot -5}$$

$$(3x^2 - 5x)(-12x + 20)$$

$$(3x^2 - 12x)(-5x + 20)$$

$$x(3x - 5) - 4(3x - 5)$$

$$3x(x - 4) - 5(x - 4)$$

$$5x(3x - 5)(x - 4)$$

Split the Middle Term

$$ax^2 + bx + c$$

Factor any GCF

Find the product of ac.

Find two numbers m and n

$$\text{Multiply to ac } m \cdot n = a \cdot c$$

$$\text{Add to b } m + n = b$$

Split the middle term using m and n

$$ax^2 + bx + c$$

$$ax^2 + mx + nx + c$$

Factor by grouping

$$\begin{aligned} & \text{Factor: } 8u^2 - 17u - 21 \\ & (8u^2 - 24u) + (7u - 21) \\ & 8u(u-3) + 7(u-3) \\ & (u-3)(8u+7) \end{aligned}$$

$$\begin{aligned} & \text{Factor: } 6x^2 + 19x - 20 \\ & (6x^2 + 24x) - 5x - 20 \\ & 6x(x+4) - 5(x+4) \\ & (6x-5)(x+4) \end{aligned}$$

$$\begin{aligned} & \text{Factor: } 3t^2 + 8t + 5 \\ & (3t^2 + 3t) + (5t + 5) \\ & 3t(t+1) + 5(t+1) \\ & (3t+5)(t+1) \end{aligned}$$

$$\begin{aligned} & \text{Factor: } 10y^2 - 55y + 70 \\ & 5(2y^2 - 11y + 14) \\ & (2y^2 - 7y)(-4y + 14) \\ & y(2y-7) - 4(2y-7) \end{aligned}$$

$$\begin{aligned} & \text{Factor: } 16x^2 - 32x + 12 \\ & 4(4x^2 - 8x + 3) \\ & (4x^2 - 6x)(-2x + 3) \\ & 2x(2x-3) - 1(2x-3) \end{aligned}$$

$$4(2x-1)(2x-3)$$

$$\begin{aligned} a \cdot c &= \frac{-168}{-84 \cdot 2} \\ & -2 \cdot 84 \\ & -42 \cdot 4 \\ & -41 \cdot 42 \\ & -21 \cdot 8 \\ & -8 \cdot 21 \end{aligned}$$

-24.7

$$\frac{-120}{24 \cdot -5}$$

$$\frac{15}{3 \cdot 5}$$

$$\frac{28}{-7 \cdot -4}$$

$$5(2y-7)(y-2)$$

$$\frac{12}{-4 \cdot -2}$$

What you will learn about:
Factoring Special Cases

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$\begin{array}{cc} (2x)^2 & (3)^2 \\ \text{Factor: } \boxed{4x^2} + \cancel{12}x + \boxed{9} \\ & (2x+3)^2 \end{array}$$

$$\begin{array}{cc} (3x)^2 & (4)^2 \\ \text{Factor: } 9x^2 - 24x + 16 \\ & (3x-4)^2 \end{array}$$

$$\begin{array}{cc} (2x)^2 & (5)^2 \\ \text{Factor: } \boxed{4x^2} + 20x + 25 \\ & (2x+5)^2 \end{array}$$

$$\begin{array}{cc} (3x)^2 & (1)^2 \\ \text{Factor: } \boxed{9x^2} - 6x + 1 \\ & (3x-1)^2 \end{array}$$

$$\begin{array}{cc} (2x)^2 & (7y)^2 \\ \text{Factor: } 4x^2 - 28xy + 49y^2 \\ & (2x-7y)^2 \end{array}$$

$$\begin{array}{c} \text{Factor: } 16x^2 + 8xy + y^2 \\ (4x+y)^2 \end{array}$$

Difference of Squares

$$(a + b)(a - b) = a^2 - b^2$$

Factor: $50x^2 + 60x + 18$

$$2(25x^2 + 30x + 9)$$
$$2(5x + 3)^2$$

$$(3x)^2 \quad (2)^2$$
$$9x^2 - 12x + 4$$

Factor: $36y^2 - 48y + 16$

$$4(9y^2 - 12y + 4)$$
$$4(3y - 2)^2$$

Factor: $8x^2y - 24xy + 18y$

$$2y(4x^2 - 12x + 9)$$

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

Factor: $x^2 - 4$

$$(x)^2 - (2)^2$$
$$(x - 2)(x + 2)$$

Factor: $h^2 - 121$

$$(h - 11)(h + 11)$$

Factor: $64y^2 - 1$

$$(8y + 1)(8y - 1)$$

Factor: $121x^2 - 49y^2$

$$(11x - 7y)(11x + 7y)$$

Factor: $144p^2 - 9q^2$

$$(12p - 3q)(12p + 3q)$$

$$x^2 + 4$$

Factor: $x^4 - y^4$
 $(x^2)^2 - (y^2)^2$

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

Factor: $x^4 - 16$

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

Factor: $8x^2y - 18y$

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

Factor: $6x^2 + 96$

$$6(x^2 + 16)$$

Factor: $45a^2b - 80b$

$$5b(9a^2 - 16)$$

Sum and Difference of cubes

$$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

Factor: $x^3 + 64$