# Polynomial Factorizations with Full Steps (121–140)

## 121) 3y² − 34y − 24

• No common factor other than 1.

• Use AC method for ay² + by + c with a=3, b=−34, c=−24.

• Compute AC = 3×(−24) = −72. Find integers whose product is −72 and sum is −34 → −36 and +2.

• Split the middle term: 3y² − 36y + 2y − 24.

• Group: (3y² − 36y) + (2y − 24) = 3y(y − 12) + 2(y − 12).

• Factor the common binomial: (3y + 2)(y − 12).

➤ Final factorization: (3y+2)(y−12)

## 122) a² + 8a + 16

• Recognize perfect square trinomial: a² + 2·4·a + 4².

• Write as a binomial square: (a + 4)².

➤ Final factorization: (a+4)²

## 123) y² − 121

• Difference of squares: y² − 11².

• Factor: (y − 11)(y + 11).

➤ Final factorization: (y−11)(y+11)

## 124) 42 + a − a²

• Reorder into standard form with positive leading coefficient optional. Here factor out −1 to make the square positive:

• 42 + a − a² = −(a² − a − 42).

• Now factor the quadratic: find numbers whose product is −42 and sum −1 → −7 and +6.

• Thus a² − a − 42 = (a − 7)(a + 6).

• Restore the sign: −(a − 7)(a + 6). (Equivalent form: (7 − a)(a + 6)).

➤ Final factorization: −(a−7)(a+6)

## 125) 9x³ − 24x² + 16x

• GCF is x: x(9x² − 24x + 16).

• Now factor the quadratic. Check discriminant or pattern: 9x² − 24x + 16 = (3x)² − 2·3x·4 + 4².

• Recognize perfect square: (3x − 4)².

• Attach the GCF back: x(3x − 4)².

➤ Final factorization: x(3x−4)²

## 126) x³ − 1/8

• Difference of cubes with a = x and b = 1/2.

• Use a³ − b³ = (a − b)(a² + ab + b²).

• So x³ − (1/2)³ = (x − 1/2)(x² + (1/2)x + (1/2)²).

• Simplify (optional): (x − 1/2)(x² + 1/2 x + 1/4).

➤ Final factorization: (x−1/2)(x²+1/2 x+1/4)

## 127) 10w² + 29w − 21

• AC method with a=10, b=29, c=−21.

• AC = 10×(−21) = −210.

• Find integers with product −210 and sum 29 → 35 and −6.

• Split b: 10w² + 35w − 6w − 21.

• Group: 5w(2w + 7) − 3(2w + 7).

• Factor common binomial: (5w − 3)(2w + 7).

➤ Final factorization: (5w−3)(2w+7)

## 128) 16x² + 54x − 7

• AC method with a=16, b=54, c=−7.

• AC = 16×(−7) = −112.

• Find integers with product −112 and sum 54 → 56 and −2.

• Split b: 16x² + 56x − 2x − 7.

• Group: 8x(2x + 7) − 1(2x + 7).

• Factor common binomial: (8x − 1)(2x + 7).

➤ Final factorization: (8x−1)(2x+7)

## 129) 27x² − 30x − 8

• AC method with a=27, b=−30, c=−8.

• AC = 27×(−8) = −216.

• Find integers with product −216 and sum −30 → −36 and +6.

• Split b: 27x² − 36x + 6x − 8.

• Group: 9x(3x − 4) + 2(3x − 4).

• Factor common binomial: (9x + 2)(3x − 4).

➤ Final factorization: (9x+2)(3x−4)

## 130) x⁶ − 1

• Difference of squares: (x³ − 1)(x³ + 1).

• Each is a sum/difference of cubes:

• x³ − 1 = (x − 1)(x² + x + 1), x³ + 1 = (x + 1)(x² − x + 1).

• Combine all factors.

➤ Final factorization: (x−1)(x+1)(x²+x+1)(x²−x+1)

## 131) x² − 0.6x + 0.09

• Recognize perfect square: 0.09 = 0.3² and −0.6x = −2·0.3·x.

• So the trinomial is (x − 0.3)².

➤ Final factorization: (x−0.3)²

## 132) 4x² − 13x − 35

• AC method with a=4, b=−13, c=−35.

• AC = 4×(−35) = −140.

• Find integers with product −140 and sum −13 → −20 and +7.

• Split b: 4x² − 20x + 7x − 35.

• Group: 4x(x − 5) + 7(x − 5).

• Factor common binomial: (4x + 7)(x − 5).

➤ Final factorization: (4x+7)(x−5)

## 133) 125x⁶ − 81

• Write as a difference of squares: (5x³)² − 9².

• Use A² − B² = (A − B)(A + B).

• Result: (5x³ − 9)(5x³ + 9). (No further real factoring.)

➤ Final factorization: (5x³−9)(5x³+9)

## 134) 49x³ − 14x² + x

• GCF is x: x(49x² − 14x + 1).

• Recognize perfect square: (7x)² − 2·7x·1 + 1².

• So 49x² − 14x + 1 = (7x − 1)².

• Attach the GCF: x(7x − 1)².

➤ Final factorization: x(7x−1)²

## 135) 40y² + 7y − 3

• AC method with a=40, b=7, c=−3.

• AC = 40×(−3) = −120.

• Find integers with product −120 and sum 7 → 15 and −8.

• Split b: 40y² + 15y − 8y − 3.

• Group: 5y(8y + 3) − 1(8y + 3).

• Factor common binomial: (8y + 3)(5y − 1).

➤ Final factorization: (8y+3)(5y−1)

## 136) 15w² − 15w − 90

• GCF is 15: 15(w² − w − 6).

• Factor the quadratic: product −6, sum −1 → −3 and +2.

• So w² − w − 6 = (w − 3)(w + 2).

• Attach the GCF: 15(w − 3)(w + 2).

➤ Final factorization: 15(w−3)(w+2)

## 137) 0.04a² − 0.49b²

• Difference of squares: (0.2a)² − (0.7b)².

• Factor: (0.2a − 0.7b)(0.2a + 0.7b).

• Optional exact-fraction form: 0.01(4a² − 49b²) = 0.01(2a − 7b)(2a + 7b).

➤ Final factorization: (0.2a−0.7b)(0.2a+0.7b)

## 138) x³y² + 7x²y² − 18xy²

• GCF is xy²: xy²(x² + 7x − 18).

• Factor the trinomial inside: product −18, sum 7 → 9 and −2.

• So x² + 7x − 18 = (x + 9)(x − 2).

• Attach the GCF: xy²(x + 9)(x − 2).

➤ Final factorization: xy²(x+9)(x−2)

## 139) 2x⁶ − 54y⁶

• GCF is 2: 2(x⁶ − 27y⁶).

• Notice x⁶ − 27y⁶ = (x²)³ − (3y²)³, a difference of cubes.

• Use a³ − b³ = (a − b)(a² + ab + b²) with a=x², b=3y².

• So x⁶ − 27y⁶ = (x² − 3y²)(x⁴ + 3x²y² + 9y⁴).

• Attach the GCF: 2(x² − 3y²)(x⁴ + 3x²y² + 9y⁴).

➤ Final factorization: 2(x²−3y²)(x⁴+3x²y²+9y⁴)

## 140) 1/4 x² − 5x + 25

• Recognize perfect square: (1/2 x)² − 2·(1/2 x)·5 + 5².

• So it factors as ( (1/2)x − 5 )².

➤ Final factorization: (x/2 − 5)²