# 8-5: FACTORING TRINOMIALS OF THE FORM $x^2+bx+c$

*Lesson Objectives:*

- *Factoring $x^2+bx+c$*
- *Factoring $x^2+bx-c$*

$$(x+4)(x+7)$$

$$x^2+7x+4x+28$$

$$x^2+11x+28$$

$4+7$ $\quad$ $4\cdot 7$

| 28 | + |
|---|---|
| 1·28 | 29 |
| 2·14 | 16 |
| +4·+7 | +11 |

$$(x+4)(x+7)$$

**EXAMPLE 1: FACTORING $x^2+bx+c$**

Factor.

1. $x^2+8x+7$

| 7 | + |
|---|---|
| +1·+7 | +8 |

$(x+1)(x+7)$

2. $b^2+9b+14$

| 14 | + |
|---|---|
| 1·14 | 15 |
| +2·+7 | +9 |

$(b+2)(b+7)$

3. $x^2+13x+22$

| 22 | + |
|---|---|
| 1·22 | 23 |
| +2·+11 | +13 |

$(x+2)(x+11)$

4. $x^2+16x+28$

| 28 | + |
|---|---|
| 1·28 | 29 |
| +2·+14 | +16 |

$(x+2)(x+14)$

5. $d^2+11d+18$

| 18 | + |
|---|---|
| 1·18 | 19 |
| +2·+9 | +11 |
| 3·6 | 9 |

$(d+2)(d+9)$

6. $x^2+10x+24$

| 24 | + |
|---|---|
| +4·+6 | +10 |

$(x+4)(x+6)$

7. $x^2+20x+36$

| 36 | + |
|---|---|
| 1·36 | 37 |
| +2·+18 | +20 |

$(x+2)(x+18)$

8. $n^2+10n+25$

| 25 | + |
|---|---|
| 1·25 | 26 |
| +5·+5 | +10 |

$(n+5)(n+5)$

$(n+5)^2$

**EXAMPLE 2: FACTORING $x^2-bx+c$**

Factor.

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

| 20 | + |
|---|---|
| 1·20 | 21 |
| 2·10 | 12 |
| −4·−5 | −9 |

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

10. $x^2-5x+6$

| 6 | + |
|---|---|
| 1·6 | 7 |
| −2·−3 | −5 |

$(x-2)(x-3)$

11. $x^2-8x+15$

| 15 | + |
|---|---|
| 1·15 | 16 |
| −3·−5 | −8 |

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

12. $x^2-10x+9$

| 9 | + |
|---|---|
| −1·−9 | −10 |
| 3·3 | 6 |

$(x-1)(x-9)$

13. $x^2 - 7x + 24$

prime

| 24 | + |
|---|---|
| 1·24 | 25 |
| 2·12 | 14 |
| 3·8 | 11 |
| 4·6 | 10 |
| ? | 7 |

$a^2 \pm 2ab + b^2$

14. $z^2 - 14z + 49$

$(z-7)(z-7)$

$(z-7)^2$

| 49 | + |
|---|---|
| 1·49 | 50 |
| -7·-7 | -14 |

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

$(x-6)(x-7)$

| 42 | + |
|---|---|
| 1·42 | 43 |
| 2·21 | 23 |
| 3·14 | 17 |
| -6·-7 | -13 |

16. $x^2 - 26x + 48$

$(x-2)(x-24)$

| 48 | + |
|---|---|
| 1·48 | 49 |
| -2·-24 | -26 |

---

$$(x - 4)(x + 7)$$

$x^2 + 7x - 4x - 28$

$x^2 + 3x - 28$

| 28 | − |
|---|---|
| 1·28 | 27 |
| 2·14 | 12 |
| -4·7 | +3 |

$-4 + 7$ $\quad -4 \cdot 7$

$(x-4)(x+7)$

**EXAMPLE 3: FACTORING $x^2+bx-c$**

Factor.

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

$(x-3)(x+9)$

| 27 | − |
|---|---|
| 1·27 | 26 |
| -3·9 | +6 |

18. $p^2 - 3p - 18$

$(p+3)(p-6)$

| 18 | − |
|---|---|
| 1·18 | 17 |
| 2·9 | 7 |
| +3·-6 | -3 |

19. $m^2 + 8m - 20$

$(m-2)(m+10)$

| 20 | − |
|---|---|
| 1·20 | 19 |
| -2·10 | +8 |
| 4·5 | 1 |

20. $x^2 - x - 56$

$(x+7)(x-8)$

| 56 | − |
|---|---|
| 1·56 | 55 |
| 2·28 | 26 |
| 4·14 | 10 |
| +7·-8 | -1 |

21. $x^2 - 4x - 60$

$(x+6)(x-10)$

| 60 | − |
|---|---|
| 1·60 | 59 |
| 2·30 | 28 |
| 3·20 | 17 |
| 4·15 | 11 |
| 5·12 | 7 |
| +6·-10 | -4 |

22. $x^2 + 4x - 12$

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

| 12 | − |
|---|---|
| 1·12 | 11 |
| -2·6 | +4 |
| 3·4 | 1 |

23. $p^2 - 12p - 28$

$(p+2)(p-14)$

| 28 | − |
|---|---|
| 1·28 | 27 |
| +2·-14 | -12 |
| 4·7 | 3 |

24. $x^2 - x - 42$

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

| 42 | − |
|---|---|
| 1·42 | 41 |
| 2·21 | 19 |
| 3·14 | 11 |
| +6·-7 | -1 |

**EXAMPLE 4: FACTORING TRINOMIALS WITH TWO VARIABLES**

Factor. $x^4 - 4x^2y^3 - 77y^6$

25. $x^2 - 4xy - 77y^2$

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

| $77y^2$ | − |
|---|---|
| 1·77 | 74 |
| +7y·-11y | -4 |

26. $m^2 + 11mn + 24n^2$

$(m+3n)(m+8n)$

| $24n^2$ | + |
|---|---|
| 1·24 | 25 |
| 2·12 | 14 |
| +3n·+8n | +11 |
| 4·6 | 10 |

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

$(v-6w)(v+8w)$

| $48w^2$ | − |
|---|---|
| 1·48 | 47 |
| 2·24 | 22 |
| 3·16 | 13 |
| 4·12 | 8 |
| -6w·8w | -2 |

28. $c^2 + 19cd + 60d^2$

$(c+4d)(c+15d)$

| $60d^2$ | + |
|---|---|
| 1·60 | 61 |
| 2·30 | 32 |
| 3·20 | 23 |
| +4d·+15d | +19 |
| 5·12 | 17 |
| 6·10 | 16 |

8-5 → 8-7

$x^2 \pm bx \pm c$

8-6

$ax^2 \pm bx \pm c$

Name _____ ***8-5 Practice Worksheet*** Period _____

**Factor.**

1. $k^2+5k+6$
2. $p^2+19p+18$
3. $m^2-9m+8$
4. $q^2-18q+45$
5. $y^2+y-20$
6. $d^2+6d-40$
7. $p^2-15p-54$
8. $p^2+10pq+9q^2$
9. $x^2+8xy+15y^2$
10. $p^2-10pq+16q^2$
11. $x^2-10xy-39y^2$
12. $n^2+10n-56$
13. $t^2+28t+75$
14. $m^2+14m-51$
15. $t^8+5t^4-24$
16. $p^6+14p^3q^2-72q^4$

**Find THREE different values to compete each expression so that it can be factored into the product of two binomials. Show each factorization.**

17. $x^2-3x-?$
18. $x^2+x-?$
19. $x^2+?x+12$

**MIXED REVIEW**

**Solve each equation. Then check your solution.**

20. $3w+2-w=-4$
21. $\frac{1}{4}(k-1)=10$
22. $6(y+3)=24$
23. $\frac{5n+1}{8}=\frac{1}{2}$
24. If $2t+3=-9$, what is the value of $-3t-7$?

25. $9j + 3 = 3(3j + 1)$

26. $4v - 9 = 6v + 7$

27. $4p - 5 + p = 7 + 5p + 2$

**A scale on a map is 1 in: 25 mi.**

28. You measure 6.5 inches between cities. How many miles is the actual distance?

**Define a variable and write an equation to model each situation. Then solve the equation and answer the problem.**

29. Jan is one year younger that her brother Bill and one year older than her sister Sue. The sum of the three children's ages is 57. How old is each child?