Expanding double brackets

Mana Maths

Te reo Māori terms

taiapa
bracket
Open in Te Aka

mōiri
expand
Open in Te Aka

tau whakarea
multiplication
Open in Te Aka

kīanga
expression
Open in Te Aka

Notes & Steps

Key idea

To expand double brackets, multiply every term in the first bracket by every term in the second bracket. Use FOIL: **F**irst, **O**uter, **I**nner, **L**ast. Then collect like terms.

Steps

1. Multiply the First terms: $x \times x = x^2$.
2. Multiply the Outer terms: $x \times b = bx$.
3. Multiply the Inner terms: $a \times x = ax$.
4. Multiply the Last terms: $a \times b = ab$.
5. Add them up: $x^2 + bx + ax + ab$, then simplify: $x^2 + (a + b)x + ab$.

FOIL diagram

$$(x + a)(x + b)$$

- **F**: $x \times x = x^2$
- **O**: $x \times b = bx$ (outer terms)
- **I**: $a \times x = ax$ (inner terms)
- **L**: $a \times b = ab$

So $(x + a)(x + b) = x^2 + (a + b)x + ab$.

Common mistake

Only doing First and Last (FO), skipping Outer and Inner. $(x+3)(x+4) = x^2+3x+4x+12 = x^2 + 7x + 12$, **not** $x^2 + 12$.

Notes & Steps

Example 1: both positive

Expand $(x+2)(x+5)$. F: x^2, O: $5x$, I: $2x$, L: 10. Sum: $x^2+5x+2x+10 = x^2+7x+10$.

Example 2: one negative

Expand $(x+6)(x-3)$. F: x^2, O: $-3x$, I: $6x$, L: -18. Sum: $x^2-3x+6x-18 = x^2+3x-18$.

Example 3: both negative

Expand $(x-4)(x-2)$. F: x^2, O: $-2x$, I: $-4x$, L: 8. Sum: $x^2-2x-4x+8 = x^2-6x+8$.

Example 4: with coefficients

Expand $(2x+1)(x+3)$. F: $2x^2$, O: $6x$, I: x, L: 3. Sum: $2x^2+6x+x+3 = 2x^2+7x+3$.

Try these

1. $(x+3)(x+7)$
2. $(x-5)(x+2)$
3. $(2x+1)(x+4)$

Common mistake

Forgetting to collect like terms. Always combine the Outer and Inner terms (bx and ax) before writing your final answer.

Start Tasks

1. $(x+1)(x+2)$

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

3. $(x+2)(x+5)$

4. $(x+1)(x+6)$

5. $(x+3)(x+5)$

6. $(x+4)(x+2)$

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

8. $(x+2)(x+3)$

9. $(x+5)(x+1)$

Start Tasks — Answers

1. $x^2 + 3x + 2$

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

3. $x^2 + 7x + 10$

4. $x^2 + 7x + 6$

5. $x^2 + 8x + 15$

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

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

8. $x^2 + 5x + 6$

9. $x^2 + 6x + 5$

Start Tasks

10. $(x+3)(x+6)$

11. $(x+4)(x+4)$

12. $(x+2)(x+8)$

13. $(x+1)(x+9)$

14. $(x+5)(x+3)$

15. $(x+6)(x+2)$

16. $(x+3)(x+7)$

17. $(x+1)(x+10)$

18. $(x+4)(x+5)$

Start Tasks — Answers

10. $x^2 + 9x + 18$

11. $x^2 + 8x + 16$

12. $x^2 + 10x + 16$

13. $x^2 + 10x + 9$

14. $x^2 + 8x + 15$

15. $x^2 + 8x + 12$

16. $x^2 + 10x + 21$

17. $x^2 + 11x + 10$

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

Start Tasks

19. $(x+2)(x+6)$

20. $(x+7)(x+3)$

21. $(x+5)(x+5)$

22. $(x+1)(x+11)$

23. $(x+3)(x+8)$

24. $(x+6)(x+4)$

25. $(x+2)(x+9)$

26. $(x+4)(x+7)$

27. $(x+8)(x+1)$

Start Tasks — Answers

19. $x^2 + 8x + 12$

20. $x^2 + 10x + 21$

21. $x^2 + 10x + 25$

22. $x^2 + 12x + 11$

23. $x^2 + 11x + 24$

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

25. $x^2 + 11x + 18$

26. $x^2 + 11x + 28$

27. $x^2 + 9x + 8$

Build Tasks

1. $(x+5)(x-2)$

2. $(x-3)(x+4)$

3. $(x-2)(x-5)$

4. $(x+6)(x-3)$

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

6. $(x-1)(x-8)$

7. $(x+4)(x-6)$

8. $(x-3)(x-9)$

9. $(x-5)(x-2)$

Build Tasks — Answers

1. $x^2 + 3x - 10$

2. $x^2 + x - 12$

3. $x^2 - 7x + 10$

4. $x^2 + 3x - 18$

5. $x^2 + 3x - 28$

6. $x^2 - 9x + 8$

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

8. $x^2 - 12x + 27$

9. $x^2 - 7x + 10$

Build Tasks

10. $(x+8)(x-4)$

11. $(x-6)(x+5)$

12. $(x-7)(x+2)$

13. $(2x+1)(x+3)$

14. $(3x+2)(x+4)$

15. $(2x-1)(x+5)$

16. $(3x-2)(x-3)$

17. $(4x+1)(x+2)$

18. $(2x+3)(x-4)$

Build Tasks — Answers

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

11. $x^2 - x - 30$

12. $x^2 - 5x - 14$

13. $2x^2 + 7x + 3$

14. $3x^2 + 14x + 8$

15. $2x^2 + 9x - 5$

16. $3x^2 - 11x + 6$

17. $4x^2 + 9x + 2$

18. $2x^2 - 5x - 12$

Build Tasks

19. $(5x-1)(x+2)$

20. $(3x+4)(2x+1)$

21. $(2x+5)(x-3)$

22. $(4x-1)(x+6)$

23. $(3x-2)(2x+3)$

24. $(2x-3)(3x-1)$

25. $(5x+2)(x-4)$

26. Fill blank:
$(x+3)(x+4) =$
$x^2+7x+\square$

27. Fill blank:
$(x-2)(x+5) =$
$x^2+3x-\square$

Build Tasks — Answers

19. $5x^2 + 9x - 2$

20. $6x^2 + 11x + 4$

21. $2x^2 - x - 15$

22. $4x^2 + 23x - 6$

23. $6x^2 + 5x - 6$

24. $6x^2 - 11x + 3$

25. $5x^2 - 18x - 8$

26. 12

27. 10

Push Tasks

1. $(2x + 1)(3x + 2)$

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

3. $(5x + 2)(2x - 3)$

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

5. $(2x + 5)(3x - 4)$

6. $(6x + 1)(x + 2)$

7. $(3x + 4)(2x - 5)$

8. $(5x - 3)(x + 4)$

9. $(2x - 5)(4x + 3)$

Push Tasks — Answers

1. $6x^2 + 7x + 2$

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

3. $10x^2 - 11x - 6$

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

5. $6x^2 + 7x - 20$

6. $6x^2 + 13x + 2$

7. $6x^2 - 7x - 20$

8. $5x^2 + 17x - 12$

9. $8x^2 - 14x - 15$

Push Tasks

10. $(7x + 2)(x - 1)$

11. $(3x - 4)(3x + 4)$

12. $(2x + 5)(2x - 5)$

13. $(x + 4)^2$

14. $(2x - 3)^2$

15. $(3x + 1)^2$

16. $(5x - 2)^2$

17. Expand and simplify
$(x + 2)(x + 3) + 5$

18. Expand and simplify
$(2x - 1)(x + 4) - 3x$

Push Tasks — Answers

10. $7x^2 - 5x - 2$

11. $9x^2 - 16$

12. $4x^2 - 25$

13. $x^2 + 8x + 16$

14. $4x^2 - 12x + 9$

15. $9x^2 + 6x + 1$

16. $25x^2 - 20x + 4$

17. $x^2 + 5x + 11$

18. $2x^2 + 7x - 4$

Push Tasks

19. Find missing
$\square(x+3)(x+4) =$
$x^2 + 7x + 12$

20. Find missing
$(x+\square)(x+5) =$
$x^2 + 7x + 10$

21. Find missing
$(x-2)(x+\square) =$
$x^2 + 3x - 10$

22. True or false:
$(x+3)^2 = x^2 + 9$?

23. True or false:
$(x-4)(x+4) =$
$x^2 - 8x - 16$?

24. True or false:
$(2x+1)(x+3) =$
$2x^2 + 7x + 3$?

25. Rectangle: $(x+2)$ by $(x+5)$. Write area as expanded expression.

26. Rectangle: $(2x+1)$ by $(x+4)$. Write area as expanded expression.

27. Which does not belong: $(x+1)(x+3)$, x^2+4x+3, $(x+2)^2-1$, $(x+2)(x+2)+1$?

Push Tasks — Answers

19. 1

20. 2

21. 5

22. False ($x^2 + 6x + 9$)

23. False ($x^2 - 16$)

24. True

25. $x^2 + 7x + 10$

26. $2x^2 + 9x + 4$

27. $(x + 2)(x + 2) + 1$
(others all expand to $x^2 + 4x + 3$**)**