Factorising single brackets

Mana Maths

Te reo Māori terms

whakatauwehe
factorise
Open in Te Aka

tauwehe
factor
Open in Te Aka

tauwehe pātahi nui rawa
highest common factor
Open in Te Aka

taiapa
bracket
Open in Te Aka

Notes & Steps

Key idea

Factorising is the reverse of expanding. Find the highest common factor (HCF) of all terms, write it outside the bracket, then put what's left inside. Expanding checks your answer.

Steps

1. Find the HCF of the coefficients (the numbers).
2. Find the HCF of the variables (lowest power of each letter).
3. Write the HCF outside the bracket: HCF$(\dots)$.
4. Divide each term by the HCF. Write the results inside.
5. Check: expand your answer — you should get back the original expression.

Examples

- $6x + 9$: HCF = 3, so $3(2x + 3)$
- $x^2 + 5x$: HCF = x, so $x(x + 5)$
- $2x^2 + 6x$: HCF = $2x$, so $2x(x + 3)$
- $4a - 10$: HCF = 2, so $2(2a - 5)$
- $-3x - 6$: HCF = -3, so $-3(x + 2)$
- $8y^2 - 12y$: HCF = $4y$, so $4y(2y - 3)$

Common mistake

Only factoring the coefficient and leaving the variable. Factorise $x^2 + 5x$ as $x(x + 5)$, not $x^2(1 + \frac{5}{x})$ or forgetting the x. Check by expanding!

Notes & Steps

Example 1: numbers only

Factorise $6x + 9$. HCF of 6 and 9 is 3.

$$3(2x + 3)$$

Check: $3 \times 2x + 3 \times 3 = 6x + 9$

Example 2: variable in common

Factorise $x^2 + 4x$. HCF of x^2 and $4x$ is x.

$$x(x + 4)$$

Check: $x \times x + x \times 4 = x^2 + 4x$

Example 3: both

Factorise $6x^2 + 9x$. HCF of $6x^2$ and $9x$ is $3x$.

$$3x(2x + 3)$$

Check: $3x \times 2x + 3x \times 3 = 6x^2 + 9x$

Example 4: negative

Factorise $-4x - 8$. HCF is -4.

$$-4(x + 2)$$

Check: $-4 \times x + (-4) \times 2 = -4x - 8$

Try these

1. Factorise $5x + 15$.
2. Factorise $x^2 + 7x$.
3. Factorise $6a^2 - 9a$.

Common mistake

Forgetting to check your answer. Always expand your factorised form to see if you get back the original expression. If not, find the right HCF.

Start Tasks

1. Factorise $2x + 6$

2. Factorise $3a + 12$

3. Factorise $4y + 8$

4. Factorise $5m + 10$

5. Factorise $6p + 12$

6. Factorise $2b + 8$

7. Factorise $3c + 15$

8. Factorise $7d + 14$

9. Factorise $4x + 8$

Start Tasks — Answers

1. $2(x + 3)$

2. $3(a + 4)$

3. $4(y + 2)$

4. $5(m + 2)$

5. $6(p + 2)$

6. $2(b + 4)$

7. $3(c + 5)$

8. $7(d + 2)$

9. $4(x + 2)$

Start Tasks

10. Factorise $5y + 20$

11. Factorise $2n + 10$

12. Factorise $3q + 18$

13. Factorise $6m + 18$

14. Factorise $4r + 12$

15. Factorise $7p + 21$

16. Factorise $2x + 14$

17. Factorise $3y + 24$

18. Factorise $5a + 25$

Start Tasks — Answers

10. $5(y + 4)$

11. $2(n + 5)$

12. $3(q + 6)$

13. $6(m + 3)$

14. $4(r + 3)$

15. $7(p + 3)$

16. $2(x + 7)$

17. $3(y + 8)$

18. $5(a + 5)$

Start Tasks

19. Factorise $8b + 16$

20. Factorise $4c + 28$

21. Factorise $6d + 30$

22. Factorise $9x + 18$

23. Factorise $3m + 27$

24. Factorise $5n + 30$

25. Factorise $2p + 16$

26. Factorise $7q + 28$

27. Factorise $4r + 24$

Start Tasks — Answers

19. $8(b + 2)$

20. $4(c + 7)$

21. $6(d + 5)$

22. $9(x + 2)$

23. $3(m + 9)$

24. $5(n + 6)$

25. $2(p + 8)$

26. $7(q + 4)$

27. $4(r + 6)$

Build Tasks

1. Factorise $x^2 + 3x$

2. Factorise $a^2 + 5a$

3. Factorise $2y^2 + 6y$

4. Factorise $3m^2 + 9m$

5. Factorise $4p^2 + 8p$

6. Factorise $5b^2 + 10b$

7. Factorise $x^2 - 4x$

8. Factorise $2a^2 - 6a$

9. Factorise $3y^2 - 12y$

Build Tasks — Answers

1. $x(x+3)$

2. $a(a+5)$

3. $2y(y+3)$

4. $3m(m+3)$

5. $4p(p+2)$

6. $5b(b+2)$

7. $x(x-4)$

8. $2a(a-3)$

9. $3y(y-4)$

Build Tasks

10. Factorise $6x - 9$

11. Factorise $4m - 10$

12. Factorise $8a - 12$

13. Factorise $9b - 15$

14. Factorise $-2x - 6$

15. Factorise $-3a + 12$

16. Factorise $-5y - 10$

17. Factorise $-4m + 8$

18. Factorise $-6p - 12$

Build Tasks — Answers

10. $3(2x - 3)$

11. $2(2m - 5)$

12. $4(2a - 3)$

13. $3(3b - 5)$

14. $-2(x + 3)$

15. $-3(a - 4)$

16. $-5(y + 2)$

17. $-4(m - 2)$

18. $-6(p + 2)$

Build Tasks

19. Factorise $10x - 25$

20. Factorise $14a + 21$

21. Factorise $12m - 18$

22. Factorise $-8a - 16$

23. Factorise $-7b + 14$

24. Factorise $-9c - 27$

25. Factorise $x^2 + 7x$

26. Expand to check: $2(x + 4)$

27. Expand to check: $3(2x - 1)$

Build Tasks — Answers

19. $5(2x - 5)$

20. $7(2a + 3)$

21. $6(2m - 3)$

22. $-8(a + 2)$

23. $-7(b - 2)$

24. $-9(c + 3)$

25. $x(x + 7)$

26. $2x + 8$

27. $6x - 3$

Push Tasks

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

2. Factorise $8a^2 + 12a$

3. Factorise $10y^2 - 15y$

4. Factorise $12m^2 + 18m$

5. Factorise $15p^2 - 20p$

6. Factorise $14b^2 + 21b$

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

8. Factorise $6a^2 - 9a + 3$

9. Factorise $8y^2 + 12y - 4$

Push Tasks — Answers

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

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

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

4. $6m(2m + 3)$

5. $5p(3p - 4)$

6. $7b(2b + 3)$

7. $2(2x^2 + 3x - 1)$

8. $3(2a^2 - 3a + 1)$

9. $4(2y^2 + 3y - 1)$

Push Tasks

10. Factorise
$9m^2 - 12m$

11. Factorise
$16p^2 + 24p$

12. Factorise
$20q^2 - 25q$

13. Factorise $2x^2y + 4xy$

14. Factorise
$3a^2b - 6ab$

15. Factorise
$5m^2n + 10mn$

16. Factorise
$4p^2q - 8pq$

17. Find missing:
$2(x + 3) = \square$ (expand)

18. Find missing:
$\square(x + 4) = 3x + 12$

Push Tasks — Answers

10. $3m(3m - 4)$

11. $8p(2p + 3)$

12. $5q(4q - 5)$

13. $2xy(x + 2)$

14. $3ab(a - 2)$

15. $5mn(m + 2)$

16. $4pq(p - 2)$

17. $2x + 6$

18. 3

Push Tasks

19. Find missing:
$5(\square + 2) = 5x + 10$

20. Find missing:
$-3(y - \square) = -3y + 6$

21. Find missing:
$4(2x + \square) = 8x + 12$

22. Find missing:
$\square(3a - 2) = 12a - 8$

23. True or false:
$3x + 6 = 3(x + 2)$?

24. True or false:
$4a - 8 = 4(a - 8)$?

25. True or false:
$x^2 + 5x = x(x + 5)$?

26. True or false:
$2x - 4 = 2(x - 4)$?

27. A rectangle has area $6x + 9$. Write possible length and width.

Push Tasks — Answers

19. x

20. 2

21. 3

22. 4

23. **True**

24. **False (**$4(a-2)$**)**

25. **True**

26. **False (**$2(x-2)$**)**

27. $3(2x+3)$ **or** $(3)(2x+3)$