Distributive Property Worksheet

Algebra 1 · expand, combine like terms, solve and factor

Name _____ **Date** _____ **Score** _____ **/ 38**

THE RULE

The number outside the brackets multiplies **every** term inside: $a(b+c) = ab + ac$ and $a(b-c) = ab - ac$.

1. Multiply the outside term by the first term inside, then by the second.
2. Carry the sign. A negative outside changes the sign of *each* term inside.
3. A minus sign in front of a bracket is -1: $-(4x-3) = -4x+3$.

WORKED EXAMPLE — simplify $4(x+3) - 2(x-1)$

Step 1. Distribute the 4: $4x + 12$

Step 2. Distribute the -2 — both signs change: $-2x + 2$

Step 3. Put it together: $4x + 12 - 2x + 2$

Step 4. Combine like terms: $\mathbf{2x + 14}$

SECTION A Use the distributive property

Expand each expression. Write your answer with no brackets.

1 $3(x+4)$

_____

= _____

2 $5(2x-3)$

_____

= _____

3 $-2(x-6)$

_____

= _____

4 $-4(3x+5)$

_____

= _____

5 $-(7x-2)$

_____

= _____

6 $\frac{1}{2}(8x+6)$

_____

= _____

7 $x(x+9)$

_____

= _____

8 $2x(3x-4)$

_____

= _____

THE MISTAKE TO AVOID

Multiplying only the first term. $3(x+4)$ is $3x+12$, not $3x+4$. And with a negative outside, the second sign flips too: $-2(x-6) = -2x+12$, not $-2x-12$.

Practise free online: ► Multi-Step Equations Worksheet ► Literal Equations Worksheet ► Math Worksheets

© notesofmath.com — CC BY-NC-SA 4.0

By Abu Abdul Rahman, NotesOfMath. Free to copy, print and adapt for non-commercial educational use, with attribution — CC BY-NC-SA 4.0: creativecommons.org/licenses/by-nc-sa/4.0/

Distributive Property Worksheet

Distributive property and combining like terms

SECTION B Distribute, then combine like terms

Remove the brackets first. Then add the x terms together and the number terms together.

9 $3(x + 2) + 4x$

=

10 $5(2x - 1) - 3x + 7$

=

11 $4(x + 3) - 2(x - 1)$

=

12 $-3(2x - 4) + 6x - 5$

=

13 $2(3x + 1) + 3(x - 4)$

=

14 $7x - 2(x + 5)$

=

15 $6 - (3x - 2) + x$

=

16 $\frac{1}{2}(6x + 4) + 2(x - 3)$

=

LIKE TERMS

Like terms have the same letter to the same power. $3x$ and $-5x$ are like terms; $3x$ and $3x^2$ are not, and neither are $3x$ and 3. Only like terms can be added together.

Practise free online: ► Multi-Step Equations Worksheet ► Literal Equations Worksheet ► Math Worksheets

© notesofmath.com — CC BY-NC-SA 4.0

By Abu Abdul Rahman, NotesOfMath. Free to copy, print and adapt for non-commercial educational use, with attribution — CC BY-NC-SA 4.0: creativecommons.org/licenses/by-nc-sa/4.0/

Distributive Property Worksheet

Solving equations with the distributive property

SECTION C Solve each equation

Distribute, combine like terms on each side, then solve. Two of these do not have a single answer — say why.

17 $3(x + 4) = 27$

$x =$ _____

18 $2(3x - 5) = 14$

$x =$ _____

19 $-4(x - 2) = 20$

$x =$ _____

20 $5(x + 1) - 2x = 17$

$x =$ _____

21 $3(2x - 1) + 4 = 25$

$x =$ _____

22 $6 - 2(x - 4) = 4$

$x =$ _____

23 $\frac{1}{2}(8x - 6) = 13$

$x =$ _____

24 $2(x + 3) = 4(x - 1)$

$x =$ _____

25 $4(2x + 1) - 3(x - 2) = 25$

$x =$ _____

26 $3(x - 2) + 5 = 2(x + 4)$

$x =$ _____

27 $2(x + 3) = 2x + 6$

$x =$ _____

28 $3(x - 1) = 3x + 5$

$x =$ _____

WHEN THE *x* TERMS CANCEL

If the x terms disappear, look at what is left. A true statement such as $6 = 6$ means **every** number is a solution. A false statement such as $-3 = 5$ means there is **no** solution.

© notesofmath.com — CC BY-NC-SA 4.0

By Abu Abdul Rahman, NotesOfMath. Free to copy, print and adapt for non-commercial educational use, with attribution — CC BY-NC-SA 4.0: creativecommons.org/licenses/by-nc-sa/4.0/

Distributive Property Worksheet

Factoring in reverse · word problems

SECTION D Factor out the greatest common factor

The distributive property backwards: find the largest factor every term shares and take it outside the brackets.

29 $6x + 12$

= _____

30 $15x - 10$

= _____

31 $9a - 27$

= _____

32 $12y + 18z$

= _____

33 $8x^2 + 4x$

= _____

34 $-4x - 20$

= _____

SECTION E Word problems

Write an equation with brackets, distribute, then solve. Answer in a sentence.

35 A rectangle is 5 cm longer than it is wide. Its perimeter is 38 cm. Write $2(w + w + 5) = 38$ and find the width w.

Answer _____

36 Four friends each pay \$$p$ for a concert ticket plus a \$3 booking fee each. Together they pay \$52. Write an equation and find p.

Answer _____

37 A teacher buys 3 boxes of markers. Each box has n markers plus 2 bonus markers. She gets 24 markers in all. Find n.

Answer _____

38 Five students each take n raffle tickets to sell. Each one returns 2 unsold, and together they sell 35. Find n.

Answer _____

Ready for longer equations? The multi-step equations worksheet on notesofmath.com has equations with brackets on both sides and fractions.

© notesofmath.com — CC BY-NC-SA 4.0

By Abu Abdul Rahman, NotesOfMath. Free to copy, print and adapt for non-commercial educational use, with attribution — CC BY-NC-SA 4.0: creativecommons.org/licenses/by-nc-sa/4.0/

Answer Key

Every answer checked: expanded back, solved independently and substituted in.

SECTION A Use the distributive property

1. $3(x+4)$
$= 3x + 12$

2. $5(2x-3)$
$= 10x - 15$

3. $-2(x-6)$
$= -2x + 12$

4. $-4(3x+5)$
$= -12x - 20$

5. $-(7x-2)$
$= -7x + 2$

6. $\frac{1}{2}(8x+6)$
$= 4x + 3$

7. $x(x+9)$
$= x^2 + 9x$

8. $2x(3x-4)$
$= 6x^2 - 8x$

SECTION B Distribute, then combine like terms

9. $3(x+2)+4x$
$= 3x + 6 + 4x$
$= 7x + 6$

10. $5(2x-1)-3x+7$
$= 10x - 5 - 3x + 7$
$= 7x + 2$

11. $4(x+3)-2(x-1)$
$= 4x + 12 - 2x + 2$
$= 2x + 14$

12. $-3(2x-4)+6x-5$
$= -6x + 12 + 6x - 5$
$= 7$

13. $2(3x+1)+3(x-4)$
$= 6x + 2 + 3x - 12$
$= 9x - 10$

14. $7x-2(x+5)$
$= 7x - 2x - 10$
$= 5x - 10$

15. $6-(3x-2)+x$
$= 6 - 3x + 2 + x$
$= 8 - 2x$

16. $\frac{1}{2}(6x+4)+2(x-3)$
$= 3x + 2 + 2x - 6$
$= 5x - 4$

SECTION D Factor out the greatest common factor

29. $6x + 12$
$= 6(x+2)$

30. $15x - 10$
$= 5(3x-2)$

31. $9a - 27$
$= 9(a-3)$

32. $12y + 18z$
$= 6(2y+3z)$

33. $8x^2 + 4x$
$= 4x(2x+1)$

34. $-4x - 20$
$= -4(x+5)$

© notesofmath.com — CC BY-NC-SA 4.0

By Abu Abdul Rahman, NotesOfMath. Free to copy, print and adapt for non-commercial educational use, with attribution — CC BY-NC-SA 4.0: creativecommons.org/licenses/by-nc-sa/4.0/

Answer Key

Solving equations and word problems, with working

SECTION C Solve each equation

17. $3(x+4)=27$

$3x+12=27$

$3x=15$

$x=5$

18. $2(3x-5)=14$

$6x-10=14$

$6x=24$

$x=4$

19. $-4(x-2)=20$

$-4x+8=20$

$-4x=12$

$x=-3$

20. $5(x+1)-2x=17$

$5x+5-2x=17$

$3x+5=17$

$3x=12$

$x=4$

21. $3(2x-1)+4=25$

$6x-3+4=25$

$6x+1=25$

$6x=24$

$x=4$

22. $6-2(x-4)=4$

$6-2x+8=4$

$14-2x=4$

$-2x=-10$

$x=5$

23. $\frac{1}{2}(8x-6)=13$

$4x-3=13$

$4x=16$

$x=4$

24. $2(x+3)=4(x-1)$

$2x+6=4x-4$

$10=2x$

$x=5$

25. $4(2x+1)-3(x-2)=25$

$8x+4-3x+6=25$

$5x+10=25$

$5x=15$

$x=3$

26. $3(x-2)+5=2(x+4)$

$3x-6+5=2x+8$

$3x-1=2x+8$

$x=9$

27. $2(x+3)=2x+6$

$2x+6=2x+6$

Both sides are the same: every number works (infinitely many solutions).

28. $3(x-1)=3x+5$

$3x-3=3x+5$

$-3=5$ **is never true: no solution.**

SECTION E Word problems

35. $2(w+w+5)=38$

$4w+10=38$

$4w=28$

$w=7$

So width = 7 cm.

36. $4(p+3)=52$

$4p+12=52$

$4p=40$

$p=10$

So each ticket costs $10.

37. $3(n+2)=24$

$3n+6=24$

$3n=18$

$n=6$

So 6 markers in each box.

38. $5(n-2)=35$

$5n-10=35$

$5n=45$

$n=9$

So each student took 9 tickets.

© notesofmath.com — CC BY-NC-SA 4.0

By Abu Abdul Rahman, NotesOfMath. Free to copy, print and adapt for non-commercial educational use, with attribution — CC BY-NC-SA 4.0: creativecommons.org/licenses/by-nc-sa/4.0/