

GRADE 6 · EXPRESSIONS & EQUATIONS · ANSWER KEY

EXPANDING & FACTORING EXPRESSIONS

Today's goal: I can apply the distributive property to expand simple expressions and apply the distributive property to factor simple expressions.



How to use this key. Problem numbers match the student sheets. Each answer shows the steps and the slip Mr DJ sees most, so a wrong answer tells you what to reteach. Pepper levels: **Mild** warm-up, **Medium** stretch, **Spicy** challenge, **Extra Spicy** big brain.

Practice

8 problems + Mr DJ's worked example

Use: During the lesson after the mini-lesson/deck. Item 8 mirrors the numeric version in the “Factoring with the distributive property” lesson — same distinction, now with a variable. **Timing:** 15–25 min · pairs or independent · circulate on 7–9. Items 1–3 fluency, 4–6 application, 7–9 reasoning. The multiply-back check should become automatic.

1 $2x + 14$ **2** $4x + 8$ **3** $7x + 21$ **4** $4(2x + 3)$ **5** $5(2x + 5)$ **6** $5(3x + 4)$; expanding gives $15x + 20$ ✓

7 $6x + 12$; both give 66 **8** True, but NOT fully factored — the GCF is 12, giving $12(2x + 3)$

1 **MILD** Expand $2(x + 7)$?

$$2x + 14$$

1. $2 \cdot x = 2x$; $2 \cdot 7 = 14$.

Watch for: Answered $2x + 7$ — first term only.

2 **MILD** Expand $4(x + 2)$?

$$4x + 8$$

1. $4 \cdot x = 4x$; $4 \cdot 2 = 8$.

Watch for: Answered $4x + 2$.

3 **MEDIUM** Expand $7(x + 3)$?

$$7x + 21$$

1. $7 \cdot x = 7x$; $7 \cdot 3 = 21$.

Watch for: Answered $7x + 3$.

4 **MEDIUM** Factor $8x + 12$?

$$4(2x + 3)$$

1. GCF(8, 12) = 4.

2. $8x \div 4 = 2x$; $12 \div 4 = 3$.

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

Watch for: Used $2 \rightarrow 2(4x + 6)$; 4 and 6 still share a factor of 2, so it is not finished.

5 **MEDIUM** Factor $10x + 25$?

$5(2x + 5)$

1. $\text{GCF}(10, 25) = 5$.
2. $10x \div 5 = 2x$; $25 \div 5 = 5$.

Watch for: Divided only one term, giving $5(2x + 25)$.

6 **SPICY** Factor $15x + 20$ and check?

$5(3x + 4)$; expanding gives $15x + 20$ ✓

1. $\text{GCF}(15, 20) = 5$.
2. $15x \div 5 = 3x$; $20 \div 5 = 4 \rightarrow 5(3x + 4)$.
3. Check: $5 \cdot 3x = 15x$ and $5 \cdot 4 = 20$. Matches the original.

Watch for: Skipped the check. Expanding back catches a wrong GCF instantly.

7 **SPICY** Expand $6(x + 2)$ and test at $x = 9$?

$6x + 12$; both give 66

1. Expansion: $6 \cdot x + 6 \cdot 2 = 6x + 12$.
2. Original at $x = 9$: $6(9 + 2) = 6(11) = 66$.
3. Expansion at $x = 9$: $6(9) + 12 = 54 + 12 = 66$. Equal, so the expansion is right.

Watch for: Evaluated only one side, so the check proved nothing. Both sides must be evaluated.

8 **EXTRA SPICY** Sam: $24x + 36 = 4(6x + 9)$?

True, but NOT fully factored — the GCF is 12, giving $12(2x + 3)$

1. Check: $4 \cdot 6x = 24x$ and $4 \cdot 9 = 36$, so the equation is TRUE.
2. But 6 and 9 still share a factor of 3.
3. $\text{GCF}(24, 36) = 12 \rightarrow 12(2x + 3)$, where 2 and 3 share nothing.

Watch for: Marked it simply right or simply wrong. Both things are true at once: valid equation, unfinished factoring.

Homework

7 problems + Mr DJ's worked example

Use: Parallels the practice sheet one-to-one. **Timing:** ~15 min at home · independent · review item 7 as the next-day warm-up.

1 $5x + 15$ **2** $3x + 24$ **3** $9x + 9$ **4** $3(3x + 5)$ **5** $7(2x + 3)$ **6** $10(2x + 3)$; expanding gives $20x + 30$ ✓

7 True, but NOT fully factored — the GCF is 9, giving $9(2x + 3)$

1 **MILD** Expand $5(x + 3)$?

$5x + 15$

1. $5 \cdot x = 5x$; $5 \cdot 3 = 15$.

Watch for: Answered $5x + 3$.

2 **MILD** Expand $3(x + 8)$?

$3x + 24$

1. $3 \cdot x = 3x$; $3 \cdot 8 = 24$.

Watch for: Answered $3x + 8$.

3 **MEDIUM** Expand $9(x + 1)$?

$9x + 9$

1. $9 \cdot x = 9x$; $9 \cdot 1 = 9$.

Watch for: Answered $9x + 1$ — forgot that $9 \cdot 1 = 9$.

4 **MEDIUM** Factor $9x + 15$?

$3(3x + 5)$

1. $\text{GCF}(9, 15) = 3$.
2. $9x \div 3 = 3x$; $15 \div 3 = 5$.

Watch for: Divided one term only, giving $3(3x + 15)$.

5 **MEDIUM** Factor $14x + 21$?

$7(2x + 3)$

1. $\text{GCF}(14, 21) = 7$.
2. $14x \div 7 = 2x$; $21 \div 7 = 3$.

Watch for: Missed 7 as a factor and left it unfactored, or used a smaller factor.

6 **SPICY** Factor $20x + 30$ and check?

$10(2x + 3)$; expanding gives $20x + 30$ ✓

1. $\text{GCF}(20, 30) = 10$.
2. $20x \div 10 = 2x$; $30 \div 10 = 3 \rightarrow 10(2x + 3)$.
3. Check: $10 \cdot 2x = 20x$; $10 \cdot 3 = 30$. Matches.

Watch for: Used $5 \rightarrow 5(4x + 6)$; 4 and 6 still share a factor of 2.

7 **SPICY** Dani: $18x + 27 = 3(6x + 9)$?

True, but NOT fully factored — the GCF is 9, giving $9(2x + 3)$

1. Check: $3 \cdot 6x = 18x$ and $3 \cdot 9 = 27$, so the equation is TRUE.
2. But 6 and 9 still share a factor of 3.
3. $\text{GCF}(18, 27) = 9 \rightarrow 9(2x + 3)$.

Watch for: Called it wrong (the equation is valid) or called it finished (it is not).

Exit Ticket

4 problems

Use: End of the distributive-property lesson. 5–8 min, independent. Builds on numeric factoring (the “Factoring with the distributive property” sheet (Grade 6)). **Timing:** 5–8 min · independent. Item 4 teaches the substitution check, which students can use to grade their own work all year.

1 $3x + 12$

2 $10x + 15$

3 $3(2x + 3)$

4 Wrong — substituting $x = 5$ gives 27 on the left and 19 on the right; the answer is $3x + 12$

1 **MILD** Expand $3(x + 4)$?

$3x + 12$

1. Multiply the 3 by EACH term inside.
2. $3 \cdot x = 3x$ and $3 \cdot 4 = 12$.
3. $3x + 12$.

Watch for: Answered $3x + 4$ — distributed to the first term only. The outside factor reaches everything inside.

2 **MEDIUM** Expand $5(2x + 3)$?

$10x + 15$

1. $5 \cdot 2x = 10x$.
2. $5 \cdot 3 = 15$.
3. $10x + 15$.

Watch for: Answered $10x + 3$ (first term only) or $7x + 8$ (added instead of multiplying).

3 **MEDIUM** Factor $6x + 9$?

$3(2x + 3)$

1. GCF of 6 and 9 is 3.
2. $6x \div 3 = 2x$ and $9 \div 3 = 3$.
3. $3(2x + 3)$. Check: $3 \cdot 2x = 6x$, $3 \cdot 3 = 9$. ✓

Watch for: Used a common factor that is not the greatest, or divided only one term.

4 **SPICY** Priya: $3(x + 4) = 3x + 4$?

Wrong — substituting $x = 5$ gives 27 on the left and 19 on the right; the answer is $3x + 12$

1. Left: $3(5 + 4) = 3(9) = 27$.
2. Her right side: $3(5) + 4 = 15 + 4 = 19$. Not equal, so it is wrong.
3. Correct expansion: $3(5) + 3(4) = 15 + 12 = 27$. ✓ The 3 must multiply BOTH terms.

Watch for: Accepted her equation because it ‘looks close.’ Substituting a value is the fastest way to test any claimed equivalence.

Slide	Time	What to do
1	0:00	Frame the skill: one property, used in both directions.
2	1:00	Hook — poll yes/no. Do NOT resolve. Distributing to the first term only is the dominant error.
3	3:00	Name the rule: EVERY term. Draw arrows from the outside number to each inside term.
4	5:00	WE1 — resolve the hook by substitution rather than assertion. Teach this as their self-checking tool.
5	7:00	WE2 — factoring as the reverse. Connect explicitly to the numeric factoring skill (the “Factoring with the distributive property” lesson); the only new thing is the variable.
6	11:00	True vs fully factored — same distinction as the “Factoring with the distributive property” lesson. Ask for the shared factor that proves it is unfinished.
7		Show the problem and the slip. Pairs: what went wrong, and what is the right answer? Take two answers before moving on.
8		Solve it together, one step at a time. It is also the worked example at the top of the practice sheet, so students can look back at it.
9	9:00	CFU — all-student response. Answers $10x + 15$ and $4(2x + 3)$. Watch for $10x + 3$. Whiteboards: everyone tries Mild, then climbs. These are #1, #3, #6 on the practice sheet.
10		Fingers up: 3 = got it, 2 = almost, 1 = not yet. Pull the 1s for a quick reteach while everyone else starts the practice sheet.
11	13:00	Launch the in-class practice sheet. Launch the practice sheet. Exit ticket in the last 5–8 minutes.