

GRADE 6 · EXPRESSIONS & EQUATIONS · ANSWER KEY

EXPRESSIONS WITH VARIABLES

Today's goal: I can write numerical expressions in which letters stand for numbers and evaluate numerical expressions in which letters stand for numbers.



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 7 deliberately rewards a shortcut that IS valid, then names its limit — a useful counterweight to items where shortcuts fail. **Timing:** 15–25 min · pairs or independent · circulate on 7–9. Items 1–3 fluency, 4–6 application, 7–9 reasoning. Items 3 and 8 both test exponent scope.

- 1 24 2 8 3 12 4 7 5 37 6 $12 + 8h$; at $h = 3$ it is \$36
7 28 — and you actually CAN, because $2b + 2c = 2(b + c)$ 8 No — the answer is 12

1 **MILD** $4n$ at $n = 6$?

24

1. $4 \times 6 = 24$.

Watch for: Answered 46 — concatenated the digits.

2 **MILD** $n - 7$ at $n = 15$?

8

1. $15 - 7 = 8$.

Watch for: Subtracted in the wrong order ($7 - 15$).

3 **MEDIUM** $3y^2$ at $y = 2$?

12

- Substitute: $3(2)^2$.
- Exponent BEFORE multiplication: $(2)^2 = 4$.
- Then $3 \times 4 = 12$.

Watch for: Answered 36 — multiplied 3×2 first, then squared. The exponent attaches only to y , not to $3y$.

4 **MEDIUM** $(m + 4) \div 2$ at $m = 10$?

7

- Parentheses first: $(10 + 4) = 14$.
- $14 \div 2 = 7$.

Watch for: Answered 12 — divided only the 4 by 2 and ignored the parentheses.

5 **MEDIUM** $5p - 3$ at $p = 8$?

37

- $5(8) = 40$, then $40 - 3 = 37$.

Watch for: Answered 25 — subtracted first ($8 - 3 = 5$), then multiplied.

6 **SPICY** \$12 fee + \$8/hour, cost of 3 hours?

12 + 8h; at h = 3 it is \$36

- The fee is paid once: 12. The hourly charge repeats: 8h.
- Expression: $12 + 8h$.
- At $h = 3$: $12 + 8(3) = 12 + 24 = 36$.

Watch for: Wrote 20h (added the fee into the hourly rate), giving \$60. A one-time fee is a separate term, not part of the rate.

7  **SPICY** $2b + 2c$ at $b = 5$, $c = 9$; why not add first?

28 — and you actually CAN, because $2b + 2c = 2(b + c)$

1. $2(5) + 2(9) = 10 + 18 = 28$.
2. Adding first: $2(5 + 9) = 2(14) = 28$. Same answer.
3. These are equivalent by the distributive property — but only because BOTH terms have the same factor of 2.

Watch for: This item is a trap in the other direction: the shortcut IS valid here. It would fail for $2b + 3c$, where the coefficients differ.

8  **EXTRA SPICY** Riley: $3y^2$ at $y = 2$ gives 36?

No — the answer is 12

1. Riley computed $(3 \times 2)^2 = 6^2 = 36$.
2. But the exponent applies only to y : $3(2^2) = 3(4) = 12$.
3. If the whole thing were squared it would be written $(3y)^2$.

Watch for: Applied the exponent to the coefficient as well.
Notation matters: $3y^2$ and $(3y)^2$ are different expressions.

Homework

7 problems + Mr DJ's worked example

Use: Parallels the practice sheet. Item 7 is the mirror of practice item 7: there the shortcut worked, here it fails. The difference is whether the coefficients match. **Timing:** ~15 min at home · independent · review items 6–8 as the next-day warm-up.

1 42 **2** 11 **3** 18 **4** 4 **5** 37 **6** $15 + 6h$; at $h = 4$ it is \$39

7 26 — and here you cannot combine, because the coefficients differ

1  **MILD** $6n$ at $n = 7$?

42

1. $6 \times 7 = 42$.

Watch for: Answered 67 — concatenated.

2  **MILD** $n - 9$ at $n = 20$?

11

1. $20 - 9 = 11$.

Watch for: Reversed the subtraction.

3  **MEDIUM** $2y^2$ at $y = 3$?

18

1. Substitute: $2(3)^2$.
2. Exponent first: $3^2 = 9$.
3. Then $2 \times 9 = 18$.

Watch for: Answered 36 — computed $(2 \times 3)^2$. The exponent applies only to y .

4  **MEDIUM** $(m + 6) \div 4$ at $m = 10$?

4

1. Parentheses: $(10 + 6) = 16$. Then $16 \div 4 = 4$.

Watch for: Answered 11.5 — divided only the 6 by 4.

5 MEDIUM $7p - 5$ at $p = 6$?

37

1. $7(6) = 42$; $42 - 5 = 37$.

Watch for: Subtracted first: $7(6 - 5) = 7$.

6 SPICY \$15 fee + \$6/class, 4 classes?

15 + 6h; at h = 4 it is \$39

1. One-time fee 15, plus 6 per class: $15 + 6h$.

2. At $h = 4$: $15 + 6(4) = 15 + 24 = 39$.

Watch for: Wrote $21h$, giving \$84 — folded the one-time fee into the per-class rate.

7 SPICY $3b + 2c$ at $b = 4$, $c = 7$; why not add first?

26 — and here you cannot combine, because the coefficients differ

1. $3(4) + 2(7) = 12 + 14 = 26$.

2. Adding first would give $3(4 + 7) = 33$, which is wrong.

3. Only terms multiplied by the SAME number can be grouped that way; here one is tripled and one is doubled.

Watch for: Grouped anyway and answered 33. Contrast with $2b + 2c$, where the shared factor of 2 makes grouping valid.

Exit Ticket

4 problems

Use: End of the variable-expressions lesson. 5–8 min, independent. **Timing:** 5–8 min · independent. Item 2 is the order-of-operations trap; substituting in parentheses is the habit that prevents it.

1 20

2 14

3 10

4 $2(\ell + w)$ or $2\ell + 2w$; equals 20

1 MILD $5x$ at $x = 4$?

20

1. $5x$ means $5 \times x$.

2. $5 \times 4 = 20$.

Watch for: Answered 54 — read $5x$ as the digits placed together. Side by side means MULTIPLY.

2 MEDIUM $2 + 3x$ at $x = 4$?

14

1. Substitute: $2 + 3(4)$.

2. Multiply first: $3(4) = 12$.

3. Then add: $2 + 12 = 14$.

Watch for: Answered 20 — added $2 + 3$ first, then multiplied by 4. Order of operations still applies once the letter is replaced.

3 MEDIUM $x^2 + 1$ at $x = 3$?

10

1. Substitute: $(3)^2 + 1$.

2. Exponent first: $9 + 1 = 10$.

Watch for: Answered 7 — computed $(3 \times 2) + 1$, treating the exponent as a multiplier.

4 SPICY Perimeter expression, then $\ell = 7$, $w = 3$?

$2(\ell + w)$ or $2\ell + 2w$; equals 20

1. Perimeter adds all four sides: $\ell + w + \ell + w = 2(\ell + w)$.

2. Substitute: $2(7 + 3) = 2(10) = 20$.

3. Check with the other form: $2(7) + 2(3) = 14 + 6 = 20$. Same answer.

Watch for: Wrote $\ell \times w$ (that is AREA) or $\ell + w$ (only two sides). A perimeter is the distance all the way around.

Lesson slides

teaching notes & timing

Slide	Time	What to do
1	0:00	Frame the skill: letters stand for numbers; reading and evaluating both matter.
2	1:00	Hook — poll 14 vs 20. Do NOT resolve. The 20 answer is order-of-operations breaking down once a letter appears.
3	3:00	Two rules. The parentheses habit is the single highest-value thing here — it prevents both errors at once.
4	5:00	WE1 — resolve the hook. Write the parentheses explicitly on the board every time.
5	7:00	WE2 — exponent scope. Show $3y^2$ beside $(3y)^2$ so the difference is visible, not asserted.

6	11:00	Writing, not just evaluating. The fee-vs-rate distinction is the modelling idea that carries into the equations skills.
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. Answer 37. Watch for 25 (subtracted first). 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.