



Equivalent expressions

GRADE 6 MATH

Answer keys for the exit ticket, practice worksheet, and homework, plus notes for the lesson slides. Each answer shows the steps and the most likely wrong answer (“If wrong”), so you can tell what a mistake means, not just that it is one. Questions go from **fluency** to **application** to **reasoning**.

Exit Ticket — answer key

Use: End of the equivalence lesson. 5–8 min, independent. Builds on expanding (EE-03) and like terms (EE-04).

Timing: 5–8 min · independent. Item 1 is the near-miss pair that agrees at exactly one value — a student who answers yes tested once.

1. $3x$ vs $x + 2$ — equivalent? **FLUENCY**

Answer: **No**

1. At $x = 1$: $3(1) = 3$ and $1 + 2 = 3$. They agree.
2. At $x = 2$: $3(2) = 6$ but $2 + 2 = 4$. They disagree.
3. One matching value is not enough — they are NOT equivalent.

If wrong: Answered yes after testing only $x = 1$. This pair is designed to agree at exactly one value.

2. $2(x + 3)$ vs $2x + 6$? **APPLICATION**

Answer: **Yes — equivalent**

1. Distribute: $2(x + 3) = 2 \cdot x + 2 \cdot 3 = 2x + 6$.
2. The properties of operations turn one into the other, so they agree for every x .
3. Spot-check at $x = 5$: $2(8) = 16$ and $10 + 6 = 16$. ✓

If wrong: Said no because they ‘look different.’ Different form does not mean different value.

3. $4x + 2x$ vs $6x$? **APPLICATION**

Answer: **Yes — equivalent**

1. $4x$ and $2x$ are like terms: $4x + 2x = 6x$.
2. Combining like terms never changes the value, only the form.

If wrong: Said no, or wrote $6x^2$.

4. $3(x + 2)$ vs $3x + 2$, and the $x = 0$ trap? REASONING

Answer: **Not equivalent** — $3(x + 2) = 3x + 6$

1. Expand: $3(x + 2) = 3x + 6$, which is not $3x + 2$.
2. Test $x = 4$: $3(6) = 18$ versus $12 + 2 = 14$. Different.
3. At $x = 0$ they give 6 and 2 — actually different, so $x = 0$ catches this one. But $x = 0$ often hides errors because it erases every x term, so never rely on it alone.

If wrong: Tested a single convenient value. Zero and one are the two worst choices for a single test, because they collapse or equalise so many expressions.

Quick answers for fast checking:

#	Level	Answer
1	fluency	Not equivalent
2	application	Equivalent
3	application	Equivalent
4	reasoning	Not equivalent

Practice Worksheet — answer key

Use: During the lesson after the mini-lesson/deck. Items 1, 8 and 9 are all near-misses that agree at one convenient value; the point is that a single test is not evidence.

Timing: 15–25 min · pairs or independent · circulate on 7–9. Items 1–3 fluency, 4–6 application, 7–9 reasoning. Name the asymmetry out loud: one disagreement disproves, one agreement proves nothing.

1. $2x$ vs $5x$? FLUENCY

Answer: **Not equivalent**

1. At $x = 0$: both give 0 — they agree.
2. At $x = 3$: 6 versus 15 — they disagree.
3. Not equivalent.

If wrong: Answered yes after testing only $x = 0$, where every multiple of x collapses to 0.

2. $5(x + 1)$ vs $5x + 5$? FLUENCY

Answer: **Equivalent**

1. Distribute: $5 \cdot x + 5 \cdot 1 = 5x + 5$.

If wrong: Said no because the forms differ.

3. $x + x + x$ vs $3x$? FLUENCY

Answer: **Equivalent**

1. Three x 's added is 3 groups of x .

If wrong: Said no, or wrote x^3 .

4. $7x - 3x$ vs $4x$? APPLICATION

Answer: **Equivalent**

1. Like terms: $7x - 3x = 4x$.

If wrong: Said no; or answered 4 by dropping the variable.

5. $4(x + 1)$ vs $4x + 1$? APPLICATION

Answer: **Not equivalent**

1. Expand: $4(x + 1) = 4x + 4$, not $4x + 1$.
2. Test $x = 2$: $4(3) = 12$ versus $8 + 1 = 9$. Different.

If wrong: Said yes — distributed to the first term only, so the two forms looked identical.

6. $2x + 6$ vs $2(x + 3)$? APPLICATION

Answer: **Equivalent**

1. Factor $2x + 6$: the GCF is 2 $\rightarrow 2(x + 3)$.
2. Same expression, written two ways.

If wrong: Said no because one has parentheses.

7. $6x + 3$ vs $3(2x + 1)$ — two ways? REASONING

Answer: **Equivalent**

1. Way 1 — factor: GCF of $6x$ and 3 is $3 \rightarrow 3(2x + 1)$. Match.
2. Way 2 — substitute: at $x = 4$, $6(4) + 3 = 27$ and $3(9) = 27$; at $x = 1$, 9 and 9 . Agree at multiple values.
3. Both routes confirm it.

If wrong: Gave only one method, or tested a single value.

8. Ben: $2x$ and $5x$ equivalent because both are 0 at $x = 0$? REASONING

Answer: **Wrong** — $x = 0$ makes every term with x vanish

1. At $x = 0$ the x terms disappear, so nearly any pair of expressions like ax and bx will agree.
2. Testing $x = 3$ gives 6 versus 15 — clearly different.
3. One value can never prove equivalence; it can only DISPROVE it.

If wrong: Accepted a single test. Worth naming the asymmetry: one disagreement disproves equivalence, but one agreement proves nothing.

9. x^2 vs $2x$? REASONING

Answer: **Not equivalent**

1. At $x = 2$: 4 and 4 — they agree.
2. At $x = 3$: 9 versus 6 — they disagree.
3. Not equivalent. This pair agrees only at $x = 0$ and $x = 2$.

If wrong: Answered yes on the strength of the $x = 2$ coincidence.

Quick answers for fast checking:

#	Level	Answer
1	fluency	Not equivalent
2	fluency	Equivalent
3	fluency	Equivalent
4	application	Equivalent
5	application	Not equivalent
6	application	Equivalent
7	reasoning	Equivalent
8	reasoning	One value proves nothing
9	reasoning	Not equivalent

Homework — answer key

Use: Parallels the practice sheet. Item 8 asks students to articulate the logic rather than apply it — a good indicator of real understanding.

Timing: ~15 min at home · independent · review item 8 as the next-day warm-up; it is the reasoning the whole skill rests on.

1. $3(x + 4)$ vs $3x + 12$? FLUENCY

Answer: **Equivalent**

1. Distribute: $3 \cdot x + 3 \cdot 4 = 3x + 12$.

If wrong: Said no because the forms differ.

2. $5x + 2x$ vs $7x$? FLUENCY

Answer: **Equivalent**

1. Like terms: $5x + 2x = 7x$.

If wrong: Said no, or wrote $7x^2$.

3. $2(x + 5)$ vs $2x + 5$? APPLICATION

Answer: **Not equivalent**

1. Expand: $2(x + 5) = 2x + 10$, not $2x + 5$.

2. Test $x = 3$: $2(8) = 16$ versus $6 + 5 = 11$.

If wrong: Said yes — distributed to the first term only.

4. $8x + 4$ vs $4(2x + 1)$? APPLICATION

Answer: **Equivalent**

1. Factor $8x + 4$: GCF is 4 $\rightarrow 4(2x + 1)$.

If wrong: Said no because of the parentheses.

5. $4x$ vs $x + 3$? APPLICATION

Answer: **Not equivalent**

1. At $x = 1$: 4 and 4 — agree.

2. At $x = 2$: 8 versus 5 — disagree.

3. Not equivalent; they cross at exactly one value.

If wrong: Answered yes from the $x = 1$ coincidence.

6. $x + x$ vs $2x$? APPLICATION

Answer: **Equivalent**

1. Two x 's added is 2 groups of x .

If wrong: Said no, or wrote x^2 .

7. $9x - 4x$ vs $5x$ — two ways? REASONING

Answer: **Equivalent**

1. Way 1 — like terms: $9x - 4x = 5x$.
2. Way 2 — substitute: at $x = 2$, $18 - 8 = 10$ and $5(2) = 10$; at $x = 6$, $54 - 24 = 30$ and 30 . Agree.
3. Both confirm it.

If wrong: Gave one method only.

8. Why does one agreement prove nothing but one disagreement proves everything? REASONING

Answer: **Equivalent means equal for EVERY value, so a single counterexample breaks it while a single match cannot confirm all the others**

1. To be equivalent, two expressions must match at every possible value — infinitely many.
2. Checking one value leaves all the others untested, and near-miss pairs like $3x$ and $x + 2$ agree at exactly one point.
3. But if they differ at even one value, the 'every value' requirement already fails, so one counterexample is enough to disprove it.

If wrong: Treated the two directions as symmetric. Proving requires all values; disproving requires only one.

Quick answers for fast checking:

#	Level	Answer
1	fluency	Equivalent
2	fluency	Equivalent
3	application	Not equivalent
4	application	Equivalent
5	application	Not equivalent

6	application	Equivalent
7	reasoning	Equivalent
8	reasoning	Asymmetry of proof

Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then launch into the practice sheet. Slide numbers match the deck.

Slide	~Time	Note
1/8	0:00	Frame the skill: deciding sameness, with justification.
2/8	1:00	Hook — most will say the match settles it. Do NOT resolve. This is the misconception the whole lesson targets.
3/8	3:00	Define equivalence as an every-value claim, then give the two legitimate methods.
4/8	5:00	WE1 — resolve the hook with a second value. The pair was chosen to agree at exactly one point.
5/8	7:00	WE2 — why 0 and 1 are the worst single tests. Students default to them precisely because they are easy.
6/8	9:00	CFU — all-student response. Answer: equivalent, by distributing. Accept either justification method.
7/8	11:00	The asymmetry is the real logic of the standard. Say it plainly; it recurs in every later proof-style task.
8/8	13:00	Launch the in-class practice sheet.