



Rewriting expressions to reveal relationships

GRADE 7 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 rewriting lesson. 5–8 min, independent. Item 4 connects directly back to RP-04 and inverts its conclusion.

Timing: 5–8 min · independent. Item 3 is marked on the EXPLANATION; a correct restatement of the algebra is not an answer.

1. Price x up 5%, two ways, at $x = 200$ **APPLICATION**

Answer: $x + 0.05x$ and $1.05x$; \$210

1. Process form: $x + 0.05x$ — the original plus 5% of it.
2. Result form: $1x + 0.05x = 1.05x$.
3. At $x = 200$: $1.05 \times 200 = 210$. Check the long way: $200 + 0.05(200) = 200 + 10 = 210$.

If wrong: Wrote $0.05x$ alone, which is just the increase and not the new price. The original has to stay in.

2. Price x down 20%, single multiplication, at $x = 50$ **APPLICATION**

Answer: $0.8x$; \$40

1. $x - 0.20x = 0.80x$.
2. At $x = 50$: $0.8 \times 50 = 40$.
3. Check: 20% of 50 is 10, and $50 - 10 = 40$.

If wrong: Wrote $0.2x$, which is the amount removed rather than what remains. $100\% - 20\% = 80\%$ is what is left.

3. What does 1.05 tell you? REASONING

Answer: **That the new price is 105% of the old — a single scaling**

1. 1.05 is one number doing the whole job: multiply by it and you are finished.
2. It says the new price is 105% of the original, so the relationship is proportional with $k = 1.05$.
3. $x + 0.05x$ describes the STEPS you take; $1.05x$ describes the RELATIONSHIP between old and new.
4. The result form is what lets you chain changes together — you can multiply 1.05 by another factor, which you cannot easily do with the two-term form.
5. Both are correct. Which you write depends on what you want the reader to see.

If wrong: Said they are the same so it does not matter. They are equal in value and different in what they communicate, and choosing the informative one is the skill.

4. Up 25%, then down 20% — one multiplication REASONING

Answer: **$1.25 \times 0.80 = 1.00$ — the price returns exactly to the start**

1. Up 25% multiplies by 1.25. Down 20% multiplies by 0.80.
2. Together: $1.25 \times 0.80 = 1.00$, so the overall factor is 1.
3. The price ends exactly where it began. Check on \$80: $80 \times 1.25 = 100$, then $100 \times 0.8 = 80$.
4. The percents are unequal (25 and 20) yet they cancel exactly, because 0.80 is the reciprocal of 1.25.
5. Writing each change as a multiplier is what makes this visible — in the add-and-subtract form the cancellation is invisible.

If wrong: Expected a loss because RP-04 showed round trips usually lose. That happens with EQUAL percents; here the pair was chosen so the multipliers are reciprocals.

Quick answers for fast checking:

#	Level	Answer
1	application	$1.05x$; 210
2	application	$0.8x$; 40
3	reasoning	105% of the original
4	reasoning	factor 1.00, returns to start

Practice Worksheet — answer key

Use: During the lesson after the deck. Items 6–9 build compounding from scratch. Item 9's decomposition of 1.1×1.1 is worth writing on the board.

Timing: 15–25 min · pairs or independent · circulate on 7 and 9. The \$100 worked example makes the extra 1% concrete faster than the algebra does.

1. x up 10%? FLUENCY

Answer: **1.1x**

1. $x + 0.1x = 1.1x$.

If wrong: Wrote $0.1x$, the increase only.

2. At x = 300? FLUENCY

Answer: **330**

1. $1.1 \times 300 = 330$.

If wrong: Answered 30, the increase.

3. x down 15%? FLUENCY

Answer: **0.85x**

1. $x - 0.15x = 0.85x$.

If wrong: Wrote $0.15x$, the amount removed.

4. At x = 200? FLUENCY

Answer: **170**

1. $0.85 \times 200 = 170$.

If wrong: Answered 30, the reduction.

5. What does 0.85 tell you? **REASONING**

Answer: **That 85% of the original remains**

1. $0.85 = 85/100$, so the new amount is 85% of the old.
2. Removing 15% leaves 85%, because the parts must total 100%.
3. The multiplier form states directly what is LEFT, while 'decreased by 15%' states what was taken.
4. Same situation, opposite emphasis — which is exactly why rewriting is useful.

If wrong: Said 0.85 means it decreased by 0.85. The multiplier is what remains, not the size of the cut.

6. Up 10%, then up 10% again? **APPLICATION**

Answer: **$1.1 \times 1.1 = 1.21x$**

1. Each rise multiplies by 1.1.
2. Two rises: $1.1 \times 1.1 = 1.21$, so the overall factor is 1.21.

If wrong: Added the multipliers to get 2.2x, which would more than double the price.

7. Same as a single 20% rise? **REASONING**

Answer: **No — 1.21 against 1.20**

1. Two 10% rises give a factor of 1.21. A single 20% rise gives 1.20.
2. $1.21 \neq 1.20$, so they are not the same — the two rises give slightly more.
3. The reason: the second 10% is taken of the ALREADY INCREASED amount, so it is worth more than the first.
4. On \$100: after one rise, \$110. The second 10% is 10% of \$110 = \$11, not \$10. Total \$121, against \$120 for a single 20% rise.
5. This is the same 'percent of what?' idea as RP-04, now visible in the algebra.

If wrong: Answered yes because $10 + 10 = 20$. Percents applied in sequence multiply; they do not add.

8. Apply 1.21 to \$100 **APPLICATION**

Answer: **\$121**

1. $1.21 \times 100 = 121$.
2. Check the long way: $100 \rightarrow 110 \rightarrow 121$.

If wrong: Answered \$120 by using a 20% rise.

9. What single rise equals two 10% rises? REASONING

Answer: **21% — the extra 1% is 10% of the first 10%**

1. The combined factor is 1.21, and $1.21 = 1 + 0.21$, so it is a 21% rise.
2. Where the extra 1% comes from: the second rise applies to the original PLUS the first increase.
3. On \$100, the second 10% covers the original \$100 (giving \$10) and also the \$10 already added (giving \$1). That extra \$1 is the 21st percent.
4. In algebra: $1.1 \times 1.1 = 1 + 0.1 + 0.1 + 0.01$, where the final 0.01 is the increase-on-the-increase.
5. This compounding is why repeated percentage changes always exceed the simple sum.

If wrong: Answered 20%. The gap is small here but grows quickly — three 10% rises give 33.1%, not 30%.

Quick answers for fast checking:

#	Level	Answer
1	fluency	1.1x
2	fluency	330
3	fluency	0.85x
4	fluency	170
5	reasoning	85% remains
6	application	1.21x
7	reasoning	no — 1.21 vs 1.20
8	application	\$121
9	reasoning	21%, compounding

Homework — answer key

Use: Parallels the practice sheet but inverts the exit ticket: there, unequal percents cancelled exactly; here, equal ones do not. The multiplier form explains both.

Timing: ~15 min at home · independent · review item 8 beside the exit-ticket item 4 as the next-day warm-up.

1. x up 50%? FLUENCY

Answer: **1.5x**

1. $x + 0.5x = 1.5x$.

If wrong: Wrote 0.5x.

2. At x = 60? FLUENCY

Answer: **90**

1. $1.5 \times 60 = 90$.

If wrong: Answered 30, the increase.

3. x down 40%? FLUENCY

Answer: **0.6x**

1. $x - 0.4x = 0.6x$.

If wrong: Wrote 0.4x.

4. At x = 45? FLUENCY

Answer: **27**

1. $0.6 \times 45 = 27$.

If wrong: Answered 18, the reduction.

5. Up 50%, then halved? APPLICATION

Answer: **$1.5 \times 0.5 = 0.75x$**

1. Rise: multiply by 1.5. Halve: multiply by 0.5.

2. Together: $1.5 \times 0.5 = 0.75$.

If wrong: Answered 1x, assuming the two 50%s cancel.

6. What does 0.75 tell you? REASONING

Answer: **The final price is 75% of the start — a 25% overall decrease**

1. 0.75 means 75% of the original remains.
2. So the price ended 25% BELOW where it started, despite going up first.
3. The single number 0.75 captures the whole journey; you do not need to track the intermediate value.

If wrong: Said 0.75 means it fell by 75%. The multiplier is what remains, so the fall is 25%.

7. Apply to \$80 APPLICATION

Answer: **\$60**

1. $0.75 \times 80 = 60$.
2. Check step by step: $80 \rightarrow 120 \rightarrow 60$.

If wrong: Answered \$80, assuming a return to the start.

8. Why no return to the start? REASONING

Answer: **Because the 50% cut is taken of the raised price, which is larger**

1. The rise added 50% of \$80 = \$40, taking it to \$120.
2. The cut removed 50% of \$120 = \$60, which is more than the \$40 that was added.
3. A bigger cut than rise leaves you below the start: \$60 against \$80.
4. In multiplier terms: $1.5 \times 0.5 = 0.75$, and $0.75 \neq 1$, so the round trip does not close.
5. To undo a 50% rise you need to multiply by the RECIPROCAL of 1.5, which is $\frac{2}{3}$ — a cut of $33\frac{1}{3}\%$, not 50%.
6. Same principle as RP-04, now readable directly from the multipliers.

If wrong: Said the percents are equal so it should return. Equal percents of different amounts are different amounts of money, and the multipliers show it at a glance.

Quick answers for fast checking:

#	Level	Answer
1	fluency	1.5x
2	fluency	90
3	fluency	0.6x
4	fluency	27
5	application	0.75x

6	reasoning	75% remains, 25% down
7	application	\$60
8	reasoning	cut is of a larger amount

Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then the practice sheet. Connects the algebra of EE-01/02 to the percent reasoning of RP-04.

Slide	~Time	Note
1/8	0:00	Frame it: rewriting is not tidying. It is choosing what the expression says out loud.
2/8	1:00	Hook — poll whether the two forms differ. Do NOT resolve. ‘They’re the same’ is the answer to complicate.
3/8	3:00	Both forms, side by side, with what each communicates. Keep both visible.
4/8	5:00	WE1 — equal in value, different in message. This is the whole standard in one line.
5/8	7:00	WE2 — chaining. Multiplying factors is the payoff of the result form.
6/8	9:00	CFU — all-student response. $0.8x$. Watch for $0.2x$, which is the amount removed.
7/8	10:30	Decompose 1.1×1.1 on the board. The \$1 makes compounding concrete.
8/8	13:00	Launch the in-class practice sheet.