



Dependent & independent variables

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 dependent/independent lesson. 5–8 min, independent. Closes the G6 Expressions & Equations domain.

Timing: 5–8 min · independent. Item 4 asks for the reasoning behind the choice, not just the equation — that is where the understanding shows.

1. 55 mph; equation; d at t = 3? **FLUENCY**

Answer: **d = 55t; 165 miles**

1. You choose how long to drive, so t is independent.
2. Distance responds to time, so d is dependent: $d = 55t$.
3. At $t = 3$: $55(3) = 165$ miles.

If wrong: Wrote $t = 55d$ — backwards. The dependent variable goes alone on the left.

2. \$8 notebooks; equation; independent? **APPLICATION**

Answer: **c = 8n; n is independent**

1. You choose how many notebooks to buy, so n is independent.
2. Cost responds: $c = 8n$.
3. At $n = 6$, $c = \$48$.

If wrong: Wrote $n = 8c$. Ask which quantity you control — that one is independent.

3. Table for $y = 3x$? **APPLICATION**

Answer: **3, 6, 9, 12**

1. $x = 1 \rightarrow y = 3$; $x = 2 \rightarrow y = 6$; $x = 3 \rightarrow y = 9$; $x = 4 \rightarrow y = 12$.
2. Each step in x adds 3 to y.

If wrong: Added 3 to x instead of multiplying, giving 4, 5, 6, 7.

4. \$12/hour; equation; which depends? REASONING

Answer: $p = 12h$; h independent, p dependent

1. You choose the hours worked, so h is the independent variable.
2. Pay depends on hours: $p = 12h$. At $h = 7$, $p = \$84$.
3. The test: hours can change on their own, but pay only changes BECAUSE hours changed. The one that responds is dependent.

If wrong: Wrote $h = 12p$, or identified pay as independent. The causal direction decides it — working more causes more pay, not the reverse.

Quick answers for fast checking:

#	Level	Answer
1	fluency	$d = 55t$; 165
2	application	$c = 8n$; n independent
3	application	3, 6, 9, 12
4	reasoning	$p = 12h$

Practice Worksheet — answer key

Use: During the lesson after the mini-lesson/deck. Item 7 rewards testing every row of a table; item 8 shows that substituting one small value exposes a reversed equation.

Timing: 15–25 min · pairs or independent · circulate on 7–9. Items 1–3 fluency, 4–6 application, 7–9 reasoning. Require both variables to be named before the equation is written.

1. \$5 tickets; c at $t = 9$? FLUENCY

Answer: $c = 5t$; \$45

1. You choose t , cost responds: $c = 5t$. At $t = 9$: 45.

If wrong: Wrote $t = 5c$.

2. Table for $y = 4x$? FLUENCY

Answer: 4, 8, 12, 16

1. Multiply each x by 4.

If wrong: Added 4 to x , giving 5, 6, 7, 8.

3. 60 km/h; d at t = 4? **FLUENCY**

Answer: **d = 60t; 240 km**

1. $d = 60t$. At $t = 4$: 240.

If wrong: Wrote $t = 60d$.

4. 2.5 kg bricks; w at b = 6? **APPLICATION**

Answer: **w = 2.5b; 15 kg**

1. Weight depends on how many bricks: $w = 2.5b$.

2. At $b = 6$: $2.5(6) = 15$ kg.

If wrong: Wrote $b = 2.5w$, or added instead of multiplying.

5. \$15 visit + \$3/hour; c at h = 5? **APPLICATION**

Answer: **c = 15 + 3h; \$30**

1. The \$15 is charged once; the \$3 repeats per hour.

2. $c = 15 + 3h$. At $h = 5$: $15 + 15 = 30$.

If wrong: Wrote $c = 18h$ (\$90) — folded the call-out fee into the hourly rate.

6. $y = 7x$ at $x = 8$; which is dependent? **APPLICATION**

Answer: **y = 56; y is dependent**

1. $7(8) = 56$.

2. y is written in terms of x , so y depends on x .

If wrong: Said x is dependent. The variable standing alone on the left is the dependent one.

7. Table $x = 1, 2, 3 \rightarrow y = 6, 12, 18$; equation? **REASONING**

Answer: **y = 6x**

1. Each y is 6 times its x : $1 \rightarrow 6$, $2 \rightarrow 12$, $3 \rightarrow 18$.

2. y increases by 6 each time x increases by 1, and y is 0 when x is 0, so the rule is multiplication: $y = 6x$.

3. Check: $6(3) = 18$ ✓

If wrong: Wrote $y = x + 5$, which works for the first row only ($1 + 5 = 6$) but fails at $x = 2$ ($7 \neq 12$). Always test every row.

8. Maya: $t = 9e$ for eggs and trays? REASONING

Answer: **Backwards — should be $e = 9t$ (or $t = e \div 9$)**

1. Each tray holds 9 eggs, so $\text{eggs} = 9 \times \text{trays}$: $e = 9t$.
2. Maya's version says $\text{trays} = 9 \times \text{eggs}$, which would make 1 egg produce 9 trays.
3. Test it: 2 trays should give 18 eggs. $e = 9(2) = 18$ ✓ Her version gives $t = 9(2) = 18$ trays from 2 eggs, which is nonsense.

If wrong: Matched the letters to the order of the words instead of the meaning. Substituting a small number exposes a reversed equation immediately.

9. $y = x + 10$ at $x = 15$; how does it differ from $y = 10x$? REASONING

Answer: **$y = 25$; one ADDS 10, the other MULTIPLIES by 10**

1. $y = 15 + 10 = 25$.
2. In $y = x + 10$, each increase of 1 in x raises y by 1 — a constant shift of 10.
3. In $y = 10x$, each increase of 1 in x raises y by 10, and doubling x doubles y .
4. At $x = 15$ they give 25 versus 150 — very different relationships.

If wrong: Treated the two forms as interchangeable. Adding shifts every value; multiplying scales them.

Quick answers for fast checking:

#	Level	Answer
1	fluency	$c = 5t$; \$45
2	fluency	4, 8, 12, 16
3	fluency	$d = 60t$; 240
4	application	$w = 2.5b$; 15 kg
5	application	$c = 15 + 3h$; \$30
6	application	56; y dependent
7	reasoning	$y = 6x$
8	reasoning	$e = 9t$
9	reasoning	25; add vs multiply

Homework — answer key

Use: Parallels the practice sheet. Item 7 asks students to justify which variable goes on the left — the reasoning, not just the result.

Timing: ~15 min at home · independent · review item 7 as the next-day warm-up; the substitution sanity check is the transferable habit.

1. \$6 tickets; c at t = 7? **FLUENCY**

Answer: **c = 6t; \$42**

1. $c = 6t$. At $t = 7$: 42.

If wrong: Wrote $t = 6c$.

2. Table for $y = 5x$? **FLUENCY**

Answer: **5, 10, 15, 20**

1. Multiply each x by 5.

If wrong: Added 5, giving 6, 7, 8, 9.

3. 45 km/h; d at t = 6? **FLUENCY**

Answer: **d = 45t; 270 km**

1. $d = 45t$. At $t = 6$: 270.

If wrong: Wrote $t = 45d$.

4. 1.5 kg books; w at b = 8? **APPLICATION**

Answer: **w = 1.5b; 12 kg**

1. $w = 1.5b$. At $b = 8$: 12 kg.

If wrong: Wrote $b = 1.5w$, or added.

5. \$20 start + \$4/hour; c at h = 6? **APPLICATION**

Answer: **c = 20 + 4h; \$44**

1. Start fee once, hourly repeats: $c = 20 + 4h$.

2. At $h = 6$: $20 + 24 = 44$.

If wrong: Wrote $c = 24h$ (\$144) — folded the start fee into the rate.

6. $y = 9x$ at $x = 7$; which is independent? APPLICATION

Answer: $y = 63$; x is independent

1. $9(7) = 63$.
2. x is the one you choose, so x is independent and y responds.

If wrong: Said y is independent. The variable alone on the left is the dependent one.

7. 11 pens per pack; e at $d = 9$; which side? REASONING

Answer: $e = 11d$; 99 pens

1. You choose the number of packs, so d is independent.
2. Pens depend on packs: $e = 11d$. At $d = 9$: 99 pens.
3. The dependent variable — the one that responds — goes alone on the left.
4. Sanity check: 2 packs should give 22 pens. $e = 11(2) = 22$ ✓

If wrong: Wrote $d = 11e$, which would say 2 pens make 22 packs. Substituting a small number catches a reversed equation at once.

8. $y = x + 18$ at $x = 12$; versus $y = 18x$? REASONING

Answer: $y = 30$; one adds 18, the other multiplies by 18

1. $y = 12 + 18 = 30$.
2. In $y = x + 18$, every value of x is shifted up by 18 — a step of 1 in x gives a step of 1 in y .
3. In $y = 18x$, a step of 1 in x gives a step of 18 in y .
4. At $x = 12$ they give 30 versus 216.

If wrong: Treated addition and multiplication as interchangeable because both ‘make it bigger.’

Quick answers for fast checking:

#	Level	Answer
1	fluency	$c = 6t$; \$42
2	fluency	5, 10, 15, 20
3	fluency	$d = 45t$; 270
4	application	$w = 1.5b$; 12 kg
5	application	$c = 20 + 4h$; \$44
6	application	63; x independent
7	reasoning	$e = 11d$; 99

8	reasoning	30; add vs multiply
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Lesson slides — teaching notes & timing

Mini-lesson deck: ~12–15 min, then launch into the practice sheet. Closes the G6 Expressions & Equations domain. Slide numbers match the deck.

Slide	~Time	Note
1/8	0:00	Frame the skill: relating two quantities in an equation, a table and a graph.
2/8	1:00	Hook — poll the two forms. Do NOT resolve. Writing it backwards is the dominant error.
3/8	3:00	The two questions. ‘Which do I control?’ is the reliable test; causation, not word order.
4/8	5:00	WE1 — resolve the hook and model the small-number sanity check ($t = 2$ gives 110 miles; the reversed form gives nonsense).
5/8	7:00	WE2 — reading a table. Insist on checking every row; $y = x + 5$ fits row one of a $y = 6x$ table and fails immediately after.
6/8	9:00	CFU — all-student response. Answer $c = 8n$. Watch for $n = 8c$.
7/8	11:00	Additive versus multiplicative relationships. This distinction reappears throughout G7 proportionality.
8/8	13:00	Launch the practice sheet. This closes the Expressions & Equations domain.