

The Variable Villain

Expressions & One-Step Equations: Write and evaluate expressions with variables, create equivalent expressions using properties of operations, use substitution to test solutions, solve one-step equations, and write inequalities to represent real-world constraints.

Learning target: I can write and evaluate expressions and solve one-step equations using inverse operations.

Success looks like: Students use the vocabulary correctly, complete the mystery case, and score 80% or higher on the evidence-based exit ticket.

Materials: Student devices, the printed lesson worksheet (one per student), projector for the mini-lesson presenter.

LESSON AT A GLANCE

60 minutes

Time	Part	Teacher does	Students do
0:00-0:08	Warm-up	Project the warm-up. Circulate, then call on 2-3 students. Save question 3 for the debrief.	Answer Part 2 of the lesson worksheet; share with a partner.
0:08-0:20	Mini-lesson	Teach with the 4-step presenter. Run each quick check with the whole class.	Complete worksheet Parts 4-11 as each slide appears; answer checks with fingers.
0:20-0:48	Mystery Case	Launch The Variable Villain. Assign mission levels; circulate with the answer key.	Play solo or in pairs; record code pieces; complete any written evidence task.
0:48-0:52	Debrief	Ask 2 debrief questions and revisit warm-up question 3.	Finish worksheet Part 13 (prediction check + one thing learned).
0:52-1:00	Exit ticket	Hand out the exit ticket. Collect and sort with the mastery guide.	Answer with evidence independently.

Key vocabulary

Word	Student-friendly definition
Variable	A letter that stands for an unknown number.
Expression	Numbers, variables, and operations with no equal sign ($3x + 2$).
Equation	A statement that two expressions are equal ($3x + 2 = 11$).
Coefficient	The number multiplied by a variable (the 3 in $3x$).
Like terms	Terms with the same variable part ($4x$ and $2x$).
Inverse operations	Operations that undo each other (+ and -, $\times$ and $\div$).

1. WARM-UP

0:00–0:08 · 8 min

Warm-up expectations (post these): Answer in Part 2 of the lesson worksheet (or on this sheet). Number each answer to match the question. Answer in complete sentences. For math, show your work. Work silently for 5 minutes, then share with a partner for 2 minutes. Be ready to share one answer with the class.

#	Question	Look for
1	Evaluate: $3 + 4 \times 2$.	11 (multiply first).
2	A number plus 7 equals 15. What is the number? How did you figure it out?	8. I subtracted 7 from 15.
3	Write a word phrase for $n + 5$.	Examples: 5 more than a number; a number increased by 5.

2. MINI-LESSON

0:08–0:20 · 12 min

Project the Lesson presenter from the room page. It runs the whole hour: target and agenda, warm-up with timer, hook vote, 4 teaching steps (key idea, interactive tool, turn and talk, check for understanding), I do / we do / you do, a work-time screen with a timer and expectations, debrief, and the exit ticket. Press N for teacher notes, T to pause the timer, and P to pick a student.

Hook (1 min): I multiplied a number by 4 and got 36. What was my number? Class vote: 8 / 9 / 32

Step 1 (3 min): Words to expressions

Teach	"5 more than n" = $n + 5$. "3 times a number" = $3n$. "A number divided by 4" = $n/4$. Careful: "3 less than n" is $n - 3$.
Interactive tool	Flip cards: 5 more than n, twice a number, 7 less than x
Students do	Translate "5 more than n," "twice a number," and "7 less than x."
Turn and talk	Why is "3 less than n" written $n - 3$ and not $3 - n$?
Worksheet Part 5A	"3 LESS THAN N" is written $n - 3$, not $3 - n$.
Check for understanding	Which expression means "4 less than a number"? Answer: (B) $n - 4$

Step 2 (3 min): Evaluate

Teach	Substitute the value, then follow the order of operations (parentheses, exponents, multiply/divide, add/subtract).
Interactive tool	Board and notes
Students do	Evaluate $2n + 3$ when $n = 5$.

Turn and talk	What happens if you skip the order of operations when evaluating?
Worksheet Part 6A	To EVALUATE, substitute the value and follow the ORDER OF OPERATIONS.
Check for understanding	Evaluate $4(x - 2)$ when $x = 7$. Answer: 20

Step 3 (3 min): Equivalent expressions

Teach	Combine like terms: $4x + 2x = 6x$. Distributive property: $3(x + 2) = 3x + 6$.
Interactive tool	Board and notes
Students do	Simplify $5y + 2 + 3y$.
Turn and talk	Why can you combine $4x$ and $2x$ but not $4x$ and 2 ?
Worksheet Part 7A	Combine LIKE TERMS. The DISTRIBUTIVE property: $3(x + 2) = 3x + 6$.
Check for understanding	Which is equivalent to $2(x + 5)$? Answer: (B) $2x + 10$

Step 4 (3 min): Solve with balance

Teach	Solve one-step equations with inverse operations. Do the same thing to both sides to keep the balance. Check by substituting.
Interactive tool	Visual: $x + 4 = 10$
Students do	Solve $x + 4 = 10$ and check your answer.
Turn and talk	Why must you do the same operation to both sides of an equation?
Worksheet Part 8A	Use INVERSE OPERATIONS and do the same to BOTH SIDES.
Check for understanding	Solve: $x + 4 = 10$ Answer: 6

I do: worked example (shown one step at a time)

1. Problem: $x + 7 = 15$.
2. Step 1: x has 7 added to it.
3. Step 2: Undo +7 by subtracting 7 from BOTH sides: $x + 7 - 7 = 15 - 7$.
4. Step 3: $x = 8$.
5. Check: $8 + 7 = 15$ (correct)

What to say on every slide is in the presenter script PDF.

We do: guided practice

Solve and check: $5x = 45$.

1. x is multiplied by 5.
2. The inverse of multiplying is dividing, so divide both sides by 5.
3. $x = 9$.
4. Check: $5 \times 9 = 45$ (correct)

Answer: $x = 9$

You do: independent check (2 min)

Solve: $y \div 6 = 7$

Answer: 42. Students who miss it: 3-minute reteach at the teacher table, then start the room at the Explorer level.

Misconception: "3x means $3 + x$." It means 3 times x.

Misconception: "Do the operation you see." Use the inverse operation to undo it.

Misconception: "Only change one side of the equation." Whatever you do to one side, do to the other.

3. MYSTERY CASE: THE VARIABLE VILLAIN

0:20–0:48 · 28 min

Launch: project the start screen, read the story aloud, and assign mission levels (Explorer = extra support, Agent = on level, Legend = challenge). Students can open Supports any time for read-aloud, bigger text, a word bank, and a scratch pad.

- Evidence files can be opened in any order. Tell students detectives always read the whole file before answering.
- Pairs can be "lead detective" and "note taker." The note taker records the code pieces as they are found.
- For the debrief, ask students which piece of evidence was most convincing and why.

Students turn in: the completion code plus their copied "turn in your work" block (Canvas Text Entry).

4. DEBRIEF

0:48–0:52 · 4 min

1. What is the difference between an expression and an equation?
2. How do you know which inverse operation to use?
3. Why should you check your solution?

Close the loop: return to warm-up question 3. Answer: Examples: 5 more than a number; a number increased by 5.

5. EXIT TICKET

0:52–1:00 · 8 min

Print the exit ticket PDF (page 2 is the key and mastery guide). Every item requires evidence: Part A asks students to justify each choice, Part B asks for an explanation, and Part C applies the standard to a new situation using Solve-Show-Explain. Sort results into Mastered, Approaching, and Beginning to plan tomorrow's groups.

LESSON RESOURCES

Resource	How it fits the lesson
Warm-up worksheet (PDF)	Optional standalone warm-up (also Part 2 of the lesson worksheet), with a key.

Resource	How it fits the lesson
Mini-lesson presenter	Projectable, step-by-step interactive lesson with tools and quick checks (room page).
Lesson worksheet (PDF + key)	One printable packet students complete during the whole lesson: short fill-ins and quick checks in 13 small parts that match the presenter slides.
The Variable Villain (.html)	The mystery case for Canvas, with differentiated levels, supports, and a turn-in.
Exit ticket (PDF + key)	Evidence-based check with a rubric and a mastery sorting guide.
Illustrative Mathematics (extra)	Free Grade 6 expressions and equations unit. https://im.kendallhunt.com/
Khan Academy: 6th Grade Math (extra)	Practice writing and solving equations. https://www.khanacademy.org/math/cc-sixth-grade-math
Desmos Classroom (extra)	Free "Solving Equations" activities. https://teacher.desmos.com/
Solve Me Mobiles (extra)	Balance puzzles that build equation sense. https://solve.me/edc.org/

ANSWER KEY: THE VARIABLE VILLAIN

Evidence File #1: The Calling Card (code piece: T)

1. Match each part of $4x + 7$. -> 4 = Coefficient; x = Variable; 7 = Constant
2. How many terms are in $3a + 2b - 5$? -> 3
3. Tap every TERM in $3a + 2b - 5$. -> "3a" + "2b" + "5"

Evidence File #2: The Age Riddle (code piece: E)

1. Evaluate $a + 5$ when $a = 32$. -> 37
2. Evaluate $3(a - 2)$ when $a = 32$. -> 90

Evidence File #3: The Scrambled Terms (code piece: R)

1. Crack the scrambled note! Build the simplified form of $6m + 3 + 2m - 1$. -> $8m + 2$
2. Which terms are like terms with $4x$? -> Like term with $4x$: x, 9x, 0.5x | Not a like term: 4, 4y, x^2

Evidence File #4: The Warehouse Code (code piece: M)

1. Use the distributive property: $5(2n + 3) = ?$ -> $10n + 15$
2. Factor $12x + 18$ using the GCF. -> $6(2x + 3)$
3. If $n = 4$, what is the warehouse code $5(2n + 3)$? -> 55

Evidence File #5: The Hideout (code piece: S)

1. Solve $L \div 3 = 24$. Which locker is the trophy in? -> 72
2. Solve $c + 150 = 900$. How much did the car cost? -> 750 dollars
3. Which equation matches the table? -> $y = 3x$
4. In the table, which is the dependent variable? -> Stolen items (y), because it depends on the number of nights
5. The loot table follows a pattern. Plot the point for night 5. -> Point at (5, 15)

Final code: TERMS