MERIT EDUCATION GROUP

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MN Standard 9.3.5.7, 9.3.5.8

ALGEBRA 1 · UNIT 1: EXPRESSIONS · LESSON 01 · TEACHER EDITION

Teacher Edition: Unit 1, Lesson 1 – What Is a Variable?

Course: Algebra 1 **Pacing ID:** `WhatIsAVariable` **Standards:** MN 9.3.5.7, MN 9.3.5.8 **Objectives:** • Define a variable and distinguish it from constants and coefficients. • Identify variables in algebraic expressions and real-world contexts. • Write one-variable algebraic expressions to model quantitative situations.

1 📋 MATERIALS CHECKLIST

[ ] Slide Deck: U1L01 WhatIsAVariable Slides.pdf [ ] Student Edition/Worksheet: U1L01 WhatIsAVariable SE.pdf [ ] Individual Whiteboards, markers, erasers (or dry-erase sleeves) [ ] Calculators (Optional for fluency checks; not required for this lesson) [ ] Projector/Smartboard

2 ⏱️ PACING TIPS (50-MINUTE BLOCK)

Phase	Activity	Time	Notes
Activate	Bell Ringer & Share Out	7 min	Focus on "unknowns" before introducing notation.
Explore	Direct Instruction & Vocabulary	12 min	Define variable, coefficient, constant. Model identification.
Practice	Guided Practice (Worksheet A-B)	15 min	Circulate; check for coefficient/constant confusion.
Apply	Cultural Connection / Career Spotlight	6 min	Optional extension or group discussion.
Assess	Exit Ticket & Closure	5 min	Collect data on expression writing accuracy.
Circulate	Circulate & Support	5 min	Targeted support for Tier 1 students.

3 🔔 BELL RINGER ANSWER KEY

Focus: Arithmetic fluency, pattern recognition, and solving for unknowns without formal variable notation.

Problem Set:

1. + 6 = 14
2. Pattern: 5, 10, 15, 20, ... What is the next term? Describe the rule.
3. Context: "A basket holds some apples. If you add 4 more apples, there are 9 apples total. How many apples were in the basket originally?"

Answers & Teacher Talk: • **Q1 Answer:** 8. • *Check:* Does $8 + 6 = 14$? Yes. The blank represents a fixed unknown value. • **Q2 Answer:** Next term is 25. Rule: "Add 5" or "Multiply the position by 5." • *Bridge to Variables:* Ask students, "If I wanted to write a rule for any position number n, how could we show that?" Preview: $5 + n$ or $5 \cdot n$ depending on interpretation. Clarify that patterns help us predict unknown values. • **Q3 Answer:** 5. • *Reasoning:* Start with 9, subtract 4 to find the original amount. $9 - 4 = 5$. • *Bridge:* "We just solved for an unknown quantity using logic. In Algebra, we use a symbol called a **variable** to represent that unknown."

4 🧠 MISCONCEPTIONS & REDIRECT QUESTIONS

Monitor students during practice; use these redirects to address common errors.

Misconception	Evidence of Error	Redirect Question	Correct Concept
Variable is only 'x'	Student refuses to accept g or n as a variable.	"If I use g for gallons and n for nickels, does that change the fact that the amount can vary? What property makes a letter a variable?"	A variable is any symbol (usually a letter) representing a quantity that can take on different values.
Coefficient vs. Constant Confusion	In $4y + 9$, student identifies 9 as coefficient or 4 as constant.	"Which number stays the same no matter what value y takes? Which number tells you how many times to multiply y?"	The **constant** is a fixed term (value does not change). The **coefficient** multiplies the variable.
"Of" means Addition	Student writes "3 of a number" as $3 + n$.	"If I have 3 groups of apples, do I add 3 apples or multiply by 3? How can we test this if the number is 2?"	The word "of" in quantitative contexts usually indicates multiplication (e.g., coefficient). Test with substitution.

5 🌍 CULTURAL CONNECTION NOTES

Context: Ojibwe Beadwork Patterns **Cultural Note:** Ojibwe beadwork is a revered art form characterized by intricate patterns, symmetry, and storytelling. Designs often utilize mathematical structures such as repetition, scaling, and geometric transformations. When teaching variables, honor the precision and intentionality found in Anishinaabe craftsmanship, where every element serves a purpose within the whole design. **Math Word Problem (Cultural Context):**

> An Ojibwe artisan creates a beaded band using a repeating pattern to represent water flowing through the land. The pattern requires **2 blue beads for every inch of length** plus **1 extra blue bead** to secure the knot at the end.

> Let n represent the number of inches in the band's length. Write an algebraic expression for the total number of blue beads needed.

CIRCLE → UNDERLINE → BOX → WRITE Strategy Breakdown: *Model this strategy on the board using the word problem above.*

1. **CIRCLE** the unknown/variable quantity:

• *Action:* Circle "number of inches" and identify it as n.

2. **UNDERLINE** key numbers/constants:

• *Action:* Underline "2 blue beads", "every inch", and "1 extra blue bead".

3. **BOX** the operations implied by keywords:

• *Action:* Box "for every" → indicates multiplication ($\times$). Box "plus" → indicates addition ($+$).

4. **WRITE** the expression:

• *Synthesis:* Combine parts based on structure. • $2 \cdot n + 1$ or $2n + 1$. • *Verification:* If length is 3 inches, beads = $2(3) + 1 = 7$. Does this match the context? Yes: 6 for length + 1 knot bead. **Answer:** $2n + 1$ *Variable:* n (length in inches). *Coefficient:* 2. *Constant:* 1.

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6 💼 CAREER SPOTLIGHT

Career: Medical Lab Scientist **Location:** Mayo Clinic — Rochester **Education:** Bachelor of Science (BS) in Medical Laboratory Science or related field **Salary:** $ 74,240 / year **Connection to Variables:** Medical Lab Scientists at the Mayo Clinic analyze patient samples using chemical reactions that follow precise stoichiometric ratios. They frequently write and evaluate algebraic expressions to calculate reagent volumes based on variable inputs such as sample size (s) or number of tests (n). For example, a protocol may require $0.5n + 2$ milliliters of buffer solution for n samples, where the coefficient represents the per-sample requirement and the constant accounts for baseline calibration volume. Mastery of variables ensures accurate dosing and reliable diagnostic results.

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7 📝 DIFFERENTIATION TIER NOTES

Tier	Student Profile	Scaffolding / Extension Strategies
Support	Needs concrete representation; struggles with abstract notation.	• Use color-coding: Variables in blue, coefficients in red, constants in green. \ - Provide sentence frames: "The coefficient is #underline()[ ]#underline()[ ] because it multiplies the variable." \ - Allow use of manipulatives (e.g., algebra tiles) to model expressions like $3x + 2$.
On-Level	Meets grade-level expectations; solid procedural grasp.	• Focus on precise vocabulary usage in explanations. \ - Require students to identify *why* a term is constant vs. coefficient using definitions. \ - Practice evaluating expressions for multiple values of the variable.
Challenge	Masters concepts quickly; seeks deeper application.	• Ask: "Can an expression have a coefficient of 1? How do we write it?" (e.g., x vs $1x$). \ - Task: Write two different real-world contexts that result in the same expression, e.g., $4c + 5$. \ - Analyze error: "A student wrote $3x - 2$ for 'two less than three times a number.' Is this correct? Explain."

8 📚 WORKSHEET ANSWER KEY

Refer to Student Edition U1L01_WhatIsAVariable_SE.pdf

Section A: Identify Parts of Expressions

Instructions: Identify the variable, coefficient, and constant term in each expression.

Expression	Variable	Coefficient	Constant Term	Notes
1. $5x + 8$	x	5	8	Standard form.
2. $y - 3$	y	1^*	-3^*	Implicit coefficient of 1; subtraction indicates negative constant.
3. $7m$	m	7	0	No constant term implies 0.
4. $2k + 9 - k$	*Simplify first?*	N/A	N/A	*Note: If unsimplified, variable is k. Coefficients are 2 and –1. Constant is 9.* \ **Recommended Answer:** Variable=k; Expression simplifies to $k + 9$.
5. $\frac{z}{4} + 6$	z	$\frac{1}{4}$	6	Division by 4 is equivalent to multiplication by $\frac{1}{4}$.

**Teacher Note: Emphasize that subtraction can be rewritten as adding a negative constant.*

Section B: Write Expressions from Context

Instructions: Write an algebraic expression. Define your variable.
6. **"Five more than a number"**

• *Expression:* $n + 5$ (or $x + 5$, etc.) • *Variable Definition:* Let n = the unknown number.
7. **"Twice a quantity decreased by 3"**

• *Expression:* $2q - 3$ • *Variable Definition:* Let q = the quantity. • *Check:* "Decreased by" implies subtraction of the constant.
8. **Context: Movie Tickets**

> A movie ticket costs $ 10. Each drink costs $ 2. Write an expression for the total cost if a person buys d drinks and one ticket.

• *Expression:* $2d + 10$ (or $10 + 2d$) • *Variable Definition:* Let d = number of drinks. • *Analysis:* Coefficient 2 represents cost per drink; Constant 10 represents fixed ticket cost.
9. **Context: Bus Passengers**

> A bus starts with 24 passengers. At each stop, p people get off. Write an expression for the number of remaining passengers after one stop.

• *Expression:* $24 - p$ • *Variable Definition:* Let p = number of people getting off.

Section C: Evaluate Expressions

Instructions: Evaluate each expression using the given value.
10. **Evaluate** $3x + 4$ **when** $x = 5$**.**

• Substitution: $3(5) + 4$ • Calculation: $15 + 4 = 19$ • *Answer:* 19
11. **Evaluate** $y - 7$ **when** $y = 12$**.**

• Substitution: $12 - 7$ • Answer: 5

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9 EXIT TICKET ANSWER KEY

Collect to assess mastery of objectives. **Q1. Identify the parts:** In the expression $9a - 4$, identify the variable, coefficient, and constant. • **Answer:** Variable = a; Coefficient = 9; Constant = -4. • *Rubric:* 1 pt per correct identification. Ensure student recognizes negative constant. **Q2. Write an expression:** "The product of a number and 8." • **Answer:** $8n$ (or $8x$, etc.) • *Rubric:* Must show multiplication relationship. Accept $n \cdot 8$. Reject $8 + n$. **Q3. Real-World Modeling:**

> A water bottle holds 16 ounces. You drink w ounces. Write an expression for the amount of water remaining in the bottle.

• **Answer:** $16 - w$ • *Rubric:* Expression must reflect subtraction from initial amount. Variable definition implied or explicit is acceptable. **Scoring Guide:** • 3/3: Mastery. Student can identify parts, translate phrases, and model contexts. • 2/3: Proficient with gaps. Likely error in constant sign or coefficient identification. Review specific item. • 0-1/3: Intervention needed. Re-teach definition of variable vs constant; use concrete models.
