Key focus

Forming equations is translating real-world situations or word problems into algebraic notation. This process involves identifying unknown quantities, choosing variables to represent them, and writing an equation that captures the relationship described in words. It is a bridge between concrete contexts and abstract algebra, and a prerequisite for solving problems systematically.

Suggested teaching sequence

1. Begin by identifying unknown quantities in simple scenarios: a bag has some apples, you add 3 more and now have 8, how many did you start with? Discuss what we know and what we don't know.
2. Introduce the idea of a variable as a label for an unknown quantity. Model choosing a letter and writing what it represents: let a = the number of apples I started with. Write this sentence explicitly.
3. Form simple addition equations from words: I have some money, I earn \$5 more, and now have \$12. Guide students to write $m + 5 = 12$.
4. Extend to subtraction: A book costs \$20 less than a game. The book costs \$15. Write an equation. Model defining g = game cost and writing $g - 20 = 15$.
5. Introduce multiplication contexts: Tickets cost \$8 each. I buy some and spend \$32. How many did I buy? Form the equation $8t = 32$ where t is the number of tickets.
6. Present situations requiring two variables: The sum of two numbers is 10. Call one number x and the other y. Write an equation. Result: $x + y = 10$.
7. Move to multi-step contexts: I buy some pens at \$2 each and also buy a notebook for \$5. The total is \$11. Using p for the number of pens, guide: $2p + 5 = 11$.
8. Practice checking if a formed equation makes sense: does the variable represent what we described? Are all quantities included? Does the operation match the word context?

Core examples to model

- Simple addition: I have some money and receive \$7 more. Now I have \$15. Define m = money I started with. Equation: $m + 7 = 15$.
- Subtraction: After spending \$8, I have \$6 left. Define m = money I had before. Equation: $m - 8 = 6$.
- Multiplication: Pens cost \$3 each. I buy some and spend \$18. Define p = number of pens. Equation: $3p = 18$.
- Division context: I have \$20 to split equally among 4 friends. Define m = money each friend gets. Equation: $4m = 20$.
- Two-step: I buy 2 notebooks at \$5 each and some pens at \$2 each, spending \$14 total. Define p = number of pens. Equation: $10 + 2p = 14$.
- Real-world with relationships: A rectangle's length is 3 cm more than its width. The perimeter

is 26 cm. Define w = width. Length is $w + 3$. Equation: $2w + 2(w + 3) = 26$.

- Matching variables to contexts: The cost of an adult ticket is twice the cost of a student ticket. Together they cost $9. Define s = student ticket cost. Equation: $s + 2s = 9$, which simplifies to $3s = 9$.

Watch for

- Students often forget to write down what their variable represents. Enforce the sentence "Let $x = \ldots$" every time. This clarifies thinking and makes work readable.
- Variables must be consistent: if you define p = price at the start, do not later use p to mean number of items.
- Read the problem carefully and identify all unknown quantities. If two quantities are related, you may need two variables or one variable and an expression.
- The operation in the equation must match the word: "more" usually means addition, "less" means subtraction, "times as many" means multiplication, and "shared among" suggests division.
- Check that the equation makes sense by substituting a known value and checking if the result is reasonable. If $2p + 5 = 13$ represents "2 pens at p each and a notebook for $5, total $13", then $p = 4$ gives $2(4) + 5 = 13$ which is correct.
- Some contexts have physical constraints: you cannot have negative numbers of items, distances, or times in real problems, even though the equation may allow it algebraically.