Algebra Agent: The Case of the Missing Variable!

Mission Briefing (Introduction - 10 mins)

Welcome, Agent Lewis! Your mission, should you choose to accept it, involves cracking codes and solving mysteries using a powerful tool: Algebra! Today, we're focusing on linear equations. Think of an equation like a perfectly balanced scale. What you do to one side, you MUST do to the other to keep it balanced. Our goal is to isolate the 'mystery variable' (usually 'x') to find its secret value.

Key Terms:

- Variable: A letter representing an unknown number (like 'x').
- **Coefficient:** The number multiplying the variable (like the '3' in 3x).
- Constant: A number on its own.
- Equation: A statement that two expressions are equal (e.g., x + 5 = 10).
- **Inverse Operations:** Operations that undo each other (Addition/Subtraction, Multiplication/Division). We use these to isolate the variable.

Agent Training: Basic Maneuvers (Explanation & Guided Practice - 20 mins)

Let's practice balancing the scales. Remember, the goal is to get 'x' by itself.

Example 1 (One-Step): x + 5 = 12

- Goal: Isolate x.
- *Problem:* 5 is being added to x.
- Solution: Do the inverse operation: subtract 5 from BOTH sides.
- Steps:
 - x + 5 5 = 12 5
 - x = 7
- Check: Does 7 + 5 = 12? Yes! Mission accomplished.

Example 2 (One-Step): 3x = 18

- Goal: Isolate x.
- *Problem:* x is being multiplied by 3.
- Solution: Do the inverse operation: divide BOTH sides by 3.
- Steps:

3x / 3 = 18 / 3 x = 6

• Check: Does 3 * 6 = 18? Yes!

Example 3 (Two-Step): 2x - 4 = 10

- Goal: Isolate x.
- Strategy: First, undo addition/subtraction, THEN undo multiplication/division.
- Steps:

1. Add 4 to BOTH sides:

2x - 4 + 4 = 10 + 4

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2x = 14

2. Divide BOTH sides by 2:

2x / 2 = 14 / 2

x = 7

• Check: Does (2 * 7) - 4 = 10? 14 - 4 = 10. Yes!
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Code-Breaking Practice: Solve these equations to find the value for each letter:

A + 8 = 15 (Solve for A)
 4B = 24 (Solve for B)
 C / 2 = 9 (Solve for C)
 D - 5 = 11 (Solve for D)
 2E + 1 = 11 (Solve for E)

(Pause here for Lewis to solve. Answers: A=7, B=6, C=18, D=16, E=5)

Field Mission: Decode the Message! (Independent Practice - 20 mins)

Agent Lewis, you've intercepted a coded message! Each number corresponds to a letter (A=1, B=2, C=3...). First, solve the equations below to find the number value for each step. Then, use those numbers to find the corresponding letters and reveal the secret message!

Clues:

- 1. x + 10 = 13 (Find x. This is the 1st letter's number)
- 2. 5y = 25 (Find y. This is the 2nd letter's number)
- 3. z / 4 = 3 (Find z. This is the 3rd letter's number)
- 4. a 1 = 7 (Find a. This is the 4th letter's number)
- 5. 2b + 3 = 23 (Find b. This is the 5th letter's number)
- 6. c/2 1 = 6 (Find c. This is the 6th letter's number)

(Pause for Lewis to solve. Answers: 1. x=3 (C), 2. y=5 (E), 3. z=12 (L), 4. a=8 (H), 5. b=10 (J), 6. c=14 (N). Message might not make sense, adjust if needed or create a specific message like 'Math is fun')

Let's create a message: 'GREAT JOB' Use these equations:

- 1. G: x 2 = 5
- 2. R: y / 3 = 6
- 3. E: 2z = 10
- 4. A: a + 9 = 10
- 5. T: 5b = 100
- 6. J: c + 4 = 14
- 7. O: d / 2 = 7.5 (Use 7 for G, adjust if needed to avoid decimals or teach them) -> Maybe use 3d = 45
- 8. B: e 1 = 1

Solve these for 'GREAT JOB':

G: x - 2 = 5 (x=7)
 R: y / 3 = 6 (y=18)
 E: 2z = 10 (z=5)
 A: a + 9 = 10 (a=1)
 T: 5b = 100 (b=20)

- 6. J: c + 4 = 14 (c=10)
- 7. O: 3d = 45 (d=15)
- 8. B: e 1 = 1 (e=2)

Now use the number for each letter (A=1, B=2...) to see if the numbers match the letters in 'GREAT JOB'. (7=G, 18=R, 5=E, 1=A, 20=T, 10=J, 15=O, 2=B). It works!

Mission Debrief (Conclusion & Assessment - 5-10 mins)

Excellent work, Agent Lewis! You've successfully used algebra to crack codes and solve equations.

- What was the main idea behind solving equations today? (Balancing/Inverse Operations)
- Which type of equation was easiest? Which was trickiest?
- Can you think of a real-life situation where you might need to figure out an unknown value? (e.g., Budgeting, figuring out time/distance, etc.)

Assessment: Your successful decoding of the message shows you're mastering the skill! We can check the answers to the practice problems together.

Extension (Optional): Try creating your own coded message for someone else to solve using equations!