Substitution Tutorial

1. Compare the equations. Look for a variable, term, or entire expression that can be replaced.
   If an equation already gives the value of a matching expression, substitute immediately.
2. Rearrange an equation to isolate a useful variable, term, or expression.
   If needed, use a positive or negative multiple of a known expression to create a match.
3. Substitute into the matching place in the other equation. Use parentheses for expressions.
4. Solve for the remaining variable.
5. Substitute the result into an original equation to solve for the other variable.
   Verify the ordered pair in both original equations.

Mild · Problems 1–6 | Immediate substitution

Problem #1 $y = x + 2$ $2x + y = 11$	**Problem #2** $x = 2y + 1$ $x + 3y = -4$	**Problem #3** $3y = 2x + 8$ $5x + 3y = 22$
Problem #4 $-3y = 2x - 12$ $4x - 3y = 6$	**Problem #5** $2x - y = 6$ $(2x - y) + 3y = 12$	**Problem #6** $y = 2x + 1$ $3x + 2y = 16$

Medium · Problems 7–12 | Signs and creating substitutions

Problem #7 $y = 2x + 3$ $5x - y = 6$	**Problem #8** $y = 3x - 2$ $8x - 2y = 10$	**Problem #9** $2x - y = 3y + 8$ $-2(2x - y) + 7y = -18$
Problem #10 $2x + y = 6$ $5x + y = 15$	**Problem #11** $x - 2y = -5$ $x + 4y = 7$	**Problem #12** $4x + 2y = 16$ $4x + 5y = 34$

Spicy · Problems 13–18 | Distribution and equivalent terms

Problem #13 $2x + y = 6$ $5x + 2y = 16$	**Problem #14** $2x + y = -2$ $5x - 2y = 13$	**Problem #15** $2x = y + 9$ $4x + 3y = 23$
Problem #16 $-2x = y - 5$ $4x + 3y = 11$	**Problem #17** $2x + 3y = 7$ $4x + 5y = 11$	**Problem #18** $2x + 3y = 5$ $-4x + 5y = -21$

Extra-Spicy · Problems 19–20 | Strategic substitution

Problem #19 $\frac{4x}{3} + y = 12$ $4x + 2y = 32$	**Problem #20** $3x + 2y = 12$ $-\frac{9x}{2} + 4y = 3$

Solutions

Mild · Problems 1–6

Problem #1: $(3,5)$	**Problem #2:** $(-1,-1)$	**Problem #3:** $(2,4)$
Problem #4: $(3,2)$	**Problem #5:** $(4,2)$	**Problem #6:** $(2,5)$

Medium · Problems 7–12

Problem #7: $(3,9)$	**Problem #8:** $(3,7)$	**Problem #9:** $(0,-2)$
Problem #10: $(3,0)$	**Problem #11:** $(-1,2)$	**Problem #12:** $(1,6)$

Spicy · Problems 13–18

Problem #13: $(4,-2)$	**Problem #14:** $(1,-4)$	**Problem #15:** $(5,1)$
Problem #16: $(2,1)$	**Problem #17:** $(-1,3)$	**Problem #18:** $(4,-1)$

Extra-Spicy · Problems 19–20

Problem #19: $(6,4)$	**Problem #20:** $(2,3)$