U1A L2 Solving Two-Step Equations — NOTES	Name: _____ HR: _____

Target Skill: Solve two-step linear equations by undoing operations in the reverse order of operations.

Quick Review: Order of Operations, in Reverse

Evaluating (forward)	Solving for x (backward)
1. Parentheses 2. Exponents 3. Multiply / Divide 4. Add / Subtract	1. Add / Subtract (undo this first — usually easiest) 2. Multiply / Divide (undo this second — usually easiest)

- Big Idea: The ONLY real rule is that whatever you undo, you must apply it to the ENTIRE side of the equation. You are free to undo Add/Subtract or Multiply/Divide first — both work!
- Why we usually undo Add/Subtract FIRST: it keeps the numbers whole longer and avoids introducing fractions/decimals early.
- Undoing Multiply/Divide first still gets the right answer, just with messier numbers along the way.

Examples of solving **Both Ways: 2x + 3 = 9**

Undo Add/Subtract FIRST	Undo Multiply/Divide FIRST
$2x+3=9$ $-3 \quad -3$ $\frac{2x}{2}=\frac{6}{2}$ $x=3$ ① +/− ② ×/÷ − Prop of = ÷ Property of Equality (POE)	$\frac{2x+3}{2}=\frac{9}{2}$ $x+\frac{3}{2}=\frac{9}{2}$ $-\frac{3}{2} \quad -\frac{3}{2}$ $x=\frac{6}{2}=3$ More Difficult
Whole numbers the whole way through.	Same answer — but decimals show up right away.

Reminder — Rules of the Math Game

1. Add or subtract the SAME number from BOTH sides. (Addition/Subtraction Property of Equality)
2. Multiply or divide BOTH sides by the SAME nonzero number. (Multiplication/Division Property of Equality)
3. You can exchange the left and right sides. (Symmetric Property)

The Two-Step Process

Step 1: Undo addition or subtraction to isolate the term with x.
Step 2: Undo multiplication or division to isolate x.

Worked Example 1

Step	Property / Reason
$-3x+4=16$	Original equation
$-4 \quad -4$	− POE
$\frac{-3x}{-3}=\frac{12}{-3}$	Simplify
	÷ POE
$x=-4$	Simplify

Example 2

Step	Property / Reason
$\frac{x}{3} - 2 = 4$	Original equation
$+2 \quad +2$	+ POE
$3 \cdot \frac{x}{3} = 6 \cdot 3$	Simplify
	mult POE
$x = 18$	Simplify

3 — Fraction Coefficient

Step	Property / Reason
$\frac{2}{3}x - 1 = 5$	Original equation
$+1 \quad +1$	+ POE
$\frac{3}{2} \cdot \frac{2}{3}x = 6 \cdot \frac{3}{2}$ $x = \frac{18}{2}$ $x = 9$	Simplify Mul. POE ÷ POE
$3 \cdot \frac{2}{3}x = 6 \cdot 3$ $\frac{2x}{2} = \frac{18}{2}$ $x = 9$	Simplify

Watch Out! Common Mistakes

- Doing an operation to only ONE side of the equation, not both.
- Sign errors when a coefficient or constant is negative.

Guided Practice — Determine x. State the RULE(S) used.

1. $3x + 2 = 11$ property(s) Used

$-2 \quad -2$

$\frac{3x}{3} = \frac{9}{3}$

x = 3

− POE

÷ POE

2. $5 - 2x = 1$ property(s) Used

$-5 \quad -5$

$\frac{-2x}{-2} = \frac{-4}{-2}$

x = 2

− POE

÷ POE

3. $\frac{x}{4} + 1 = 3$ property(s) Used

$-1 \quad -1$) − POE

$4 \cdot \frac{x}{4} = 2 \cdot 4$) * POE

$x = 8$

x = 8

4. $-2x + 5 = -1$ property(s) Used

$-5 \quad -5$ − POE

$\frac{-2x}{-2} = \frac{-6}{-2}$ ÷ POE

x = 3

5. $5 = \frac{2}{3}x + 1$ property(s) Used

$-1 \quad -1$

$3 \cdot 4 = \frac{2x}{3} \cdot 3$) − POE

$\frac{12}{2} = \frac{2x}{2}$) ÷ POE

) Symmetric

x = 6

6. $\frac{3}{4}x - 2 = 4$ property(s) Used

$+2 \quad +2$) + POE

$4 \cdot \frac{3}{4}x = 6 \cdot 4$) * POE

$\frac{3x}{3} = \frac{24}{3}$) ÷ POE

$x = 8$

x = 8