Properties of Equality

Properties of Equality	Property	Example(s)
Addition Property of Equality	If a = b, then a + c = b + c.	$x-3=5$ $+3 \quad +3$ ← add 3 to BOTH sides
Subtraction Property of Equality	If a = b, then a – c = b – c	$y+7=9$ $-7 \quad -7$ ← subtract 7 on BOTH sides
Multiplication Property of Equality	If a = b, then ac = bc	$6 \cdot \frac{x}{6} = 2 \cdot 6$ ← multiply by 6 on Both sides
Division Property of Equality	If a = b, then a/c = b/c	$\frac{4x}{4} = \frac{20}{4}$ ← divide by 4 on Both sides
Reflexive Property of Equality	a = a	$\overline{AB} \cong \overline{AB}$ ← something is equal or ≅ to itself
Symmetric Property of Equality	If a = b, then b = a	$CD = 5 + AM$ then $5 + AM = CD$ ← flip the sides
Transitive Property of Equality	If a = b and b = c, then a = c	If $p \to q$ & $q \to r$, then $p \to r$. If $a = 5$ & $5 = c$, then $a = c$ ← Like the Law of Syllogism
Substitution Property	If a = b, then b may be substituted for a in any expression containing a	Given: $x = 6$ & $2x$ So, $2(6)$ ← plug it in to the equation
Distributive Property	$a \cdot (b + c) = a \cdot b + a \cdot c$ $a \cdot (b - c) = a \cdot b - a \cdot c$	$5(x-3) = 5x-15$

For these 4 properties, we had to do this on BOTH sides

Additional Examples:

① Given: $-6 = 3x - (x+4)$
Prove: $x = -1$

Statement	Reason
1) $-6 = 3x - (x+4)$	1) Given
2) $-6 = 3x - x - 4$	2) Distributive Property
3) $-6 = 2x - 4$	3) Combine like terms
4) $-2 = 2x$	4) Addition Property of =
5) $-1 = x$	5) Division Property of =
6) $x = -1$	6) Symmetric Property of =

② Given: $2x + (4x - 1) = 17$
Prove: $x = 3$

Statement	Reason
1) $2x + (4x - 1) = 17$	1) Given
2) $6x - 1 = 17$	2) Combine like terms
3) $6x = 18$	3) Addition Property of =
4) $x = 3$	4) Division Property of =