

Using the Properties of Equality

Property of equality can be used to justify steps in solving an equation.

Two-Column Proof: A common format used to organize a proof

Left Side: List the Statements (Or steps)

Right Side: List the reasons that justify each step.

What can be used as reasons?

postulates, theorems, definitions, properties

1. **Given:** $4x - 1 = 27$ **Prove:** $x = 7$

Statements	Reasons
1. $4x - 1 = 27$	1. given
2. $4x = 28$	2. addition property of =
3. $x = 7$	3. division property of =

2. **Given:** $\frac{a}{-6} + 2 = 5$ **Prove:** $a = -18$

Statements	Reasons
1. $\frac{a}{-6} + 2 = 5$	1. given
2. $\frac{a}{-6} = 3$	2. subtraction prop. of =
3. $a = -18$	3. multiplication prop. of =

3. **Given:** $-9(2x - 3) = 63$; **Prove:** $x = -2$

Statements	Reasons
1. $-9(2x - 3) = 63$	1. given
2. $-18x + 27 = 63$	2. distributive property
3. $-18x = 36$	3. subtraction prop. of =
4. $x = -2$	4. division prop. of =

4. Given: $6x + 7 = 8x - 17$; Prove: $x = 12$

Statements	Reasons
1. $6x + 7 = 8x - 17$; $6x + 7 = 8x - 17$	1. given ; given
2. $6x = 8x - 24$; $6x + 24 = 8x$	2. subtraction ; addition
3. $-2x = -24$; $24 = 2x$	3. subtraction ; subtraction
4. $x = 12$; $12 = x$	4. division ; division
5. ; $x = 12$	5. ; symmetric

5. Given $-7(x + 2) + 4x = 6(2x - 4)$; Prove: $x = \frac{2}{3}$

Statements	Reasons
1. $-7(x+2) + 4x = 6(2x-4)$	1. given
2. $-7x - 14 + 4x = 12x - 24$	2. distributive property
3. $-3x - 14 = 12x - 24$	3. Simplify (combine like terms)
4. $-3x = 12x - 10$	4. addition property of =
5. $-15x = -10$	5. subtraction prop of =
6. $x = \frac{2}{3}$	6. division prop of =

6. Given: $3x + 1 = -14$; Prove: $x = -5$

Statements	Reasons
1. $3x + 1 = -14$	1. given
2. $3x = -15$	2. subtraction prop. of =
3. $x = -5$	3. division prop. of =
4.	4.

7. Given: $14 - 2(x + 8) = 5x - (3x - 34)$; Prove: $x = -9$

Statements	Reasons
1. $14 - 2(x+8) = 5x - (3x-34)$	1. given
2. $14 - 2x - 16 = 5x - 3x + 34$	2. distributive property
3. $-2x - 2 = 2x + 34$	3. simplify CLT
4. $-2 = 4x + 34$	4. addition prop. of =
5. $-36 = 4x$	5. subtraction prop of =
6. $-9 = x$	6. division prop. of =
$x = -9$	Symmetric property