

Algebraic Properties and Proofs

Name _____

You have solved algebraic equations for a couple years now, but now it is time to justify the steps you have practiced and now take without thinking... and acting without thinking is a dangerous habit!

The following is a list of the reasons one can give for each algebraic step one may take.

ALGEBRAIC PROPERTIES OF EQUALITY	
ADDITION PROPERTY OF EQUALITY	If $a = b$, then $a + c = b + c$
SUBTRACTION PROPERTY OF EQUALITY	If $a = b$, then $a - c = b - c$
MULTIPLICATION PROPERTY OF EQUALITY	If $a = b$, then $a \cdot c = b \cdot c$
DIVISION PROPERTY OF EQUALITY	If $a = b$, then $\frac{a}{c} = \frac{b}{c}$
DISTRIBUTIVE PROPERTY OF MULTIPLICATION OVER ADDITION or OVER SUBTRACTION	$a(b + c) = ab + ac$ $a(b - c) = ab - ac$
SUBSTITUTION PROPERTY OF EQUALITY	If $a = b$, then b can be substituted for a in any equation or expression
REFLEXIVE PROPERTY OF EQUALITY	For any real number a , $a = a$
SYMMETRIC PROPERTY OF EQUALITY	If $a = b$, then $b = a$
TRANSITIVE PROPERTY OF EQUALITY	If $a = b$ and $b = c$, then $a = c$

Complete the following algebraic proofs using the reasons above. If a step requires simplification by combining like terms, write *simplify*.

Given: $3x + 12 = 8x - 18$

Prove: $x = 6$

Statements	Reasons
1. $3x + 12 = 8x - 18$	1.
2. $12 = 5x - 18$	2.
3. $30 = 5x$	3.
4. $6 = x$	4.
5. $x = 6$	5.

Given: $3k + 5 = 17$

Prove: $k = 4$

Statements	Reasons
1. $3k + 5 = 17$	1.
2. $3k = 12$	2.
3. $k = 4$	3.

Given: $-6a - 5 = -95$

Prove: $a = 15$

Statements	Reasons

Given: $3(5x + 1) = 13x + 5$

Prove: $x = 1$

Statements	Reasons