**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c = b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 + aca(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 |
| Symmetric Property of Equality | If a = b then b = a  |
| Transitive Property of Equality | If a = b and b = c, then a = c  |

1. If 5 = x, then x = 5.
2. If a = b, then 2a = 2b.
3. m = n, so n = m
4. 7 = 7
5. If a = b, then a + 8 = b + 8
6. 9(x + y) = 9x + 9y
7. If x = 3 and 3 = y, then x = y
8. p = q and q = -1, so p = -1
9. If 3x = 27, then x = 9
10. If a = b and c ≠ 0 then $\frac{a}{c}= \frac{b}{c}$
11. If a = b, then b can be substituted for a in any expression.

12. If a = b, then a – c = b – c.

1. Addition Property of Equality
2. Subtraction Property of Equality
3. Multiplication Property of Equality
4. Division Property of Equality
5. Reflexive Property of Equality
6. Symmetric Property of Equality
7. Transitive Property of Equality
8. Substitution Property of Equality
9. Distributive Property of Equality

Solve the equation. Show all the steps and write a justification for each step.

$$\frac{1}{5}\left(a+10\right)= -3$$

Algebraic Properties of Equality Practice

State the property that justifies each statement.

1. If RS = TU and TU = YP then RS = YP.
2. If 7x = 28, then x = 4.
3. If x + 5 = 15, then x = 10.
4. If CD = EF, then EF = CD.
5. If $\frac{x}{3}$ = 8, then x = 24.
6. If x – 7 = 10, then x = 17.
7. EF = EF.
8. If 4(x + 3) = 17, then 4x + 12 = 17.
9. If CD = 5 and AB = CD, then AB = 5.

Solve the equation. Show all the steps and write a justification for each step.

3x + 12 = 8x - 18