

PROPERTIES OF ADDITION

COMMUTATIVE PROPERTY: The order in which two numbers are added does not change the sum. $a + b = b + a$

ASSOCIATIVE PROPERTY: The way three numbers are grouped when adding does not change the sum. $(a + b) + c = a + (b + c)$

IDENTITY PROPERTY: The sum of a number and 0 is the number. $a + 0 = a$

PROPERTIES OF MULTIPLICATION

COMMUTATIVE PROPERTY: The order in which two numbers are multiplied does not change the product. $ab = ba$

ASSOCIATIVE PROPERTY: The way you group three numbers when multiplying does not change the product. $(ab)c = a(bc)$

IDENTITY PROPERTY: The product of a number and 1 is the number. $1 \cdot a = a$

MULTIPLICATIVE PROPERTY OF ZERO: The product of a number and 0 is 0. $0 \cdot a = 0$

Name the property shown by the statement.

1. $0 + 8 = 8$ identity prop. of addition

2. $5 + 11 = 11 + 5$ Commutative prop. of addition

~~3. $3 + 7 = 7 + 3$~~

4. $3 + (7 + 1) = (3 + 7) + 1$
associative prop. of addition

Name the property shown by the statement.

5. $7 \cdot 32 = 32 \cdot 7$ Commutative prop. of multiplication

6. $(6a)b = 6(ab)$ associative prop. of multiplication

7. $8 \cdot 1 = 8$ identity prop. of multiplication

8. $0 = a \cdot 0$ multiplicative prop. of zero

Name the property shown by the statement.

9. $6 + a = a + 6$ commutative prop. of addition

10. $z \cdot 1 = z$ identity prop. of multiplication

11. $0 + xy = xy + 0$ commutative prop. of addition

12. $21 + 0 = 21$ identity prop. of addition

Name the property shown by the statement.

13. $7ab = 7ba$ commutative prop. of multiplication

14. $4(bc) = (4b)c$ associative prop. of multiplication

15. $9a + b = b + 9a$ commutative prop. of addition

16. $(4 + 7)0 = 0$ multiplicative prop. of zero

Do these properties apply to subtraction or division?

One way to find out is to look for a counterexample. A counterexample is an example that shows a statement is not true.

17. Is division of whole numbers commutative? If not, give a counterexample.

No because $10 \div 2 \neq 2 \div 10$
 $10 \div 2 = 5$ $2 \div 10 = \frac{2}{10} = \frac{1}{5} = 0.2$

18. Is subtraction of decimals associative? If not, give a counterexample.

No because $5.5 - (4.4 - 3.3) \neq (5.5 - 4.4) - 3.3$
 $5.5 - (4.4 - 3.3) = 5.5 - 1.1 = 4.4$
 $(5.5 - 4.4) - 3.3 = 1.1 - 3.3 = -2.2$

To simplify an algebraic expression, perform all possible operations. You can use the properties you learned in this lesson. Using facts, properties, or rules to reach valid conclusions is called deductive reasoning.

19. $3 + e + 7$

$$\underbrace{3 + 7}_{10} + e$$

20. $8 \cdot x \cdot 5$

$$\underbrace{8 \cdot 5}_{40} \cdot x$$

21. $12(10z)$

$$\underbrace{(12 \cdot 10)}_{120} \cdot z$$

22. $10 + (p + 18)$

$$10 + (18 + p)$$

$$\underbrace{(10 + 18)}_{28} + p$$