

Alg 1

1.3

Recognize the properties of equality and identity.

Recognize the associative property

Reflexive

$$3 = 3$$

Symmetric

$$x = 3$$

$$3 = x$$

Transitive

if

then

Substitution

replace

Additive identity

$$8$$

$$a = (b) \quad (b) = c$$


$$a = c$$

$$\begin{array}{r} 3 = x - 2 \\ + 2 \qquad + 2 \\ \hline 5 = x \\ x = 5 \end{array}$$

KeyConcept Properties of Equality			
Property	Words	Symbols	Examples
Reflexive Property	Any quantity is equal to itself.	For any number a , $a = a$.	$5 = 5$ $4 + 7 = 4 + 7$
Symmetric Property	If one quantity equals a second quantity, then the second quantity equals the first.	For any numbers a and b , if $a = b$, then $b = a$.	If $8 = 2 + 6$, then $2 + 6 = 8$.
Transitive Property	If one quantity equals a second quantity and the second quantity equals a third quantity, then the first quantity equals the third quantity.	For any numbers a , b , and c , if $a = b$ and $b = c$, then $a = c$.	If $6 + 9 = 3 + 12$ and $3 + 12 = 15$, then $6 + 9 = 15$.
Substitution Property	A quantity may be substituted for its equal in any expression.	If $a = b$, then a may be replaced by b in any expression.	If $n = 11$, then $4n = 4 \cdot 11$.

$$8 = 2 + 6$$

$$2 + 6 = 8$$

KeyConcept Addition Properties			
Property	Words	Symbols	Examples
Additive Identity	For any number a , the sum of a and 0 is a .	$a + 0 = 0 + a = a$	$2 + 0 = 2$ $0 + 2 = 2$
Additive Inverse	A number and its opposite are additive inverses of each other.	$a + (-a) = 0$	$3 + (-3) = 0$ $4 - 4 = 0$

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$$4 + 0 = 4$$

$$3 + ? = 3$$

$$-5 + 5 = 0$$

↑
opposite → zero pair

KeyConcept Associative Property	
Words	The way you group three or more numbers when adding or multiplying does not change their sum or product.
Symbols	For any numbers a , b , and c , $(a + b) + c = a + (b + c)$ and $(ab)c = a(bc)$.
Examples	$(3 + 5) + 7 = 3 + (5 + 7)$ $(2 \cdot 6) \cdot 9 = 2 \cdot (6 \cdot 9)$

$$2 + (3 + 5) = 10 \quad (2 + 3) + 5 = 10$$

$$2 \cdot (5 \cdot 4) = 40$$

$$(2 \cdot 5) \cdot 4 = 40$$

Party Supplies	
Item	Cost (\$)
balloons	6.75
decorations	14.00
food	23.25
beverages	20.50

$$2.3 + -6$$

$$6 + -6$$

$$0$$

Subs.

add. inv.

$$\underbrace{6.75 + 14.00}_{20.75 \text{ (Sub.)}} + \underbrace{23.25 + 20.50}_{43.75 \text{ (Sub.)}}$$

$$= \$64.50 \text{ subs}$$

Real-World Example 2 Apply Properties of Numbers

PARTY PLANNING Eric makes a list of items that he needs to buy for a party and their costs. Find the total cost of these items.

GEMA

Check Your Understanding

Step-by-Step Solutions begin on page R13.



Example 1 Evaluate each expression. Name the property used in each step.

1. $(1 \div 5)5 \cdot 14$

2. $6 + 4(19 - 15)$

3. $5(14 - 5) + 6(3 + 7)$

4. FINANCIAL LITERACY Carolyn has 9 quarters, 4 dimes, 7 nickels, and 2 pennies, which can be represented as $9(25) + 4(10) + 7(5) + 2$. Evaluate the expression to find how much money she has. Name the properties used in each step.

Handwritten notes for problem 4: $6 + 4 \cdot 4$ subs, $5 \cdot 9 + 6 \cdot 10$ sub, $45 + 60$ sub, $6 + 16$ subs, 105 sub, 22 subs

1. $(1 \div 5)$

Sub. $\frac{1}{5} \cdot 5 \cdot 14$

Sub. $\frac{1}{5} \cdot 70$

Sub 14

$\frac{1}{5} \cdot 5 \cdot 14$ Sub

$1 \cdot 14$ sub

14 Sub

! Evaluate each expression using the properties of numbers. Name the property used in each step.

5. $23 + 42 + 37$

6. $2.75 + 3.5 + 4.25 + 1.5$

7. $3 \cdot 7 \cdot 10 \cdot 2$

8. $\frac{1}{4} \cdot 24 \cdot \frac{2}{3}$

Evaluate each expression. Name the property used in each step.

9. $3(22 - 3 \cdot 7)$

10. $7 + (9 - 3^2)$

11. $\frac{3}{4} [4 \div (7 - 4)]$

12. $[3 \div (2 \cdot 1)] \frac{2}{3}$

13. $2(3 \cdot 2 - 5) + 3 \cdot \frac{1}{3}$

14. $6 \cdot \frac{1}{6} + 5(12 \div 4 - 3)$