Alg 1   1.3
Recognize the properties of equality and identity.
Recognize the associative property

Reflexive
Symmetric
Transitive
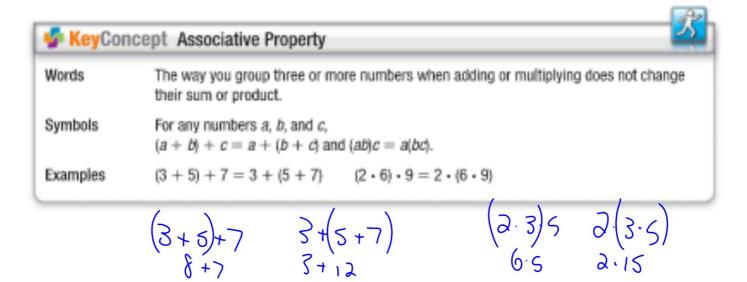Substitution
Additive identity

$$2x + 3 = 9$$
$$ -3 \quad -3$$
$$\frac{2x}{2} = \frac{6}{2}$$
$$x = 3$$

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 $4n = 4 \cdot 11$

Handwritten annotations:

$3 = x$
$x = 3$

$8 = 2 + 6$
$2 + 6 = 8$

$K = R$
$R = J$
$K = J$

LOTS

$4 \cdot 3 + 2 \cdot 5$
$12 + 10$

KeyConcept Addition Properties

$2 + ? = 2$

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.	$a + (-a) = 0$	$3 + (-3) = 0$ $4 - 4 = 0$

$3 + -3 = 0$

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 $(3 + 5) + 7 = 3 + (5 + 7)$ $(2 \cdot 6) \cdot 9 = 2 \cdot (6 \cdot 9)$

$(3 + 5) + 7$ $3 + (5 + 7)$ $(2 \cdot 3)5$ $2(3 \cdot 5)$
$8 + 7$ $3 + 12$ $6 \cdot 5$ $2 \cdot 15$

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

$6.75 + 14.00 + 23.25 + 20.50 =$

64.80

64.50

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.

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

GemA

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

2. $6 + 4(19 - 15)$
.25

3. $5(14 - 5) + 6(3 + 7)$
.10   .05

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 property used in each step.

$\left(1 \div 5\right) \cdot 5 \cdot 14$

$\left(\frac{1}{5}\right) \cdot 5 \cdot 14$ Subs

14 Subs

$225 + 40 + 35 + 2$ Subs

302 Subs

$\$3.02$

$\$302$

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

5. $23 + 42 + 37$ $= 102$ Subs

6. $2.75 + 3.5 + 4.25 + 1.5$ $= 12$

7. $3 \cdot 7 \cdot 10 \cdot 2$ $= 420$ Subs

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

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

9 $3(22 - 2 \cdot 7)$ $3 \cdot 1 =$

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