

1.3 Properties of Numbers

Properties of Equality			
Property	Words	Symbols	Examples
Reflexive Property	Any quantity is equal to itself.	$a = a$	$5 = 5$ $4 + 7 = 4 + 7$
Symmetric Property	If one quantity equals a second quantity, then the second quantity equals the first.	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, then the first quantity equals the third quantity.	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 b can replace a .	$n = 11$, $4n$ $4 \cdot 11$

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

Properties of Multiplication			
Property	Words	Symbols	Examples
Multiplicative Identity	For any number a , the product of a and 1 is a .	$a \cdot 1 = a$	$4 \cdot 1 = 4$
Multiplicative Property of Zero	For any number a , the product of a and 0 is 0.	$a \cdot 0 = 0$	$2 \cdot 0 = 0$
Multiplicative Inverse	For every number $\frac{a}{b}$, where $a, b \neq 0$, there is exactly one number $\frac{b}{a}$ such that the product of $\frac{a}{b}$ and $\frac{b}{a}$ is 1.	$\frac{a}{b} \cdot \frac{b}{a} = 1$	$\frac{4}{5} \cdot \frac{5}{4} = 1$

$$\frac{14}{18} \cdot \frac{18}{14} = \frac{20}{20} = 1$$

Commutative Property		
Words	Symbols	Examples
The order in which you add or multiply numbers does not change their sum or product.	For any numbers a and b , $a + b = b + a$ and $a \cdot b = b \cdot a$. <i>order change</i>	$4 + 8 = 8 + 4$ $4 \cdot 8 = 8 \cdot 4$

Associative Property		
Words	Symbols	Examples
The way you group three or more numbers when adding or multiplying does not change their sum or product.	For any numbers a , b , and c , $(a + b) + c = a + (b + c)$ and $(ab)c = a(bc)$. <i>order stays same moves grouping symbol</i>	$(3 + 5) + 7 = 3 + (5 + 7)$ $(3 \cdot 5) 7 = 3(5 \cdot 7)$

Ex 1) Evaluate each expression. Name the property used in each step.

$$7(4 - 3) - 1 + 5 \cdot \frac{1}{5}$$

$$2 \cdot 3 + (4 \cdot 2 - 8)$$

$$7 \cdot \frac{1}{7} + 6(15 \div 3 - 5)$$

Ex 2) Eric makes a list of items that he needs to buy for a party and their costs. Find the total cost of these items.

Party Supplies	
Item	Cost (\$)
Balloons	6.75
Decorations	14.00
Food	23.25
Beverages	20.50
