Properties

You can use the properties of addition to help you solve problems.

The Associative Property states that you may group addends differently without changing the value of the sum.

$9 + (6 + 5) = (9 + 6) + 5$
$9 + 11 = 15 + 5$
$20 = 20$

The Commutative Property states that addends may be added in any order without changing the value of the sum

$8 + 5 = 5 + 8$
$13 = 13$

The Zero Property states that you may add zero to any number without changing the value of the number.

$4 + 0 = 4$

Examples:

A- Name each addition property shown.

1) $(4 + 3) + 7 = 4 + (3 + 7)$
$7 + 7 = 4 + 10$ → Associative Property
$14 = 14$

2) $12 + 0 = 12$
$12 = 12$ → Zero Property

3) $9 + 6 = 6 + 9$
$15 = 15$ → Commutative Property

You can use mental math and the properties of multiplication to solve problems.

Properties of Multiplication	Example	Explanation
Commutative Property	4×2=n×4 4×2=2×4 n=2	You can multiply numbers in any order. The product is always the same.
Associative Property	(3×n)×5 = 3×(4×5) (3×4)×5 = 3×(4×5) n=4	You can group factors differently. The product is always the same.
Property of one	n×1=5 5×1=5 n=5	When one of the factors is 1, the product equals the other number.
Zero Property	4×n =0 4×0=0 n=0	When one factor is 0, the product is 0.

Examples:

B- Find the value of *n* based on the different properties.

4) $(7 \times n) \times 8 = 7 \times (5 \times 8)$
$(7 \times 5) \times 8 = 7 \times (5 \times 8)$
$n = 5$

5) $n \times 1 = 48$
$48 \times 1 = 48$
$n = 48$

6) $9 \times 6 = n \times 9$
$9 \times 6 = 6 \times 9$
$n = 6$

7) $15 \times n = 0$
$15 \times 0 = 0$
$n = 0$

You can use the Distributive Property to break apart numbers to make them easier to multiply.

To find 20 × 13 you can break apart 13.

20 × 13 = 20 × (10 + 3) ← Break apart

= (20 × 10) + (20 × 3) ← Multiply

= (200) + (60) ← Add

= 260

Examples:

C- Use the distributive properties or mental math to find the value.

8) 41 x 16

41 x (10 + 6)

(41 x 10) + (41 x 6)

410 + 246

656

9)38 x 22

38 x (20 + 2)

(38 x 20) + (38 x 2)

760 + 76

816

10 64 x 31

64 x (30 + 1)

(64 x 30) + (64 x 1)

192 + 64

256

D- Which property would Alicia use to mentally solve the following equation: 16 x 9? Find the value.

16 x 9 → Alicia needs to use the distributive property

(10 + 6) x 9

(10 x 9) + (6 x 9)

90 + 54

144