Properties of Multiplication
Use with section 1.5

Multiplication Property of 0
The product of 0 and any number is 0.
For example,

$5 \cdot 0 = 0$ $\qquad$ $0 \cdot 8 = 0$ $\qquad$ $a \cdot 0 = 0$ $\qquad$ $0 \cdot b = 0$

Multiplication Property of 1 (Identity Property of Multiplication)
The product of 1 and any number is that same number.
For example,

$5 \cdot 1 = 5$ $\qquad$ $1 \cdot 3 = 3$ $\qquad$ $a \cdot 1 = a$ $\qquad$ $1 \cdot b = b$

Commutative Property of Multiplication
Changing the order of factors does not change their product.
For example,

(a) $3 \cdot 4 = 12$ $\qquad$ $4 \cdot 3 = 12$ $\qquad$ $3 \cdot 4 = 4 \cdot 3$ $\qquad$ $a \cdot b = b \cdot a$

(b) $5 \cdot 7 = 35$ $\qquad$ $7 \cdot 5 = 35$ $\qquad$ $5 \cdot 7 = 7 \cdot 5$ $\qquad$ $ab = ba$

Example 1.
Use the Commutative Property of Multiplication to rewrite each of the following products.
(a) $2 \cdot 6$ $\qquad$ (b) $3 \cdot 7$ $\qquad$ (c) $5 \cdot n$ $\qquad$ (d) $(5 \cdot 1) \cdot 4$ $\qquad$ (e) $(2 \cdot 3) \cdot 4$

Solution:
(a) $2 \cdot 6 = 6 \cdot 2$
(b) $3 \cdot 7 = 7 \cdot 3$
(c) $5 \cdot n = n \cdot 5$
(d) $(5 \cdot 1) \cdot 4 = 4 \cdot (5 \cdot 1)$
(e) $(2 \cdot 3) \cdot 4 = 4 \cdot (2 \cdot 3)$

Associative Property of Multiplication
Changing the grouping of factors does not change their product.
For example,

$2 \cdot (3 \cdot 4) = 2 \cdot 12 = 24$ $\qquad$ $(2 \cdot 3) \cdot 4 = 6 \cdot 4 = 24$ $\qquad$ $2 \cdot (3 \cdot 4) = (2 \cdot 3) \cdot 4$

$a \cdot (b \cdot c) = (a \cdot b) \cdot c$ $\qquad$ $a(bc) = (ab)c$

Example 2.
Use the Associative Property of Multiplication to rewrite each product.
(a) $4 \cdot (5 \cdot 6)$ $\qquad$ (b) $(0 \cdot 2) \cdot 3$ $\qquad$ (c) $(a \cdot 4) \cdot 5$

Solution:
(a) $4 \cdot (5 \cdot 6) = (4 \cdot 5) \cdot 6$
(b) $(0 \cdot 2) \cdot 3 = 0 \cdot (2 \cdot 3)$
(c) $(a \cdot 4) \cdot 5 = a \cdot (4 \cdot 5)$

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