2.4 Multiply Real Numbers

Goal • Multiply real numbers.

Your Notes

VOCABULARY

Multiplicative identity The number 1; The identity property states the product of a and 1 is a.

THE SIGN OF A PRODUCT

The product of two real numbers with the **same sign** is positive.

Examples: $5(2) =$ 10

$-4(-5) =$ 20

The product of two real numbers with **different signs** is negative.

Examples: $5(-3) =$ -15

$-8(4) =$ -32

Example 1 *Multiply real numbers*

Find the product.

Solution

a. $-7(-3) =$ 21 — **Same signs: product is positive.**

b. $3(4)(-2) =$ 12 (-2) — **Multiply 3 and 4.**

$=$ -24 — **Different signs: product is negative.**

c. $\frac{1}{4}(-16)(-3) =$ -4 (-3) — **Multiply $\frac{1}{4}$ and -16.**

$=$ 12 — **Same signs: product is positive.**

Your Notes

✔ ***Checkpoint*** **Find the product.**

1. $-4(-6)$ 24	**2.** $-3(-2)(-7)$ -42

PROPERTIES OF MULTIPLICATION

Commutative Property The order in which two numbers are multiplied does not change the product.

$a \cdot b =$ *b* $\cdot$ *a*

Example: $3 \cdot 4 =$ 4 $\cdot$ 3

Associative Property The way you group three numbers when multiplying does not change the product.

$(a \cdot b) \cdot c =$ *a* $\cdot$ (*b* $\cdot$ *c*)

Example: $(2 \cdot 3) \cdot 4 =$ 2 $\cdot$ (3 $\cdot$ 4)

Identity Property The product of a number and 1 is that number.

$a \cdot 1 =$ 1 $\cdot$ *a* $=$ *a*

Example: $(-2) \cdot 1 =$ -2

Property of Zero The product of a number and 0 is 0.

$a \cdot 0 =$ 0 $\cdot$ *a* $= 0$

Example: $4 \cdot$ 0 $= 0$

Property of -1 The product of a number and -1 is the opposite of the number.

$a \cdot (-1) =$ -1 $\cdot$ *a* $=$ $-a$

Example: $-5 \cdot (-1) =$ 5

Your Notes

Example 2 ***Identify properties of multiplication***

Identify the property illustrated by each expression.

Solution

Statement	Property Illustrated
a. $3 \cdot 0 = 0$	Multiplicative property of zero
b. $t \cdot 1 = t$	Identity property of multiplication
c. $a \cdot 3 = 3 \cdot a$	Commutative property of multiplication
d. $n \cdot (3 \cdot 5) = (n \cdot 3) \cdot 5$	Associative property of multiplication
e. $-7(-1) = 7$	Multiplicative property of -1

✔ ***Checkpoint*** **Identify the property illustrated.**

3. $-4 \cdot 0 = 0$

Multiplicative property of zero

4. $6 \cdot 2 = 2 \cdot 6$

Commutative property of multiplication

5. $(4 \cdot 5) \cdot 6 = 4 \cdot (5 \cdot 6)$

Associative property of multiplication

6. $4 \cdot (-1) = -4$

Multiplicative property of -1

Your Notes

Example 3 ***Use properties of multiplication***

Find the product $(0.5)(-2x)(6)$. Justify your steps.

Solution

$(0.5)(-2x)(6) = (-2x)(0.5)(6)$	Commutative property of multiplication
$= (-2x)(0.5 \cdot 6)$	Associative property of multiplication
$= (-2x)(3)$	Product of 0.5 and 6 is 3.
$= 3 \cdot (-2x)$	Commutative property multiplication
$= [3 \cdot (-2)]x$	Associative property of multiplication
$= -6x$	Product of 3 and -2 is -6.

✔ ***Checkpoint*** **Find the product. Justify your steps.**

7. $-\frac{1}{2}(2)(3y)$

$-\frac{1}{2}(2)(3y) = (-1)(3y)$	Product of $-\frac{1}{2}$ and 2 is -1.
$= [(-1) \cdot 3]y$	Associative property of multiplication
$= -3y$	Multiplicative property of -1

8. $(-2)(a)(-5)$

$(-2)(a)(-5) = (a)(-2)(-5)$	Commutative property of multiplication
$= a \cdot 10$	Product of -2 and -5 is 10.
$= 10a$	Commutative property of multiplication

Homework