

Properties of Real Numbers

Property	Addition Example	Multiplication Example
Commutative	$a + b = b + a$	$a \cdot b = b \cdot a$
Associative	$(a + b) + c = a + (b + c)$	$(a \cdot b) \cdot c = a \cdot (b \cdot c)$
Identity	$a + 0 = a$	$a \cdot 1 = a$
Inverse	$a + (-a) = 0$	$a \cdot \frac{1}{a} = 1$
Distributive	$a(b + c) = a \cdot b + a \cdot c$	

Name that Property!

13. $5 \cdot (2 \cdot 8) = (5 \cdot 2) \cdot 8$ Associative (mult)	14. $6(3 - 7) = 6 \cdot 3 - 6 \cdot 7$ Distributive
15. $7y + (-7y) = 0$ Inverse (Addition)	16. $3a + 2b = 2b + 3a$ Commutative (Addition)
17. $(x^2 + 8x) + 1 = x^2 + (8x + 1)$ Associative (Addition)	18. $\frac{1}{5} \cdot 5 = 1$ Inverse (mult)
19. $(m + n)3 = 3m + 3n$ Distributive	20. $9c + 0 = 9c$ Identity (Addition)

Name the additive and multiplicative inverse for each number.

21. -8 Additive: <u>8</u> Multiplicative: <u>$-\frac{1}{8}$</u>	22. $\frac{2}{3}$ Additive: <u>$-\frac{2}{3}$</u> Multiplicative: <u>$\frac{3}{2}$</u>
23. $6w$ Additive: <u>$-6w$</u> Multiplicative: <u>$\frac{1}{6w}$</u>	24. $\sqrt{10}$ Additive: <u>$-\sqrt{10}$</u> Multiplicative: <u>$\frac{1}{\sqrt{10}}$</u>

Closure Property

A set is **closed** (under an operation) if the operation always produces an element of the same set. If an element outside the set is produced, then the operation is **not closed**.

Answer True or False. If False, give a counterexample.

- 25.** Integers are closed under multiplication. True
- 26.** Irrational numbers are closed under subtraction. False, $\pi - \pi = 0$
- 27.** Whole numbers are closed under division. False, $\frac{2}{3} = 0.\bar{6}$
- 28.** Odd numbers are closed under addition. False, $3 + 5 = 8$