KEY

1.2: Properties of Real Numbers

Real numbers are classified in a variety of ways.

Natural numbers: 1, 2, 3, …

Whole numbers: all Natural numbers, and 0.   So, 0, 1, 2, 3, …

Integers: all Whole numbers, and the negative countable numbers: … , -3, -2, -1, 0, 1, 2, 3, …

Rational numbers: all Integers, and *ratios* of integers, so fractions, ending decimals, and repeating decimals

Irrational numbers: cannot be represented by a ratio of integers. They're decimals that continue on without a pattern. Common examples include $\sqrt{\ }$ and π.

KeyConcept Real Numbers (R)

Letter	Set	Examples
Q	rationals	$0.125, -\dfrac{7}{8}, \dfrac{2}{3} = 0.66\ldots$
I	irrationals	$\pi = 3.14159\ldots$ $\sqrt{3} = 1.73205\ldots$
Z	integers	$-5, 17, -23, 8$
W	wholes	$2, 96, 0, \sqrt{36}$
N	naturals	$3, 17, 6, 86$

Ex#1: Name all of the sets of numbers to which each number belongs.

a) -185 Z, Q, R

b) $\sqrt{49} = 7$ Thus, N, W, Z, Q, R

c) $\sqrt{95}$ I, R

d) $-\dfrac{7}{8}$ Q, R

e) 0 W, Z, Q, R

f) $0.\overline{58}$ Q, R

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Real Number Properties (and Examples)

	For any real numbers, a, b, and c	
Property	Addition	Multiplication
Commutative	a + b = b + a	a • b = b • a
Associative	(a + b) + c = a + (b + c)	(a • b) • c = a • (b • c)
Identity	a + 0 = a	a • 1 = a
Inverse	a + (-a) = 0	$a \cdot \dfrac{1}{a}$
Distributive	a(b + c) = ab + ac	

Ex:#2: Please name the property illustrated by each of the following.

a) $(6 \cdot 8) \cdot 5 = 6 \cdot (8 \cdot 5)$ *associative*

b) $84 + 16 = 16 + 84$ *commutative*

c) $(12 + 5)6 = 12 \cdot 6 + 5 \cdot 6$ *distributive*

Ex#3: Please find the additive and multiplicative inverses of each of the following numbers.

a) -7

b) 0.8 (hint: turn into a fraction)

Additive: $-7 + 7 = 0$

Multiplicative $-7 \cdot \frac{-1}{7} = 1$

Additive: $0.8 + (-0.8) = 0$

Multiplicative $(0.8 = \frac{4}{5})$ so, $\frac{4}{5} \cdot \frac{5}{4} = 1$

Ex#4: Please simplify the following expressions.

a) $-2a + 4a(8 - 3a)$

$-2a + 32a - 12a^2$

$\boxed{30a - 12a^2}$

b) $3(4x - 2y) - 2(3x + y)$

$12x - 6y - 6x - 2y$

$6x - 8y$

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