Properties of Real Numbers

Computation Examples – Mental Math & Reasons in Proofs

Commutative Property (+,x) $4 + 1$ is a lot easier than $1 + 4$
$\forall a,b \in R, a + b = b + a$

Associative Property (+,x) $4 \times 13 \times 25 = 4 \times (13 \times 25) = (4 \times 25) \times 13$
$\forall a,b \in R, (a \times b) \times c = a \times (b \times c)$

Distributive Property $5(99) = 5(100 - 1) = 500 - 5$
$\forall a,b,c \in R, a(b+c) = ab + ac$

Additive Inverse
$\forall a \in R, \exists! -a \ni a + (-a) = 0$

Multiplicative Inverse $16 \times 35 = 16 \times \frac{1}{2} \times 2 \times 35$
$\forall a,b \in R, \exists! 1/a \ni a(1/a) = 1$ $\qquad 8 \quad \times \quad 70$

Property of Zero
$\forall a \in R, a + 0 = a$

Property of One
$\forall a \in R, a \times 1 = a$

Closure Property
$\forall a,b \in R, a*b \in R$

Decompose Numbers $150 - 72 = 150 - 50 - 20 - 2$

Order of Operations   An agreement like

Driving right side
Wedding bands left hand
Home team listed second

Parentheses
Exponentials
Multiply/Divide   *Left to right*
Add/Subtract

$$2 + \underline{30 \div 5} \times 2 + 1 \quad \textit{Do division first}$$
$$= 2 + \quad \underline{6 \quad \times 2} + 1$$
$$= 2 + \quad\quad 12 \quad + 1$$
$$= 15$$

Properties of Equality

Addition Property of Equality

Subtraction Property of Equality

Multiplication Property of Equality

Division Property of Equality

Reflexive Property $a = a$

Symmetric Property   if $a = b$, then $b = a$

Transitive Property   if $a = b$ and $b = c$, then $a = c$

Substitution Principle