Properties of Equality

Addition	If $a = b$, then $a + c = b + c$
Multiplication	If $a = b$, then $a \bullet c = b \bullet c$

Properties of Inequality

Addition	If $a > b$, then $a + c > b + c$
	If $a < b$, then $a + c < b + c$
Multiplication	If $a > b$ and $c > 0$, then $a \bullet c > b \bullet c$
	If $a < b$ and $c > 0$, then $a \bullet c < b \bullet c$
	If $a > b$ and $c < 0$, then $a \bullet c < b \bullet c$
	If $a < b$ and $c < 0$, then $a \bullet c > b \bullet c$

Properties of operations on real numbers

Operation	**Addition**	**Multiplication**
Commutative	$a + b = b + a$	$ab = ba$
Associative	$(a + b) + c = a + (b + c)$	$(ab)c = a(bc)$
Identity	$a + 0 = a$	$a \bullet 1 = a$
Inverse	$a + (-a) = 0$	$a \bullet 1/a = 1$, if $a \neq 0$
Distributive Rule	$a(b + c) = ab + ac$	

Numbers

Natural numbers	$\mathbf{N} = \{1, 2, 3, 4, \dots\}$
Integers	$\mathbf{Z} = \{\dots -4, -3, -2, -1, 0, 1, 2, 3, \dots\}$
Rational numbers	$\mathbf{Q} = \{p/q$, where $p,q \in \mathbf{Z}$ and $q \neq 0\}$
Real numbers	$\mathbf{R}$ = points on the number line

Divisibility and prime numbers

- Division algorithm: Given integers a and b with $a \neq 0$, there exist unique integers q and r such that $b = qa + r$, with $0 \leq r < |a|$
- The integer a is a *divisor* of integer b if $b = na$, where n is an integer. Denote this by $a|b$.
- A natural number p is *prime* if its only divisors are 1 and p.
- Every natural number > 1 is either prime or a product of primes (*composite*).