Properties of Real Numbers

- **identity property of addition** Adding 0 to a number leaves it unchanged
- **identity property of multiplication** Multiplying a number by 1 leaves it unchanged
- **multiplication property of 0** Multiplying a number by 0 gives 0
- **additive Inverse & definition of opposites** Adding a number to its opposite gives 0
  - Every number has an opposite
  - **definition of subtraction** \(x - y\) is \(x\) plus the opposite of \(y\)
- **multiplicative inverse & definition of reciprocal** Multiplying a number by its reciprocal gives 1
  - Every number except 0 has a reciprocal
  - **definition of division** \(x/y\) is \(x\) times the reciprocal of \(y\)

**order properties**

- **commutative property of addition** \(x + y = y + x\)
- **commutative property of multiplication** \(xy = yx\)

**regrouping properties**

- **associative property of addition** \((x + y) + z = x + (y + z)\)
- **associative property of multiplication** \((xy)z = x(yz)\)

**distributive property** \(x(y + z) = xy + xz\)

**properties of equality**

- **reflexivity of equality** \(x = x\)
- **symmetry of equality** if \(x = y\) then \(y = x\)
- **transitivity of equality** if \(x = y\) and \(y = z\) then \(x = z\)
- **addition property of equality** if \(a = b\) then \(a + c = b + c\)
- **multiplicative property of equality** if \(a = b\) then \(a * c = b * c\)