

Maths refreshing course

HSLU, Semester 1

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Part I

Lesson 1

1 Algebraic definitions

- $\mathbb{N} :=$ Natural numbers
- $\mathbb{Z} :=$ Integral numbers
- $\mathbb{Q} :=$ Rational numbers
- $\mathbb{R} :=$ Real numbers

We have that:

$$\mathbb{N} \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{C}$$

2 Prime numbers

A prime number is a natural number which can be divided only by itself or 1

$$n \in \mathbb{N}, n \neq 0, 1$$

3 Positive powers

Let $a \in \mathbb{R}, n \in \mathbb{N}, n \neq 0$ and $a \in \mathbb{R}$

$$3 := 3$$

$$3 := 3 \cdot 3$$

$$3^{23} := 3 \cdot 3 \cdot \dots \cdot 3, 23 \text{ times}$$

3.1 Property 1

Let $a, b \in \mathbb{R}, n, m \in \mathbb{N}$, then

$$a^n \cdot a^m = a^{n+m}$$

3.2 Property 2

Let $a, b \in \mathbb{R}, n \in \mathbb{N}$, then

$$(a \cdot b)^n = a^n \cdot b^n$$

Notation: The power a^n , a is the base and n is the exponent.

3.3 Property 3

Let $a \in \mathbb{R}, m, n \in \mathbb{N}^*$, then

$$(a^n)^m = a^{n \cdot m}, \text{ which is } \neq a^{(n^m)}$$

4 Fractions

Notation 1: $a \cdot b = a \times b = ab$; $\frac{a}{b} = a \div b = a : b$

Notation 2: a is called numerator, b is called denominator.

Notation 3: $\frac{a}{b}$, $a, b \in \mathbb{R}$, $b \neq 0$

4.1 Property 1

Let $a, b, c, d \in \mathbb{R}$, $a, b \neq 0$

$$\boxed{\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}}$$

4.2 Property 2

Let $a, b, c, d \in \mathbb{R}$, $a, b \neq 0$

$$\boxed{\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}}$$

4.3 Property 3

Let $a, b, c, d \in \mathbb{R}$, $a, b \neq 0$

$$\boxed{\frac{a}{b} \pm \frac{c}{d} = \frac{a \cdot d \pm c \cdot b}{b \cdot d}}$$

5 Negative powers

5.1 Definition

$$\boxed{\forall a \in \mathbb{R}, a \neq 0; \quad a^{-1} := \frac{1}{a}}$$

5.2 Property 1

5.3 Property 2