Diskmath Week 4

Emil Straschil

Hello

I am Emil.

I have a **website**:

emils.site (yes thats the URL)

repo: https://github.com/emil3tr/emil3tr.github.io

All materials will be uploaded there.

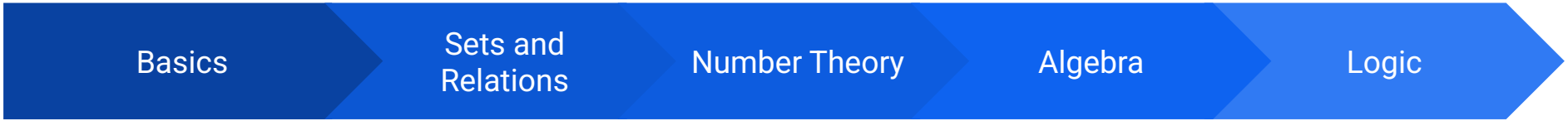
Any Feedback / Questions / Wishes / … ?

→ estraschil@student.ethz.ch

→ “Emil” (floxi4) on dinfk-discord

→ Diskmath-questions: ask here so others can benefit (:

Where are we right now?



Abstraction
Formulas
Statements
Prop. Logic
Pred. Logic
Proof Patterns

Sets
Set Operations
Relations
Equivalence
Partial Order
Functions
Countability

Division
Primes
Modular Arith.
Diffie-Hellman

Monoids
Groups
Euler Totient
RSA
Rings
Polynomials
Finite Fields
Err. Corr. Codes

Proof Systems
Logic
Calculi
Res. Calculus
Prop. Logic
Pred. Logic

Today

Chapter 3 is one of the easier topics. You can collect lots of points on the exam here!

1. Questions?
2. Last Serie
3. Kahoot: Set Basics
4. Exercises: Set Properties
5. Relations

Feedback Form

https://docs.google.com/forms/d/e/1FAIpQLScMBTx1By4t7mXx528I7nb5h_opOEFm7qCXl9oZ3G9RFjT87Q/viewform?usp=header

Only takes 2 minutes!

Very important for me (and you!)

Please be honest (:

Questions?

Last Serie

Some Content for Set Theory

discmath.ch as always

my mega summary contains a good cheatsheet

formulas vs. statements from session 3

This is the first topic where you can look at an old exam to get an idea of what will be asked

Kahoot

Proofs with Sets

Most proofs are of this kind:

1. set-language → logic language
2. work with logic
3. logic language → set-language

Use the definitions to transform expressions from set-language to logic-language and vice versa

Proving Subsets

Want to show $A \subseteq B$?

$\rightarrow$ show that any element in A is also in B

$\rightarrow$ take some x in A and show that this x is also in B

Proving A = B

Show that both A is subset of B and B is subset of A

Exercise:

Use emils.site and the script as a cheatsheet

Relations

A x B

Tuple = ordered set

{a, b} = {b, a} but (a, b) != (b, a)

A x B contains all tuples (a, b) where a is in A and b in B

Relations

Relation from A to B is simply a subset of A x B.

Can write:

- Literally {(a,b), (c,d), ...}
- As a Matrix
- As a graph

Relation over A x A is a directed graph

Relation $p \subseteq A \times A$ is

reflexive

if for all a in A the tuple (a, a) is in the relation.

Graph: every node has an arrow to itself

symmetric

if (a, b) is in the relation then (b, a) is also in the relation.

Graph: if arrow from a to b then also from b to a

antisymmetric

if NOT (a, b) and (b, a) are in the relation for all a,b.

Graph: if arrow from a to b then no arrow from b to a

NOT THE NEGATION OF SYMMETRIC! A relation can be neither symmetric nor antisymmetric

transitive

if (a,b) and (b,c) in the relation then (a,c) must also be in the relation.

Graph: if arrow from a to b and then from b to a then there is also an arrow from a to c.

$a \rightarrow b \rightarrow c$ implies $a \rightarrow c$

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