



# Programmiersprachen II

Homework 1 – WS 18

Tübingen, 18. Oktober 2018

In order to be admitted to the exam, you have to successfully submit your homework every week, except for 2 weeks. A successful submission is one where you get at least 1 point.

**Handin** Please submit this homework until Thursday, October 25, either via email to Philipp Schuster (philipp.schuster@uni-tuebingen.de) before 12:00, or on paper at the beginning of the lab.

**Groups** You can work in groups of up to 2 people. Please include the names and Matrikelnummern of all group members in your submission.

**Points** For each of the Tasks you get between 0 and 2 points for a total of 6 points. You get:  
1 point, if your submission shows that you tried to solve the task.  
2 points, if your submission is mostly correct.

## Task 1: Syntax

Consider the following language, given in BNF:

$\langle term \rangle ::= \text{'squiggle'} \langle term \rangle \mid \text{'squaggle'} \langle term \rangle \mid \text{'sqop'} \mid \text{'transmogriify'} \langle term \rangle \langle term \rangle$

Are the following terms in the language? (No proof required)

1. squiggle sqop
2. sqop sqop
3. transmogrify (squiggle squaggle) squiggle
4. squiggle (squaggle sqop)

## Task 2: Inference rules

How could we define the set of terms (called  $\mathcal{T}$ ) from Task 1 with inference rules?  
One inference rule would be for example:

$$\frac{t_1 \in \mathcal{T}}{\text{squiggle } t_1 \in \mathcal{T}}$$

Which of the inference rules are axioms?

## Task 3: Induction

We define the sequence of sets  $S_i$ :

$$S_0 := \emptyset$$

$$S_{i+1} := \{\text{sqop}\} \cup \{\text{squiggle } t, \text{squaggle } t \mid t \in S_i\} \cup \{\text{transmogripy } t_1 t_2 \mid t_1 \in S_i, t_2 \in S_i\}$$

Prove by induction on  $i$ :  $\forall i \in \mathbb{N} : S_i \subseteq S_{i+1}$