Practical "Introduction to Artificial Intelligence"

Prof. Dr. Gunter Grieser

Block 1: Prolog

Sheet 4: More Lists and Practicing

Hints:

- *In Block 1 (Prolog) you do not have to submit your solutions to me. Just solve the excercies and discuss your problems and solutions.The aim of Block 1 is that you become familiar with the prolog programming.*
- *If you do not succed with a task, just delay it and try it again later. Some constructs need time to settle in the brain and will become easier as you get more experienced.*

Preparation (at home):

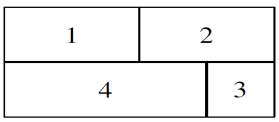
Read Chapter 6 of LearnPrologNow!.

Excercise 4.1

Reproduce the examples from the chapter of LearnPrologNow! on your machine and solve the excercises.

Excercise 4.2

Let the following four rectangles be given:



You have three colors red, yellow and green. We are looking for a coloring of all rectangles such that neighbouring areas are colored differently.

a) Write a prolog program that solves this problem.

b) Depict the search tree till the first solution is found.

c) change your program so that the first solution is found as fast as possible.

d) (advanced) Extend your solution so that it works for arbitrary maps. (using 4 colors).

Excercise 4.3

Consider the following puzzle:

```
AB  +  C  =  DE
 *     +     +
AB  -  C  =  AD
 =     =     =
DFB  :  G  =  HD
```

Here, the letters A-H represent single digits of decimal numbers. If e.g. we assign the digits 3,4, and 2 to the letters B, D, and F, then DFB means the number 423.
An assignment of {0, . . . , 9} to A-H solves the puzzle if

- every letter is assigned a different digit, and
- all equations hold.

Write a predicate `puzzle/8` that is true if `puzzle(A,B,C,D,E,F,G,H)` is a solution for the puzzle.

Hint: First start by ignoring the requirement that every letter is assigned a different digit.

Excercise 4.4

Write a tail recursive predicate `psum/2` with the following properties:
If L is a list of numbers $n_1, ..., n_m$ *(m>0)* then the query

```
?- psum(L, P).
```

is true if `P` is the sum of any subset of numbers in `L`.

For example, the query

```
?- psum([1, 2, 3], P).
```

shall return the following answers (the order does not matter):

```
P = 6 ;
P = 3 ;
P = 4 ;
P = 1 ;
P = 5 ;
P = 2 ;
P = 3 ;
P = 0.
```

Excercise 4.5

Write a pretty print for lists:

a) Each element of the list is written in a new line indented by 3 spaces. E.g. The list [a,b] is written as

```
[
   a
   b
]
```

b) If the element is again a list then indent again. E.g. the list [a, [b, [c],d]] shall be written as

```
[
   a
   [
      b
      [
         c
      ]
      d
   ]
]
```

Hint: You could use the predicates `write`, `nl`, `format`, e.g.

c) (Advanced) Extend your program so that all but the last element ist followed by a comma, i.e.:

```
[
   a,
   [
      b,
      [
         c
      ],
      d
   ]
]
```