Assignments week 2

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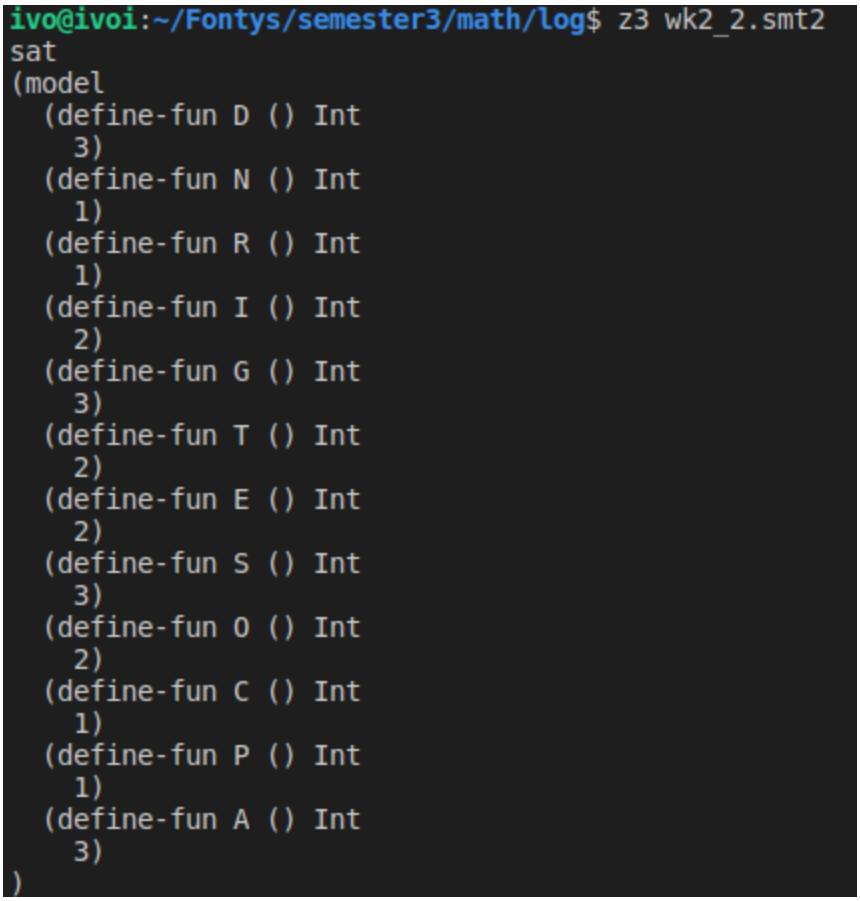
Task 1:

We just make sure that all of the ages are different integers larger than 0 and all of the statements are entered correctly (we used the ite instruction for it).

```
ivo@ivoi:~/Fontys/semester3/math/log$ z3 wk2_1.smt2
sat
(model
  (define-fun Alex () Int
    30)
  (define-fun Erin () Int
    37)
  (define-fun Brook () Int
    51)
  (define-fun Cody () Int
    55)
  (define-fun Dusty () Int
    46)
)
```

Task 2:

Each letter on the dices is represented by a variable with the same name. The variable holds the value of the die (the dies are numbered 1, 2, 3) on which the letter is placed. We make sure that the die has exactly 4 sides.



Task 3.1:

We decided to tackle a smaller problem as a warmup. This is the problem that we started with. https://www.brainzilla.com/logic/self-referential-quiz/basic-1/. We represent the questions as string variables with names Q1 to Q3 and ensured that the strings are between the proper boundaries (so a string can only be A B C or D).

```
ivo@ivo1:~/Fontys/semester3/math/log$ z3 wk2_3.smt2
sat
(model
  (define-fun Q3 () String
    "C")
  (define-fun Q2 () String
    "A")
  (define-fun Q1 () String
    "A")
  (define-fun AllToInt ((x!0 String)) Int
    (+ (* 2 (ite (= "A" x!0) 1 0)) (ite (= "C" x!0) 1 0)))
  (define-fun ToInt ((x!0 String) (x!1 String)) Int
    (ite (= x!1 x!0) 1 0))
  (define-fun AnswerLimit ((x!0 String)) Bool
    (or (= x!0 "A") (= x!0 "B") (= x!0 "C") (= x!0 "D")))
)
```

Task 3.2:

We decided to tackle the hardest problem on the website. It can be found here: https://www.brainzilla.com/logic/self-referential-quiz/srat/. We represent the questions with string variables (A B C D E) named Q1 to Q20. We then apply the instructions of each question using those variables. We utilize functions to make the code shorter and more readable. Whenever we need to find a first occurrence, we use nested if-then-else statements.

```
ivo@ivoi:~/Fontys/semester3/math/log$ z3 wk2_3new.smt2
sat
(model
  (define-fun Q8 () String
    "E")
  (define-fun Q7 () String
    "D")
  (define-fun Q20 () String
    "E")
  (define-fun Q3 () String
    "D")
  (define-fun Q13 () String
    "D")
  (define-fun Q11 () String
    "B")
  (define-fun Q19 () String
    "B")
  (define-fun Q10 () String
    "A")
  (define-fun Q1 () String
    "D")
  (define-fun Q6 () String
    "D")
  (define-fun Q9 () String
    "D")
  (define-fun Q14 () String
    "B")
  (define-fun Q18 () String
    "A")
  (define-fun Q4 () String
    "B")
  (define-fun Q5 () String
    "E")
  (define-fun Q15 () String
    "A")
  (define-fun Q2 () String
    "A")
  (define-fun Q17 () String
    "B")
  (define-fun Q16 () String
    "D")
  (define-fun Q12 () String
    "A")
```

At the end of the file, there is a comment. There are actually multiple solutions to the problem, which can be obtained by uncommenting the lines at the bottom. The new solutions are very similar to the original one shown above, only the last 2 questions interact with each other.

As the creator of this puzzle James Propp says on http://faculty.uml.edu/jpropp/srat-Q.txt:
“I should mention that if you don't agree with me about the answer to #20, you will get a

different solution to the puzzle than the one I had in mind. But I should also mention that if you don't agree with me about the answer to #20, you are just plain wrong. 😊”