Lecture 1: Introduction -- Homework

Homework

The starred exercises are assigned as homework, and are due at the beginning of the following lecture.

***Exercise 1.1** Let us know the preferred form of your name, preferred pronouns, the time-zone you're working from, and anything else that you want us to know about you.

Exercise 1.2 Do Lab 0 at home, which mostly involves installing Haskell and learning about various command-line utilities including git. If you have trouble with the installation, attend either a lab TA or instructor's office hours, and we'll try to get you sorted out. Note that knowledge of Windows among the teaching staff is weak, and you may need to look to your peers via Piazza.

Exercise 1.3 Consider the expression `(1 :: Integer) + 2 * (3 :: Double)`. This will cause a type error, because the two different type constraints are inconsistent. One bit of trickiness is that the inconsistency could be revealed either in the analysis of `(+)` or `(*)`. Provide both analyses.

continues...

*__Exercise 1.4__ The law of cosines is a generalization of the Pythagorean Theorem, which allows us to compute the length c of the third side of a triangle, given the lengths of the two other sides a and b, and the included angle γ.

Expand the Haskell script file Hypotenuse.hs to include a function `law_of_cosines` which takes three arguments: `a`, `b`, and `gamma`, and returns the length of `c`.

Some notes: your function should take the angle `gamma` in *degrees*, but you need to be aware that the Haskell's built in `cos` function expects its argument to be in *radians*, i.e.,

```
> cos pi
-1
```

Note that `pi` is a predefined constant in Haskell for the mathematical constant π.

Floating point arithmetic in Haskell (like almost all programming languages) is finite precision, and only approximately corresponds to the real numbers of mathematics. My implementation returned the following results, which you might want to use as test data:

```
> law_of_cosines 1 1 60
0.9999999999999999
> law_of_cosines 1 1 120
1.7320508075688772
> law_of_cosines 3  4 90
5.0
> law_of_cosines 3 4 0
1.0
> law_of_cosines 3 4 180
7.0
```

Exercise 1.5 If you have a mathematical turn of mind, you may find the optional lecture on Peano Arithmetic interesting.