

Problem Sheet 2.2: Data Types in Haskell

Data Types

We return to our family of ducks. However, rather than making a list of pairs like last week, we have now created a special data type for them: `Duck` ! This type stores the name of the duck as a `String`, then the age of the duck as an `Int`. We have given you a family of ducks to get started with.

- a) Implement the function `birthday`, which takes a `Duck` as an input and returns the same duck, except that its age has increased by one.

```
*Main> birthday donald
Duck "Donald" 7
```

- b) We want to add more information to our Ducks. Amend the type constructor `Duck` so that it also includes a `Float` that will represent the duck's height in metres. Amend our family of ducks so that they fit this new type, and also the function `birthday`. You can choose whatever heights you like for the ducks.

```
*Main> duckFamily
[Duck "Donald" 6 0.63,Duck "Daisy" 5 0.56,
Duck "Huey" 2 0.23,Duck "Dewey" 1 0.25]
```

- c) Give a type to and implement the function `tall`, which returns `True` if a duck is over 0.6m tall, `False` otherwise.

```
*Main> tall donald
True
*Main> tall huey
False
```

- d) We should probably distinguish between ducks and ducklings. Add another constructor `Duckling` to the type `Duck` that also takes a `String`, `Int` and `Float`. Amend `huey` and `dewey` so that they are registered as ducklings rather than ducks.

```
*Main> duckFamily
[Duck "Donald" 6 0.63,Duck "Daisy" 5 0.56,
Duckling "Huey" 2 0.23,Duckling "Dewey" 1 0.25]
```

- e) Since we have added the constructor `Duckling`, `birthday` and `tall` are no longer well defined. Add a case for ducklings to `birthday`, and add to the definition of `tall` such that a duckling is tall if its height is greater than or equal to 0.25m.

```
*Main> birthday dewey
Duckling "Dewey" 2 0.25
*Main> tall dewey
True
```

- f) Once a duckling reaches 3 years of age, it is a full grown duck. Amend the function `birthday` so that two year old ducklings become three year old ducks.

```
*Main> birthday huey
Duck "Huey" 3 0.23
```