COM2001 — Advanced Programming Topics

Exercise Sheet 2: More Instance Declarations

Spring Semester

1 More instance declarations

When grading students' work, two of the main requirements of a grading system are that

- It should be possible to determine whether one grade is higher or lower than another; and
- It should be possible to determine whether a grade counts as a pass or a fail.

This can be modelled as a class:

```
class (Ord gs) ⇒ GradingSystem gs where
  isPass :: gs → Bool
  isFail :: gs → Bool

  -- default
  isFail = not ∘ isPass
  isPass = not ∘ isFail
```

Problem 1. What would you say (use your own judgment) is the "minimal complete definition" required for making a type into an instance of `GradingSystem`?

There are many different grading systems in everyday use. For example:

- School exams are often assigned a grade ranging from A (highest) to E (lowest), with a special mark "U" (*unclassified*) for failing solutions;
- Our university modules are assigned a percentage ranging from 100% (highest) to 0% (lowest), together with a special mark "NC" (*Not Completed*) for students who were registered for the module but didn't do the assessment.
- Overall performance in a UK degree is often indicated by grades from the set { 1, 2.1, 2.2, 3, Pass, Fail }, and can be with or without "honours".

Problem 2. Define data types representing each of these grading systems, and show how to make them instances of `GradingSystem`.

2 Correcting and editing instance declarations

Problem 3. Without running it, identify as many syntax and typing errors in the following Haskell code as you can:

```
type UserInfo = UserInfo {
  Name        :: String;
  PhoneNumber :: Integer
  }

class Show UserInfo
  show :: UserInfo → String
  show UserInfo n p =    "(name: " + n + ", tele: " + p
```

Problem 4. Write a corrected version of this code and check that it correctly displays the details of a user called Bob whose phone number is 555-7890.

Problem 5. Edit your version of the code so that it can also display the details of a user called Mary whose phone number is unlisted.