McMaster University   **CAS 707**
Department of Computing and Software   **Sheet 1**
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CAS 707 — Formal Specification Techniques
6 January 2016

Individual solutions to the assignment question here are due **electronically** and on paper to the instructor **before class (11:00 a.m.) on Monday, January 11**.

Submit your solutions electronically to Avenue and your course subversion directory — detailed instructions for file organisation will be on Avenue. Submit both your source files and a PDF document containing listings of all your source files together with explanations as you find appropriate.

Please avoid spaces and special characters in file names!

For including ACSL listings in a LATEX document, include the following in your preamble:

```
\usepackage{listings}
\usepackage{listingsACSL} % provided on the course web page
```

If all your listings use the same style, you may invoke the following before your first listing:

```
\lstset{%
  language=[ACSL]C,
  frame=single,
  identifierstyle=\slshape,
  columns=flexible}
```

(This is what is used here.) Your LATEX installation should contain the documentation file "listings.pdf" of the listings package.

For including the listings, you can put the following for each file:

```
\texttt{MyFile.c}:
\lstinputlisting{MyFile.c}
```

Make sure that "gcc -std=c99" and Frama-C accept your files!

Exercise 1.0 — General Background Preparation

- If you don't have it yet: Install and learn LATEX— tug.org/texlive
- Read **RSD** chapters 1–4
- Review quantification, sets relations, functions, . . .
  (RSD 4; LADM 8,9,11,14; Using Z 3–8)
- Download and browse the C99 standard as referenced by the Wikipedia page on C.
- (If you don't have a UNIX-like system yet: Install **Linux** or ***BSD**)
- (If you don't know functional programming yet:
  - Learn **Haskell** — haskell.org
  - or **OCaml** — ocaml.org
  and look in particular at simple tree datatypes)

Exercise 1.1 — Frama-C and ACSL

(a) Download the "ACSL Mini-Tutorial and **read** chapters 1–7.

(b) Install **Frama-C** — frama-c.com

(c) Familiarise yourself with basic use of the Frama-C GUI.

(d) **Start to familiarise yourself** with
  - the ACSL Reference document "ACSL: ANSI/ISO C Specification Language Version 1.9"
  - the Frama-C User Manual (Release Sodium 20150201)

Assignment Question 1.2 — Character Deletion

(a) Implement the C function

> **int** *deleteChar*(**char** $* s$, **int** n, **char** c)

that takes a C string of maximal length n as argument, and modifies it by removing all occurrences of c. It should return the length of the remaining string.

(b) In a seperate module, write a driver program (*main*() function) that tests you *deleteChar* function on a number of "interestingly different" test cases.

(c) Start annotating your function with ACSL specifications for the function itself and for any contained loops.

Document the problems you encounter — real solutions to this item are not yet expected.