Informatik für Mathematiker und Physiker  

Serie 9  

HS 10

Skript-Aufgabe 92 (4 Punkte)

Find pre- and postconditions for the following functions.

a) double f (const double i, const double j, const double k)
   
   {  
      if (i > j)
          if (i > k)
              return i;
          else
              return k;
      else
      if (j > k)
          return j;
      else
          return k;
   }

b) double g (const int i, const int j)
   
   {  
      double r = 0.0;  
      for (int k = i; k <= j; ++k)
         r += 1.0 / k;
      return r;
   }

Skript-Aufgabe 94 (4 Punkte)

What is the output of the following program, depending on the input number i? Describe the output in mathematical terms, ignoring possible over- and underflows.

#include <iostream>

int f (const int i)

{  
    return i * i;
}

int g (const int i)

{  
    return i * f(i) * f(f(i));
}

void h (const int i)

{ 
    std::cout << g(i) << "\n";
}
int main()
{
    int i;
    std::cin >> i;
    h(i);
    return 0;
}

Skript-Aufgabe 101 (4 Punkte)

Write a program unique.cpp that implements and tests the following function.

// PRE:  (first, last) is a valid range and describes a sequence
//       of elements that are sorted in nondecreasing order
// POST: the return value is true if and only if no element
//       occurs twice in the sequence
bool unique (const int* first, const int* last);

Skript-Aufgabe 105 (4 Punkte)

A perpetual calendar can be used to determine the weekday (Monday, ..., Sunday) of any
given date. You may for example know that the Berlin wall came down on November 9, 1989, but
what was the weekday? (It was a Thursday.) Or what is the weekday of the 1000th anniversary
of the Swiss confederation, to be celebrated on August 1, 2291? (Quite adequately, it will be a
Saturday.)

a) The task is to write a program that outputs the weekday (Monday, ..., Sunday) of a
given input date.

Identify a set of subtasks to which you can reduce this task. Such a set is not unique, of
course, but all individual subtasks should be small (so small that they could be realized
with few lines of code). It is of course possible for a subtask in your set to reduce to
other subtasks. (Without giving away anything, one subtask that you certainly need is to
determine whether a given year is a leap year).

b) Write a program perpetual_calendar.cpp that reads a date from the input and outputs
the corresponding weekday. The range of dates that the program can process should start
no later than January 1, 1900 (Monday). The program should check whether the input is
a legal date, and if not, reject it. An example run of the program might look like this:

    day =? 13
    month =? 11
    year =? 2007
    Tuesday

To structure your program, implement the subtasks from a) as functions, and put the
program together from these functions.

Die Aufgaben 110 und 111 aus den Vorlesungsunterlagen sind die Challenge Aufgaben und geben
jeweils 8 Punkte, wenn sie vollständig gelöst werden.

Abgabe:  Bis 30. November 2010, 15.15 Uhr.