

CSC 106 - SPRING 2016
THE PRACTICE OF COMPUTER SCIENCE
ASSIGNMENT 4
UNIVERSITY OF VICTORIA

Due: Tuesday, March 15th, 2016 at 11:00pm.

This assignment will be submitted electronically through **conneX** (as described in ‘Submission Instructions’ below). Do not submit a hard copy of your answers; paper submissions will not be marked. All code submissions must be your own work. However, you are permitted to use the code discussed in lectures and labs (or code posted on **conneX**) as the basis for your submissions if proper attribution is given.

Question 1: Survey of Programming Languages [30 marks]

Consider the problem of finding the **median** of three numbers x, y and z . Recall that the median of a set of numbers is the value which lies in the middle when the numbers are sorted. For example, the median of 4, 9 and 1 is 4 and the median of 2, 5 and 3 is 3.

Choose 3 of the languages listed below and, for each language, write a program which reads three integer values from the user and prints the median of the three. Some of the languages listed will not be officially covered by the course, so they may be more challenging to use.

- Ada
- C or C++ (but not both)
- C#
- FORTRAN (any version, including Fortran-95, is fine)
- Java
- Common Lisp
- Pascal
- Perl
- Pep/8 assembly
- Python

All of the languages above (except Pep/8) are supported by the online tools at <http://www.tutorialspoint.com/codingground.htm>. If you develop your program using the tools on that website, you can download the source file by right-clicking on the file in the left-hand pane of the IDE and selecting “Download file”.

Your submission for this question will consist of three files (one for each chosen language). Each program will be worth 10 marks. Please name your files according to the table below.

Language	Filename
Ada	median3.adb
C	median3.c
C++	median3.cpp
C#	median3.cs
FORTTRAN IV	median3.f
FORTTRAN 77	median3.f
Fortran 90	median3.f90
Fortran 95	median3.f95
Java	Median3.java
Lisp	median3.lisp
Pascal	median3.pas
Perl	median3.pl
Python	median3.py

Bonus (optional): You will receive 10 bonus marks if you submit implementations for all 10 options above. (This is mostly a character building exercise, since the work required far outweighs the number of bonus marks offered)

Question 2: Database Systems [30 marks]

One example of a large scale database system is the University of Victoria's registration database, which tracks the enrollment and scheduling for all courses offered at the university. Consider the three tables below, which contain a subset of the course scheduling information for Spring 2016. The table **course_names** maps each course to its name, the table **course_sections** specifies the instructor for each section of each course, and the table **prerequisites** maps each course to its prerequisite courses. Note that a course may have multiple sections and multiple prerequisites.

Table course_names		
subject_code	course_number	course_name
CSC	106	The Practice of Computer Science
CSC	110	Fundamentals of Programming I
CSC	115	Fundamentals of Programming II
CSC	205	2d Graphics and Image Processing
CSC	225	Algorithms & Data Structures I
CSC	226	Algorithms & Data Structures II
CSC	230	Intro. to Computer Architecture
SENG	265	Software Development Methods
CSC	370	Database Systems
SENG	310	Human Computer Interaction

Table course_sections				
subject_code	course_number	section_name	instructor_firstname	instructor_lastname
CSC	106	A01	Bill	Bird
CSC	106	A02	Bill	Bird
CSC	110	A01	Tibor	van Rooij
CSC	110	A02	Tibor	van Rooij
CSC	115	A01	LillAnne	Jackson
CSC	115	A02	LillAnne	Jackson
CSC	115	A03	Tibor	van Rooij
CSC	115	A04	Tibor	van Rooij
CSC	205	A01	Bill	Bird
CSC	225	A01	Venkatesh	Srinivasan
CSC	226	A01	Frank	Ruskey
CSC	226	A02	Frank	Ruskey
CSC	230	A01	Sudhakar	Ganti
SENG	265	A01	Daniel	Hoffman
SENG	265	A02	Daniel	Hoffman
CSC	370	A01	Alex	Thomo
SENG	310	A01	Peggy	Storey

Table prerequisites			
subject_code	course_number	prereq_subject	prereq_number
CSC	115	CSC	110
CSC	225	CSC	115
CSC	226	CSC	225
CSC	230	CSC	115
SENG	265	CSC	115
CSC	370	CSC	226
CSC	370	SENG	265
SENG	310	SENG	265

A file `courses.sql` has been posted to `conneX` (in the Lectures section) which creates a database containing the three tables above (and the data for each table). In the space indicated in the `courses.sql` file (without modifying any of the existing SQL statements), write SQL queries for each of the questions below. Your submission for this question should be a single modified version of `courses.sql`, with all of the table data intact, containing your answers for all of the questions below.

Note that it is acceptable for errors to be reported on lines 3, 4 and 5 of the `courses.sql` file (since those lines are used to clear any existing data from the database).

When you experiment with `sqlite3`, you may want to use the `.mode column` and `.header on` commands to improve the readability of the output.

The sample output given below was generated after running `.mode column` and `.header on`. It is not necessary for your queries to produce output in the same order as the samples, unless the ordering is specified in the question.

- (a) Write a query to print the subject code, course number and course name of every course listed above, sorted by the course number.

Sample output:

subject_code	course_number	course_name
-----	-----	-----
CSC	106	The Practice of Computer Science
CSC	110	Fundamentals of Programming I
CSC	115	Fundamentals of Programming II
CSC	205	2d Graphics and Image Processing
CSC	225	Algorithms & Data Structures I
CSC	226	Algorithms & Data Structures II
CSC	230	Intro. to Computer Architecture
SENG	265	Software Development Methods
SENG	310	Human Computer Interaction
CSC	370	Database Systems

- (b) Write a query to print the subject code, course number, section name and instructor name (first/last) for all sections of CSC 115.

Sample output:

subject_code	course_number	section_name	instructor_firstname	instructor_lastname
-----	-----	-----	-----	-----
CSC	115	A01	LillAnne	Jackson
CSC	115	A02	LillAnne	Jackson
CSC	115	A03	Tibor	van Rooij
CSC	115	A04	Tibor	van Rooij

- (c) Write a query to print the subject code, course number and course name of all second year (200-level) courses.

Sample output:

subject_code	course_number	course_name
-----	-----	-----
CSC	205	2d Graphics and Image Processing
CSC	225	Algorithms & Data Structures I
CSC	226	Algorithms & Data Structures II
CSC	230	Intro. to Computer Architecture
SENG	265	Software Development Methods

- (d) Write a query to print the subject code, course number, course name and section name of all courses taught by Tibor van Rooij.

You should use the command `.width 15 15 30 15` before your query to prevent the course name from being truncated.

Sample output:

subject_code	course_number	course_name	section_name
-----	-----	-----	-----
CSC	110	Fundamentals of Programming I	A01

CSC	110	Fundamentals of Programming I	A02
CSC	115	Fundamentals of Programming II	A03
CSC	115	Fundamentals of Programming II	A04

- (e) Write a query to print the instructor name (first/last), course name and section name for every SENG course.

You should use the command `.width 15 15 30 15` before your query to prevent the course name from being truncated.

Sample output:

<code>instructor_firs</code>	<code>instructor_last</code>	<code>course_name</code>	<code>section_name</code>
-----	-----	-----	-----
Daniel	Hoffman	Software Development Methods	A01
Daniel	Hoffman	Software Development Methods	A02
Peggy	Storey	Human Computer Interaction	A01

- (f) Write a query to print the subject code, course number, course name and the total number of sections for each course, sorted by course number. Note that your output is not required to have `num_sections` as the heading for the last column (you should use the SQL COUNT function).

You should use the command `.width 15 15 30 15` before your query to prevent the course name from being truncated.

Sample output:

<code>subject_code</code>	<code>course_number</code>	<code>course_name</code>	<code>num_sections</code>
-----	-----	-----	-----
CSC	106	The Practice of Computer Science	2
CSC	110	Fundamentals of Programming I	2
CSC	115	Fundamentals of Programming II	4
CSC	205	2d Graphics and Image Processing	1
CSC	225	Algorithms & Data Structures I	1
CSC	226	Algorithms & Data Structures II	2
CSC	230	Intro. to Computer Architecture	1
SENG	265	Software Development Methods	2
SENG	310	Human Computer Interaction	1
CSC	370	Database Systems	1

- (g) Write a query to print the subject code, course number and course name of every course which has CSC 115 as a prerequisite.

You should use the command `.width 15 15 32` before your query to prevent the course name from being truncated.

Sample output:

<code>subject_code</code>	<code>course_number</code>	<code>course_name</code>
-----	-----	-----
CSC	225	Algorithms & Data Structures I
CSC	230	Intro. to Computer Architecture
SENG	265	Software Development Methods

- (h) (Bonus - 4 marks - optional) Write a query to print the name (first/last) of every instructor who teaches more than one section, sorted by last name.

You should use the command `.width 20 20` before your query to prevent the output data from being truncated.

Sample output:

<code>instructor_firstname</code>	<code>instructor_lastname</code>
-----	-----
Bill	Bird
Daniel	Hoffman
LillAnne	Jackson
Frank	Ruskey
Tibor	van Rooij

Submission Instructions

All submissions for this assignment will be accepted electronically. You are permitted to delete and resubmit your assignment as many times as you want before the due date, but no submissions or resubmissions will be accepted after the due date has passed.

Ensure that each file contains a comment with your name and student number, and that the files for each question are named as dictated by the question. If you do not name your files correctly, or if you do not submit them electronically, it will not be possible to mark your submission and you will receive a mark of zero.

After submitting your assignment, conneX will automatically send you a confirmation email. If you do not receive such an email, your submission was not received. If you have problems with the submission process, send an email to the instructor **before** the due date.