

Programming Assignment 2

Each team/student may choose one of the tracks for the programming assignment 2.

Compiler Track:

Augment your *MiniJ* parser with semantic actions for constructing parse trees, and write a C code generator for your *MiniJ* compiler.

- See an attached package for the reference files.
- You are requested to separate the C code, the Lex/Flex specification, the Yacc/Bison specification into distinct files.

Programming Languages Track:

Practice on programming the same exercises in 5 different programming languages: Java, Python, R, ML, and Prolog. You may integrate the two programming exercises into one program for each programming language.

- **Programming Exercises:** The attached file HW2data.csv has the scores of a class: HW1, HW2, HW3, Midterm, and Final.

A) The overall score of a student is calculated by the following formula:

$$\text{Score} = \text{HW1} * 0.1 + \text{HW2} * 0.1 + \text{HW3} * 0.1 + \text{Midterm} * 0.3 + \text{Final} * 0.4$$

Write a program in the above 5 different programming languages to calculate the overall score of each student.

B) The grade of a student is translated according to the following table:

Score	Grade
0-49	E
50-59	D
60-62	C-
63-66	C
67-69	C+
70-72	B-
73-76	B
77-79	B+
80-84	A-
85-89	A
90-100	A+

Write a program in the above 5 different programming languages to translate the overall score of each student into a grade.

Guideline:

1. You have to demonstrate your program in person and have the report in paper with you.
2. You may get up to additional 15% bonus if you succeed in each of the following conditions:
 - Redesign the overall data structures for parse trees.
 - Rewrite all pieces of the C code generator.
 - Implement a type analyzer for the *MiniJ* Compiler.And, up to 15% penalty will be given for lateness. More precisely, if you get X in demonstration, and Y for the report:
 - (6/7th or 9th) Your score = $(X * 70\%) * 115\% + Y * 30\%$
 - (6/14nd or 16th) Your score = $X * 70\% + Y * 30\%$
 - (Late) Your score = $(X * 70\% + Y * 30\%) * 85\%$
3. Your report has to include the following elements:
 - A cover page.
 - The problem description.
 - Highlight of the way you write the program.
 - The program listing.
 - Test run results.
 - Discussion.
4. For remote demonstration, you may choose to demonstrate in one of the two suggested ways:
 - A) Install all the software tools for programming assignment 2 on the same computer that you are going to use for connecting to the remote classroom.
 - B) Connect to the remote classroom with a mobile device with web cam, and demonstrate your programs with live video.

A Sample Input Program

```

/* This is a comment line in the sample program. */
INT f2 ( INT x, INT y )
BEGIN
    INT z;
    z := x*x - y*y;
    RETURN z;
END

INT MAIN f1 ()
BEGIN
    INT x;
    READ(x, "Please input an integer number x: ");
    INT y;
    READ(y, "Please input another integer number y: ");
    INT z;
    z := f2(x, y) + f2(y, x);
    WRITE(z, "f2(x, y) + f2(y, x) = ");
END

```

A Sample Generated C Code

```

#include <stdio.h>
#include <stdlib.h>
#include <string.h>
void tiny_readint ( int *x, char *s ) {
    printf("%s ", s);
    scanf("%d", x);
}
void tiny_writeint ( int x, char *s ) {
    printf("%s ", s);
    printf("%d\n", x);
}
int f2 ( int x, int y)
{ int z;
  z = x * x - y * y;
  return z;
}
int main ( )
{ int x;
  tiny_readint(&x, "A41.input");
  int y;
  tiny_readint(&y, "A42.input");
  int z;
  z = f2(x, y) + f2(y, x);
  tiny_writeint(z, "A4.output");
}

```