國立清華大學資訊工程學系

計算機結構

2019 Fall Homework 3

Deadline: 2019.10.20 23:59

- Those two exercises are to practice procedure call and recursive call.

Q1：Write a MIPS assembly program for the following C program.

```
#include "math.h"
#include "stdio.h"

int abs_sub(int x, int y);
int madd(int x, int y);

int main() {
  int a = 0;
  int b = 0;
  int c = 0;
  int d = 0;
  printf("input a:");
  scanf("%d", &a);
  printf("input b:");
  scanf("%d", &b);
  printf("input c:");
  scanf("%d", &c);
  d = abs_sub(b, madd(a, c));
  printf("result = %d", d);
  return 0;
}

int abs_sub(int x, int y) {
  int large = (x >= y) ? x : y;
  int small = (x <= y) ? x : y;
  return large - small;
}


int madd(int x, int y) {
```

```
  int ans = 0;
  int large = (x >= y) ? x : y;
  int small = (x <= y) ? x : y;
  while (large >= small) {
    ans = ans + small;
    large = large - 1;
  }
  return ans;
}
```

P.S. a, b, c, d are stored in `$s0`, `$s1`, `$s2`, `$s3` respectively.
And you must use the procedure (function) call to implement `madd` and `abs_sub` .
Also, your program should terminal normally (the output should show "-- program is finished running --").

Output format example:

```
input a: 4
input b: 2
input c: 1
result = 2
```

Q2：Write a MIPS assembly program for the following C program.

```
#include "stdio.h"
int fn(int x, int y);
int re(int x);

int main() {
  int a = 0;
  int b = 0;
  int c = 0;
  int d = 0;
  printf("input a: ");
  scanf("%d", &a);
  printf("input b: ");
  scanf("%d", &b);
  c = re(a);
  printf("ans: %d", c);
  d = fn(b, c);
  printf("ans: %d", d);
```

```
  return 0;
}

int fn(int x, int y) {
  if (x <= 0)
    return 0;
  else if (y <= 0)
    return 0;
  else if (x > y)
    return 2;
  else
    return 3 * fn(x - 1, y) + 2 * fn(x, y - 1) + fn(x - 1, y - 1);
}
int re(int x) {
  return (x >= 2) ? (x * x + x * re(x - 1) + (x - 1) * re(x - 2))
                  : ((x == 1) ? 1 : 0);
}
```

P.S. a, b, c, d are stored in `$s0`, `$s1`, `$s2`, `$s3` respectively.

Output format example:

```
input a: 1
input b: 2
ans: 1ans: 2
```

- **Submission** (2 assembly programs)

Please name your assembly program with your student ID, for example:
"arch_hw3_p1_100000001.asm" & "arch_hw3_p2_100000001.asm".
Use the iLMS (http://lms.nthu.edu.tw/) to submit your program.

- **Grading Criteria**

Correctness: 80%
Comment in program: 10%
Output format: 10%