Programming is fun, no kidding!

~ Dr. Zhou Lifeng

CS1010E Programming Methodology

Tutorial 11: Simple Recursion

To students:

Last tutorial! ☺

Recursion is often used in the next programming module CS1020. Hence it is important for you to understand the basics well in CS1010E.

I. Manual tracing

1. [CS1010 AY2013/14 Semester 1 Exam, Q1.4]

   Assuming that **n** is a positive integer, consider the following four methods.

```
int f1(int n) {
  int a, sum = 0;
  for (a = 1; a <= n; a++) {
    sum += a;
  }
  return sum;
}
```

```
int f2(int n) {
  int sum = 0;
  while (n > 0) {
    sum += n;
    n--;
  }
  return sum;
}
```

```
int f3(int n) {
  if (n == 1) {
    return n;
```

```
  } else {
    return n + f3(n-1);
  }
}
```

```
int f4(int n) {
  return n*(1+n)/2;
}
```

Which of the following statement is true?

A. Given a positive **n**, **f1** and **f2** will return different values.
B. Given a positive **n**, **f1** and **f3** will return different values.
C. Given a positive **n**, **f2** and **f4** will return different values.
D. Given a positive **n**, **f3** and **f4** will return different values.
E. Given a positive **n**, all the four methods will return the same value.

2.

(a) [CS1010 AY2010/11 Semester 1 Exam, Q1.2]

Given the following function, what is the return value of **calculate(5)**?

```
int calculate(int n) {
  if (n == 0) {
    return 0;
  } else {
    return (2*n + calculate(n-1));
  }
}
```

(b) [CS1010 AY2012/13 Semester 1 Exam, Q1.3]

Given the following function **`f()`**, what is the return value of **`f(4)`** ?

```
int f(int n) {
  if (n == 1) {
    return 3;
  } else if (n == 2) {
    return 8;
  } else {
    return 2 * (f(n-1)+f(n-2));
  }
}
```

(c) What does the following function do?

```
int smallest_digit_pairs(int n) {

  int val;
  if (n < 100) {
    return n;
  }

  val = smallest_digit_pairs(n/100);

  if (n%100 < val) {
    return n%100;
  } else {
    return val;
  }
}
```

II. Programming

3. **[Problem Set 4 Exercise #22] Conway Sequence**

4. **[Problem Set 4 Exercise #24] Square Sum**

5. **[Problem Set 4 Exercise #25] Contains**