NATIONAL UNIVERSITY OF SINGAPORE

SCHOOL OF COMPUTING

MID-SEMESTER TEST
Semester 1 AY2012/2013

CS1010 PROGRAMMING METHODOLOGY

13 October 2012 Time Allowed: **1 hour 30 minutes**

INSTRUCTIONS

1. This question paper contains **TEN** (**10)** questions and comprises **SIX (6)** printed pages**,** including this page.
2. An **ANSWER SHEET** is provided for you to write the answers. It comprises **THREE (3)** printed pages.
3. Answer **ALL** questions within the space provided on the **Answer Sheet**.
4. Maximum score is **30 marks**.
5. This is an **OPEN BOOK** test.
6. Write legibly with a pen or pencil.
7. Calculators, electronic dictionaries, laptops, and other computing devices are not allowed.
8. Submit only the **Answer Sheet** at the end of the test. You may keep the question paper.
9. Write your **MATRICULATION NUMBER** on the **Answer Sheet** using **A PEN**.

——— END OF INSTRUCTIONS ———

SECTION A: 5 Multiple Choice Questions (5 Marks)

Each question has only one correct answer. Write your answers in the boxes provided on the **Answer Sheet**. 1 mark for each correct answer and no penalty for wrong answer.

1. What is another way of writing the following expression?

```
x = x * y + z;
```

A. `x *= y + z;`
B. `x *= (y) + z;`
C. `(x *= y) + z;`
D. `x *= (y + z);`
E. None of the above.

2. Which of the following statements is/are the correct way of assigning the integer 8 to all the 5 elements of the array **A**?

i. `int A[5] = {8};`
ii. `int A[] = {8, 8, 8, 8, 8};`
iii. `int A[5] = {8, 8, 8, 8, 8};`
iv. `int A[5]; A = {8, 8, 8, 8, 8};`

A. Only (ii) is correct.
B. Only (i) and (ii) are correct.
C. Only (ii) and (iii) are correct.
D. Only (i), (ii), and (iii) are correct.
E. All are correct.

3. If you wanted to test if an integer variable **x** is between the range of 2 and 8 inclusively, and you wrote:

```
if (1.5 < x < 8.5)
    printf("Number is between 2 and 8 inclusively.\n");
```

You code would have been incorrect. Which of the following statements pertaining to the above is correct?

A. The **printf** statement will be executed regardless of the value of x.
B. The condition should be: `if (1 < x < 9)`
C. The condition should be: `if (2 <= x <= 8)`
D. The condition should be: `if (x > 1 || x < 9)`
E. A compilation error will occur.

4. Suppose `x` and `y` are integer variables with values of 3 and 5 respectively, and `z` is an integer variable. What is the value of `z` after the following statement is executed?

```
z = ++(x + y);
```

A. **8**
B. **9**
C. **10**
D. A compilation error will occur.
E. A run-time error will occur.

5. What is the value of **x** after the following code fragment is executed?

```
int x = 1, i = 5;

switch (i%7) {
    case 0:
    case 1:
    case 2: x += 5;
    case 3: x += 6;
    case 4:
    case 5: x += 2;
    default: x += 4;
             break;
}
```

A. 3
B. 4
C. 7
D. 11
E. 18

SECTION B: Structured Questions (14 Marks)

Write your answers in the boxes provided in the **Answer Sheet**.

6. What is the output of the following program fragment? [3 marks]

```
int i, j = 6;

for (i = 10; i > j/3; i-=3) {
   j += i;
   printf("%d, ", j);
}
printf("%d\n", i);
```

7. What is the output of the following program fragment? [3 marks]

```
int confuse(int *, int *);

int main(void) {
   int a, b = 12, c;

   a = b/3;
   c = confuse(&a, &b);
   b = confuse(&b, &a);
   printf("a = %d,  b = %d, c = %d\n", a, b, c);

   return 0;
}

int confuse(int *a, int *b) {
   int c;

   c = *a;
   *a = *b;
   *b = c*2;

   return c;
}
```

8. Write a function called **printPyramid** to print the pyramid of numbers as shown below. You are to use loop, and not hardcode using 5 printf() statements. [4 marks]

```
1*2*3*4*5*6*7*8*9*
3*4*5*6*7*8*9*
5*6*7*8*9*
7*8*9*
9*
```

9. A **rotateRight()** function is given below to rotate an integer array **k** positions to the right, where **k** is a positive integer. Parameter **size** is the number of elements in the array **arr**.

   For example, if list is a 6-element integer array (size = 6) that contains { 1, 2, 3, 4, 5, 6 }, then the following shows the results of the respective calls:

   - Calling rotateRight(list, 6, 1) would result in list becoming { 6, 1, 2, 3, 4, 5 }.
   - Calling rotateRight(list, 6, 3) would result in list becoming { 4, 5, 6, 1, 2, 3 }.
   - Calling rotateRight(list, 6, 60002) would result in list becoming { 5, 6, 1, 2, 3, 4 }.

```
void rotateRight(int arr[], int size, int k) {
    int i, j, temp;

    for (i = 1; i <=                ; i++) {
        temp = arr[size-1];
        for (j =                    ; j >= 0; j--)
            arr[j+1] = arr[j];
        arr[0] = temp;
    }
}
```

The body of the inter loop rotates the array 1 position to the right, and the outer loop repeats this a certain number of times to achieve the desired result.

Fill in the 2 boxes without changing the rest of the given code. Your answer should make the loop execute the fewest number of iterations. [4 marks]

SECTION C: Short Programming Question (11 Marks)

Write your answer in the space provided on the **Answer Sheet**.

10. A recently launched campaign has three levels of awards to be given to the participants. The criteria for the different levels of awards are given in the table below.

Type of Award	Minimum number of hours accumulated in the years 2010 and 2011	Minimum total accumulated hours
Bronze	50	200
Silver	100	300
Gold	200	400

For example, a participant will receive a gold award if he has accumulated at least a total of 400 hours out of which at least 200 must be accumulated in the years 2010 and 2011. If he has accumulated 400 hours but has only 50 hours in the years 2010 and 2011, he will receive a bronze award. On the other hand, if he has accumulated 100 hours in the years 2010 and 2011 but his total accumulated hours is only 200, he will still receive a Bronze award. You may make reasonable assumption on the number of participants.

If the participant does not meet the criteria for Bronze award, he will be given a Participation certificate.

a) The input is a list of (*id, yr, hr*) denoting that participant *id* has accumulated *hr* hours in the year *yr*. The entry *(-1, -1, -1*) denotes the end of list. Complete the pseudo code below to determine the type of awards to be given to each participant. We use $recent_i$ to denote the number of hours accumulated by participant i in the years 2010 and 2011, and $total_i$ denote the total number of accumulated hours. [5 marks]

```
read id, yr, hr

while id not equal to -1
    //accumulate recent_i and total_i


    read id, yr, hr
endwhile
for i = 1 to numParticipant
    print id
    //determine award type



endfor
```

b) Based on the pseudo-code in (a), write the complete C program to output the award to be given to each participant. [6 marks]

——— END OF PAPER ———