NATIONAL UNIVERSITY OF SINGAPORE

1

CS1101S — PROGRAMMING METHODOLOGY

(AY2018/2019 SEMESTER 1)

READING ASSESSMENT 1

Time Allowed: **45 Minutes**

ANSWERS

INSTRUCTIONS

1. This question paper comprises **EIGHT (8)** printed pages, including this page.

2. You are also provided with **one OCR Form** to write your answers.

3. Clearly **write** and **shade** your **STUDENT NUMBER** on your **OCR Form** using a **2B PENCIL**.

4. There are **15** multiple-choice questions. Each question has one correct answer. **1 mark** is awarded for each correct answer and there is no penalty for a wrong answer.

5. The full score is **15 marks**.

6. Answer **ALL** questions.

7. Use only a **2B PENCIL** to **shade** your answers on your **OCR Form**.

8. This is a **CLOSED BOOK** assessment, but you are allowed to bring in one A4 sheet of notes (handwritten or printed on both sides).

9. **Submit only the OCR Form**.

(1) What is the single-digit **number** at the **top-right corner** on the **front page** of this question paper? (**Important**: Please make sure your answer is correct because it determines how we mark your answers to all the subsequent questions.)

A. 1 **(answer)**
B. 2
C. 3
D. 4
E. 5

Scoping

(2) What is the result of evaluating the following Source program?

```
const r = 5;
function t(f) {
    const r = 3;
    return r + f;
}
t(2 * r);
```

A. 9
B. 11
C. 13 **(answer)**
D. 15
E. Error: name `r` is redeclared

(3) What is the result of evaluating the following Source program?

```
const w = 5;
const x = 3;
function w(x) {
    return x + x;
}
w(5);
```

A. 6
B. 10
C. Error: only name `x` is redeclared
D. Error: only name `w` is redeclared **(answer)**
E. Error: both names `w` and `x` are redeclared

(4) What is the result of evaluating the following Source program?

```
function f(x) {
    return x => x * 5;
}
f(8)(2);
```

A. 10 **(answer)**
B. 40
C. 60
D. 80
E. There is a syntax error

(5) What is the result of evaluating the following Source program?

```
const x = 10;
function w(x) {
    function g(x) {
        return x + 20;
    }
    const h = g(20);
    return g(x) + h;
}
w(50);
```

A. 70
B. 110 **(answer)**
C. 140
D. 80
E. There is a syntax error

(6) What is the result of evaluating the following Source program?

```
function f(g, h, x) {
    return h(g(h(x)));
}
f(x => x + 1, y => 2 * y, 5);
```

A. 13
B. 21
C. 22 **(answer)**
D. 24
E. There is a syntax error

(7) What is the result of evaluating the following Source program?

```
function twice(f) {
    return x => f(f(x));
}
((twice(twice))(x => 2 * x + 1))(2);
```

A. 5
B. 11
C. 20
D. 47 **(answer)**
E. 65

Processes

(8) Two Source functions, `hR` and `hI`, implement the same function *h*. Given that `hR` gives rise to a recursive process and `hI` gives rise to an iterative process, which of the following statements is correct?

A. `hI` is always more efficient than `hR` in terms of time resource used.
B. `hR` is always more efficient than `hI` in terms of time resource used.
C. `hI` does not make use of recursion.
D. `hI` does not accumulate deferred operations, whereas `hR` does. **(answer)**
E. `hR` does not accumulate deferred operations, whereas `hI` does.

(9) To what kind of process does the following Source program give rise to?

```
function f(n) {
    return (n <= 1)
        ? 1
        : (n % 2 === 1)
            ? n + f(n - 1)
            : f(n - 1);
}
f(101);
```

A. Iterative process
B. Recursive process **(answer)**
C. Infinite process
D. Illegal process
E. No process: there is a syntax error

(10) To what kind of process does the following Source program give rise to?

```
function f(x) {
    return x < 50
        ? 5 + x
        : x < 100
            ? f(x - 1)
            : f(x / 2);
}
f(200);
```

A. Iterative process **(answer)**
B. Recursive process
C. Infinite process
D. Illegal process
E. No process: there is a syntax error

(11) To what kind of process does the following Source program give rise to?

```
function f(n) {
    return n <= 0 ? 1 : f(n - 1) * 2;
}
f(10);
```

A. Iterative process
B. Recursive process **(answer)**
C. Infinite process
D. Illegal process
E. No process: there is a syntax error

(12) To what kind of process does the following Source program give rise to?

```
function f(n) {
    return n <= 0
        ? true
        : false && f(n - 1);
}
f(200);
```

A. Iterative process **(answer)**
B. Recursive process
C. Infinite process
D. No process: there is a syntax error
E. Illegal process

Correctness

(13) We specify that the function *E*, when applied to any number argument, should return `true` if the argument is a positive even integer, and return `false` otherwise. Consider the following implementation:

```
function E(x) {
    return (x === 1)
        ? false
        : (x === 2)
            ? true
            : E(x - 2);
}
```

Which one of the following statements is correct?

A. The function `E` does not return a correct result for *any* number argument.

B. The function `E` returns the correct result *only when* the number argument is a positive integer. **(answer)**

C. The function `E` returns the correct result *only when* the number argument is an integer.

D. The function `E` returns the correct result *only when* the number argument is non-integer.

E. The function `E` meets the specification.

(14) We specify that the function *M* should always return the minimum of any three number arguments. Consider the following implementation:

```
function M(a, b, c) {
    if (a < b) {
        return (a < c) ? a : c;
    } else {
        return (b < c) ? b : c;
    }
}
```

Which one of the following statements is correct?

A. The function `M` does not return a correct result for *any* three number arguments.

B. The function `M` returns the correct result *only when* all the arguments are distinct from each other.

C. The function `M` returns the correct result *only when* all the arguments have the same value.

D. The function `M` returns the correct result *only when* all the arguments are integers.

E. The function `M` meets the specification. **(answer)**

(15) We specify that the function *X*, when applied to two boolean arguments, should return `true` if exactly one of the arguments is a `true` value, and return `false` otherwise. Consider the following implementation:

```
function X(a, b) {
    return (a !== b);
}
```

Which one of the following statements is correct?

A. The function `X` does not return a correct result for *any* two boolean arguments.

B. The function `X` does not meet the specification because it can be applied to non-boolean arguments.

C. The function `X` does not return the correct result when both arguments are `false`.

D. The function `X` does not return the correct result when both arguments are `true`.

E. The function `X` meets the specification. **(answer)**

——— END OF QUESTIONS ———

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