

NATIONAL UNIVERSITY OF SINGAPORE  
**CS1101S — PROGRAMMING METHODOLOGY**

**1**

(AY2018/2019 SEMESTER 1)

**READING ASSESSMENT 1**

Time Allowed: **45 Minutes**

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**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
- 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
- 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
- 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
- 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
- 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
- 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
- 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.
- 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
- 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
- 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
- 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
- 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.
- 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.

- (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.

————— **END OF QUESTIONS** —————

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