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香港國際編程競賽初賽 2019 – 2020 (香港賽區)



HONG KONG INTERNATIONAL COMPUTATIONAL OLYMPIAD

HEAT ROUND 2019 - 2020 (HONG KONG REGION)

Java

時限：60 分鐘

Time allowed: 60 minutes

模擬試題

Mock Paper

考生須知：

Instructions to Contestants:

1. 本卷包括 試題 乙份，試題紙不可取走。
Each contestant should have ONE Question-Answer Book which CANNOT be taken away.
2. 本卷共 20 題，答對得 2 分，空題得 0 分，**答錯倒扣 1 分。**
There are a total of 20 questions in this Question-Answer Book. Two points for correct answers. No points for incorrect answers. **ONE penalty point will be deducted for incorrect answers.**
3. 請將答案寫在 **答題紙** 上。
All answers should be written on ANSWER SHEET.
4. 比賽期間，小學組不得使用計算工具，**中學組可以使用計算工具。**
During the contest, NO calculators can be used for PRIMARY GROUP **but calculators can be used for SECONDARY GROUP.**
5. 本卷中所有圖形不一定依比例繪成。
All figures in the paper are not necessarily drawn to scale.
6. 比賽完畢時，本試題會被收回。
This Question-Answer Book will be collected at the end of the contest.

本試題不可取走。

THIS Question-Answer Book CANNOT BE TAKEN AWAY.

未得監考官同意，切勿翻閱試題，否則參賽者將有可能被取消資格。

請將答案寫在

答題紙

 上。

All answers should be written on the ANSWER SHEET.

DO NOT turn over this Question-Answer Book without approval of the examiner.
Otherwise, contestant may be DISQUALIFIED.

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選擇題 (第 1 至 20 題) (答對得 2 分, 空題得 0 分, 答錯倒扣 1 分)

Multiple Choice Questions (1st ~20th) (Two points for correct answers. No points for incorrect answers. **ONE penalty point will be deducted for incorrect answers.**)

1. Java source code is compiled to byte code, which is then executed by the JVM. What is Java?
 - A. Graphical Language
 - B. Math library language
 - C. Compiled language
 - D. Machine language
 - E. None of the above

2. Which of the following operating system(s) can Java be used on?
 - A. Windows
 - B. Linux
 - C. Mac OS
 - D. All of the above
 - E. None of the above

3. Which of the following classes is not used for I/O in Java?
 - A. java.util.Scanner
 - B. java.lang.Writer
 - C. java.io.Console
 - D. None of the above
 - E. All of the above

請將答案寫在

答題紙

 上。

All answers should be written on the ANSWER SHEET.

4. State the truthfulness of the two following statements.

Statement 1: “Java is a low level language, because it still requires code-writing from programmers”

Statement 2: “Java is cross-platform because the source code is the same on every platform”

	Statement 1	Statement 2
A	True	True
B	False	True
C	True	False
D	False	False
E	None of the above	

請將答案寫在 **答題紙** 上。

All answers should be written on the ANSWER SHEET.

Refer to the following code for question 5 to 8

```
1
2 import java.util.stream.IntStream;
3
4 public class Main {
5
6     public static void println(int ...args){
7         System.out.printf("%d".repeat(args.length), IntStream.of(args).boxed().toArray());
8     }
9
10    public static void main(String args[]) {
11
12        int a = 50;
13        var b = a * a;
14
15        println(a, b);
16    }
17 }
```

5. Given the definition of `java.io.PrintStream.printf`

```
printf
public PrintStream printf(String format, Object... args)
```

Which of the following is an appropriate explanation that (in place of line 7)
`System.out.printf("%d".repeat(args.length), args);` doesn't work?

- A. The correct syntax should be `System.out.printf("%d".repeat(args.length), ...args);`
 - B. `args` is an array but `printf` only accepts `Object` as the second argument
 - C. `var` declaration of `b` in line 13 makes `args` type in line 6 undetermined
 - D. Primitive array cannot be converted to an `Object`
 - E. None of the above
6. What is the expected output of the code?
- A. 2550
 - B. 50 2500
 - C. 502500
 - D. 2500
 - E. None of the above
7. What is the type of `b` (line 13)?
- A. `var`
 - B. `int[]`
 - C. `int`
 - D. `Integer`
 - E. None of the above

請將答案寫在 **答題紙** 上。

All answers should be written on the ANSWER SHEET.

8. From the function definition given below and its use in the above code, which of the following statement concludes the effect of this code segment `IntStream.of(args).boxed()` (line 7)?

boxed

`Stream<Integer> boxed()`

from `java.util.stream.IntStream`

- A. Turn the primitive `IntStream` generated from `args` into a `Integer Stream`
- B. Turn `args` into an `Integer` array
- C. Put `args` into an `Integer` box
- D. Doing both A & B sequentially
- E. None of the above

請將答案寫在 答題紙 上。

All answers should be written on the ANSWER SHEET.

```
1
2 class Foo
3 {
4     String a = "Hello World";
5     Foo(){
6     Foo(String str){
7         a = str;
8     }
9
10    Foo foo(){
11        System.out.print(this.a);
12        return this;
13    }
14 }
15
16 public class Main
17 {
18     public static void main(String args[]){
19         Foo f = new Foo("Bar").foo();
20         f.a = "Foo Bar";
21         System.out.print(f.foo().a);
22     }
23 }
```

9. What is the expected output of the program?
- A. Hello WorldBarFoo Bar
 - B. BarFoo Bar
 - C. BarFoo BarFoo Bar
 - D. BarFoo BarFoo BarFoo Bar
 - E. None of the above
10. Continue on question 9, is `f.foo().foo().foo().foo().foo();` a valid code? (assume it is inserted after line 19) If not, why?
- A. Yes, this is valid
 - B. No, this is not valid because it is not allowed syntax-wise
 - C. No, this is not valid because it would reach maximum call stack
 - D. No, this is not valid because this is meaningless
 - E. None of the above

請將答案寫在 答題紙 上。

All answers should be written on the ANSWER SHEET.

11. What is the expected output of the following code?

```
1
2 public class Main
3 {
4     static final int a = 2;
5     int b = 4;
6
7     int func(){
8         return this.a + this.b;
9     }
10
11    public static void main(String args[]){
12        System.out.println(new Main().func());
13    }
14 }
```

- A. 6 B. 2 4 C. 24 D. java.lang.Object@2423345c E. Compile Error

請將答案寫在 答題紙 上。

All answers should be written on the ANSWER SHEET.

Ada has written a program in Java for the pet clinic she is working at, it is shown below.

```
1
2  class Owner
3  {
4      private String name;
5      private String phone_number;
6  Owner(String name, String phone_number){
7      this.name = name;
8      this.phone_number = phone_number;
9  }
10 }
11
12 class Animal
13 {
14     boolean has4Legs(){ return false; }
15     boolean has2Legs(){ return false; }
16
17     boolean canBark(){ return false; }
18     boolean canMeow(){ return false; }
19
20     int getSize(){ return -1; }
21 }
22 class Dog extends Animal
23 {
24     private int size;
25     private Owner owner;
26 Dog(Owner owner, int size){
27     this.owner = owner;
28     this.size = size;
29 }
30 public boolean has4Legs(){ return true; }
31 public boolean canBark(){ return true; }
32 }
33 class Cat extends Animal
34 {
35     private int size;
36     private Owner owner;
37 Cat(Owner owner, int size){
38     this.owner = owner;
39     this.size = size;
40 }
41 public boolean has4Legs(){ return true; }
42 public boolean canMeow(){ return true; }
43 }
```

Answer question 12 to 17 referring to the code above.

請將答案寫在 答題紙 上。

All answers should be written on the ANSWER SHEET.

12. Which of the following statement is correct for declaring and initializing a new Owner?
- A. `Owner owner = new Owner();`
 - B. `Owner owner = new Owner(Claire, 123456789);`
 - C. `Owner owner = new Owner("Ada Wong", 123456789);`
 - D. `Owner owner("Ada", "123456789");`
 - E. None of the above
13. What does declaring a member variable “private” do?
- A. Make the variable belongs to the instance only
 - B. Make it not visible to anyone
 - C. Make it inaccessible outside of the class
 - D. It does nothing
 - E. None of the above
14. Ada declares private variables for class Owner but forgets to add “getters”. Which of the following is the correct definition for getters of member “name”?
- A.

```
public static String getters(){  
    return name;  
}
```
 - B.

```
public String getName(){  
    return name;  
}
```
 - C.

```
public void getName(){  
    return this.name;  
}
```
 - D.

```
private String getName(){  
    return this.name;  
}
```
 - E. None of the above
15. Justify for Ada choosing String as phone_number’s type instead of int
- A. int has negative values and phone_number should not be negative
 - B. int might not show country code starting with 0 properly
 - C. String comparison is faster than int
 - D. String is more secure
 - E. None of the above
16. Would the code still compile without error if line 33 is changed to `33 class Cat extends Dog` ? Why?
- A. Yes, the code would compile
 - B. No, the code would not compile because a Cat is never a Dog
 - C. No, the code would not compile because they are using different variables (defined in the class Animal)
 - D. No, the code would not compile because Cat cannot bark
 - E. None of the above

請將答案寫在 答題紙 上。

All answers should be written on the ANSWER SHEET.

Animal dog = new Cat(new Owner("ada", "+123"), 23);
17. What is the output of `System.out.println(dog.canMeow());` ?

- A. true
- B. false
- C. null
- D. Compilation Error
- E. Runtime Error

18. What is the output of `System.out.println("" + (2 != 3 || 1 <= 5) + 5);` ?
A. true5 B. false C. 5 D. 25 E. Compilation Error

Refer to the following code for question 19 to 20

```
1
2 import java.util.stream.Collectors;
3 import java.util.stream.Stream;
4
5 public class Main
6 {
7     public static void main(String args[]){
8         System.out.println(
9             Stream.of(new char[] {72, 101, 108, 108, 111}
10                ).map(c -> new String(c)
11                ).collect(Collectors.joining()));
12     }
13 }
```

19. What is the expected output?

- A. 72 101 108 108 111
- B. String String String String String
- C. Hello
- D. Compilation Error
- E. Runtime Error

20. Would the code be able to compile without `System.out.println`? If not, why?

- A. Yes
- B. No, because Java does not allow empty expression
- C. No, because the parentheses are left there
- D. No, because the program has no output
- E. None of the above