

Beijing National Day School
Department of Mathematics & Computer Science

AP Computer Science A

Semester 2 Exam

Location: Library, 6th Floor, Aspiration Building

Date: Wednesday, June 26th, 2019

Start Time: 2:00PM

End Time: 4:00PM

NO CALCULATORS PERMITTED

English Name: _____

Pinyin Name: _____

Mr. Alwin Tareen, June 2019

Exam Record

Multiple Choice _____ / 30 pts

Short Answer _____ / 30 pts

Java Programs _____ / 10 pts

Total: _____ / 70 pts

Grade: _____

Section I: Multiple Choice (30 points)

- Number of questions: 30.
- Decide which is the best of the choices given, and select the correct answer by placing an “X” in the corresponding box.

(1^{pt}) 1. Which of the following is NOT a primitive data type?

- int
 double
 String
 boolean

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| 1 pt |

(1^{pt}) 2. Which of the following arithmetic expressions produces a result of 3?

- (1 + 17) % 3
 1 + 17 % 3
 12 % 3 - 1
 5 * 2 % 3

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| 1 pt |

(1^{pt}) 3. If the operator AND is used, which of the following will make the whole condition true?

- First operand true, second operand false
 First operand false, second operand true
 Both operands true
 Both operands false

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| 1 pt |

(1^{pt}) 4. The Boolean expression !(E && F) is logically equivalent to which of the following?

- E || F
 !E || !F
 E && F
 !E && !F

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| 1 pt |

(1^{pt}) 5. What is the output of the following code fragment?

```
for (int i = 3; i <= 12; i++)  
{  
    System.out.print(i + " ");  
}
```

- 5 6 7 8 9
 4 5 6 7 8 9 10 11 12
 3 5 7 9 11
 3 4 5 6 7 8 9 10 11 12

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| 1 pt |

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| 5 pts |

(1^{pt}) 6. What is the value of `pos` after the following code executes?

```
String s1 = "ac ded ca";  
int pos = s1.indexOf("d");
```

- 3
 4
 5
 -1

1 pt

(1^{pt}) 7. How many times does the following code fragment print a `*`?

```
for (int i = 3; i <= 9; i++)  
{  
    System.out.print("*");  
}
```

- 9
 7
 6
 10

1 pt

(1^{pt}) 8. Given the following code fragment, what will be the contents of the array `arr` if the method `doubleLast()` is executed?

```
public int[] arr = {-20, -15, 2, 8, 16, 33};  
public void doubleLast()  
{  
    for (int i = arr.length/2; i < arr.length; i++)  
    {  
        arr[i] = arr[i] * 2;  
    }  
}
```

- [-40, -30, 4, 16, 32, 66]
 [-40, -30, 4, 8, 16, 32]
 [-20, -15, 2, 16, 32, 66]
 [-20, -15, 2, 8, 16, 33]

1 pt

(1^{pt}) 9. Which of the following is a valid reason to use an `ArrayList`, instead of an array?

- An `ArrayList` can grow or shrink as needed, while an array is always the same size.
 You can use a for-each loop on an `ArrayList`, but not on an array.
 You can store objects in an `ArrayList`, but not in an array.
 You can find the length of an `ArrayList`, but you can't find the length of an array.

1 pt

4 pts

(1^{pt}) 10. How many recursive calls does the following method contain?

```
public int fibonacci(int n)
{
    if (n == 0 || n == 1)
        return 1;
    else
        return fibonacci(n-1) + fibonacci(n-2);
}
```

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| 1 pt |

- 0
 1
 2
 3

(1^{pt}) 11. Which one of the following statements assigns the letter S to the third row and first column of a two-dimensional array named `strGrid`, assuming row-major order?

- `strGrid[0][2] = "S"`
 `strGrid[1][3] = "S"`
 `strGrid[3][1] = "S"`
 `strGrid[2][0] = "S"`

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| 1 pt |

(1^{pt}) 12. Which of the following statements would correctly retrieve the value 6 out of the array `arr`?

```
int[][] arr = {{2, 4, 6, 8}, {1, 2, 3, 4}};
```

- `arr[0][3]`
 `arr[1][3]`
 `arr[0][2]`
 `arr[2][0]`

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| 1 pt |

(1^{pt}) 13. What is a class?

- A class is a data structure similar to an `ArrayList`.
 A class is a section of main memory which contains no data.
 A class is like a blueprint, which describes the state and behaviour of an object.
 A class is an array data structure that can only contain integers.

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| 1 pt |

(1^{pt}) 14. Which of the following invokes the method `length()` of the object referenced by `str` and stores the result in `val`?

- `val = str.length();`
 `val = length.str();`
 `val = length().str;`
 `val = length(str);`

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| 1 pt |

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| 5 pts |

(1^{pt}) 15. What is the class of the type wrapper for the primitive type `int`?

- `myInt`
- `INT`
- `Integer`
- `Double`

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| 1 pt |

(1^{pt}) 16. How many choices are possible when using a single `if-else` statement?

- 1
- 2
- 3
- 4

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| 1 pt |

(1^{pt}) 17. A colony of rabbits doubles its population every 28 days. The population starts out at 2, and increases until it reaches 100000. Say that a section of code simulates this process. Which of the following `while` statements is most likely to be used?

- `while (population = 100000)`
- `while (population < 100000)`
- `while (population > 28)`
- `while (population = 28)`

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| 1 pt |

(1^{pt}) 18. When you run a Java application by typing `java SomeClass` what is the first method that starts?

- The `main()` method of `SomeClass`.
- The `run()` method of `SomeClass`.
- The `someClass` method.
- The `applet` method.

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| 1 pt |

(1^{pt}) 19. What value is assigned to a reference variable to show that there is no object?

- `0`
- `void`
- `null`
- `nada`

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| 1 pt |

(1^{pt}) 20. When an object no longer has any reference variables referring to it, what happens to it?

- It sits around in main memory forever.
- It is swapped out to the hard disk drive.
- The garbage collector makes the memory it occupies available for new objects.
- It gets emailed to the Oracle corporation, who then disposes of it.

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| 1 pt |

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| 6 pts |

(1^{pt}) 21. What is the output of the following code fragment?

```
String str = "Hello World!";
System.out.println(str.length());
```

1 pt

- 0
 10
 11
 12

(1^{pt}) 22. What is the output of the following code fragment?

```
for (int i = 0; i < 5; i++)
{
    System.out.print(i + " ");
}
```

1 pt

- 1 2 3 4 5
 0 1 2 3 4
 0 1 2 3 4 5
 i i i i i

(1^{pt}) 23. What is the output of the following code fragment?

```
int[] arr = {2, 4, 6, 8};
System.out.println(arr[0] + " " + arr[1]);
```

1 pt

- 2 6
 8
 2 4
 6 8

(1^{pt}) 24. What is the output of the following code fragment?

```
int[] arr = {2, 4, 6, 8, 10, 1, 3, 5, 7, 9};
for (int i = 0; i < 5; i++)
{
    System.out.println(arr[i] + " ");
}
```

1 pt

- 2 4 6 8
 2 4 6 8 10
 2 4 6 8 10 1
 2 4 6 8 10 1 3 5 7 9

4 pts

(1^{pt}) **25.** Given the following array declaration, what is values[2][1]?

```
double[] [] values = { {1.2, 9.0, 3.2},  
                        {9.2, 0.5, 1.5},  
                        {7.3, 7.9, 4.8} };
```

- 7.3
 7.9
 9.2
 There is no such array element.

1 pt

(1^{pt}) **26.** What is the name of the superclass that every other class in Java inherits from?

- Object
 Base
 Root
 Foundation

1 pt

(1^{pt}) **27.** Which of the following is the correct way to declare an ArrayList with data type Integer?

- ArrayList<String> list = new ArrayList<String>();
 ArrayList<int> list = new ArrayList<int>();
 ArrayList list = new ArrayList();
 ArrayList<Integer> list = new ArrayList<Integer>();

1 pt

(1^{pt}) **28.** Which of the following choices is the correct way to set up a constructor?

- public String Rectangle()
 public static int SportsTeam(int players)
 public constructor Bicycle(int gears)
 public Compass(int direction)

1 pt

(1^{pt}) **29.** Consider a class that has two constructors. Which of the following conditions must be true in order for the program to compile correctly?

- The constructors must be declared private and void.
 The constructors must be placed in separate source code files.
 The constructors must specify a return type.
 The constructors must have unique parameter lists.

1 pt

(1^{pt}) **30.** Which of the following choices would be considered an accessor method?

- public Kennel(double price)
 public String getName()
 public Ticket()
 public class Player

1 pt

6 pts

Part II: Short Answer (30 points)

- Number of questions: 30.
- Answer each of the following questions in the space provided.

(1^{pt}) 1. Which of Java's primitive data types would you use to store the square root of 2?

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| 1 pt |

(1^{pt}) 2. Which of Java's primitive data types would you use to store your age?

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| 1 pt |

(1^{pt}) 3. Write a single line of code that will create an integer variable called `num` and store the number 407 in it.

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| 1 pt |

(1^{pt}) 4. Write a single line of code that will create a `String` variable called `name` and store your name in it.

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| 1 pt |

(1^{pt}) 5. If `String buddy = "groovy dude";` then what is the output of:
`System.out.println(buddy.toUpperCase());`

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| 1 pt |

(1^{pt}) 6. Which character is at the 5th index in the `String "Herman Munster"`?

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| 1 pt |

(1^{pt}) 7. When comparing two `Strings` for equality, the double equals operator(`==`) should not be used. What is the name of the method that *should* be used?

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| 1 pt |

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| 7 pts |

(1^{pt}) **8.** Write a single line of code that will increment the integer variable `num` by 1.

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| 1 pt |

(1^{pt}) **9.** What are the two possible values of a `boolean` variable?

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| 1 pt |

(1^{pt}) **10.** What is the Java operator for the boolean **AND** operation?

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| 1 pt |

(1^{pt}) **11.** What is the Java operator for the boolean **OR** operation?

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| 1 pt |

(1^{pt}) **12.** What is the output of: `System.out.println(true && true || false);`

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| 1 pt |

(1^{pt}) **13.** Write a statement that will store the value `true` in a `boolean` variable `throttle` if the value in the variable `height` is 44 or less.

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| 1 pt |

(1^{pt}) **14.** Write code using a `for`-loop that will print out the numbers 3, 6, 9, 12, 15.

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| 1 pt |

(1^{pt}) **15.** Given the following line of code, identify the class, and identify the object:
`Rectangle board = new Rectangle(length, width);`

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| 1 pt |

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| 8 pts |

(1^{pt}) **16.** Instantiate an object called `fido` from the `Puppy` class using a single line of code. Assume that no parameters are sent to the constructor.

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(1^{pt}) **17.** Write a single line of code that will create an array of type `double` called `scores` having 800 elements.

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| 1 pt |

(1^{pt}) **18.** Given the array: `double[] digits = new double[21]`
What is the output of: `System.out.println(digits.length);`

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| 1 pt |

(1^{pt}) **19.** Assume that the integer array `data` contains the five values: 34, 56, -102, 18 and 5. What is the value of `data[1]`?

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| 1 pt |

(1^{pt}) **20.** Write a single line of code that will instantiate an `ArrayList` object called `places` and have the restriction that only `String` objects can be stored in it.

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| 1 pt |

(1^{pt}) **21.** A class from which you cannot create objects is called what kind of class?

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| 1 pt |

(1^{pt}) **22.** Is it possible to have multiple constructors in the same class?

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| 1 pt |

(1^{pt}) **23.** Is it true that inheritance models the “is-a” relationship, where objects of the subclass are also objects of the superclass? Answer **yes** or **no**.

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| 8 pts |

- (1^{pt}) **24.** What must be required of an array of numbers before a binary search can be done?

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| 1 pt |
- (1^{pt}) **25.** Which is generally more efficient, a linear search or a binary search, if the array is already sorted?

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| 1 pt |
- (1^{pt}) **26.** If we were given a sufficiently large amount of memory space, which of the following sorting algorithms would be more efficient: selection sort, insertion sort, or merge sort?

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| 1 pt |
- (1^{pt}) **27.** Consider the following array: `int[] temps = {34, 56, -102, 18, 5}`
What is the output of: `System.out.println(temps[3] + temps[4])`?

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| 1 pt |
- (1^{pt}) **28.** Consider the following array: `String[] names = {"Bob", "Jim", "Sally"}`
Write a single line of Java code that will display the element "Sally" from this array.

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| 1 pt |
- (1^{pt}) **29.** Consider the following array: `int[] nums = new int[7];`
Write a section of Java code that would place the number 23 into every position in the array. *Hint:* Use a for loop.

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| 1 pt |
- (1^{pt}) **30.** Merge sort uses the “divide-and-conquer” approach in its algorithm. In this context, explain what “divide-and-conquer” means.

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| 1 pt |

Section III: Java Programs (10 points)

- Number of questions: 3.
- Show all of your work. Remember that program segments are to be written in the **Java** programming language.

- (4^{pts}) 1. Assume that `word` is a **String** of lower case text characters. Write a **Java** function that counts the number of **a**'s and **b**'s that are contained in the **String** `word`. Your function should be called:

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| 4 pts |

```
public static int countAlphaBeta(String word)
```

The function should return an integer which is the total quantity of **a**'s and **b**'s in the **String**.

- If the following statements are executed:

```
int result = countAlphaBeta("azcbobobegghakl");  
System.out.println(result);
```

Then the output of your program should be: 5

```
public static int countAlphaBeta(String word)  
{  
    // YOUR CODE HERE
```

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| 4 pts |

- (3^{pts}) 2. Write a Java function that takes in a single `int` parameter called `num`, and returns an `int []` array containing the values `0, 1, 2, ..., num - 1`. Your function should be called:

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| 3 pts |

```
public static int[] fizzArray(int num)
```

The function should return an `int []` array.

- If the following statement is executed:

```
int[] result = fizzArray(5);
```

Then `result` should contain: `[0, 1, 2, 3, 4]`

```
public static int[] fizzArray(int num)
{
    // YOUR CODE HERE
```

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| 3 pts |

- (3pts) 3. Consider the following Java program that contains a student's daily schedule of school courses, represented as **Strings** in an **ArrayList** called **courseSchedule**. This **ArrayList** stores each course in consecutive order, by period. For instance, **Computer Science** takes place in the first period, **Spanish** takes place in the second period, etc.

3 pts

After one week of school, the student decides that she would like to change her schedule in the following manner:

- Change the **Calculus** course to **Geometry**.
- Drop the **Physics** course.

Write the necessary Java code statements that would update the **ArrayList** to reflect the student's new course schedule.

```
import java.util.*;

public class SelectedCourses
{
    public static void main(String[] args)
    {
        ArrayList<String> courseSchedule = new ArrayList<String>();
        courseSchedule.add("Computer Science");
        courseSchedule.add("Spanish");
        courseSchedule.add("Calculus");
        courseSchedule.add("English");
        courseSchedule.add("History");
        courseSchedule.add("Physics");

        // YOUR CODE HERE

    }
}
```

3 pts