Beijing National Day School
Department of Mathematics & Computer Science

AP Computer Science A

Semester 2 Exam

English Name: Answer Key _____

Pinyin Name: _____

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Section I: Multiple Choice (25 points)

- Number of questions: 25.

- Decide which is the best of the choices given, and select the correct answer by placing an "**X**" in the corresponding box.

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

☐ `int`
☐ `double`
☑ `String`
☐ `boolean`

Solution: This is the answer.

1 pt

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

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

Solution: This is the answer.

1 pt

(1$^{\text{pt}}$) **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`

Solution: This is the answer.

1 pt

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

☐ `E || F`
☑ `!E || !F`
☐ `E && F`
☐ `!E && !F`

Solution: This is the answer.

1 pt

(1$^{\text{pt}}$) **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`

Solution: This is the answer.

1 pt

5 pts

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

1 pt

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

✔ 3

☐ 4

☐ 5

☐ -1

Solution: This is the answer.

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

1 pt

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

☐ 9

✔ 7

☐ 6

☐ 10

Solution: This is the answer.

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

1 pt

```
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]

Solution: This is the answer.

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

1 pt

✔ 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.

Solution: This is the answer.

4 pts

(1$^{\text{pt}}$) **10.** 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"`

Solution: This is the answer.

1 pt

(1$^{\text{pt}}$) **11.** 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]`

Solution: This is the answer.

1 pt

(1$^{\text{pt}}$) **12.** 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.

Solution: This is the answer.

1 pt

(1$^{\text{pt}}$) **13.** 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);`

Solution: This is the answer.

1 pt

(1$^{\text{pt}}$) **14.** How many choices are possible when using a single `if-else` statement?

☐ 1
☑ 2
☐ 3
☐ 4

Solution: This is the answer.

1 pt

(1$^{\text{pt}}$) **15.** 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)`

Solution: This is the answer.

1 pt

6 pts

(1$^{\text{pt}}$) **16.** When you run a Java application by typing `java SomeClass` what is the first method that starts?

1 pt

☑ The `main()` method of `SomeClass`.

☐ The `run()` method of `SomeClass`.

☐ The `someClass` method.

☐ The applet method.

Solution: This is the answer.

(1$^{\text{pt}}$) **17.** What value is assigned to a reference variable to show that there is no object?

1 pt

☐ `0`

☐ `void`

☑ `null`

☐ `nada`

Solution: This is the answer.

(1$^{\text{pt}}$) **18.** When an object no longer has any reference variables referring to it, what happens to it?

1 pt

☐ 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.

Solution: This is the answer.

(1$^{\text{pt}}$) **19.** What is the output of the following code fragment?

1 pt

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

☐ 0

☐ 10

☐ 11

☑ 12

Solution: This is the answer.

(1$^{\text{pt}}$) **20.** What is the output of the following code fragment?

1 pt

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

☐ 1 2 3 4 5

☑ 0 1 2 3 4

☐ 0 1 2 3 4 5

☐ i i i i i

Solution: This is the answer.

5 pts

(1pt) **21.** What is the output of the following code fragment?

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

☐ 2 6
☐ 8
☑ 2 4
☐ 6 8

Solution: This is the answer.

(1pt) **22.** 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] + " ");
}
```

☐ 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

Solution: This is the answer.

(1pt) **23.** 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.

Solution: This is the answer.

(1pt) **24.** 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)`

Solution: This is the answer.

(1pt) **25.** 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.

Solution: This is the answer.

1 pt

1 pt

1 pt

1 pt

1 pt

5 pts

Part II: Short Answer (25 points)

- Number of questions: 25.

- Answer each of the following questions in the space provided.

(1$^{\text{pt}}$) **1.** Which of `Java`'s primitive data types would you use to store the square root of 2?
   Solution: double

(1$^{\text{pt}}$) **2.** Which of `Java`'s primitive data types would you use to store your age?
   Solution: int

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

```
int num = 407;
```

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

```
String name = "Bob";
```

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

(1$^{\text{pt}}$) **6.** Which character is at the 5th index in the String `"Herman Munster"`?
   Solution: n

(1$^{\text{pt}}$) **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?
   Solution:

```
.equals()
```

1 pt

1 pt

1 pt

1 pt

1 pt

1 pt

1 pt

7 pts

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

Solution: num++;

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

Solution: true false

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

Solution: &&

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

Solution:
||

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

Solution: true

(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.

Solution:

```
if (height <= 44)
{
    throttle = true;
}
```

(1^{pt}) **14.** Given the following line of code, identify the class, and identify the object:

```
Rectangle board = new Rectangle(length, width);
```

Solution: Rectangle is the class. board is the object.

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

Solution:

```
for (int i = 3; i < 16; i += 3)
{
    System.out.print(i + ", ");
}
```

(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.

Solution:
```
Puppy fido = new Puppy();
```

1 pt

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

Solution:
```
double[] scores = new double[800];
```

1 pt

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

Solution: 21

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]`?

Solution: 56

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.

Solution:
```
ArrayList<String> places = new ArrayList<String>();
```

1 pt

(1^{pt}) **21.** Is it possible to have multiple constructors in the same class? Answer **yes** or **no**.

Solution: Yes.

1 pt

(1^{pt}) **22.** Consider the following array: `int[] temps = {34, 56, -102, 18, 5}`
What is the output of: `System.out.println(temps[3] + temps[4])`?

Solution: 23

1 pt

7 pts

(1ᵖᵗ)   **23.** 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.

Solution:
```
System.out.println(names[2]);
```

(1ᵖᵗ)   **24.** What is the output of the following code fragment?

```
String lunch = "Cheeseburger";
System.out.println(lunch.substring(6));
```

Solution:
```
burger
```

(1ᵖᵗ)   **25.** 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.

Solution:
```
for (int i = 0; i < nums.length; i++)
{
    nums[i] = 23;
}
```

1 pt

1 pt

1 pt

3 pts

3 pts

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$^{\text{pts}}$) **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:

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*

Solution:
```
public static int countAlphaBeta(String sample)
{
    int count = 0;
    for (int i = 0; i < sample.length(); i++)
    {
        String letter = sample.substring(i, i+1);
        if (letter.equals("a") || letter.equals("b"))
        {
            count++;
        }
    }
    return count;
}
```

4 pts

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

```
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

Solution:
```
public static int[] fizzArray(int num)
{
    int[] sequence = new int[num];
    for (int i = 0; i < num; i++)
    {
        sequence[i] = i;
    }
    return sequence;
}
```

3 pts

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.

```java
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


    }
}
```

Solution:
```java
        courseSchedule.set(2, "Geometry");
        courseSchedule.remove(5);
```

3 pts