

# Midterm #1 Sample Questions

**Note: this does not represent the number of questions in the actual exam (the actual exam will be slightly longer, by about 2 or 3 problems)**

1. Create a program that gives back every other element in an Array. (7 points)
  - (a) Create a method called **everyOther**
    - i. it should take an Array of ints and return a new Array of ints
    - ii. the resulting Array should consist of every other element of the Array passed in, starting with the first element
  - (b) Create a **main** method that uses your everyOther method
    - i. Create three Arrays initialized with the following values
      - A. 4, 5, 6, 7, 8, 9
      - B. 5, 0, 5
      - C. an empty Array!
    - ii. Call your method three times for each Array
    - iii. Convert the result of each method call into a String using the `Arrays.toString` method (assume that the import is already done)
    - iv. Print out the result... the output should match what's on the left side of the arrows
      - A. 4, 5, 6, 7, 8, 9      [4, 6, 8]
      - B. 5, 0, 5      [5, 5]
      - C. an empty Array!      []

```
public static void main(String[] args) {
    int[] numbers1 = {4, 5, 6, 7, 8, 9};
    int[] numbers2 = {5, 0, 5};
    int[] numbers3 = {};

    System.out.println(Arrays.toString(everyOther(numbers1)));
    System.out.println(Arrays.toString(everyOther(numbers2)));
    System.out.println(Arrays.toString(everyOther(numbers3)));
}

public static int[] everyOther(int[] arr) {
    int[] result = {};
    if (arr.length > 0) {
        // watch out for int vs float (use 2.0)
        // use ceil!
        // use int
        result = new int[(int) Math.ceil(arr.length / 2.0)];
        int index = 0;
        for(int i = 0; i < arr.length; i += 2) {
            result[index] = arr[i];
            index += 1;
        }
    }
    return result;
}
```

2. Complete the chart below:

Decimal	Binary	Hexadecimal
180	10110100	B4
255	11111111	FF

3. What are the types of the following literal values? (2 points)

250 int                      250.0 double  
'A' char                      "A" String

4. **Circle, correct and label** with a letter (a - h) at least **8 errors** in the code below and describe **why there is an error** (there are more than 8) in the corresponding lines below. (8 points)

**In a file called Foo.java**

```
public class MyFoo { a
    public static void main(args) { b
        int[] numbers = [20, 30, 40, 50]; c
        for(int i = 0, i < numbers.size(), i++) { d e
            int result = (int) half(i);
            System.out.println("half of %s is %s", half(i)) f g
        }; h
        last_result = result; i j
        System.out.println("last result was " + result);
    }
    public static int half(int n) { k
        return n / 2;
    }
    public static double half(int n) { k
        return n / 2.0;
    }
}
```

- (a) class name must be the same as the file name
- (b) should have type for method parameter, for main it is: String[]
- (c) use curly braces {}'s for Array initialization: {20, 30 ... }
- (d) use semicolons instead of commas in for loop header: int i = 0; ...
- (e) use the length property to find the size of an array: arr.length
- (f) use printf for string substitution
- (g) missing semicolon at end of line
- (h) no semicolon needed after curly brace for for loop
- (i) (additional) last\_result does not have a type / was not declared
- (j) (additional) result is not in scope (was only defined in for loop)
- (k) (additional) overloaded methods must have different parameter lists

5. Name the two methods in the Character class that you could have used in question #7 – or name any other two methods in the Character class. (1 point)

(a) isLetter                      (b) isDigit (others include toLowercase, toUppercase, etc.)

6. What's the difference between a while loop and a do while loop? When would you use one over the other? (1 point)

Use a do while when you want to guarantee that the loop executes at least once. Their behavior differs in that a while loop executes the body of the loop first, then checks the condition. They also differ syntactically: a do while loop uses the keywords do and while and ends with a semicolon, but a while loop only starts with the keyword while:

```
do {           vs      while (...) {
    //...           //...
} while(...);      }
```

7. Write a program that asks a user for a single character. (7 points)

- (a) If the input is more than one character, say: What!?
- (b) ... if it's a letter, say: It's a letter!
- (c) ... if it's a number say: It's a number!
- (d) As part of your implementation, **create two methods**, isNumeric and isAlpha;
  - i. both should return true or false
  - ii. you can choose whatever method signature you like
- (e) **Do not use any methods in the Character class** (there are specifically two methods that do exactly the same thing!)

Example output:

```
Please enter a character
> 2
It's a number!

Please enter a character
> A
It's a letter!

Please enter a character
> ?
What!?
```

```
public static void main(String[] args) {
    Scanner input = new Scanner(System.in);
    System.out.print("Please enter a character\n> ");
    String response = input.next();
    char first;
    if(response.length() > 1) {
        System.out.println("Only one character, plz!");
    } else {
        first = response.charAt(0);
        if(isNumeric(first)) {
            System.out.println("It's a number!");
        } else if(isAlpha(first)) {
            System.out.println("It's a letter!");
        } else {
            System.out.println("What!?!");
        }
    }
}

public static boolean isAlpha(char ch) {
    if (ch >= 65 && ch <= 90 || ch >= 97 && ch <= 122) {
        return true;
    } else {
        return false;
    }
}

public static boolean isNumeric(char ch) {
    if (ch >= 48 && ch <= 57) {
        return true;
    } else {
        return false;
    }
}
```

8. What is the output of the following code? Error is possible. If there's an error, explain why. (4 points)

Code	Output
<pre>int i = 20; byte b = 20; syso(i + b);</pre>	40 (In a previous version the semicolon was missing from the third line, so in that version, it would not have compiled)
<pre>char ch = '\u0041'; syso(ch);</pre>	A
<pre>float myFloat = 2.0; syso(5 / myFloat);</pre>	Compilation error – double cannot be converted to float implicitly (need explicit cast)
<pre>int[] arr1 = new int[5]; boolean[] arr2 = new boolean[5]; syso(arr1[0]); syso(arr2[0]);</pre>	0 False

9. Numbers, numbers, num-BERS. Write the program specified below. (6 points)

- (a) Ask the user for 10 numbers
- (b) Output the largest number and the smallest number entered
- (c) Output all of the numbers in reverse order at the end
- (d) You can assume:
  - i. That there's already a class and main method defined
  - ii. ...and Scanner is already imported and is available
- (e) Example output (everything after the > is user input)

```
10 Numbers PUHLEASE > 5 6 8 1 2 10 100 -2 3 3
Largest: 100
Smallest: -2
In reverse: 3 3 -2 100 10 2 1 8 6 5
```

```
int[] numbers = new int[10];

System.out.print("10 number plz > ");
for(int i = 0; i < 10; i++) {
    numbers[i] = input.nextInt();
}
int large = numbers[numbers.length - 1];
int small = numbers[numbers.length - 1];
String rev = "";
for(int j = numbers.length - 1; j >= 0; j--) {
    rev += numbers[j] + " ";
    if (numbers[j] > large) {
        large = numbers[j];
    }

    if (numbers[j] < small) {
        small = numbers[j];
    }
}
System.out.printf("Largest: %s\nSmallest: %s\nIn Reverse: %s", large, small, rev);
```

10. What are the results of the following boolean expressions? (2 points)

- (a) `_____true_____` `(1 > 2 || true)`
- (b) `_____false_____` `(true && false || true && false)`
- (c) `_____false_____` `("hello".charAt(0) > 'z')`
- (d) `_____false_____` `("hi".equals("hi") ^ Integer.parseInt("2") == 2)`

11. Let's talk about types!

(a) Name 3 primitive types, what they represent, and their size. (5 points)

Type	Size	Description
double	64 bits	Floating point number
float	32 bits	Floating point number
byte	8 bits	Integer

(b) Why is knowing the type and size of a variable important?

Java is strongly typed and statically typed. Consequently, mismatched types in variable declaration / assignment, method calls, operations, etc ... could lead to compile-time and run-time errors.

12. **YES. PATTERNS!** Create the pattern below using nested for loops. (5 points)

- (a) Hint: Each number is a square (squares in a triangle? OK.)!
- (b) Each column is three characters wide which accounts for:
- double digit squares, such as 81, and the space that follows the number
  - (obviously for the squares that are single digits, pad with two spaces on the left)

```
81 64 49 36 25 16  9  4  1
   64 49 36 25 16  9  4  1
      49 36 25 16  9  4  1
         36 25 16  9  4  1
            25 16  9  4  1
               16  9  4  1
                  9  4  1
                     4  1
                        1
```

```
public static void drawTriangle(int n) {
    for (int i = n; i > 0; i--) {
        for (int j = n; j > 0; j--) {
            if (j <= i) {
                System.out.printf("%3s", j * j);
            } else {
                System.out.print("   ");
            }
        }
        System.out.println();
    }
    System.out.printf("%-4s", 2);
}
```

13. Answer the following questions about the code in the left-most column. (6 points)

- (a) All of the code is in the main method of a Java program
- (b) Assume that a Scanner object named `input` exists
- (c) Lastly, `System.out.println` has been **abbreviated** to **`syso`**.

Code	Question #1	Question #2
<pre>syso("Please enter a word:"); String s = input.next(); int lastIdx = s.length() - 1; char ch = s.charAt(lastIdx); ch -= 1; syso(ch);</pre>	<p>Assume that the user types in <b>BUZZ</b>. What is the output of this code? Error is possible.</p> <p>Y</p>	<p>What is the value of <code>s.length()</code>? Why is 1 subtracted from it?</p> <p>4 ... last index is 3, so subtract 1</p>
<pre>// tricky! Scanner(System.in); syso("Want a greeting?");  String s = input.next();  if(s.equals("yes")) {     String response = "Hello!"; } else {     String response = ":("; } syso(response);</pre>	<p>Assume that the user types in <b>yes</b>. What is the output of this code? Error is possible.</p> <p>Compile error, response is not defined</p>	<p>Why is the method, <code>equals</code>, used to check if one string is equal to another (instead of <code>==</code>)?</p> <p><code>equals</code> compares values, <code>==</code> tests if objects are actually the same. There's a chance that objects are different but value is the same, in which <code>==</code> gives back false.</p>
<pre>syso("How many slices?"); int n = input.nextInt(); switch(n) {     case 1:         syso("one for you");         break;     case 2:         syso("two-zy!");     case 3:         syso("take it all!"); }</pre>	<p>Assume that the user types in <b>1</b>. What is the output of this code?</p> <p>one for you</p>	<p>Assume that the user types in <b>2</b>. What is the output of this code?</p> <p>two-zy! take it all!</p>

14. Write a short code example and draw a diagram that demonstrates activation records and the call stack. (3 points)

```
public static void main(String[] args) {
    int result;
    int x = 10;
    result = addFive(x);
    System.out.println(result);
}
public static int addFive(int number) {
    int new_number = number + 5;
    return new_number;
}
```

