Consolidated Solution Manual

CSC 1103 - Midterm Exam 2

Includes Explanations for All Questions

Contents

1 Version A Solutions

Part I: Multiple Choice (Version A)

Q	Question	Correct Answer	Explanation
1	Which loop construct is guaranteed to execute its body at least once?	**C** (`do-while` loop)	A `do-while` loop evaluates its condition at the bottom of the loop, ensuring the body runs at least one time before checking.
2	Which of the following is true about **method overloading**?	**B** (Methods must have the same name but different parameter lists)	Method overloading is defined as having multiple methods with the same name but different parameter lists (signatures) within the same class.
3	What is the output of: `System.out.println("Result: " + 3 + 7);`?	**B** (`Result: 37`)	Java evaluates string concatenation from left to right. `"Result: " + 3` becomes the string `"Result: 3"`. Then `"Result: 3" + 7` becomes `"Result: 37"`.
4	Given `String s = "Welcome";`, what is the result of `s.charAt(3)`?	**B** (`'c'`)	String indices are 0-based. W(0), e(1), l(2), **c(3)**.
5	Which signature is valid for a static method returning a `boolean`?	**A** (`public static boolean check(int a)`)	The syntax is: `AccessModifier static ReturnType MethodName(Params)`.
6	What is the output of `Math.max(10, Math.min(15, 5))`?	**B** (`10`)	First, `Math.min(15, 5)` returns 5. Then, the expression becomes `Math.max(10, 5)`, which returns 10.
7	Which `Scanner` method reads a single word (token) as a `String`?	**C** (`next()`)	`next()` reads the next token up to a delimiter (whitespace). `nextLine()` reads the whole line.
8	What happens if you call `s.charAt(10)` on a string of length 5?	**D** (Throws `StringIndexOutOfBoundsException`)	Valid indices are 0 to 4. Accessing index 10 is illegal.
9	Which code snippet correctly converts `"123"` to an `int`?	**B** (`Integer.parseInt("123")`)	`Integer.parseInt(String)` is the standard wrapper class method to parse a string into a primitive int.
10	What is the output of the recursive method `fun(3)`?	**A** (`3 2 1`)	The method prints `n` *before* the recursive call. `fun(3)` prints 3, calls `fun(2)` prints 2, calls `fun(1)` prints 1.

11	What is the return value of `Math.pow(2, 3)`?	**B** (`8.0`)	`Math.pow` always returns a `double` type. $2^3 = 8.0$.
12	In a `for` loop, when is the update statement (e.g., `i++`) executed?	**B** (After loop body executes)	The flow is: Init → Condition → Body → **Update** → Condition.
13	What happens during **ambiguous invocation** of a method?	**A** (The compiler cannot determine the most specific match)	This occurs when the compiler finds two or more overloaded methods that match the arguments provided, but neither is more specific than the other.
14	What is the correct index of the last character in String `s`?	**B** (`s.length() - 1`)	Since indices are 0-based, the last character is at `s.length() - 1`.
15	Every recursive method must have a _____ to stop recursion.	**B** (Base case)	A base case is the condition where the recursive calls stop, preventing infinite recursion.
16	Which method converts a string to all lowercase letters?	**A** (`toLowerCase()`)	The correct method name in the String class is `toLowerCase()`.
17	What does `Math.round(2.6)` return?	**B** (`3`)	`Math.round` rounds to the nearest long/int. 2.6 is closer to 3 than 2.
18	Which keyword skips the rest of the current loop iteration?	**D** (`continue`)	`continue` jumps immediately to the next iteration of the loop, skipping any remaining code in the body.
19	What is the value of `"Hello".length()`?	**B** (`5`)	"Hello" contains 5 characters.
20	Which method finds the index of the first occurrence of a character?	**C** (`indexOf()`)	`indexOf(char c)` searches the string and returns the first index found.

Part II: Short Answer (Version A)

1. **Question:** The _____ class contains methods like `min`, `max`, and `abs`.
   Answer: `Math`
   Reasoning: The `java.lang.Math` class contains static utility methods for basic numeric operations.

2. **Question:** Write a statement to find the length of the string variable `text` and store it in an `int` variable named `size`.
   Answer: `int size = text.length();`
   Reasoning: The `.length()` method is called on the string object to get the count of characters.

3. **Question:** Write a `for` loop that prints the sequence: `0, 5, 10, 15, 20`.
   Answer: `for(int i=0; i<=20; i+=5) System.out.println(i);`
   Reasoning: Initialize at 0, check if ≤ 20, and increment by 5 in every step.

4. **Question:** What is the range of values returned by the `Math.random()` method? (Interval notation).
   Answer: $[0.0, 1.0)$ *or* $0.0 \leq x < 1.0$
   Reasoning: `Math.random()` returns a double value greater than or equal to 0.0 and strictly less than 1.0.

5. **Question:** A method that calls itself is known as a _____ method.
   Answer: Recursive
   Reasoning: This is the definition of recursion.

6. **Question:** Write a static method named `calculateArea` that takes two `double` parameters (`L`, `W`) and returns the area (`L * W`).
   Answer:

```
public static double calculateArea(double L, double W) {
    return L * W;
}
```

   Reasoning: The header must be `public static`, return type `double`, and accept two doubles.

7. **Question:** Write a code snippet using a loop to print all numbers from **1 to 1000** (inclusive) that are divisible by **both 3 and 7**.
   Answer:

```
for(int i=1; i<=1000; i++) {
    if(i % 3 == 0 && i % 7 == 0) {
        System.out.println(i);
    }
}
```

   Reasoning: Iterate 1 to 1000. Use modulus `%` to check divisibility. Use logical AND `&&` to ensure both conditions are met.

8. **Question:** Fill in the blanks to count down from 10 to 1: `int i = 10; while (___) { ... ___; }`
   Answer: `while (i >= 1)` ... `i--;`
   Reasoning: To count down to 1, the loop must run while $i \geq 1$. The update must decrement (`i--`).

9. **Question:** What is the result of `System.out.println(4 + 5 + " Java");`?
   Answer: `9 Java`
   Reasoning: Addition happens first because of left-to-right associativity for `+`. $4 + 5 = 9$. Then 9 is concatenated with string " Java".

10. **Question:** Write a statement to parse the string `"3.14"` into a `double` variable named `val`.
    Answer: `double val = Double.parseDouble("3.14");`
    Reasoning: `Double.parseDouble` is the standard method to parse a string into a primitive double.

2 Version B Solutions

Part I: Multiple Choice (Version B)

Q	Question	Correct Answer	Explanation
1	Which keyword immediately stops the execution of a loop?	**C** (`break`)	`break` terminates the loop completely. `continue` only skips one iteration.
2	Which of the following is true regarding **method overloading**?	**A** (Methods must have the same name but different parameter lists)	Overloaded methods must have the same name but different parameter lists (signatures).
3	What is the output of: `System.out.println(4 + 5 + " Rules");`?	**A** (`9 Rules`)	`4 + 5` is calculated first (integers) = 9. Then `9 + " Rules"` becomes `"9 Rules"`.
4	What is the result of `"Student".charAt(0)`?	**B** (`'S'`)	The character at index 0 is the first letter, 'S'.
5	Which is a valid static method header?	**B** (`static void name()`)	Correct order: `static` modifier, `void` return type, method name.
6	What is the output of `Math.min(20, Math.max(5, 10))`?	**B** (`10`)	`Math.max(5, 10)` is 10. `Math.min(20, 10)` is 10.
7	Which `Scanner` method reads a full line of text?	**C** (`nextLine()`)	`nextLine()` reads the entire line input.
8	Attempting to access a negative index in a String results in:	**C** (`StringIndexOutOfBoundsException`)	Indices cannot be negative. This throws an exception.
9	Which method converts a `String` to an `int`?	**A** (`Integer.parseInt()`)	`Integer.parseInt` is the correct static method.
10	What is the output of the recursive method `rec(3)`?	**B** (`1 2 3`)	The print happens *after* the return. `rec(3)` calls `rec(2)`... down to `rec(0)`. Unwinding: `rec(1)` prints 1, `rec(2)` prints 2, `rec(3)` prints 3.
11	What is the output of `Math.sqrt(25)`?	**A** (`5.0`)	$\sqrt{25} = 5.0$. Math functions return doubles.
12	In `for(init; cond; update)`, which part executes first?	**C** (`init`)	The initialization (`init`) runs exactly once at the start.
13	Ambiguous invocation of a method results in a:	**B** (Compile Error)	It is a compile-time error; the code will not compile if the compiler cannot decide which method to call.
14	What is the index of the first character in a `String`?	**B** (`0`)	Java strings are 0-indexed.

15	A recursive method without a base case typically causes:	**B** (`StackOverflowError`)	Infinite recursion exhausts stack memory.
16	Which method converts a string to all lowercase letters?	**A** (`toLowerCase()`)	`toLowerCase()` is the correct method.
17	What does `Math.ceil(2.1)` return?	**B** (`3.0`)	`ceil` rounds up to the nearest integer value (as a double).
18	Which loop might NOT execute its body at all?	**B** (`while`)	`while` (and `for`) loops check the condition first. If false, the body never runs.
19	What is the value of `"Java".length()`?	**B** (`4`)	4 characters.
20	The method `indexOf('x')` returns ___ if `'x'` is not found.	**C** (`-1`)	-1 is the standard return value for "not found".

Part II: Short Answer (Version B)

1. **Question:** The _____ class is used for math operations like square roots and absolutes.
   Answer: `Math`
   Reasoning: The standard math class in Java.

2. **Question:** Write a statement to cast `double d = 9.99` to an `int` variable `i`.
   Answer: `int i = (int)d;`
   Reasoning: Converting double to int requires an explicit cast because decimals are lost.

3. **Question:** Write a `for` loop printing: `10, 20, 30, 40`.
   Answer: `for(int x=10; x<=40; x+=10) System.out.println(x);`
   Reasoning: Start 10, limit 40, increment by 10.

4. **Question:** The `Math.random()` method returns a `double` value greater than or equal to 0.0 and less than _____.
   Answer: `1.0`
   Reasoning: The range is $[0.0, 1.0)$. It is strictly less than 1.0.

5. **Question:** Recursion requires a _____ case to stop the process.
   Answer: Base
   Reasoning: The base case is the terminating condition.

6. **Question:** Write a static method `sum` that takes two integers (`a`, `b`) and returns their sum.
   Answer:

```
public static int sum(int a, int b) {
    return a + b;
}
```

   Reasoning: Simple addition method returning int.

7. **Question:** Write a loop printing numbers from **1 to 500** divisible by **both 2 and 5**.
   Answer:

```
for(int i=1; i<=500; i++) {
    if(i % 2 == 0 && i % 5 == 0) {
        System.out.println(i);
    }
}
```

Reasoning: Iterate to 500, check divisibility by 2 AND 5.

8. **Question:** Fill in: `int k = 1; while (____) { ... ____; }` (Run until 5)
   Answer: `while(k <= 5)` ... `k++;`
   Reasoning: Loop must run for k=1,2,3,4,5. Increment k at every step.

9. **Question:** What is the output of `"Val: " + (4 + 5)`?
   Answer: `Val: 9`
   Reasoning: Parentheses `(4+5)` force the addition to happen first (equals 9), then concatenation occurs.

10. **Question:** Write a statement to parse `"10.5"` into a `double`.
    Answer: `double d = Double.parseDouble("10.5");`
    Reasoning: Standard method for parsing a String to double.

3 Version C Solutions

Part I: Multiple Choice (Version C)

Q	Question	Correct Answer	Explanation
1	What is the output of `"A" + 1 + 2`?	**B** (`A12`)	"A" + 1 becomes "A1". "A1" + 2 becomes "A12". String context dominates left-to-right.
2	Which loop is guaranteed to run at least one time?	**C** (`do-while`)	`do-while` evaluates the condition after the body.
3	What is the return type of `Math.pow(2, 3)`?	**B** (`double`)	`pow` always returns a `double`.
4	What is the last character of the string `"Exam"`?	**A** (`'m'`)	Index 0='E', 1='x', 2='a', **3='m'**.
5	Which is the correct syntax for a static method?	**A** (`public static void m()`)	`public static void m()` is valid syntax.
6	In **method overloading**, methods must have:	**A** (The same name and different parameters)	The definition of overloading is same name, different parameters.
7	The `Scanner.next()` method reads until it finds:	**B** (Whitespace)	Whitespace (space, tab, enter) acts as the delimiter for `next()`.
8	String indices in Java start at:	**B** (`0`)	0.
9	How do you convert `"99"` to an integer?	**B** (`Integer.parseInt("99")`)	`Integer.parseInt` is the correct method.
10	What is the output of `fun(2)`?	**A** (`2 1`)	`fun(2)` prints 2, calls `fun(1)`. `fun(1)` prints 1, calls `fun(0)`. Output: 2 1.
11	Which method converts a `String` to upper case letters?	**B** (`toUpperCase()`)	`toUpperCase()` is the correct method name.
12	In a `while` loop, the condition is checked:	**A** (Before body execution)	The condition is verified before entering the block.
13	Which of the following describes **ambiguous invocation**?	**A** (Compiler cannot decide...)	It happens when the compiler cannot determine the single best match among overloaded methods.
14	Which loop runs exactly 5 times?	**A** (`for(int i=0; i<5; i++)`)	`i=0; i<5` runs for i=0,1,2,3,4. Total 5 iterations.
15	To avoid infinite recursion, a recursive method must have a:	**B** (Base case)	A base case is required.
16	What is the output of: `s = s.concat("Dog")` where s="Hot"?	**A** (`HotDog`)	`concat` appends "Dog" to "Hot", resulting in "HotDog".
17	What is the result of `"JAVA".toLowerCase()`?	**A** (`"java"`)	All letters become lowercase: "java".

18	Which keyword skips the remaining code in the loop body?	**B** (`continue`)	`continue` skips to the next iteration.
19	What is the length of an empty string `""`?	**A** (`0`)	0 characters.
20	What is the output of `"Java".indexOf('a')`?	**B** (`1`)	J(0), a(1), v(2), a(3). The *first* occurrence is at index 1.

Part II: Short Answer (Version C)

1. **Question:** To find the square root of a number, use the _____ method.
   Answer: `Math.sqrt`
   Reasoning: Standard method for square roots.

2. **Question:** Write a statement to cast `float f = 5.5f` to an `int`.
   Answer: `int i = (int)f;`
   Reasoning: Explicit cast needed for float → int.

3. **Question:** Write a loop that prints: `5, 4, 3, 2, 1`.
   Answer: `for(int i=5; i>=1; i--) System.out.println(i);`
   Reasoning: Start 5, go down to 1, decrement.

4. **Question:** Write a statement to generate a random `double` value between 0.0 (inclusive) and 1.0 (exclusive) using the `Math` class.
   Answer: `double d = Math.random();`
   Reasoning: Returns a random double in $[0.0, 1.0)$.

5. **Question:** Infinite recursion eventually leads to a _____ error.
   Answer: StackOverflow
   Reasoning: Recursion too deep fills the stack.

6. **Question:** Write a static method `sayHi()` that prints `"Hi"` to the console.
   Answer:

```
public static void sayHi() {
    System.out.println("Hi");
}
```

   Reasoning: Simple static void method.

7. **Question:** Write a loop printing numbers from **1 to 100** divisible by **4 and 10**.
   Answer: `if(i%4==0 && i%10==0)`
   Reasoning: Modulo 4 and 10 check inside the loop.

8. **Question:** Fill in: `int x = 0; while (____) { ... ____; }` (Run while x less than 5)
   Answer: `while(x < 5)` ... `x++;`
   Reasoning: Counting up to 5 requires a less-than check and increment.

9. **Question:** What is the output of `1 + 2 + " Go"`?
   Answer: `3 Go`
   Reasoning: `1+2` is evaluated as math first (3). Then concat " Go".

10. **Question:** Write a statement to parse `"500"` into a `double`.
    Answer: `double d = Double.parseDouble("500");`
    Reasoning: Parsing string to double.

4 Version D Solutions

Part I: Multiple Choice (Version D)

Q	Question	Correct Answer	Explanation
1	What is the output of `1 + "2" + 3`?	**B** (`123`)	`1+"2"` → `"12"`. `"12"+3` → `"123"`. String context spreads.
2	Which loop checks the condition AFTER executing the body?	**C** (`do-while`)	`do-while` loops execute first, check later.
3	Which of the following is true for **method overloading**?	**A** (Same name, different parameters)	Same method name, different parameter types/order.
4	What is the first character of the String `"World"`?	**A** (`'W'`)	Index 0 is 'W'.
5	Static methods are typically called using the:	**A** (`ClassName.method()`)	`ClassName.methodName()` is the standard way to call static methods.
6	What is the result of `Math.min(-5, -10)`?	**B** (`-10`)	-10 is smaller than -5.
7	The `Scanner.nextInt()` method reads:	**C** (An integer)	Reads an integer token.
8	Executing `"Hi".charAt(2)` results in:	**C** (Exception)	Indices are 0 and 1. Index 2 is out of bounds, throwing an Exception.
9	Which method parses `"2.5"` to a `double`?	**B** (`Double.parseDouble`)	`Double.parseDouble` is the correct API.
10	How many total times is method `f(3)` called?	**C** (4)	`f(3)` calls `f(2)`, then `f(1)`, then `f(0)`. Total 4 calls.
11	What is the result of `"STOP".toLowerCase()`?	**A** (`"stop"`)	"stop" (all lowercase).
12	In `while(condition)`, the loop runs as long as the condition is:	**A** (`true`)	The loop continues while the boolean expression is `true`.
13	Which of the following results in **ambiguous invocation**?	**A** (Compiler finding multiple...)	When the compiler finds multiple matching methods (e.g., via auto-casting) and none is more specific.
14	The index of the last character in String `str` is:	**B** (`str.length()-1`)	Length minus 1.
15	A base case is necessary in recursion to prevent:	**B** (`StackOverflow`)	StackOverflowError caused by infinite recursion.
16	Which method converts a string to all upper case letters?	**A** (`toUpperCase()`)	`toUpperCase()`.
17	What is the result of `"Rain".concat("Bow")`?	**B** (`RainBow`)	Appends "Bow" to "Rain" → "RainBow".
18	The keyword `break` inside a loop causes it to:	**C** (Exits loop)	Exit the loop structure entirely.

19	What is the length of `" A "` (space A space)?	**C** (3)	3 characters.
20	If the character is not found, `indexOf` returns:	**D** (`-1`)	-1 is the return value for not found.

Part II: Short Answer (Version D)

1. **Question:** `Math.max(5, 5)` returns _____.
   Answer: `5`
   Reasoning: Max of 5 and 5 is 5.

2. **Question:** Write a statement to cast `int i = 100` to a `char` variable `c`.
   Answer: `char c = (char)i;`
   Reasoning: Casting int to char requires explicit syntax.

3. **Question:** Write a loop that prints: `2, 4, 6, 8`.
   Answer: `for(int i=2; i<=8; i+=2) System.out.println(i);`
   Reasoning: Start 2, stop 8, step 2.

4. **Question:** (True/False) The `Math.random()` method can return the value `1.0`.
   Answer: False
   Reasoning: `Math.random()` is strictly less than 1.0.

5. **Question:** A method calling a different method is a _____ call.
   Answer: Method (or Normal)
   Reasoning: A method calling *another* method is a standard method call (as opposed to recursive).

6. **Question:** Write a static method `msg(String s)` that prints the passed string.
   Answer:

```
public static void msg(String s) {
    System.out.println(s);
}
```

   Reasoning: Method returning nothing (`void`), takes String, prints it.

7. **Question:** Write a loop printing numbers from **1 to 50** divisible by **3 and 5**.
   Answer: `if(i%3==0 && i%5==0)`
   Reasoning: Divisibility by 3 and 5 check.

8. **Question:** Fill in: `int j = 10; while (____) { ... ____; }` (Run while j ¿= 0)
   Answer: `while(j >= 0)` ... `j--;`
   Reasoning: Countdown loop logic.

9. **Question:** What is the output of `"A" + "B" + "C"`?
   Answer: `ABC`
   Reasoning: ”A” + ”B” + ”C” concatenates them all.

10. **Question:** Write a statement to parse `"0"` into an `int`.
    Answer: `int x = Integer.parseInt("0");`
    Reasoning: Parse string ”0” to integer 0.