

Homework 10

Q1)(E)

The code compiles but throws an exception at runtime. `sb` variable is initialized with an empty `StringBuilder` object. Then the program arguments are iterated. For every given argument, the loop tries to insert the `String` element being iterated to the `sb` `StringBuilder` at the index of character `'c'` in `sb`. But since the `sb` `StringBuilder` is empty, `sb.indexOf("c")` returns `-1`, and hence the code throws `StringIndexOutOfBoundsException` at runtime.

Q2)(C, E)

Addition operator has higher precedence over assignment operator, so option A is wrong. For option B, addition operator is listed last, but it has lower precedence over the previous three operators, so it is wrong too. Option D is wrong because the subtraction operator has lower precedence over the multiplication operator. Option C and option E have the correct order of operators according to increasing or the same level of precedence.

Q3)(C, B, F)

Option A is a getter method but it has a parameter in its method signature, so it is not a valid JavaBean. Option D should return a boolean, looking at the name, as it is prefixed with `'is'`, so this option is not a valid bean too. Lastly Option E is wrong because there is no such naming convention. C, B, F are valid beans.

Q4)(A, E)

Array has `length` variable instead of a `size()` method. `size()` method is used for `ArrayLists`. Upon the correction of this one line, code would compile and run without issue. The nested for loop iterates correctly, and without trying to access out of bounds of the crossword array. It only iterates through the half of the every array in the second dimension though. Because the second dimension has `10` arrays in it with every array having length `20`, we are iterating every `10` array but stopping after the ninth element which corresponds to half of the whole elements. And unassigned half has their values set to default value `0`.

Q5)(B, D)

If a file system resource becomes temporarily unavailable, a checked exception must be used. `Error` is not a subclass of the class `Exception`, but `Throwable` class. If a user enters invalid input, I think an unchecked exception must be used, because we can consider it a programming error. Although it is possible, it is very unlikely that we would've wanted to catch it.

Q6)(D, A, C)

`import jungle.tree.*` statement imports all of the class inside tree package, allows us to access them without specifying the full package name. This is also true for the import statement `import savana.*`. `import forest.Bird` imports a class, Bird class, so again we don't need to use its full package name. `java.lang.Object` package does not need to be imported, since its inherently imported, we can use Object class without a full package name. `savana.sand.Wave` class cannot be accessed as asked in the question since the import statement only import classes in the savana package. Classes option E and F, should be used with full package name too since only Bird class imported from the forest package. Key point here is that we should not overlook the fact that by using '*', we are not recursively importing all packages.

Q7)(C)

Two of the given four variables represent immutable objects. Strings and LocalDateTime object are immutable objects, while ArrayLists and StringBuilder classes represent mutable objects.

Q8)(C)

The output of the given code is "wing". Given code iteratively removes characters from the StringBuilder unless the length of the Character sequence is less than 5. First iteration leaves the object with the value "s growing", since the length is greater than 5, iteration runs again, leaving the value with "wing". while condition check returns false since the length is now less than 5. And the last value of the variable which is "wing" is printed after the do-while loop.

Q9)(D)

All of the created String objects are new objects, meaning that the all three variables points to different object. new keyword always instantiates a new object in the heap. Only the ceiling string is interned, but the next two variable are instantiated and initialized with new keyword. The == operator checks if the references point to the same object, so since none of the three point to the same object as other, there is no any possibility that any equality check on these three references returns true. equals method returns true with every combination of these three variables, one of them as caller other the argument. Because the equals method is implemented to check the elements in the String rather than comparing references.

Q10)(C)

The code prints true three times. Since `String` objects are mutable, all the methods which return a `String` after an operation which seems to mutate the string, actually returns a new `String` object. Because again, `Strings` are immutable. Last three statements prints true. Since they are equality checks on the contents of the strings rather than the references, and the `ignoreCase` is used where the contents are different.

Q11)(A, B, C)

Lines 15 and 17 can be removed since we are not referencing to them. Lines 15, 16, 21 describes the outer loop with its label. We can remove those lines safely. Because the operation is inside the inner do-while, and the condition of the outer loop does not affect the output since when the inner loop condition returns false, outer loop condition would also, always return false. So it doesn't really affect the outcome, but it would if the condition would be checking against some value bigger than 5.

Option D describes removing the inner do-while, which would cause the output to change since the condition in the while statement is different. There would be 4 'x' character added and printed instead of 5. Option E and F is certainly wrong since they suggest a do-while without a while.

Q12)(B, C)

Option B does not compile since since we are assigning a `double` literal to a `long` type reference, java cannot convert `double` to `long` since it would not be promotion. But note that a `long` value would be promoted to `double` value. Option C does not compile too because a floating point number is given with a `'L'` postfix which defines a `long`. That is clearly a syntax error. Option D and E does compile, both `'l'` and the uppercase `'L'` are practically the same. Option A compiles, because an `int` can be inherently promoted to `long`. Option F compiles too because underscores are fine to use between numbers for readability of big numbers.

Q13)(A)

Since `time.getHour()` returns 1, while loop is never branched, hence no line is printed. But keep in mind that the `time.plusHours()` is dangerous here since it returns a reference to a copy, not a reference to the time object itself, since the `LocalTime` class is immutable. If the while condition was to evaluate true, we would have an infinite loop.

Q14)(D)

The code compiles but throws a `NullPointerException` at runtime. Since `game` variable is not initialized, it gets the value `null` which is the default value for objects. But hidden with the first thrown exception there is another issue with the code. A reference type variable of

one-dimensional Object array is assigned with `game` variable, which is a two-dimensional array itself. Which means that the every element we obtain with `obj` reference (with something like `obj[3]`) is an one dimensional `int` array (`int[]`). A character is assigned to where should be an object of one-dimensional array. This is a problem which would cause an `ArrayStoreException`.

Q15)(C, E)

Option B, D and F does not even compile because no type argument given on the left hand side. Option A gives a warning because of the usage of a raw type when instantiating the `ArrayList`. Compiler gives warnings because a raw type prevents compiler from doing some type safety checks. It is strongly discouraged to use raw types.

Option C and E does compile without warning because they properly utilize generics. For the option C (`List<String> c = new ArrayList<>();`), it is not mandatory to give a type argument on the right side, because it is inferrible by the compiler from the argument given to the reference type on the left side.

Q16)(B, D)

After the assignments, `shoe1` and `shoe3` references both points to `"flip flop"` and `shoe2` reference points to `"croc"`. `"sandal"` is not referenced by any variable so it is eligible for garbage collection just before the `main()` method ends. After it ends, all off them are eligible anyway. Option D is correct because being eligible to be garbage collected does not mean it is guaranteed that the garbage collector will run.

Q17)(C)

One line of the application does not compile. `"f.getFish();"` statement does not compile because even though the `Clownfish` class' `getFish()` method does not declare an exception `Fish` class' `getFish()` method does and the type of the reference variable `'f'` is `Fish` so we need to declare or handle it in the `main()` method.

Q18)(A)

Only one line printed. `static print()` method expects a `List` and a `Predicate` as parameter. In `print()` method, every item in the list is iterated and is given as argument to `Predicate's test()` method. If the `test()` returns `true` number is printed.

In the `main()` method, we see that a lambda expression `"e -> e < 0"` is given to the `print()` method. This expression tests the parameter `e` if it is less then `0` or not. The given `list` variable contains three items, one of which is `'-5'`. This item makes the `test()` method returns `true`, and hence it is printed.

Q19)(F)

None of the given options are mandatory with a `try` statement. `finalize()` is a `Object` method which is called by the garbage collector on an object when garbage collection determines that there are no more references to the object. `catch` and `finally` blocks are optional as long as one of them is present. `throws` keyword is used to declare exceptions in method signatures.

Q20)(A)

The code outputs `5`. The outer while loop is branched because variable `result` is bigger than `7`. Inner do-while loop decrements the `result` variable until it's equal to `5` and then hands over the control because the condition does not meet anymore. The very next statement after the inner do-while loop breaks the loop labeled "loop" which is the outer loop itself. Using a label here is unnecessary actually. After that, we see a print statement which prints the value of `result` variable which is `5`.

Q21)(C)

The result of the given application after compiling and executing is "`1 2`". The constructor of the `Alligator` class increments the class variable, which by the way is initialized with default value `0`, every time when an instance of the class is created. The `teeth` in the `main()` method resolves to the class variable `teeth`. With the first invoke of the `snap()` method, `teeth` is already incremented by `1` so `1` is passed to the `snap()` method. But the `snap()` method's parameter is also named "`teeth`" so it shadows the class variable `teeth` which resides in the outer scope. Referring `teeth` inside `snap()` method does not refer to the class variable but the local variable `teeth`, hence the class variable is not affected by the decrementation. So, the first invoke of the `snap()` method prints `1`, and by the second invoke of the `snap()` method, for the reasons explained above, `2` is printed.

Q22)(A)

`concat()` method concatenates the specified string to the end of this string. Key point here is to know that the string objects are immutable. `witch.concat(tail)` does not mutate the object which is referred by the `witch` variable but returns a new one, concatenated with the string value represented by the `tail` variable. Newly created, concatenated `String` is not assigned to `witch` `String` type reference variable, hence the `witch`, still refers to the same object as before. So, "`b`" is printed.

Q23)(A, C, F)

In java 7 and earlier versions, interfaces could only contain `public abstract` methods, which must be implemented by classes that implement the interface. From java 8, apart from public abstract method, we can also have `public static` and `public default` methods. An interface method can not be `final` since it would have prevented the method

to be overridden. **protected** keyword can not be applied to interface methods to because all interface methods are inherently **public** and **protected** methods are intended for sharing implementation with subclasses but interfaces have no implementation at all. Additionally, while being not true for Java 8, with Java 9 an onward, we can also have **private** interface methods both as static and non-static methods.

Q24)(D)

The code given in the question does not compile because, in while loop condition does not return a boolean value due to the use of assignment operator. We should use equality operator instead, or some expression which returns a boolean value. Having equality operator (`==`) instead of assignment operator, while would be branched since the tie variable is `null` and inside while block it would be assigned to string value `"shoelace"`, hence the code would output `"shoelace"`.

Q25)(B, F)

The option B is true since every class in the `java.lang` package is auto imported. Option C is wrong, `java.util` classes must be imported explicitly. Option D is wrong, java does not require every file to declare package statement, without a package statement it would be in the default package, option A is wrong because of the same reason . Option E is not true, there is no requirement such as to declare at least one import statement. Option F is true, every class is either direct or indirect descendant of the `Object` class.

Q26)(D)

The code does not compile because of line m1. `Tree` class overloads the inherited `grow()` methods, but does not override it. It must override it since there is an ambiguity about which default method would be invoked if it was not overridden. If the `Tree` class would overridden the `grow()` method, then there would be no ambiguity about which implementation is going to be called, since the `Tree` class `grow()` will be called on an instance of `Tree` class whether the reference type is `Living` or `Plant`, since the `grow()` method is polymorphic.

Q27)(D)

The `println` statement does not compile. The first three option complains about variable declarations not being able to compile, because of the variable names. This is not true, all of the variable names (`name`, `_number` and `profit$$$$`) have valid syntax. Dollar sign and underscores are allowed to be used in identifiers. The problem with the code is, the `profit$$$$` variable not being initialized. `profit$$$$` is a local variable and local variables don't get any default values like class or member variables. For this reason `println` statement does not compile.

Q28)(A)

Post-decrement (`x--`) operator decreases the value by one and returns the original value while pre-increment (`++x`) operator increases the value of `x` by one and returns the new value.

Q29)(B, E, C)

Three methods contain compiler errors. `public Trouble()` does not compile because there is no default `Big()` constructor is defined, so we need to explicitly invoke another constructor. `public Trouble(long deep)` does not compile because the assumed signature `Trouble(String, long)` is undefined in `Trouble` class. Last but not least, `public Trouble(int deep)` does not compile because there are two constructor calls, but a constructor call must be a first statement in a constructor.

Q30)(E, F)

Because `main` method is static, we can't refer to instance variables. So, all the A, B, C and D options are wrong. Option E and F is the correct answers. Option E declares two variables but initializes only one which is the `max` variable, `min` variable gets the default value which is `1` for integers. Option F too, declares two variables with one statement but it initializes both variables, but since `min` is assigned to `0`, both option E and option F are practically the same.

Q31)(B, E)

Only one of the right-hand sides of the ternary expression will be evaluated, making the option A wrong. Option B is true since there could only be one default statement in a `switch` statement which does makes sense. Option C is wrong since only one else statement if allowed to execute if all other conditions returns false. Option D is wrong because one of them (`||`) is called short-circuit operator because second operand will not be evaluated if the outcome is guaranteed with the evaluation of the first operand. Option E is true since the logical complement operator (`!`) is undefined for numerical types.

Q32)(C)

The code outputs `"ed"`. `StringBuilder sb` is appended with `"red"` then the first character is deleted leaving the `StringBuilder` with `"ed"`. `sb.delete(1, 1)` does not delete any character since the start index and the end index are the same. So, the `println` statement print `"ed"`.

Q33)(A, D)

Dollar sign and underscore are permitted to use anywhere in identifiers. Although the first option seems absurd, it is valid. All the other special characters used in method identifiers (%, \, #, -) are invalid to use. We should note that even if numbers are permitted to use in identifiers, it can not be used as the first character of an identifier.

Q34)(B, C)

Option B is true and it is describing polymorphism. Option C is true too since inheriting commonly used attributes and methods is one of the main benefits of inheritance. Option D is wrong because every class, even if it does not extend any other class, it inherently extends the object class. Option E is wrong because one of the advantages of inheritance is that it improves code reuse. Lastly, if we are talking about class data rather than instance data, static methods is the way to access them.

Q35)(E)

Statement I is true since java does use dot (.) to separate packages. Statement II is true, with Java 8 and onward java supports functional programming with lambdas. III is true, Java is strongly object oriented, even the entry point which is the main method has to be in a class for some reason. Since java is strongly object oriented, and one of the main benefits of the object-oriented programming is polymorphism.

Q36)(C)

The output of the following application is "3 2". listing is initialized with an array literal with first dimension's length being 3 since there is 3 array inside the array, and second dimension's length being 2 since all of the arrays inside the array has the 2 elements. Hence the listing.length is 3, and listing[0].length is 2.

Q37)(A, B, E)

Switch statement allows byte, short, char and int primitive types. Other than these primitive types it also allows enumerated types and the String class. Few special classes which wrap primitive types such as Character, Byte, Short and Integer are allowed too.

Q38)(D)

The code does not compile because of line //k2. The arrow which separates the body of the lambda and the parameters is typed wrong. It should be -> instead of =>. Having the error corrected, the code would print true since the given lambda checks if the parameter is between the range of values 5 and -5, if it is not, it return true, meaning we should correctly aim.

Q39)(B, C, E)

There are three types of comments in Kava.

1. Single Line Comment
2. Multi Line Comment
3. Documentation Comment

The single line comment is used to comment only one line. The multi line comment is used to comment multiple lines of code. The documentation comment is used to create documentation API. To create documentation API, you need to use javadoc tool. Option C is a valid single line comment, Option B is documentation comment, asterisks after the second one is ignored. Option E does count as a documentation comment too.

Q40)(A, F)

Static imports allows to use `static` methods or variables of a class elsewhere in the application without referring its full path with package name. Option A and B correctly imports `static` members of the `Grass` class. While A imports the members one by one, option F imports all of the `static` members by using asterisk. Option C and E are both have invalid syntaxes since `static` keyword is in wrong order. Option B is wrong because, this type of import is used to import classes. `pacakage_name.*` imports all classes in `package_name` and we can't use `static` when importing classes. Option D looks like its trying to import members from a class without the `static` keyword.

Q41)(D)

`Arrays.asList()` Returns a fixed-size list backed by the specified array. Note that the returned `List` implementation is not the same everyday `ArrayList` we use. SOme of the methods inside the `List` interface are optional methods. Returned implementation does not support every `List` method one of which is `remove()`. That throws `UnsupportedOperationException` at runtime.

Q42)(A, D)

Underscores are allowed in identifiers but they are only allowed in numeric values if they are place between numbers. Option A and D is a correct example while other options depicts wrong examples according to the aforementioned rule.

Q43)(B)

Result of the given code when executed is [0, 01, 1, 10]. The program arguments arg is assigned to an array literal { "0", "1", "01", "10" }, sorted alphabetically and then printed.

Q44)(D)

The blanks must be filled with **public** and **static**. Static members belong to classes in which they are declared. Hence they do not need instances to be accessed. While **public** access modifier makes variables accessible anywhere in the application. Making a member **public** and **static**, kind of depicts global variables in other languages.

Q45)(A)

Given code prints only one line, the second blank `println` statement is a trick. It is not part of the inner enhanced for loop since no brackets were used. Nested loop iterates the `exams` list as many times the number of elements in the list which is 2. In first iteration of the outer for loop `e1` is "OCA", in second iteration it is "OCP". So, in the inner loop, "OCA" is concatenated and printed with the two elements in the list and then "OCP" is concatenated and printed with the two elements in the list, which as a result corresponds to "OCA OCAOCA OCP OCP OCAOCP OCP"

Q46)(C, D)

Option C and D is true since the `javac` command compiles a .java source code text file into a .class file which is a bytecode file. Also for that reason, option F and A is wrong. Option B and E is wrong because, `java` command does not compile any file, it is used for running already compiled .java files.

Q47)(C)

Only two lines of code compiles. `Integer.parseInt()` method returns an `int`. An `int` can be assigned to `Integer` type, `int` type or some primitive type that it can be promoted to, like `float`, `double` or `long`.

Q48)(F, B, D)

The `drive` method in the `Highway` class is an overloaded method with four different versions. Each version accepts different type of argument. There is two method signatures which returns `int` 3. the one which accepts `double` as a parameter and the other one accepts `short` as a parameter, so the type of the value should be `double` or `short`. Also, because of the promotion of the primitive types to bigger types, a `float`, `byte` can be used too. They will be promoted to `double` type and `short` type respectively when passed to `int drive(double car)` and `public int drive(short car)` as an argument. `int` and `long` can also be promoted to `double`

but they are already used as a type in other overloaded drive() method which returns 5 and 2 respectively.

Q49)(A)

The main() method, which is the entry point in our program has the static keyword missing. So the code compiles fine, but it would throw exception at runtime. But if we correct the signature of the main method. Then it would print true two times. The first and the fourth println statement prints false because new keyword always instantiates new objects. Last println statement would print also false because, LocalTime.now() creates a new object and returns its reference and also, a little time passes between execution of LocalTime.now() on the left hand side and the right handside. The third println statement prints true because the "bart" string is interned and reused. Second println statement, would obviously return true, but note that it could not if there was an operation, maybe an addition and then, result of the addition was being compared to some value that we think it is equal to. That would be because the numbers in base 10 which are not the exponents of 2, can not be represented exactly in binary systems.

Q50)(D)

The code compiles and runs without any issue, printing "245". Try statement throws a RuntimeException, more specifically ArrayIndexOutOfBoundsException exception because in the main method two arguments are passed as variable arguments, so trying to access a third element will throw a RuntimeException. First block catches the RuntimeException and prints 2, and remember that the finally block executes, after catch block whether or not it throws an exception, printing 4. Finally, after the swing method returns control to the main method, there is a print line which prints 5, summing up to printed "245" on the screen.

Q51)(E)

The code compiles but throws an exception at runtime. The size of the drinks array is 2. container variable of the for loop is initialized with drinks.size() which is 2 and incremented by 1 as long as it is greater than zero. Problem occurs when we arrive the second iteration, (container - 1) given to drinks.get() evaluates to 2 and then get() throws IndexOutOfBoundsException exception because there is no third element. So, we get the output "cup," with the first iteration since (container - 1) evaluates to 1, and the second iteration throws RuntimeException.

Q52)(A, F, E)

A main method/entry point to a program must be a method declared as public static void main(String[] args). Some equivalent signatures are:

```
public static void main(String a[])
public static void main(String[] a)
public static void main(String... a)
```

Also, it is still a valid entry point signature if main is declared final. All final versions of the above entry point signatures are valid entry points too.

Q53)(C, E, D)

Case statement values must be final variables or literals or we get an error, case expressions must be constant expressions. winter variable is declared final but the type long type is an incompatible type for switch statements. fall variable has a compatible type, but it is not declared as final. Line 11 should be removed too, because there can not be two default blocks in a switch statement.

Q54)(A, B, C)

Lines h1, h2, and h3 does not compile. h1 does compile because abstract interface methods can only be declared public. h2 does not compile because we can not reduced the visibility of inherited method from Friend interface. h3 does not compile because of the same reason. Line h3 also declares a RuntimeException but since it is an UncheckedException it is fine to do so. line h4 compiles fine because a Dog is also a Friend. Line h5 compiles fine too, but throws an exception at runtime because of the casting to Cat class. friend variable refers to a Dog object, not a Cat object so casting it to Cat will throw a ClassCastException. Line h6 compiles fine but casting a null variable, or in this case null value itself, will throw NullPointerException.

Q55)(F, E, B)

Unchecked Exceptions are caused by programming errors, so one could guess from the options. FileNotFoundException, IOException are certainly exceptions that the program could reasonably recover. Exception is the parent class of all exceptions and is an unchecked exception. ArithmeticException, IllegalArgumentException and RuntimeException can be considered as programming errors, and they are unchecked exceptions.

Q56)(F)

The code compiles and runs without issue. The ship variable is assigned to 10 because the ternary operation on the right-hand side returns 10. space variable is not less than 2 and because of that 10 is returned from the ternary operation.

printmessage() member method has two distinct if-then statements. First if block gets executed because the condition (ship > 1) returns true and prints "Goodbye". With second if-then-else, else block gets executed and prints "See you again" due to the fact that the condition inside the if statement (ship < 10 && space >= 2) returns false because ship is not less than 10.

Q57)(B, C, D)

clock variable is accessed in Coffee class which is in the same package with the Alarm class variable declared in. So the access modifier of the clock variable must be at least package-private or above. getTime() method is accessed in Snooze class which extends Alarm class but in a different package, so protected would suffice, public would grant more.

Q58)(B)

The code does not compile because of the line q1. CarbonStructure class is not an abstract class so it can not declare abstract methods. Aside from that problem, the override is done correctly. Subclass method throws a more specific subclass exception and it returns a Long which is covariant with Number type.

Q59)(C)

Although the main method's signature is not a proper signature to be an entry point, it is still a valid method. New LocalDate objects are acquired through static methods like of() or now() or ofYearDay() etc. There is no visible constructor that we can use to acquire a LocalDate object. Line 7 although is used wrongly, since each of the chained methods (ofYear and ofDays) returns new Period objects, it is a valid code and compiles without any issue. Line 8 does not compile, there is no class such as DateTimeFormat, the correct name is DateTimeFormatter.

Q60)(A, E)

Option A is true; a catch block can never appear after a finally block. Option E is also true; a try block can have zero or more catch block. Option B is wrong since catch block is optional. Option C is wrong because it the opposite is true. Option D is false since a try block can be followed by a catch. Lastly; option F is wrong because a try statement can have zero or one finally block, not zero or more.

Q61)(B)

The fish variable is assigned to 4, because the ternary operation evaluates to 4. First the multiplication is done and then the addition, making the ternary operation $11 \geq 2 ? 4 : 2$ which returns 4. mammals variables evaluation is a little bit tricky. There is another ternary operation inside a ternary operation. 3 is not less than itself, so the right-hand side is going to be returned from the ternary operation which is another ternary operation itself and it evaluates to 9. The next statement which is a print statement prints the sum of fish and mammals which is 13.

Q62)()

Q63)()

Q64)()

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