to add two integer numbers
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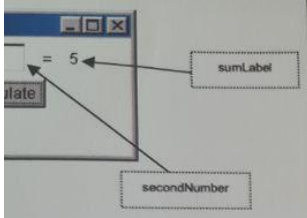
ith the names of the components



he eventHandler of

```
tionPerformed(ActionEvent

, second, sum;
st + second;
setText("" + sum);

tionPerformed(ActionEvent

, second, sum;
nt(firstNumber.getText());
nt(secondNumber.getText());
st + second;
setText("" + sum);

tionPerformed(ActionEvent

, second, sum;
nt(firstNumber.getText());
nt(secondNumber.getText());
st + second;
setText(sum);

tionPerformed(ActionEvent

rst, second, sum;
firstNumber.getText();
secondNumber.getText();
st + second;
setText(sum);

tionPerformed(ActionEvent
```

2. Which of the following collections guarantees no duplicates and elements in their natural order?
   A. `HashSet`
   B. `TreeSet`
   C. `LinkedHashSet`
   D. `ArrayList`
   E. `PriorityQueue`

3. Which of the following is not a valid way to create a collection in Java?
   A. `List<String> list = new ArrayList<>();`
   B. `Set<Integer> set = new HashSet<>();`
   C. `Queue<Double> queue = new PriorityQueue<>();`
   D. `Map<String, String> map = new TreeMap<>();`
   E. `Collection<Object> collection = new LinkedList<>();`

4. Which of the following is true about enums in Java?
   A. Enums can extend other classes.
   B. Enums can implement interfaces.
   C. Enums cannot have methods.
   D. Enums are implicitly final.
   E. Enums cannot have fields.

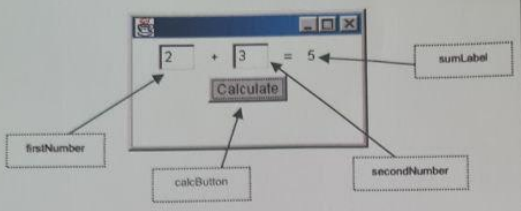
5. Which of the following is true about a local inner class?
   A. It can access final variables of the enclosing block.
   B. It can be static.
   C. It can be instantiated outside the enclosing method.
   D. It can declare static fields.
   E. It cannot be abstract.

6. What is the main reason to declare a class as final in Java?
   A. To prevent it from being extended
   B. To enhance performance
   C. To allow serialization
   D. To facilitate garbage collection
   E. To enable cloning

Refer the following sample code for the questions **7**, **8**, and **9**.

```
public class InitializerExample {

    // Static block
    static {
        System.out.println("Static initializer.");
    }

    // Instance initializer block
    {
        System.out.println("Instance
initializer.");
    }

    // Constructor
    public InitializerExample() {
        System.out.println("Constructor.");
    }

}
```

1. A program is required to add two integer numbers together. The graphical user interface for this program is shown below, together with the names of the components used:



The correct code for the `eventHandler` of `calcButton` is:

A.
```
public void actionPerformed(ActionEvent
e)
{
     int first, second, sum;
     sum = first + second;
     sumLabel.setText("" + sum);
}
```

B.
```
public void actionPerformed(ActionEvent
e)
{
     int first, second, sum;
     first =
Integer.parseInt(firstNumber.getText());
     second =
Integer.parseInt(secondNumber.getText());
     sum = first + second;
     sumLabel.setText("" + sum);
}
```

C.
```
public void actionPerformed(ActionEvent
e)
{
     int first, second, sum;
     first =
Integer.parseInt(firstNumber.getText());
     second =
Integer.parseInt(secondNumber.getText());
     sum = first + second;
     sumLabel.setText(sum);
}
```

D.
```
public void actionPerformed(ActionEvent
e)
{
     String first, second, sum;
     first =  firstNumber.getText();
     second = secondNumber.getText();
     sum = first + second;
     sumLabel.setText(sum);
}
```

E.
```
public void actionPerformed(ActionEvent
e)
{
     String first, second, sum;
     first =
Integer.parseInt(firstNumber.getText());
     second =
Integer.parseInt(secondNumber.getText());
     sum = first + second;
     sumLabel.setText("" + sum);
}
```

2. Which of the following collections
duplicates and elements in their natural
A. `HashSet`
B. `TreeSet`
C. `LinkedHashSet`
D. `ArrayList`
E. `PriorityQueue`

3. Which of the following is not a valid
collection in Java?
A. `List<String> list = new ArrayLi`
B. `Set<Integer> set = new HashSet<`
C. `Queue<Double> queue = new Priori`
D. `Map<String, String> map = new T`
E. `Collection<Object> collect`
`LinkedList<>();`

4. Which of the following is true about enu
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B. Enums can implement interfaces.
C. Enums cannot have methods.
D. Enums are implicitly final.
E. Enums cannot have fields.

5. Which of the following is true about a lo
A. It can access final variables of the en
B. It can be static.
C. It can be instantiated outside the encl
D. It can declare static fields.
E. It cannot be abstract.

6. What is the main reason to declare a clas
A. To prevent it from being extended
B. To enhance performance
C. To allow serialization
D. To facilitate garbage collection
E. To enable cloning

Refer the following sample code for the que

```
public class InitializerExample {

    // Static block
    static {
        System.out.println("Static i
    }

    // Instance initializer block
    {
        System.out.println("Instanc
initializer.");
    }

    // Constructor
    public InitializerExample() {
        System.out.println("Constru
    }

}
```

A. 0

B. 5

C. 1000

D. -1

22. What is the primary benefit of polymorphism in Java?

A. Faster code execution.

B. Simplified code maintenance and enhancement.

C. Reduced memory usage.

D. Enhanced security features.

E. None of the above.

23. In which scenario is runtime polymorphism used in Java?

A. Method overloading.

B. Constructor overloading.

C. Method overriding.

D. Operator overloading.

E. All of the above.

24. Which keyword is used to call the parent class method in polymorphism?

A. super

B. this

C. parent

D. base

E. main

25. Which of the following is true about Java exception handling?

A. All exceptions must be caught or declared to be thrown.

B. Java exceptions are divided into checked and unchecked exceptions.

C. Runtime exceptions are checked exceptions.

D. An exception can only be thrown once.

E. None of the above.

26. What is the purpose of the finally block in Java exception handling?

A. To execute code that should run regardless of whether an exception is thrown.

B. To catch any exceptions that were not caught in the catch block.

C. To declare additional exceptions.

D. To terminate the program immediately.

E. None of the above.

27. Which of the following statements about the throw keyword in Java is true?

A. It is used to declare an exception.

B. It is used to catch an exception.

C. It is used to create a new exception object and throw it.

D. It is used to rethrow an exception from a catch block.

E. None of the above.

28. Which of the following is not a checked exception?

A. IOException

B. SQLException

C. FileNotFoundException

D. RuntimeException

E. ClassNotFoundException

29. Which of the following is true about abstract classes in Java?

A. Abstract classes can be instantiated directly.

B. An abstract class must have at least one abstract method.

C. Abstract classes can have concrete methods.

D. Abstract classes cannot have constructors.

E. None of the above.

30. What happens if a subclass does not implement all abstract methods of an abstract class?

A. The subclass will become abstract.

B. The program will compile successfully.

C. The subclass can still be instantiated.

D. The subclass can have only concrete methods.

E. None of the above.

Part II – Matching

Select the **best** possible matching pairs.

	A		B
1	one iteration guaranteed	A	uses index 0 to n
2	compiler	B	String
3	array	C	portability
4	length()	D	%
5	bytecode	E	polymorphism
6	overloading	F	java command
7	Java comment	G	{ }
8	boolean default	H	static
9	array initialize	I	/** */
10	modulus operator	J	false
		K	do...while loop
		L	While loop
		M	true
		N	same method name
		O	while...do loop
		P	same parameter list
		Q	javac command
		R	/* **/

Which of the following instructions from the program in the question above might throw an exception:

A. `char [] vowel = ('a','e','i','o','u');`
B. `System.out.print("enter a vowel number (1-5): ");`
C. `num = EasyIn.getInt();`
D. `System.out.println(vowel[num-1]);`
E. none of the above;

15. Assuming the five lines from the question above are placed in a `try` block, which of the following `catch` blocks would *not* catch the offending exception:

A.
```
catch (IOException e)
{
    System.out.println(e.getMessage());
}
```

B.
```
catch (Exception e)
{
    System.out.println(e.getMessage());
}
```

C.
```
catch (RuntimeException e)
{
    System.out.println(e.getMessage());
}
```

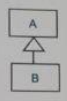
D.
```
catch (ArrayIndexOutOfBoundsException e)
{
    System.out.println(e.getMessage());
}
```

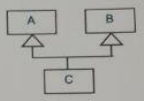
E.
```
catch (Throwable e)
{
    System.out.println(e.getMessage());
}
```

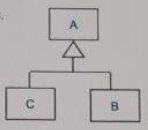
16. Which of the following is an example of a *checked exception*

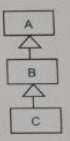
A. `RuntimeException;`
B. `NumberFormatException;`
C. `IOException;`
D. `NegativeArraySizeException;`
E. none of the above;

17. Which of the following class designs CANNOT be implemented in Java:

A.


B.


C.


D.


E. none of the above.

18. Which of the following keywords is used to invoke a method in the sub class?

A. this
B. super
C. sub
D. static
E. None of the above

19. All Java classes implicitly inherit from:

A. `java.util.Object`
B. `java.com.lang.Class`
C. `java.lang.Object`
D. `javax.swing.JFrame`
E. None of the above

20. Which of the following methods and variable better be static?

A. a method returning the sum of its arguments
B. a constant VAT value used throughout the program
C. a method accessing only static variables
D. when no need of instantiating an object is needed
E. All of the above

21. What is the output of the following Java code?

```
public class A {
    static int x;

    public static void main(String[] args) {
        A that1 = new A();
        A that2 = new A();
        that1.x = 5;
        that2.x = 1000;
        x = -1;
        System.out.println(x);
    }
}
```

11. Assuming that `Class_A`, `Class_B` and `Class_C` in the previous question have all been written and compiled successfully, which of the following code fragments in a program that used these classes would result in a compiler error:

A.

```
public void someMethod(Class_C
  objectIn)
{
   objectIn.whatAmI();
}
```

B.

```
Class_C obj = new Class_C();
obj.whatAmI();
```

C.

```
public void someMethod(Class_A
  objectIn)
{
   objectIn.whatAmI();
}
```

D.

```
Class_A obj = new Class_A();
```

E. none of the above.

12. An interface called `SampleInterface` is to be provided for an application. It is to have two methods, called `sample1` and `sample2`, neither of which returns a value, nor has any parameters. Which of the following is the correct code for `SampleInterface`?

A.

```
interface class SampleInterface
{
    public void sample1();
    public void sample2();
}
```

B.

```
abstract interface SampleInterface
{
    public void sample1();
    public void sample2();
}
```

C.

```
abstract interface SampleInterface
{
    public abstract void sample1();
    public abstract void sample2();
}
```

D.

```
interface SampleInterface
{
    public void sample1()
    {
    }
    public void sample2()
    {
    }
}
```

E.

```
interface SampleInterface
{
    public void sample1();
    public void sample2();
}
```

13. Consider the following program then answer the question that follows

```
public class AnotherProg
{
  public static void main (String[] args)
  {
      int num;
      char [] vowel =
{'a','e','i','o','u'};
      System.out.print("enter a vowel
number (1-5): ");
      num = EasyIn.getInt();
      System.out.println(vowel[num-1]);
      EasyIn.pause();
  }
}
```

Which of the following statements is true of the above program

A. this program will not compile;
B. this program may throw an unchecked exception;
C. this program will compile but not run;
D. this program may throw an `IOException`;
E. none of the above.

```
class ClassA extends ClassX
{
    public void testMethod()
    {
        System.out.println("Goodbye");
    }
}
```

Now study the following program and choose the correct output from the options that follow.

```
public class Test
{
    public static void main(String[] args)
    {
        ClassA objectY = new ClassA();
        ClassB objectZ = new ClassB();

        objectZ.testMethod();
        testMethod();
        objectY.testMethod();
    }

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

A. Goodbye
   Hi
   Hello

B. Hello
   Hi
   Goodbye

C. Hi
   Hello
   Goodbye

D. Hello
   Goodbye
   Hi

E. Hello
   Goodbye

7. Declaring a class as `abstract` means that:

   A. the class consists entirely of `abstract` methods;
   B. the class cannot be subclasssed;
   C. it is not possible to declare objects of that class;
   D. the class has no attributes of its own;
   E. none of the above.

8. Declaring a class as `final` means that:

   A. the class consists entirely of `abstract` methods;
   B. the class cannot be subclasssed;
   C. it is not possible to declare objects of that class;
   D. the class has no attributes of its own;
   E. none of the above.

9. Which of the statements below is correct in regard to interfaces?

   A. an interface consists of abstract methods only;
   B. an interface has some abstract methods and some regular methods;
   C. an interface is implemented with the keyword `extends`;
   D. a class cannot implement more than one interface;
   E. none of the above.

10. Consider the inheritance hierarchy shown in the diagram below:

`Class_A` is declared as `abstract`, and also contains an `abstract` method called `whatAmI`; this method takes no parameters, and returns a `String`. Which of the following definitions of `Class_B` will NOT cause a compiler error?

A.
```
public class Class_B extends Class_A
{
    public String whatSortOfObjectAmI()
    {
        return "I am a class B object";
    }

    public String whatAmI()
    {
        return "I am a class C object";
    }

    public int whatAmI(int y)
    {
        int x = 2 * y;
        return x;
    }
}
```

B.
```
public class Class_B extends Class_A
{
    public String whatSortOfObjectAmI()
    {
        return "I am a class B object";
    }
}
```

C.
```
public class Class_B extends Class_A
{
    public void whatAmI(String str)
    {

    }

}
```

D.
```
public class Class_B extends Class_A
{

    public int whatAmI()
    {
        int x = 10;
        return x;
    }
}
```

E. none of the above.

Given a class with both static and instance initializer blocks, what is the correct sequence of their execution?
A. Instance initializer block -> static block -> constructor
B. Static block -> instance initializer block -> constructor
C. Constructor -> static block -> instance initializer block
D. Static block -> constructor -> instance initializer block
E. Instance initializer block -> constructor -> static block

8. If a class has multiple static blocks, in which order are they executed?
A. Random order
B. Reverse order of their appearance in the code
C. In the order they appear in the code
D. After all instance blocks
E. After the main method

9. Which of the following is true about the constructor block?
A. It executes before any static blocks.
B. It executes before instance initializer blocks.
C. It is executed after the constructor is called.
D. It is executed every time an object is created.
E. It executes only once when the class is loaded.

10. Which of the following statements is true about anonymous classes in Java?
A. They can have multiple constructors.
B. They can extend multiple classes.
C. They can implement multiple interfaces.
D. They are defined and instantiated in a single expression.
E. They can be declared as abstract.

11. Which statement is true regarding Java Records?
A. They can have mutable fields.
B. They can have explicit setter methods.
C. They implicitly define constructor, getters, and equals/hashCode methods.
D. They cannot be used as data carriers.
E. They must be declared final.

12. Which SOLID principle ensures that derived classes can be substituted for their base classes without altering the correctness of the program?
A. Single Responsibility Principle
B. Open/Closed Principle
C. Liskov Substitution Principle
D. Interface Segregation Principle
E. Dependency Inversion Principle

13. According to the Interface Segregation Principle, what should be avoided in software design?
A. Large, monolithic interfaces
B. Use of multiple inheritance
C. Deep inheritance hierarchies
D. Excessive use of design patterns
E. Tightly coupled classes

14. Which of the following is a valid lambda expression in Java?
A. `() -> System.out.println("Hello World");`
B. `(String s) -> {return s.length();}`
C. `(a, b) -> a + b`
D. `(int x, int y) -> { return x > y ? x : y; }`
E. All of the above

15. What is a significant advantage of using lambda expressions in Java?
A. Improved runtime performance
B. Enhanced readability and maintainability of code
C. Increased memory consumption
D. Simplified thread management
E. Better exception handling

16. What method must be overridden to define the entry point for a thread in Java?
A. `start()`
B. `run()`
C. `execute()`
D. `init()`
E. `main()`

17. In Java, which method is used to accept a connection from a client socket?
A. `connect()`
B. `bind()`
C. `accept()`
D. `listen()`
E. `open()`

18. Which class in JavaFX is used to create a stage for displaying scenes?
A. `Application`
B. `Stage`
C. `Scene`
D. `Pane`
E. `Node`

19. Which of the following collection classes provides a method to retrieve the smallest element?
A. `LinkedList`
B. `HashSet`
C. `TreeSet`
D. `ArrayList`
E. `Vector`

20. In Java, which of the following collections guarantees the fastest random access time?
A. `ArrayList`
B. `LinkedList`
C. `HashSet`
D. `TreeMap`
E. `PriorityQueue`