Question 1. (2 pt) For each sentence, please indicate if it is right or wrong:

<table>
<thead>
<tr>
<th>True</th>
<th>False</th>
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</thead>
<tbody>
<tr>
<td>☑</td>
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</tr>
</tbody>
</table>

Question 2. (1 pt)
Consider the following classes and indicate the correct answer (there might be several correct answers):

```java
package fr.esial;

public class TestVisibility {
    public int j;
    protected int k;
    private int l;
}
```

<table>
<thead>
<tr>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

Question 3. (1 pt)
Consider the following classes and indicate the correct answer:

```java
class Shape {
    private String color;
    public Shape(String color) {
        System.out.print("Shape");
        this.color = color;
    }
}

class Rectangle extends Shape {
    public Rectangle() {
        System.out.print("Rectangle");
    }
}

public class TestConstructor {
    public static void main(String[] args) {
        new Shape("Red");
    }
}
```

<table>
<thead>
<tr>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Question 4. (1 pt)
Consider the following classes and indicate the correct answer:

```java
class Parent {
    public Parent() {
        System.out.print("A");
    }
}

class Child extends Parent {
    public Child(int x) {
        System.out.print("B");
    }
    public Child() {
        this(123);
        System.out.print("C");
    }
}

public class TestConstructor2 {
    public static void main(String[] args) {
        new Child();
    }
}
```

<table>
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<th>Incorrect</th>
</tr>
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<tr>
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</tbody>
</table>
Question 5. (1 pt)
Consider the following classes and indicate the correct answer:

```java
public class WhatAMess {
    public static void main(String[] args) {
        System.out.print("1");
        try {
            System.out.print("2");
            if (true) throw new Exception();
            System.out.print("3");
        } catch (Exception e) {
            try {
                System.out.print("4");
                if (true) throw new Exception();
                System.out.print("5");
            } catch (Exception ex) {
                System.out.print("6");
                if (false) throw new Exception();
                System.out.print("7");
            } finally {
                System.out.print("8");
            }
        } finally {
            System.out.print("9");
        }
        System.out.print("A");
        System.out.print("B");
    }
}
```

□ This code compiles and the program output is: 1
□ This code compiles and the program output is: 123
□ This code compiles and the program output is: 12467B
☒ This code compiles and the program output is: 124679AB

Question 6. (2 pt)
Consider the following classes and indicate the correct answer (there might be several correct answers) when the provided instructions are inserted at line 19. If there is no error then please indicate the program output.

```java
class Animal {
    public void eat() {
        System.out.println("Generic animal eating");
    }
}

class Horse extends Animal {
    public void eat() {
        System.out.println("Horse eating hay");
    }
    public void eat(String meal) {
        System.out.println("Horse eating "+meal);
    }
}

class Farm {
    public static void main(String[] args) {
        // insert instructions here
    }
}
```

<table>
<thead>
<tr>
<th>Error (compilation)</th>
<th>Error (execution)</th>
<th>Ok</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal a = new Animal();</td>
<td>☐</td>
<td>☐</td>
<td>☒ Generic animal eating</td>
</tr>
<tr>
<td>a.eat();</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horse h = new Horse();</td>
<td>☒</td>
<td>☐</td>
<td>☒ Horse eating hay</td>
</tr>
<tr>
<td>h.eat();</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal ah = new Horse();</td>
<td>☒</td>
<td>☐</td>
<td>☒ Horse eating hay</td>
</tr>
<tr>
<td>ah.eat();</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horse ha = new Animal();</td>
<td>☐</td>
<td>☐</td>
<td>☒ incompatibility types, found: Animal, required: Horse</td>
</tr>
<tr>
<td>ha.eat();</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horse he = new Horse();</td>
<td>☐</td>
<td>☐</td>
<td>☒ Horse eating apples</td>
</tr>
<tr>
<td>he.eat(&quot;apples&quot;);</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal a2 = new Animal();</td>
<td>☐</td>
<td>☐</td>
<td>☒ eat() in Animal cannot be applied to (java.lang.String)</td>
</tr>
<tr>
<td>a2.eat(&quot;treats&quot;);</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal ah2 = new Horse();</td>
<td>☐</td>
<td>☐</td>
<td>☒ eat() in Animal cannot be applied to (java.lang.String)</td>
</tr>
<tr>
<td>ah2.eat(&quot;carrots&quot;);</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal ah3 = new Horse();</td>
<td>☒</td>
<td>☐</td>
<td>☒ Horse eating cabbage</td>
</tr>
<tr>
<td>((Horse) ah3).eat(&quot;cabbage&quot;);</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Question 7. (1 pt)
Consider the following classes and indicate the correct answer:

```java
class Car {
    public static int velocity = 100;
}

public class TestDrive {
    public static void accelerate(Car c) {
        c.velocity += 30;
    }
    public static void main(String[] args) {
        Car lamborghini = new Car();
        accelerate(lamborghini);
        Car gt500 = new Car();
        accelerate(gt500);
        System.out.println("speed=gt500.velocity");
    }
}
```

□ This code compiles and the program output is: speed=100
□ This code compiles and the program output is: speed=130
☑ This code compiles and the program output is: speed=160

Question 8. (2 pt)
Consider the following classes and indicate the correct answer (there might be several correct answers) when the provided instructions are inserted at line 25. If there is no error then please indicate the program output.

```java
class Bidule {
    void bipbip(Bidule x) {
        System.out.println("bipbip de Bidule");
    }
    void coincoin(Bidule x) {
        System.out.println("coincoin de Bidule");
    }
}
class Machin extends Bidule {
    void bipbip(Bidule x) {
        System.out.println("bipbip de Machin");
    }
    void coincoin(Machin x) {
        System.out.println("coincoin de Machin");
    }
}
class Test {
    public static void main(String[] argv) {
        Bidule x = new Machin();
        Machin y = new Machin();
        Bidule z = new Bidule();
        // replace here
    }
}
```

<table>
<thead>
<tr>
<th>Error (compilation)</th>
<th>Error (execution)</th>
<th>Ok</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>x.bipbip(y);</td>
<td></td>
<td>☐</td>
<td>☒ bipbip de Machin</td>
</tr>
<tr>
<td>y.bipbip(y);</td>
<td></td>
<td>☐</td>
<td>☒ bipbip de Machin</td>
</tr>
<tr>
<td>x.bipbip(z);</td>
<td></td>
<td>☐</td>
<td>☒ bipbip de Machin</td>
</tr>
<tr>
<td>z.bipbip(y);</td>
<td></td>
<td>☐</td>
<td>☒ bipbip de Bidule</td>
</tr>
<tr>
<td>x.coincoin(z);</td>
<td></td>
<td>☐</td>
<td>☒ coincoin de Bidule</td>
</tr>
<tr>
<td>x.coincoin(y);</td>
<td></td>
<td>☐</td>
<td>☒ coincoin de Bidule</td>
</tr>
<tr>
<td>y.coincoin(y);</td>
<td></td>
<td>☐</td>
<td>☒ coincoin de Machin</td>
</tr>
<tr>
<td>z.coincoin(y);</td>
<td></td>
<td>☐</td>
<td>☒ coincoin de Bidule</td>
</tr>
</tbody>
</table>
Question 9. (6 pt)
Consider the following classes and at each step (indicated by the marker // POINT_?) draw a schema representing the memory state (stack and heap) during the execution of the method main() of the pizza.Main class.

Please indicate the program output (standard output) at the end of the program execution.

```java
class Ingredient {
    private String name;
    private int quantity;
    public Ingredient(String name, int quantity) {
        this.name = name;
        this.quantity = quantity;
    }...
}
class Pizza {
    private String name;
    private List<Ingredient> ingredients;
    public Pizza(String name) {
        this.name = name;
        this.ingredients = new ArrayList<Ingredient>();
    }...
}
package pizza;
public class Main {
    public static void main(String[] args) {
        Pizza mg = new Pizza("Marguarita");
        mg.addIngredient(new Ingredient("Tomatoes", 150));
        Pizza mg2 = new Pizza("Mozzarella", 100); mg2.addIngredient(new Ingredient("Mozzarella", 100));
        Pizza nap = mg.duplicate();
        mg2.addIngredient(new Ingredient("Mozzarella", 100));
        mg2.addIngredient(new Ingredient("Tomatoes", 150));
        System.out.println(nap);
    }
}
```
true
POINT 2
Marguarita[Tomatoes 150 unit(s), Mozarella 100 unit(s)]
Marguarita[Tomatoes 150 unit(s), Mozarella 100 unit(s)]
false
true
true
true
POINT 3
Marguarita[Tomatoes 170 unit(s), Mozarella 100 unit(s)]
Marguarita[Mozarella 100 unit(s), Tomatoes 160 unit(s)]
Marguarita[Tomatoes 170 unit(s), Mozarella 100 unit(s)]

\begin{quote}
\textbf{Fin réponse}
\end{quote}

\paragraph*{Question 10. (1 pt)} Write the code of the \texttt{mostUsedIngredient()} method from the \texttt{pizza.Pizza} class. This method will return an object reference to the pizza’s ingredient whose quantity is the highest. In case that several \texttt{Ingredient} are used in the same quantity, the last found \texttt{Ingredient} whose quantity is the highest will be returned.

\begin{verbatim}
public Ingredient mostUsedIngredient() {
    int quantity = 0;
    Ingredient res = null;
    for (int i = 0; i < this.ingredients.size(); i++) {
        Ingredient ing = this.ingredients.get(i);
        if (ing.getQuantity() >= quantity) {
            res = ing;
            quantity = res.getQuantity();
        }
    }
    return res;
}
\end{verbatim}

\begin{quote}
\textbf{Fin réponse}
\end{quote}