You have ninety minutes to answer all of the questions below. Write your answers in the space provided. You should read over the entire exam before you answer any questions and budget your time accordingly.

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1. (20 points) Find 10 errors (there are more than 10) in the following Java program. The errors are both compile-time (syntactic) and run-time (logical). For each error, identify the line number and briefly explain how to fix it.

```java
import javax.swing.JOptionPane;

public Number {
    public static void MAIN(String[] args) {
        String str;
        int num, int digit1, i;
        char c;

        /* Get the number */
        str = JOptionPane.showInputDialog(Enter a number (1-100):);
        num = (int) str;

        System.out.println("You picked " + Num);

        if( num % 2 == 0 )
            System.out.println("It is an even number.");
        else
            System.out.println('It is an odd number.');
        else
            System.out.println("It is a very odd number.");

        digit1 = num % 10;
        System.out.println("Its first digit is " + digit1);
        c = char(num);
        println("It is the ASCII code for " + c);

        // Counting up to num
        i = 1.0;
        while( i < num );
        System.out.println(i);
    } // end main
} // end class
```
1. (cont’d)

Line 1: import statement should end with a semicolon.
Line 3: public Number should be public class Number.
Line 4: MAIN should be main.
Line 6: There should be no int before digit1.
Line 9: Comment has no */ end tag.
Line 10: Message argument to showInputDialog us not a String. Should be
   
   str = JOptionPane.showInputDialog("Enter a number (1-100):");  

Line 11: Can’t cast from String to int. Use Integer.parseInt instead.
Line 13: Num should be num.
Line 15: = is the assignment operator. Use == instead.
Line 18: Argument to System.out.println is not a String. Should be
        
        System.out.println("It is an odd number.");

Line 19: Can’t have two elses on a single if.
Line 24: There is no concatenation operator before digit1. Should be
        
        System.out.println("Its first digit is " + digit1);

Line 26: char(int) is not a cast from int to char. Should be

   c = (char)num;

Line 28: Should be System.out.println.
Line 31: 1.0 is a floating point number, but i is an int. Should be i = 1;
Line 32: The semicolon after the while test makes the loop empty.
Line 32-33: There is no increment of i inside the loop, so the loop will never terminate. Should be
        
        while(i <= num) {
               
               System.out.println(i);
               
               i++;
        }

or

        while(i <= num) {
               
               System.out.println(i++);
        }
2. (10 points) Given

```java
int silly;
```

Which of the following causes a number to be placed in `silly`. (circle one)

(a) `System.out.println ( silly );`
(b) `silly = JOptionPane.showMessageDialog("Type your number") ;`
(c) `System.out.println ( "silly" ) ;`
(d) "silly" = JOptionPane.showMessageDialog("Type your number") ;
(e) `silly = Integer.parseInt("123");`

The correct answer is (e) `silly = Integer.parseInt("123");`

3. (10 points) Fill in the blanks so that no compile-time errors occur:

```java
answer1, answer2;
answer1 = JOptionPane.showMessageDialog("Type your first number") ;
answer2 = JOptionPane.showMessageDialog("Type your second number") ;
```

4. (10 points) What are the values of `x`, `y`, and `z` after the following code executes?

```java
int x, y, z;
x = 9;
y = ++x / 5;
z = x + y++;
```

```java
int x, y, z;
x = 9; /* x == 9 */
y = ++x / 5; /* x == 10, y == 2 */
z = x + y++; /* x == 10, y == 3, z == 12 */
```
5. (25 points) In the following, state the type and value of each of the following expressions. If the expression contains an error, write invalid as the type and omit the value.

(a) 200 / 60

TYPE: int
VALUE:

\[
\begin{align*}
200 / 60 \\
\rightarrow 3
\end{align*}
\]

(b) 4 + 5.0 / 2

TYPE: double
VALUE:

\[
\begin{align*}
4 + 5.0 / 2 \\
\rightarrow 4 + 2.5 \\
\rightarrow 6.5
\end{align*}
\]

(c) -3 / 4 + 6 / (27 % 9)

TYPE: INVALID
VALUE:

\[
\begin{align*}
-3 / 4 + 6 / (27 \% 9) \\
\rightarrow 0 + 6 / (27 \% 9) \\
\rightarrow 0 + 6 / 0 \\
\rightarrow \text{Divide by zero error!}
\end{align*}
\]

(d) (7 >= 3) || ! 9 == 8

TYPE INVALID
VALUE:

The boolean not operator `!` has higher precedence than the equality operator `==`, but `!9` is not a valid expression.

(e) (\((\text{byte}(127+1) > 0) \&\& (\text{true} == \text{false}) \| (21.0/4.0 > 5)\))

TYPE boolean
VALUE:

\[
\begin{align*}
((\text{byte}(127+1) > 0) \&\& (\text{true} == \text{false}) \| (21.0/4.0 > 5) \\
\rightarrow (\text{byte}128 > 0) \&\& (\text{true} == \text{false}) \| (21.0/4.0 > 5) \\
\rightarrow (-128 > 0) \&\& (\text{true} == \text{false}) \| (21.0/4.0 > 5) \\
\rightarrow \text{false} \&\& (\text{true} == \text{false}) \| (21.0/4.0 > 5) \\
\rightarrow \text{false} \| (21.0/4.0 > 5) \\
\rightarrow \text{false} \| (5.25 > 5) \\
\rightarrow \text{false} \| \text{true} \\
\rightarrow \text{true}
\end{align*}
\]
6. (25 points) Write a program that reads digits from the keyboard using `JOptionPane.showInputDialog`.
   Convert each digit to the letter of the alphabet whose position is given by the digit, where 0 corresponds to the letter 'a'. E.g., if the input is 024, the output will be ace.

```java
import javax.swing.JOptionPane;

public class DigitsToLetters {
    public static void main(String[] args) {
        String inputStr;
        int i;
        char digit, letter;

        /* Get the digits */
        inputStr = JOptionPane.showInputDialog("Enter a sequence of digits:");

        /* Loop over individual chars */
        i = 0;
        while (i < inputStr.length()) {
            digit = inputStr.getChar(i);
            /* Convert from digit to letter */
            letter = (digit - '0') + 'a';
            System.out.print(letter);
            i++;
        } // end while
    } // end main
} // end class
```