Tutorial 3

You will be expected to engage with the tutor and discuss solutions to the problems presented here. The content covered in the tutorials will assist in your understanding of the practical requirements for the checkpoints.

1. Strings

a. Write a statement that prints the number of characters in a `String` object called `overview`.

b. Write a statement that prints the 8^{th} character of a `String` object called `introduction`.

c. Write a declaration for a `String` variable called `change` and initialise it to the characters stored in another `String` object called `original` with all `'e'` characters changed to `'j'`.

d. What output is produced by the following code fragment?

```
String m1, m2, m3;
m1 = "Quest for the Holy Grail";
m2 = m1.toLowerCase();
m3 = m1 + " "  + m2;
System.out.println (m3.replace('h', 'z'));
```

2. Random Numbers

i. Assuming that a `Random` object has been created called generator, what is the range of the result of each of the following expressions?

a. generator.nextInt(20)

b. generator.nextInt(8) + 1

c. generator.nextInt(45) + 10

d. generator.nextInt(100) – 50

ii. Write a list of expressions for the `rand` object the use the `nextInt` method to generate random numbers in the following specified ranges (including the endpoints). Use the version of the `nextInt` method that accepts a single integer parameter.

```
Random rand = new Random();
```

a. 0 to 10

b. 0 to 500

c. 1 to 10

d. 1 to 500

e. 25 to 50

f. –10 to 15

3. The Math class and formatting output

a. Write an assignment statement that computes the square root of the sum of `num1` and `num2` and assigns the result to `num3`.

b. Write a single statement that computes and prints the absolute value of `total`.

c. Write code statements to create a `DecimalFormat` object that will round a formatted value to 4 decimal places and then print the value of `result` properly formatted.

d. Write code statements that prompt for and read a double value from the user then print the result of raising that value to the fourth power. Output the result to 3 decimal places.

4. Write Java statements that use the String methods `indexOf` and `substring` to find the first word in a string. We define *word* to be a string of characters that does not include whitespace. For example, the first word in the string "Hello, my good friend!" is the string "Hello," and the second word is the string "my".

5. Write a program that reads a four-bit binary number from the keyboard as a string and then converts it into decimal. For example, if the input is `1100`, the output should be 12.

6. Write a complete Java program that simulates the rolling of a pair of dice. For each die in the pair, the program should generate a random number between 1 and 6 (inclusive). It should print out the result of the roll for each die and the total roll (the sum of the two dice) with appropriate labels. You must use the Random class.

7. Write a program that prompts a user for the lengths of two sides of a right angle triangle and then computes the length of the hypotenuse. The length of the `hypotenuse` is the square root of `side1` squared plus `side2` squared. The answer should be to three decimal places.

8. Write a program that generates a random integer `radius` (r) and `height` (h) for a cylinder in the range 1 to 10 inclusive and then computes the volume and surface area of the cylinder. The output should be to two decimal places.

Volume: $\pi r^2 h$
Surface area: $2\pi rh$