--> CSc 102 -- Practical 2 <--
50 + 25 = 75 MARKS

Deadlines

You must **complete and submit your solutions** up to and including ***Task 5*** by **5pm** on the day of your practical. Instructions for how to submit your work are given in each section. Work that is not submitted by this deadline *will not be marked*.

All remaining questions must be completed and submitted by **2pm** on the **Monday** after the practical.

You only need to submit the `.java` file for each task on RUConnected.

Task 1: Water Crisis [10 marks]

Grahamstown is in the midst of a water crisis. Raising awareness about water wastage from dripping taps can help to minimize the risk of "day zero".

1. Write a program WaterWastage.java, with a **method** that calculates water waste litres, as a function of time. Assume that each drip wastes 0.25 ml (millilitres) of water. Use the scanner class to obtain input from a user as to how often he/she hears/sees a drip from the tap. Assume that the input is given in seconds. Your program must print the amount of water being wasted, correct to **two decimal places**, in an hour, in a day, and in a week. For a drip that happens every n seconds, the number of litres wasted is:

    - $3600 \div n \times 0.00025$ litres per hour
    - $86400 \div n \times 0.00025$ litres per day
    - $604800 \div n \times 0.00025$ litres per week

    For example, if a drip happens every 5 seconds, your program should look like this:

```
How often do you hear a drip drop (in seconds)? 5
This wastes 0,18 litres of water every hour
This wastes 4,32 litres of water every day
This wastes 30,24 litres of water every week
```

Task 2: [10 marks]

In Java you can raise a base to an exponent using the Math.pow method. For example:

`Math.pow(4.0, 5.0)` returns `1024.0`

Write a Java program that will ask the user to supply a base and exponent and uses a **loop** to calculate the result. It should contain the method below,

```
public static int pow (int base, int exponent)
{
...
}
```

You are **not** allowed to use the Math library.

Task 3: [10 marks]

In Java you can raise a base to an exponent using the Math.pow method. For example:

`Math.pow(4.0, 5.0)` returns `1024.0`

Write a program that will ask the user to supply a base and exponent and uses **recursion** to calculate the result. It should contain the method below,

```
public static int pow (int base, int exponent)
{
...
}
```

You are **not** allowed to use the Math library.

Task 4: [10 marks]

Factorial of `n` is denoted as `n!` and is defined as:

```
n! = 1 x 2 x 3 x ... x n
```

Write a Java program that uses a **loop** to calculate the factorial of any given `n` as input. The factorial of `n` should be calculated, and the result printed.

Some examples:
`1! = 1`

```
2! = 2
3! = 6
4! = 24
5! = 120
0! = 1
```

Task 5: [10 marks]

Factorial of `n` is denoted as `n!` and is defined as:

```
n! = 1 x 2 x 3 x ... x n
```

Write a Java program that uses **recursion** to calculate the factorial of any given `n` as input. The factorial of `n` should be calculated, and the result printed.

Some examples:

```
1! = 1
2! = 2
3! = 6
4! = 24
5! = 120
0! = 1
```

Code Submission: *In order for your tutor to mark your program, you need to upload it to RUConnected using the submission link. If you do not submit your code on RUConnected your tutor can not mark it and you will get zero for this question.*

Homework follows below

Homework

Task 6: [5 marks]

Many people keep time using a 24 hour clock (11 is 11am and 23 is 11pm, 0 is midnight). If it is currently 13:42 and you set your alarm to go off in 50 hours and 10 minutes, it will be 15:52 (8 minutes to 4pm) when the alarm goes off.

Write a Java program to solve the general version of the above problem. Ask the user for the time now (in hours and minutes), and then ask for the number of hours and minutes to wait for the alarm. Your program should output what the time will be on the clock when the alarm goes off.

For example:

```
Current time (hours): 14
Current time (minutes): 25
Number of hours till alarms goes off: 16
Number of minutes till alarm goes off: 55

The alarm will go off at: 7:20
```

Task 7: [5 marks]

It is possible to name the days 0 through 6 where day 0 is Sunday and day 6 is Saturday. If you go on a wonderful holiday leaving on day number 3 (a Wednesday) and you return home after 10 nights you would return home on a Saturday (day 6) Write a general version of the program which asks for the starting day, and the length of your stay, and it will tell you the day of the week you will return on.

For example:

```
On which day will you be leaving?  Wednesday
How many days will you be away? 10

You will return on a Saturday
```

Task 8: [5 marks]

The formula for computing the final amount if one is earning compound interest is given on Wikipedia as

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Where,

- P = principal amount (initial investment)
- r = annual nominal interest rate (as a decimal)
- n = number of times the interest is compounded per year
- t = number of years

Write a Java program that assigns the principal amount of 10000 to variable P, assign to n the value 12, and assign to r the interest rate of 8% (0.08). Then have the program prompt the user for the number of years, t, that the money will be compounded for. Calculate and print the final amount after t years.

Task 9: [10 marks]

Degrees fahrenheit and celsius are two popular units of measurement for temperature. Write a program that will convert degrees fahrenheit to degrees celsius and vice versa. The user should be prompted to enter a number and the unit of measurement to convert to.

For example 1:

```
Please enter a temperature: 24.0
Which unit? C

24.0 C is 75.2 F
```

For example 2:

```
Please enter a temperature: -1.0
Which unit? F

-1.0 F is -18.3 C
```

Code Submission: *In order for your tutor to mark your program, you need to upload it to RUConnected using the submission link. If you do not submit your code on RUConnected your tutor can not mark it and you will get zero for this question.*