

Recitations 04 & 05

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Repetition Structures

Note

This series of exercises is divided in three sections: W, F and NL

- W stands for **while**: these exercises have to be solved with **while** loops
- F stands for **for**: these exercises have to be solved with **for** loops
- NL stands for **nested loops**: these exercises have to be solved with **nested loops**

When an exercise is noted with both W and F, you have to write 2 programs: one for W, one for F

When an exercise is not noted with letters, you are free to choose the method to program it.

Exercise 1 - (Gaddis 4.1) Bug Collector (W and F)

A bug collector collects bugs every day for five days.

Write a program that keeps a running total of the number of bugs collected during the five days. The loop should ask for the number of bugs collected for each day, and when the loop is finished, the program should display the total number of bugs collected.

Exercise 2 - (Gaddis 4.2) Calories Burned (W)

Running on a particular treadmill you burn 4.2 calories per minute.

Write a program that uses a loop to display the number of calories burned after 10, 15, 20, 25, and 30 minutes.

Exercise 3 - (Gaddis 4.4) Distance Travelled (W)

The distance a vehicle travels can be calculated as follows:

$$distance = speed \times time$$

For example, if a train travels 40 kilometres per hour for three hours, the distance travelled is 120 kilometres.

Write a program that asks the user for the speed of a vehicle (in kilometres per hour) and the number of hours it has travelled. It should then use a loop to display the distance the vehicle has travelled for each hour of that time period.

Here is an example of the desired output :

```
>>> What is the speed of the vehicle in kph? 40
>>> How many hours has it travelled? 3
Hour      Distance Travelled
1          40
2          80
3         120
```

Exercise 4 - (Gaddis 4.6) Celsius to Fahrenheit Table (W)

Write a program that displays a table of the Celsius temperatures 0 through 20 and their Fahrenheit equivalents.

The formula for converting a temperature from Celsius to Fahrenheit is:

$$F = \frac{9}{5}C + 32$$

where F is the Fahrenheit temperature and C is the Celsius temperature.

Your program must use a loop to display the table.

Exercise 5 - (Gaddis 4.10) Tuition Increase (W)

At one college, the tuition for a full-time student is \$8,000 per semester. It has been announced that the tuition will increase by 3 percent each year for the next 5 years.

Write a program with a loop that displays the projected semester tuition amount for the next 5 years.

Exercise 6 - (Gaddis 4.11) Calculating the Factorial of a Number (W and F)

In mathematics, the notation $n!$ represents the factorial of the nonnegative integer n . The factorial of n is the product of all the nonnegative integers from 1 to n .

For example,

$$7! = 1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 = 5,040$$


and

$$4! = 1 \times 2 \times 3 \times 4 = 24$$

Write a program that lets the user enter a nonnegative integer and then uses a loop to calculate the factorial of that number. Display the factorial.

Exercise 7 - (Gaddis 4.12) Population (W and F)

Write a program that predicts the approximate size of a population of organisms. The application should ask the user to enter the starting number of organisms, the average daily population increase (as a percentage), and the number of days the organisms will be left to multiply.

(check next page )

For example, assume the user enters the following values:

- Starting number of organisms: 2
- Average daily increase: 30%
- Number of days to multiply: 10

The program should display the following table of data:

Day	Approximate Population
1	2.000
2	2.600
3	3.380
4	4.394
5	5.712
6	7.425
7	9.653
8	12.549
9	16.314
10	21.209

Exercise 8 - (Gaddis 4.13) Pattern 1 (NL)

Write a program that uses nested loops to draw this pattern:

```
*****
*****
*****
****
***
**
*
```

Exercise 9 - (Gaddis 4.14) Pattern 2 (NL)

Write a program that uses nested loops to draw this pattern:

```
##
# #
# #
# #
# #
# #
```

Exercise 10 - Pattern 3 (NL)

Write a program that draws the following pattern:

```
*
* *
* * *
* * * *
* * * * *
* * * *
* * *
* *
*
```

Exercise 11 - Pattern 4 (NL)

Write a program that draws N triangles of size M (both values are input by the user).

For example, 4 triangles of size 3 look like:

```
*
* *
* * *
*
* *
* * *
*
* *
* * *
*
* *
* * *
*
```

Exercise 12 - Dice Statistics

Write a program that rolls a six-sided die 1000 times.

Keep track of the numbers of ones, twos, ..., and sixes that got rolled and display them.

Exercise 13 - FizzBuzz

Write a program that displays every integer value between 1 and 100, but replaces multiples of 3 by "Fizz" and multiples of 5 by "Buzz"; multiples of both 3 and 5 are replaced by "FizzBuzz".

Exercise 14 - Fibonacci

Write a program that asks the user to input a strictly positive integer value N , and displays the Fibonacci sequence up till the N^{th} value. ([link to Wikipedia](#))

Exercise 15 - Password Generator

Write a program that repeatedly generates passwords for the user.

Upon every iteration, the program starts by asking the user to input a password length. If the user inputs 0, the program terminates. If the value X input by the user is greater than 0, the program creates a password comprising X numerical digits chosen at random between 0 and 9.

Example output:

```
Password size? > 4
9605
Password size? > 9
654395954
Password size? > 1
4
Password size? > 0
```