CSE108 – Computer Programming Lab.
Lab 9
Date: 26.04.2024

Part 1. (30 points):

Hailstone numbers, also known as the Collatz sequence, generate consecutive numbers based on certain rules starting from a positive integer. The rules are as follows:

If the number is even, divide it by 2.

If the number is odd, multiply it by 3 and add 1.

These rules determine the behavior of each number in consecutive terms. For example, starting with 3, you would obtain the following sequence: 3, 10, 5, 16, 8, 4, 2, 1. The sequence reaches 1, where a repeating loop begins.

Write a C function that calculates Hailstone numbers recursively. The function has the following syntax

```
int hs(int nums[], int * cn, int maxit)
```

where nums array has the current sequence with cn indicating the number of entries in the sequence.

For example

```
#define MAXIT 100

int a[MAXIT] = {3}, n=1;

hs(a, &n, MAXIT)
```

return with n=8, a={3, 10, 5, 16, 8, 4, 2, 1}. The function will return zero if the repeating sequence is found within the given size (maxit).

Part 2. (30 points):

Write a C program receives a string from the user and checks recursively whether the characters in it are palindromes. You are expected to implement and use a function to check if a string is a palindrome. This function should be recursive (no loops are allowed in its implementation).

Palindrome: Words or phrases that read the same forwards and backwards. Examples such as "radar", "level", "madam", "noon".

Part 3.(40 points):

Write a C function that prints out all its substrings that are starting and ending with the same character – excluding strings with only one character. For example; "abcab", has the following substrings; "abca" and "bcab". Your function should be recursive (no loops are used). You can use only strlen from string.h.

```
void print_special_substrings(const char * str)
```

For example,

```
print_special_substrings("caba")
```

Will output

```
aba
```