Féidearthachtaí as Cuimse
Infinite Possibilities

Semester 2
Week 6 - Tutorial

OLLSCOIL TEICNEOLAÍOCHTA BHAILE ÁTHA CLIATH
TU DUBLIN
TECHNOLOGICAL UNIVERSITY DUBLIN

Programming - Week 6 – 3rd March 2025

Overview

- String Conversions
- atof()
- strtod()
- Character Arrays
- Lab Mandatory Question

Conversion (String to Numeric)

Function	Converts to	Error Checking?	Recommended?
atoi()	Int	No	No (Use strtol())
atof()	Float	No	No (Use strtod())
strtol()	Long	Yes	Yes
strtod()	Double	Yes	Yes

Program Example 1

```c
#include <stdio.h>

int main() {
    char pi[10];
    char radius[4];
    int n = 10;

    printf("What is Pi to 5 decimal places: ");
    fgets(pi, n, stdin);
    printf("Pi is: %s", pi);

    printf("What is the circle radius: ");
    fgets(radius, 4, stdin);
    printf("Radius is: %s", radius);

    // function goes here

    return 0;
}
```

- Create a function to calculate the area of a circle.
- The function will be used in an existing program
- We don't want to refactor the operation of main, this already works.
- Create a function and pass the pi and radius character arrays.
- The function will return a number of type double.
- The function must use atof() for the conversions.

Program Example 1 (Considerations)

- We need to create a function to take in two strings
- The function will convert these values to numbers
- Calculate the area of the circle and return the result to the caller

- atof()
  - atof() returns 0 if the string isn't a valid number.
  - If the user enters "abc", "12abc", or " ", atof() fails silently.

Program Example 1 - solution

```c
#include <stdio.h>
#include <stdlib.h>  // Needed for atof()

double areaOfCircle(char pi[], char radius[]);

int main() {
    char pi[10];
    char radius[4];
    int n = 10;

    printf("What is Pi to 5 decimal places: ");
    fgets(pi, n, stdin);
    printf("Pi is: %s", pi);

    printf("What is the circle radius: ");
    fgets(radius, 4, stdin);
    printf("Radius is: %s", radius);

    // function goes here
    double result = areaOfCircle(pi, radius);
    printf("\nArea of circle is: %.2f\n", result);

    return 0;
}
```

```c
double areaOfCircle(char pi[], char radius[]) {
    double pi_num = atof(pi);
    double radius_num = atof(radius);
    double area;

    area = pi_num * radius_num * radius_num;
    printf("\n%.2f\n",area);
    return area;
}
```

```
What is Pi to 5 decimal places: 3.14159
Pi is: 3.14159
What is the circle radius: 3
Radius is: 3

28.27

Area of circle is: 28.27
```

Program Example 2

- Refactor the solution for Program 1 to use strtod()
- strtod() (string to double) is a C standard library function that converts a string into a double. It is safer than atof() because it allows error detection.
- double strtod(const char *str, char **endptr);
  - Reads a number from the string.
  - Ignores leading whitespace (e.g., spaces, tabs).
  - Stops at the first non-numeric character.
  - Stores the address of the first invalid character in endptr (if provided).
  - Returns 0.0 if the conversion fails.

Program Example 2 - solution

example_2.c > ...

```c
#include <stdio.h>
#include <stdlib.h>  // Needed for strtod()

double areaOfCircle(char pi[], char radius[]);

int main() {
    char pi[10];
    char radius[4];
    char *endPtr;
    int n = 10;

    printf("What is Pi to 5 decimal places: ");
    fgets(pi, n, stdin);
    printf("Pi is: %s", pi);

    printf("What is the circle radius: ");
    fgets(radius, 4, stdin);
    printf("Radius is: %s", radius);

    // Function call
    double result = areaOfCircle(pi, radius);

    // Check for error (result == -1.0 means conversion failed)
    if (result != -1.0) {
        printf("\nArea of circle is: %.2f\n", result);
    } else {
        printf("\nInvalid input! Please enter numeric values for Pi and Radius.\n");
    }

    return 0;
}
```

```c
double areaOfCircle(char pi[], char radius[]) {
    char *endPtr;

    double pi_num = strtod(pi, &endPtr);
    if (*endPtr != '\0' && *endPtr != '\n') return -1.0;  // Error: invalid conversion

    double radius_num = strtod(radius, &endPtr);
    if (*endPtr != '\0' && *endPtr != '\n') return -1.0;  // Error: invalid conversion

    double area = pi_num * radius_num * radius_num;
    return area;
}
```

```
What is Pi to 5 decimal places: qw
Pi is: qw
What is the circle radius: 2
Radius is: 2

Invalid input! Please enter numeric values for Pi and Radius.
```

Program Example 3

- Create a program to ask the user to enter 5 student names.
- The program must store full name (e.g. Diana Prince)
- The 5 names must be stored in an array
- Display the 5 names back to the user.

Program Example 3 - solution

example_3.c > main()

```c
#include <stdio.h>
#include <string.h>

#define MAX_STUDENTS 5  // Number of students
#define MAX_NAME_LEN 50  // Maximum length for each name

int main() {
    char students[MAX_STUDENTS][MAX_NAME_LEN];  // Array to hold names of students

    // Prompt the user to enter names for 5 students
    printf("Enter the names of %d students:\n", MAX_STUDENTS);

    for (int i = 0; i < MAX_STUDENTS; i++) {
        printf("Enter name of student %d: ", i + 1);
        fgets(students[i], MAX_NAME_LEN, stdin);  // Read student name

        // Remove newline character added by fgets
        students[i][strcspn(students[i], "\n")] = '\0';
    }

    // Display the names entered
    printf("\nList of students entered:\n");
    for (int i = 0; i < MAX_STUDENTS; i++) {
        printf("%d. %s\n", i + 1, students[i]);
    }

    return 0;
}
```

```
Enter the names of 5 students:
Enter name of student 1: Diana Prince
Enter name of student 2: Bruce Wayne
Enter name of student 3: Clark Kent
Enter name of student 4: Jean Gray
Enter name of student 5: Vera Sharpe

List of students entered:
1. Diana Prince
2. Bruce Wayne
3. Clark Kent
4. Jean Gray
5. Vera Sharpe
```

Mandatory Question – in class solution

Q3. Write a program that allows a user to input two words. Compare these words to see if they are the same. Display appropriate messages whether or not the two words are the same.

- Using separate functions for part (a) and (b) below, extend your program in Q3 to do the following:
- a) Concatenate the first word entered to the end of the string: "First word entered is ". Display this entire string on the screen.
- b) Calculate the length of the string in part (a) above and display the number of characters used.

Questions