

# EE102: Software Engineering I

## Section 8 – Applications

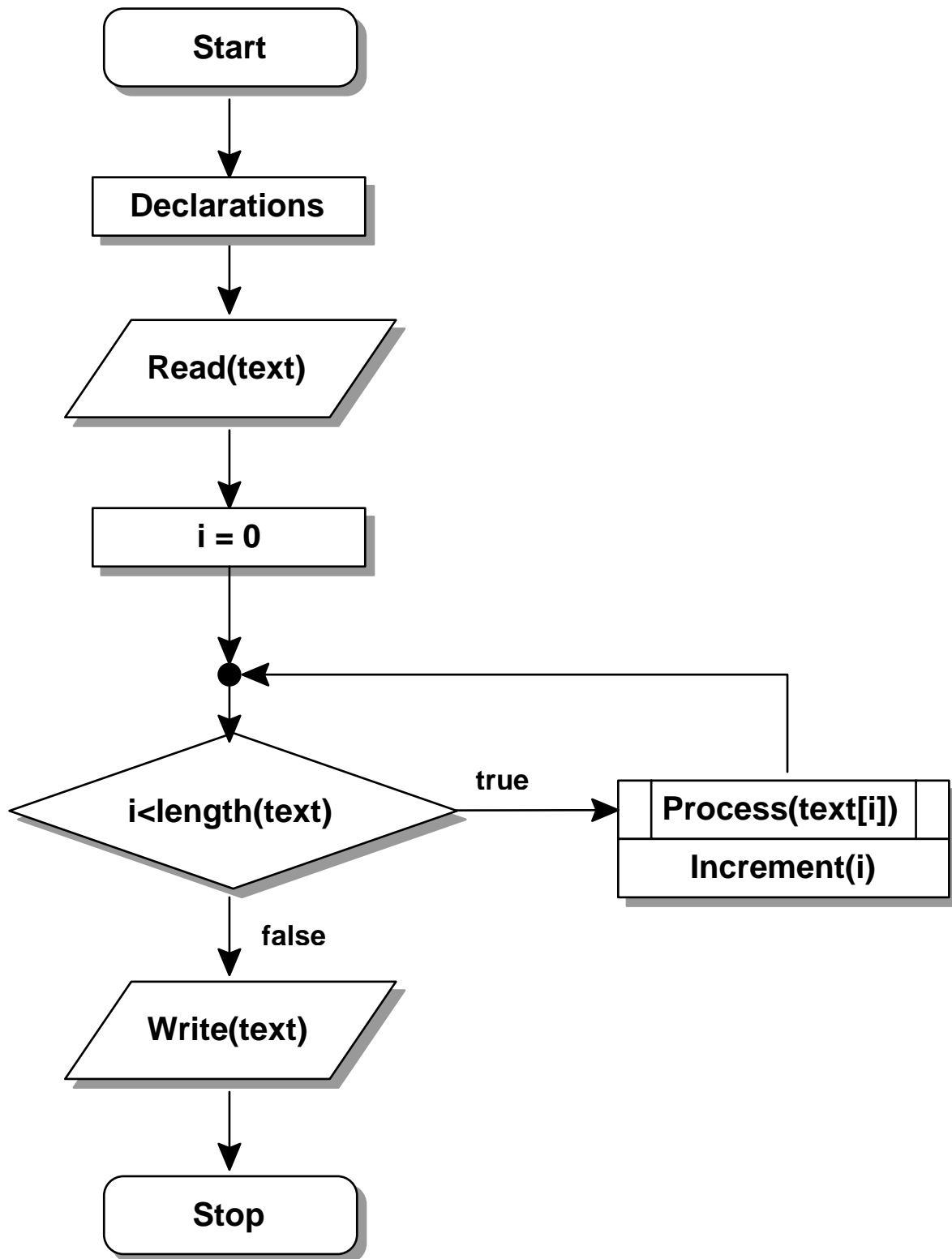
### 8.1 Transform lower case into upper case letters (1)

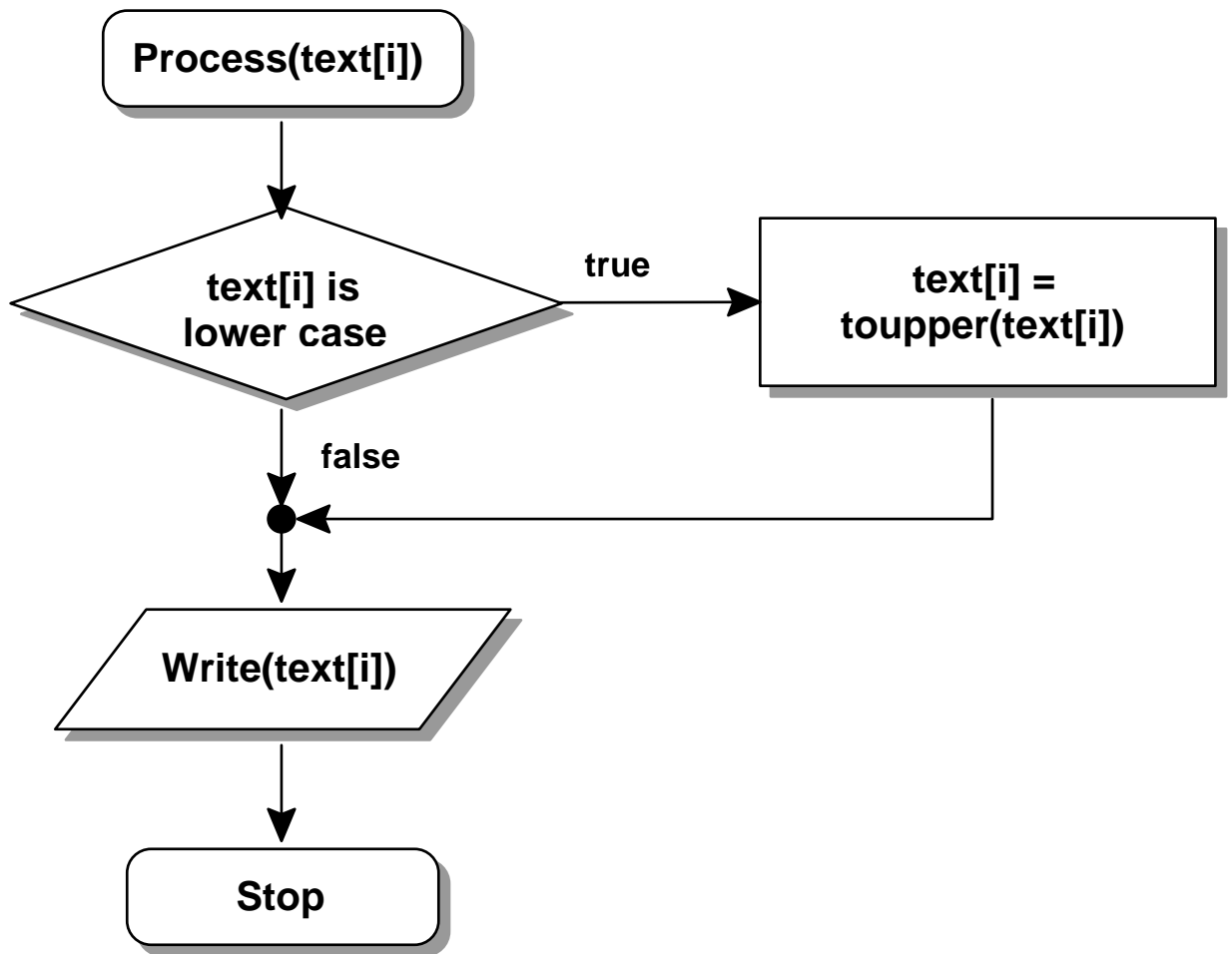
- **Requirements**

- Ask the user to input a text
- Read the text
- Process the inputted text (letter by letter)
- Output the modified text

- **Design**

- Follows basic blocks in order to solve the given problem:
  - Definition(s)
  - Input/Output
  - Assignment(s)
  - Processing
  - Loop
  - Decision





- **Coding**

- The solution is implemented in C

```
/*
to_upper1.c: Transforms lower case letters from text into upper case
*/
#include <stdio.h>
#include <stdlib.h>
int main()
{
    /* declarations */
    char up_char, text[20];
    int i;

    /* input */
    printf("Converting a text to upper case!\n");
    printf("Enter the text: ");
    scanf("%s", text);

    /* loop */
    i = 0;
    while (text[i] != '\0')
    {
        /* process text[i] */
        if (text[i] >= 'a' && text[i] <= 'z')
        {
            up_char = 'A' + (text[i] - 'a');
            printf("Position: %d", i);
            printf("Old: %c New: %c\n", text[i], up_char);
            text[i] = up_char;
        }
        else
            printf("Position: %d Char: %c\n", i, text[i]);
        /* increment i */
        i = i + 1;
    }
    /* stop */
    return(EXIT_SUCCESS);
}
```

- **Testing**

- **Compiling:**

- **gcc -Wall -o to\_upper1.o to\_upper1.c**

- **Debugging:**

- **If there are errors, they will be listed, including the line on which they appear**
    - **Parse the errors, read error messages one by one, localize each error and correct it in the source code file**
    - **Save the file and recompile**

- **Run different tests:**

- **Modify the input (use extreme cases!)**
    - **Verify the correctness of the output**
    - **If errors, modify the source and repeat the tests**

**Possible output:****Converting a text to upper case!****Enter the text: dublin\_CITY\_2004****Position: 0 Old: d New: D****Position: 1 Old: u New: U****Position: 2 Old: b New: B****Position: 3 Old: l New: L****Position: 4 Old: i New: I****Position: 5 Old: n New: N****Position: 6 Char: \_****Position: 7 Char: C****Position: 8 Char: I****Position: 9 Char: T****Position: 10 Char: Y****Position: 11 Char: \_****Position: 12 Char: 2****Position: 13 Char: 0****Position: 14 Char: 0****Position: 15 Char: 4**

## 8.2 Transform lower case into upper case letters (2)

- **Coding**

- This solution uses the “for” loop and functions

```
/*
to_upper3.c: Transforms lower case letters from text into upper case
*/
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <string.h>
int main()
{
    /* declarations */
    char up_char, text[20];
    int i;

    /* input */
    printf("Converting a text to upper case!\n");
    printf("Enter the text: ");
    scanf("%s", text);

    /* loop */
    for (i = 0; i < strlen(text); i++)
    {
        /* process text[i] */
        if (islower(text[i]))
        {
            up_char = toupper(text[i]);
            printf("Position: %d ", i);
            printf("Old: %c New: %c\n", text[i], up_char);
            text[i] = up_char;
        }
        else
            printf("Position: %d Char: %c\n", i, text[i]);
    }
    /* stop */
    return(EXIT_SUCCESS);
}
```

## 8.3 Count the upper case letters from a text

- **Coding**

- This solution uses the “for” loop and functions

```
/*
count_upper.c: Counts upper case letters from a text
*/
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <string.h>
int main()
{
    /* declarations */
    char up_char, text[20];
    int i, count;

    /* input */
    printf("Counts upper case letters from a text!\n");
    printf("Enter the text: ");
    scanf("%s", text);

    /* initialization */
    count = 0;

    /* loop */
    for (i = 0; i < strlen(text); i++)
    {
        /* process text[i] */
        if (isalpha(text[i]) && isupper(text[i]))
            count++;
    }
    /* print result */
    printf("\nThere are %d capital letters in %s\n", count, text);

    /* stop */
    return(EXIT_SUCCESS);
}
```

**Possible output:**

**Counts upper case letters from a text!**

**Enter the text: Dublin\_CITY\_2004**

**There are 5 capital letters in Dublin\_CITY\_2004**

## 8.4 Computes the average of three numbers

```
/*
average0.c: Program that computes the average of three numbers
*/

#include <stdio.h>
#include <stdlib.h>

int main()
{
    /* declarations */
    float average, num1, num2, num3;

    /* input data */
    printf("Welcome to Average computation!");
    printf("\nEnter first number: ");
    scanf("%f", &num1);
    printf("\nEnter second number: ");
    scanf("%f", &num2);
    printf("\nEnter third number: ");
    scanf("%f", &num3);

    /* compute result */
    average = (num1 + num2 + num3) / 3;

    /* print result */
    printf("\nThe average is: %f\n", average);

    /* stop */
    return(EXIT_SUCCESS);
}
```

### Possible output:

```
Welcome to Average computation!
Enter first number: 2.5
Enter second number: 3.5
Enter third number: 7
The average is: 4.333333
```

## 8.5 Computes the sum of N numbers

```
/*
sum0.c: Program that computes the sum of N numbers
*/

#include <stdio.h>
#include <stdlib.h>

int main()
{
    /* declarations */
    float sum;
    int i, n;
    float nums[20];

    /* input data */
    printf("Welcome to Sum computation!");
    printf("\nEnter the number of numbers (n < 20): ");
    scanf("%d", &n);

    /* reading loop */
    for (i = 0; i < n; i++)
    {
        /* read num[i] */
        printf("\nEnter the %d-th number: ");
        scanf("%f", &nums[i]);
    }

    /* initialize */
    sum = 0;

    /* processing loop */
    for (i = 0; i < n; i++)
    {
        /* add num[i] */
        sum += nums[i];
    }
}
```

```
/* print result */  
printf("\nThe sum is: %f\n", sum);  
  
/* stop */  
return(EXIT_SUCCESS);  
}
```

### Possible output:

```
Welcome to Sum computation!  
Enter the number of numbers (n < 20): 4  
Enter 0-th number: 2.5  
Enter 1-th number: 3.5  
Enter 2-th number: 7  
Enter 3-th number: 3.3  
The sum is: 16.3
```

## 8.6 Computes the average of N numbers

```
/*  
average2.c: Program that computes the average of N numbers  
*/
```

```
#include <stdio.h>  
#include <stdlib.h>
```

```
int main()
```

```
{
```

```
    /* declarations */
```

```
    float sum, average;
```

```
    int i, n;
```

```
    float nums[20];
```

```
    /* input data */
```

```
    printf("Welcome to Average computation!");
```

```
    printf("\nEnter the number of numbers (n < 20): ");
```

```
    scanf("%d", &n);
```

```
    /* reading loop */
```

```
    for (i = 0; i < n; i++)
```

```
    {
```

```
        /* read num[i] */
```

```
        printf("\nEnter the %d-th number: ");
```

```
        scanf("%f", &nums[i]);
```

```
    }
```

```
    /* initialize */
```

```
    sum = 0;
```

```
    /* processing loop */
```

```
    for (i = 0; i < n; i++)
```

```
    {
```

```
        /* add num[i] */
```

```
        sum += nums[i];
```

```
    }
```

```
/* compute result */  
average = sum / n;  
  
/* print result */  
printf("\nThe average is: %f\n", average);  
  
/* stop */  
return(EXIT_SUCCESS);  
}
```

### **Possible output:**

```
Welcome to Average computation!  
Enter the number of numbers (n < 20): 5  
Enter 0-th number: 2.5  
Enter 1-th number: 3.5  
Enter 2-th number: 7  
Enter 3-th number: 3  
Enter 4-th number: 4  
The average is: 4.000000
```

## 8.7 Tests the characters from a text

```
/*
char_test.c: Program that tests the characters from a text
*/
#include <stdio.h>
#include <stdlib.h>

int main()
{
    char text[20];
    int i;

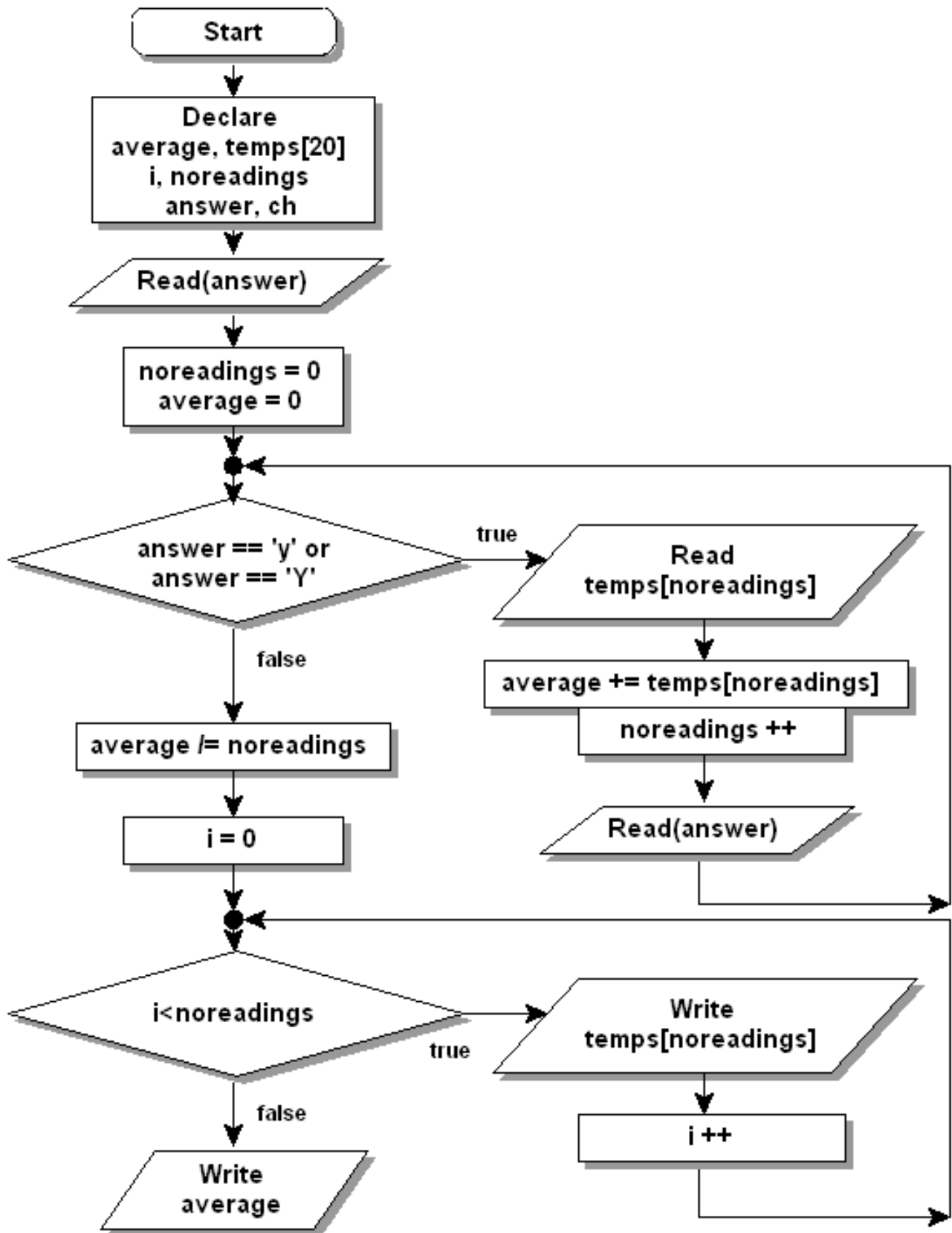
    printf("Testing character codes!\n");
    printf("Enter the text: ");
    scanf("%s", text);

    for (i = 0; text[i] != '\0'; i++)
    {
        if (text[i] >= '0' && text[i] <= '9')
            printf("Position: %d, Digit: %c, Code: %d\n",
                i, text[i], text[i]);
        else
            if (text[i] >= 'A' && text[i] <= 'Z')
                printf("Position: %d, Capital letter: %c, Code:
                    %d\n", i, text[i], text[i]);
            else
                if (text[i] >= 'a' && text[i] <= 'z')
                    printf("Position: %d, Lower case: %c,
                        Code: %d\n", i, text[i], text[i]);
                else
                    printf("Position: %d, Character: %c,
                        Code: %d\n", i, text[i], text[i]);
    }

    return(EXIT_SUCCESS);
}
```

**Possible output:****Testing character codes!****Enter the text: asd\_123\_ASD\_>?@****Position: 0, Lower case: a, Code: 97****Position: 1, Lower case: s, Code: 115****Position: 2, Lower case: d, Code: 100****Position: 3, Character: \_, Code: 95****Position: 4, Digit: 1, Code: 49****Position: 5, Digit: 2, Code: 50****Position: 6, Digit: 3, Code: 51****Position: 7, Character: \_, Code: 95****Position: 8, Capital letter: A, Code: 65****Position: 9, Capital letter: S, Code: 83****Position: 10, Capital letter: D, Code: 68****Position: 11, Character: \_, Code: 95****Position: 12, Character: >, Code: 62****Position: 13, Character: ?, Code: 63****Position: 14, Character: @, Code: 64**

## 8.8 Reads interactively current temperature values and computes the average



```
/*  
temperat.c: Program that reads temperature values and computes  
the average  
*/  
  
#include <stdio.h>  
#include <stdlib.h>  
  

```

```
        /* ask user if wants another loop */
        printf("Do you want to enter another value (y/n)?\n");
        scanf("%c%c", &answer, &ch);
    }

    /* compute average */
    average /= noreadings;

    /* printing section */
    printf("Following %d temps were recorded:\n", noreadings);

    /* printing loop */
    for (i = 0; i < noreadings; i++)
    {
        /* print one item of the temps array */
        printf("The %d-th temperature: %f\n", i, temps[i]);
    }

    /* print average */
    printf("\nThe average is: %6.2f\n", average);

    /* stop */
    return(EXIT_SUCCESS);
}
```

## 8.9 Presents the user with a choice to perform multiple activities

```
/*  
choice.c: Program that reads a choice from user and performs an  
action accordingly  
*/
```

```
#include <stdio.h>  
#include <stdlib.h>
```

```
int main()  
{  
    /* declaration */  
    int answer;  
  
    /* welcome message */  
    printf("Welcome to Dispatcher!\n ");  
  
    /* initialisation */  
    answer = 0;  
  
    /* loop */  
    while(answer != 4)  
    {  
        /* print options */  
        printf("Here are some choices:\n");  
        printf("Start new game! – press 1\n");  
        printf("Load a game! – press 2\n");  
        printf("Save a game! – press 3\n");  
        printf("Exit a game! – press 4\n");  
  
        /* read choice */  
        printf("Enter your choice:\n");  
        scanf("%d", &answer);
```

```
    /* perform activity */  
    switch(answer)  
    {  
        case 1: printf("New game started!\n"); break;  
        case 2: printf("Old game loaded!\n"); break;  
        case 3: printf("Game saved!\n"); break;  
        case 4: printf("Bye!!!!\n"); break;  
    }  
}  
  
/* print bye message */  
printf("Bye from Dispatcher!\n ");  
  
/* stop */  
return(EXIT_SUCCESS);  
}
```