

Tutorial 1a MT262

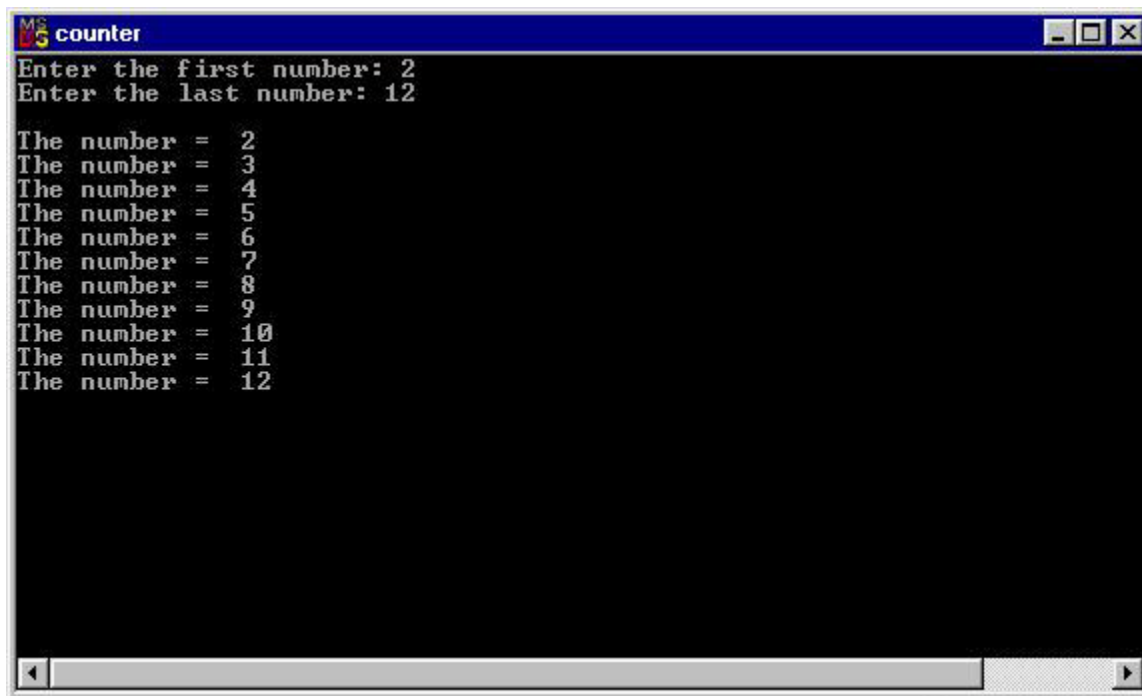
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Staff No. : 00567451

Pager No. : 07669-801 509

I have put this tutorial on the web. This tutorial can be viewed and downloaded from <http://www.users.totalise.co.uk/~rifat> then selecting MT262 Tutorials then Tutorial 1.

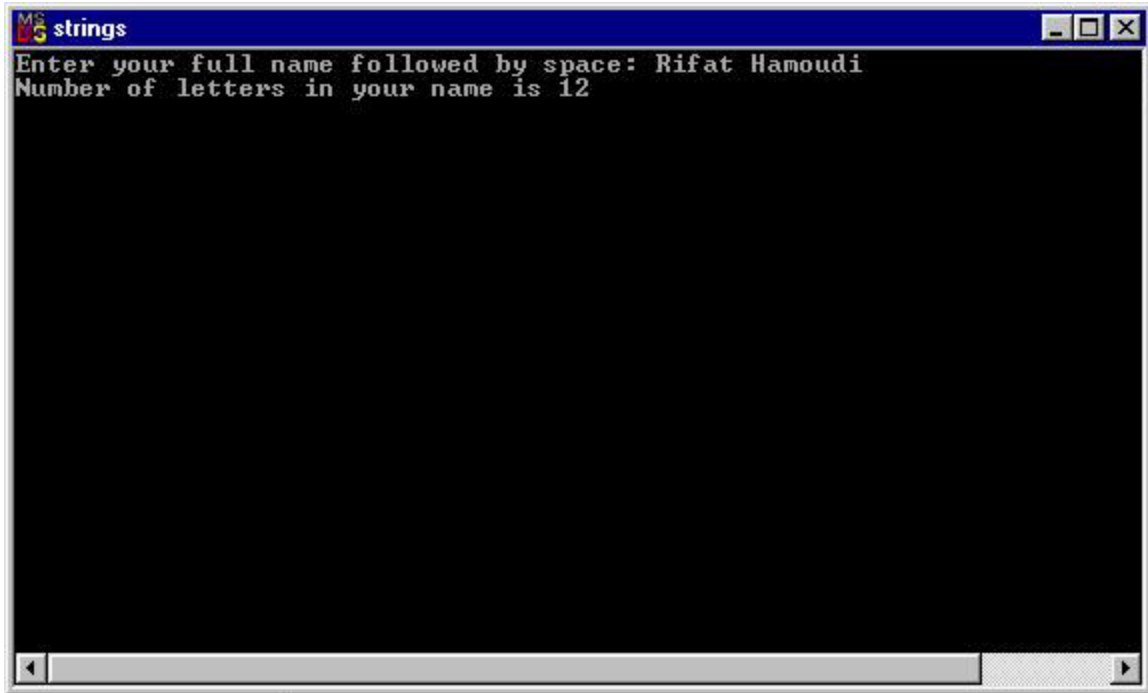
1) Design and implement a C++ program that counts a range of numbers entered by the user. An example output is as shown below :



```
MS-DOS counter
Enter the first number: 2
Enter the last number: 12

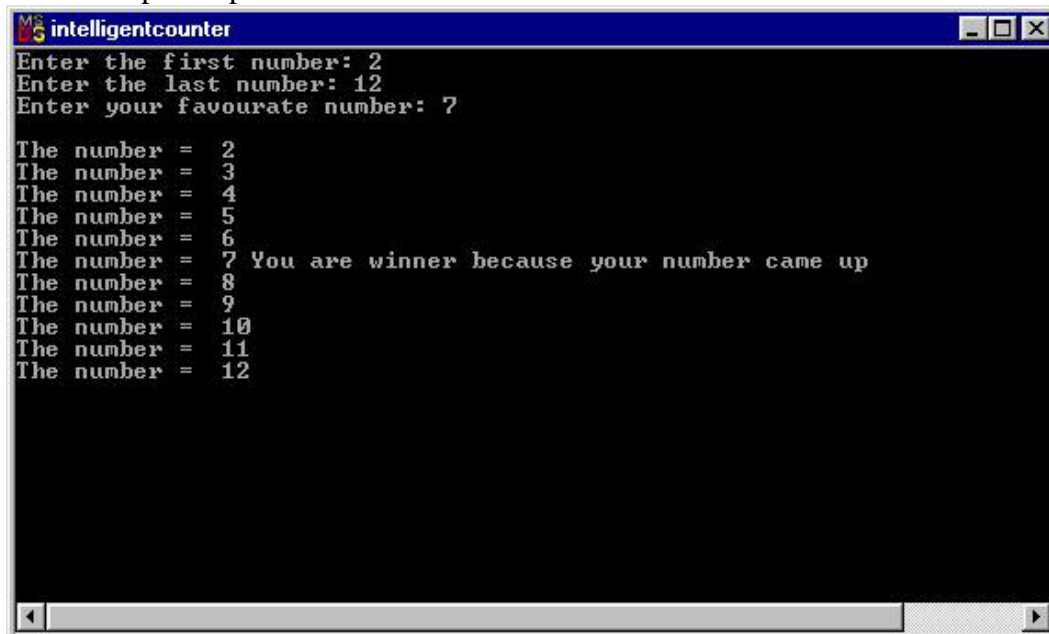
The number = 2
The number = 3
The number = 4
The number = 5
The number = 6
The number = 7
The number = 8
The number = 9
The number = 10
The number = 11
The number = 12
```

2) Design and implement a C++ program that counts the number of letters in a user's name. An example output is as shown below :



```
MS strings
Enter your full name followed by space: Rifat Hamoudi
Number of letters in your name is 12
```

3) Modify question (1) so that the program asks the user to input a favourite number and displays the following text "You are a winner because your number came up" next to the user's favourite number. An example output is as shown below :



```
MS intelligentcounter
Enter the first number: 2
Enter the last number: 12
Enter your favourite number: 7

The number = 2
The number = 3
The number = 4
The number = 5
The number = 6
The number = 7 You are winner because your number came up
The number = 8
The number = 9
The number = 10
The number = 11
The number = 12
```

Answer to Question 1

The design

Top level design

```
1      read in the user numbers
2      initialise variables
3      loop while the numbers are in the user's range
4          process next number
5      loopend
```

Final design using stepwise refinement

```
1.1.1 write out "Enter the first number: "
1.1.2 read in FirstNumber
1.2.1 write out "Enter the last number: "
1.2.2 read in LastNumber
1.3.2 read in favouriteNumber
2.1  count <- FirstNumber
3    loop while count <= LastNumber
4.1  write out "The number = "
4.2  write out count
4.3  count <- count + 1
5    loopend
```

The C++ source code

```
/*
    Unit      :   MT262
    Tutorial:   Tutorial 1
    Title     :   Counter Program
    Author    :   Rifat Hamoudi
    Version   :   0.1
    Date      :
*/

#include "MT262io.h" // modules defined in it e.g. ReadInt
#pragma hdrstop    //tells Builder how to deal with library files

//-----
// Project|Add to project - MT262io.lib
USELIB("MT262io.lib");
//-----

#pragma argsused // to avoid the production of warning messages relating to
argc           // and **argv

int main(int argc, char **argv)
{
    int count;
    int FirstNumber;
    int LastNumber;
```

```

FirstNumber = ReadIntPr("Enter the first number: ");
LastNumber = ReadIntPr("Enter the last number: ");
count = FirstNumber;

while (count <= LastNumber)
{
    WriteIntPrCr("The number = ", count);
    count = count + 1;
}
getchar(); // to keep the display on until you press Enter key
return 0;
}

```

Answer to Question 2

The design

Top level design

```

1      read in user name
2      count the letters in the user's name
3      write out the letters in the user's name

```

Final design using stepwise refinement

```

1.1    write out "Enter your full name followed by space: "
1.2    read in Line
2.1.1  Index loop while Index <= Length(Line)
2.3.1      if PreviousLetter != ' ' then
2.3.2          LetterCount ifend
2.3.4      Index loopend
3.1    write out "Number of letters in your name is", LetterCount

```

The C++ source code

```

/*
    Unit      :   MT262
    Tutorial  :   Tutorial 1
    Title     :   Count letters in name program
    Author    :   Rifat Hamoudi
    Version   :   0.1
    Date      :
*/

#include "MT262io.h" // modules defined in it e.g. ReadInt
#pragma hdrstop //tells Builder how to deal with library files

//-----
// Project|Add to project - MT262io.lib
USELIB("MT262io.lib");

```

```

//-----
#pragma argsused // to avoid the production of warning messages
                // relating to argc and **argv

int main(int argc, char **argv)
{
    AnsiString Line;
    int Index;
    int LetterCount;
    char PreviousLetter;

    Line = ReadStringPr("Enter your full name followed by space: ");
    Index = 1;
    LetterCount = 0;
    PreviousLetter = ' ';

    while (Index <= Length(Line))
    {
        if (PreviousLetter != ' ')
            LetterCount = LetterCount + 1;
        PreviousLetter = Line[Index];
        Index = Index + 1;
    }
    WriteIntPrCr("Number of letters in your name is", LetterCount);
    getchar(); // to keep the display on until you press Enter key
    return 0;
}

```

Answer to Question 3

The design

Top level design

```

1      read in the user numbers
2      initialise variables
3      loop while the numbers are in the user's range
4          process next number
5      loopend

```

Final design using stepwise refinement

```

1.1.1  write out "Enter the first number: "
1.1.2  read in FirstNumber
1.2.1  write out "Enter the last number: "
1.2.2  read in LastNumber
1.3.1  write out "Enter your favourite number: "
1.3.2  read in FavouriteNumber
2.1    loop while count <= LastNumber
4.1        write out "The number = "
4.2        write out count

```

```

4.3          if count = FavouriteNumber then
4.4.2        write out "You are a winner because your number came up"
4.4.3        ifend
5           loopend

```

The C++ source code

```

/*
    Unit      :   MT262
    Tutorial  :   Tutorial 1
    Title     :   Intelligent Counter Program
    Author    :   Rifat Hamoudi
    Version   :   0.1
    Date      :
*/

#include "MT262io.h" // modules defined in it e.g. ReadInt
#pragma hdrstop    //tells Builder how to deal with library files

//-----
// Project|Add to project - MT262io.lib
USELIB("MT262io.lib");
//-----

#pragma argsused // to avoid the production of warning messages relating to
argc
                // and **argv

int main(int argc, char **argv)
{
    int count;
    int FirstNumber;
    int LastNumber;
    int FavouriteNumber;

    FirstNumber = ReadIntPr("Enter the first number: ");
    LastNumber = ReadIntPr("Enter the last number: ");
    FavouriteNumber = ReadIntPr("Enter your favourite number: ");
    Count = FirstNumber;

    while (count <= LastNumber)
    {
        WriteIntPr("\nThe number = ", count);

        if (count == FavouriteNumber)
        {
            WriteString(" You are winner because your number came up");
        }
        count = count + 1;
    }
    getch(); // to keep the display on until you press Enter key
    return 0;
}

```

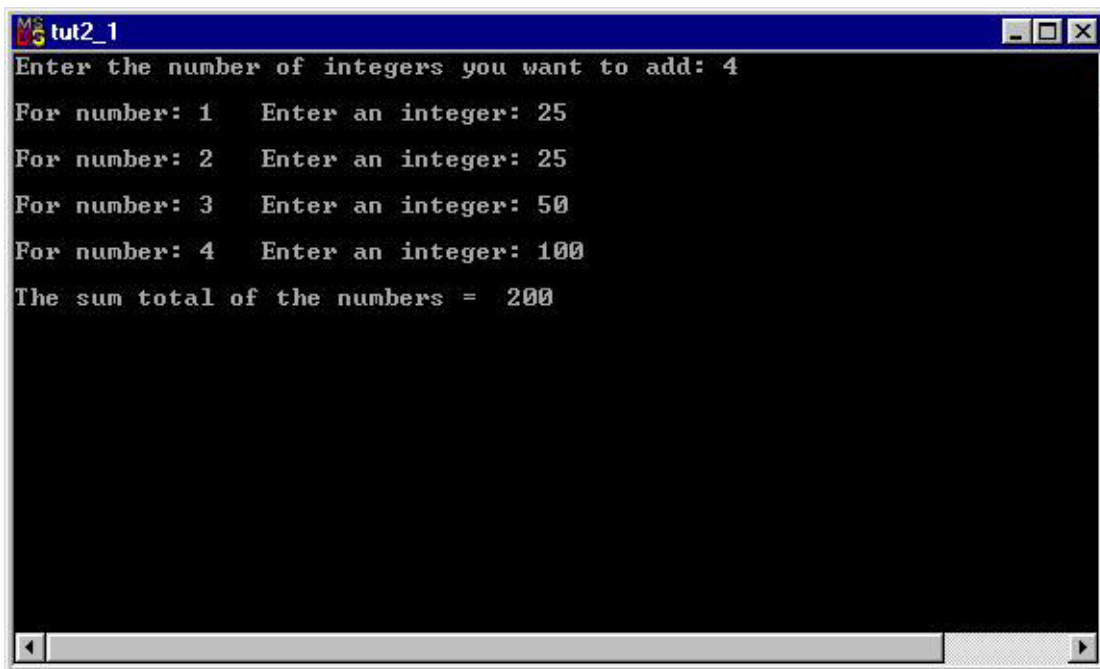
Tutorial 1b MT262

Tutor : Rifat Hamoudi
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Pager No. : 07669-801 509

I have put this tutorial on the web. This tutorial can be viewed and downloaded from <http://www.users.totalise.co.uk/~rifat> then selecting MT262 Tutorials then Tutorial 2.

1) Design and implement a C++ program that adds a range of numbers entered by the user.

An example output is as shown below :



```
MS tut2_1
Enter the number of integers you want to add: 4
For number: 1   Enter an integer: 25
For number: 2   Enter an integer: 25
For number: 3   Enter an integer: 50
For number: 4   Enter an integer: 100
The sum total of the numbers = 200
```

2) Design and implement a C++ program that counts the total number of letters, number of vowels and number of consonants in a user's name.

An example output is as shown below :



```
MS-DOS tut2_2
Enter your full name followed by space: Rifat Hamoudi
Number of letters in your name is 12
Number of vowels in your name is 6
Number of consonants in your name is 6
```

3) In question (2) the program produces the wrong results if the user does not type a space at the end of the name as shown below.

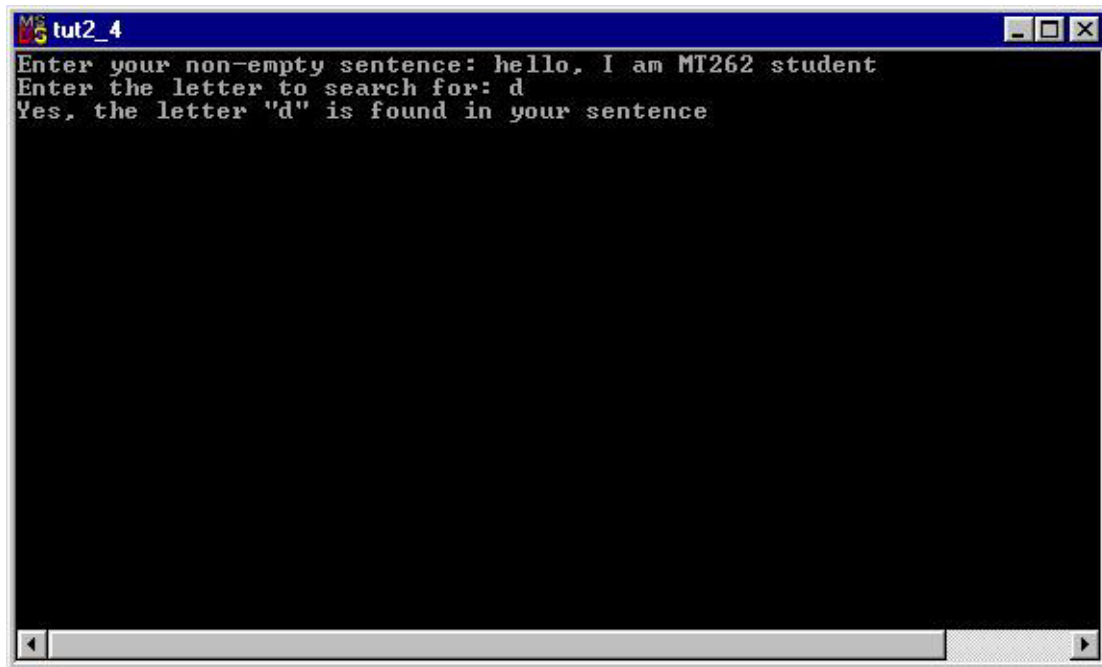


```
MS-DOS tut2_2
Enter your full name followed by space: Rifat Hamoudi
Number of letters in your name is 11
Number of vowels in your name is 5
Number of consonants in your name is 6
```


Identify the source of the semantic error in question (2) and correct it so that the program will count the correct number of letters even if the user does not enter a space after the name.

4) Design and implement a program that allows to enter a sentence and search for the existence or otherwise of a letter within the sentence. Include a data table of your design.

An example output is shown below :



```
MS-DOS [C:\] > tut2_4
Enter your non-empty sentence: hello, I am MT262 student
Enter the letter to search for: d
Yes, the letter "d" is found in your sentence
```

Answer to Question 1

The design

Top level design

- 1 read in the total number of integers to be added
- 2 initialise variables
- 3 **loop** while there are still numbers to be added
- 4 process next number
- 5 **loopend**
- 6 Display the total sum of numbers

Final design using stepwise refinement

- 1.1 write out “Enter the number of integers you want to add: “
- 1.2 read in Number_of_Integers
- 2.1 count <- 1
- 2.2 current_number <- 0
- 2.3 sum <- 0
- 3 **loop while** count <= Number_of_Integers
- 4.1 write out “For number:“
- 4.2 write out count
- 4.3.1 write out “ Enter an integer:”
- 4.3.2 read in current_number
- 4.4 sum <- sum + current_number
- 4.5 count <- count + 1
- 5 **loopend**
- 6.1 write out “The sum total of the numbers = “
- 6.2 write out sum

The C++ source code

```
/*
    Unit      :   MT262
    Tutorial  :   Tutorial 1b
    Title     :   Calculating the sum in a range of numbers
    Author    :   Rifat Hamoudi
    Version   :   0.1
    Date      :
*/

#include "MT262io.h" // modules defined in it e.g. ReadInt
```

```

#pragma hdrstop //tells Builder how to deal with library files

//-----
// Project|Add to project -> MT262io.lib
//-----
USELIB("Mt262io.lib");
//-----
#pragma argsused // to avoid the production of warning messages relating to
argc
                // and **argv

int main(int argc, char **argv)
{
    int count;
    int sum;
    int current_number;
    int Number_of_Integers;

    Number_of_Integers = ReadIntPr("Enter the number of integers you want to
add: ");
    count = 1;
    current_number = 0;
    sum = 0;

    while (count <= Number_of_Integers)
    {
        WriteIntPrCr("For number:", count);
        current_number = ReadIntPr("    Enter an integer: ");
        sum = sum + current_number;
        count = count + 1;
    }

    WriteIntPrCr("The sum total of the numbers = ", sum);
    getchar(); // to keep the display on until you press Enter key
    return 0;
}

```

Answer to Question 2

The design

Top level design

- 1 read in user name
- 2 count the letters, vowels and consonants in the user's name
- 3 write out the letters, vowels and consonants in the user's name

Final design using stepwise refinement

- 1.1 write out "Enter your full name followed by space: "
- 1.2 read in Line
- 2.1.1 Index <- 1
- 2.1.2 LetterCount <- 0
- 2.1.3 VowelCount <- 0
- 2.1.4 ConsonantCount <- 0
- 2.1.5 Letter <- ' '
- 2.2 **loop while** Index <= Length(Line)
- 2.3.1 **if** Letter != ' ' **then**
- 2.3.2 LetterCount <- LetterCount + 1
- 2.3.3 **if** Letter = vowel **then**
- 2.3.4 VowelCount <- VowelCount + 1
- 2.3.5 **else**
- 2.3.6 ConsonantCount <- ConsonantCount + 1
- 2.3.7 **ifend**
- 2.3.8 **ifend**
- 2.3.9 Letter <- Line[Index]
- 2.3.10 Index <- Index + 1
- 2.4 **loopend**
- 3.1 write out "Number of letters in your name is", LetterCount
- 3.2 write out "Number of vowels in your name is", VowelCount
- 3.3 write out "Number of consonants in your name is", ConsonantCount

The C++ source code

```
/*
    Unit      :   MT262
    Tutorial  :   Tutorial 1b
    Title     :   Count letters, vowels and consonants in a name
                with semantic error
    Author    :   Rifat Hamoudi
    Version   :   0.1
    Date      :
*/
```

```

#include "MT262io.h" // modules defined in it e.g. ReadInt
#pragma hdrstop //tells Builder how to deal with library files

//-----
// Project|Add to project -> MT262io.lib
USELIB("MT262io.lib");
//-----
#pragma argsused // to avoid the production of warning messages relating to
argc // and **argv

int main(int argc, char **argv)
{
    AnsiString Line;
    int Index;
    int LetterCount;
    int VowelCount;
    int ConsonantCount;
    char Letter;

    Line = ReadStringPr("Enter your full name followed by space: ");
    Index = 1;
    LetterCount = 0;
    VowelCount = 0;
    ConsonantCount = 0;
    Letter = ' ';

    while (Index <= Length(Line))
    {
        if (Letter != ' ')
        {
            LetterCount = LetterCount + 1;

            if ((Letter == 'a') || (Letter == 'e') ||
                (Letter == 'i') || (Letter == 'o') ||
                (Letter == 'u'))
                VowelCount = VowelCount + 1;
            else
                ConsonantCount = ConsonantCount + 1;
        }
        Letter = Line[Index];
        Index = Index + 1;
    }
    WriteIntPrCr("Number of letters in your name is", LetterCount);
    WriteIntPrCr("Number of vowels in your name is", VowelCount);
    WriteIntPrCr("Number of consonants in your name is", ConsonantCount);

    getchar(); // to keep the display on until you press Enter key
    return 0;
}

```

Answer to Question 3

To correct the semantic error, put step 2.3.9 in the final design as step 2.3.1 as follows:

```
.....
2.1.5 Letter <- ' '
2.2   loop while Index <= Length(Line)
2.3.1     Letter <- Line[Index]
2.3.2     if Letter != ' ' then
2.3.3         LetterCount <- LetterCount + 1
2.3.4         if Letter is a vowel then
2.3.5             VowelCount <- VowelCount + 1
2.3.6         else
2.3.7             ConsonantCount <- ConsonantCount + 1
2.3.8         ifend
2.3.9     ifend
2.3.10    Index <- Index + 1
2.4     loopend
```

..... etc

The C++ source code

```
/*
    Unit      :   MT262
    Tutorial  :   Tutorial 1b
    Title     :   Count letters, vowels and consonants in a name
    Author    :   Rifat Hamoudi
    Version   :   0.1
    Date      :
*/

#include "MT262io.h" // modules defined in it e.g. ReadInt
#pragma hdrstop    //tells Builder how to deal with library files

//-----
// Project|Add to project -> MT262io.lib
USELIB("MT262io.lib");
//-----
#pragma argsused // to avoid the production of warning messages relating to
argc           // and **argv

int main(int argc, char **argv)
{
    AnsiString Line;
    int Index;
    int LetterCount;
```

```

int VowelCount;
int ConsonantCount;
char Letter;

Line = ReadStringPr("Enter your full name: ");
Index = 1;
LetterCount = 0;
VowelCount = 0;
ConsonantCount = 0;
Letter = ' ';

while (Index <= Length(Line))
{
    Letter = Line[Index];
    if (Letter != ' ')
    {
        LetterCount = LetterCount + 1;

        if ((Letter == 'a') || (Letter == 'e') ||
            (Letter == 'i') || (Letter == 'o') ||
            (Letter == 'u'))
            VowelCount = VowelCount + 1;
        else
            ConsonantCount = ConsonantCount + 1;
    }
    Index = Index + 1;
}
WriteIntPrCr("Number of letters in your name is", LetterCount);
WriteIntPrCr("Number of vowels in your name is", VowelCount);
WriteIntPrCr("Number of consonants in your name is", ConsonantCount);

getchar(); // to keep the display on until you press Enter key
return 0;
}

```

Answer to Question 4

Data table

Type	Identifier	Description
AnsiString	Line	Sentence entered by the user
Char	Letter	Letter entered by the user to be searched for in the sentence
Integer	Begin	Runs over the indexes of characters in <i>Line</i>
Integer	End	Used to terminate the loop if the letter is found in the sentence
Boolean	Found	Set true if <i>Line</i> contains the letter; otherwise set false

Final design

- 1.1 write out “Enter your non-empty sentence : “
- 1.2 read in Line
- 1.3 read in Letter
- 1.4 Begin <- 1
- 1.5 End <- Length(Line)
- 1.6 Found <- **false**
- 2.1 **loop while** Begin < End
 - 3.1 **if** Line[Begin] = Letter **then**
 - 3.2 Found <- **true**
 - 3.3 **else**
 - 3.4 Found <- **false**
 - 3.5 **ifend**
- 4.1 Begin <- Begin + 1
- 5 **loopend**
- 6.1 **if** Found = **true** **then**
- 6.2 write out “Yes, the letter is found in the sentence.”

6.3 else

6.4 write out “No, the letter is not found in the sentence.”

6.5 ifend

This consist of semantic error!

```
/*
    Unit      :   MT262
    Tutorial  :   Tutorial 1b
    Title     :   Program to search for a letter in a sentence
    Author    :   Rifat Hamoudi
    Version   :   0.1
    Date      :
*/

#include "MT262io.h" // modules defined in it e.g. ReadInt
#pragma hdrstop //tells Builder how to deal with library files

//-----
// Project|Add to project -> MT262io.lib
USELIB("MT262io.lib");
//-----
#pragma argsused // to avoid the production of warning messages relating to
argc
                // and **argv

int main(int argc, char **argv)
{
    AnsiString Line;
    char Letter;
    bool Found;
    int Begin;
    int End;

    Line = ReadStringPr("Enter your non-empty sentence: ");
    Letter = ReadCharPr("Enter the letter to search for: ");
    Found = false;
    Begin = 1;
    End = Length(Line);

    while (Begin < End)
    {
        if (Line[Begin] == Letter)
            Found = true;
        else
            Found = false;

        Begin = Begin + 1;
    }

    if (Found == true)
    {
        WriteString("Yes, the letter \");
        WriteChar(Letter);
    }
}
```

```

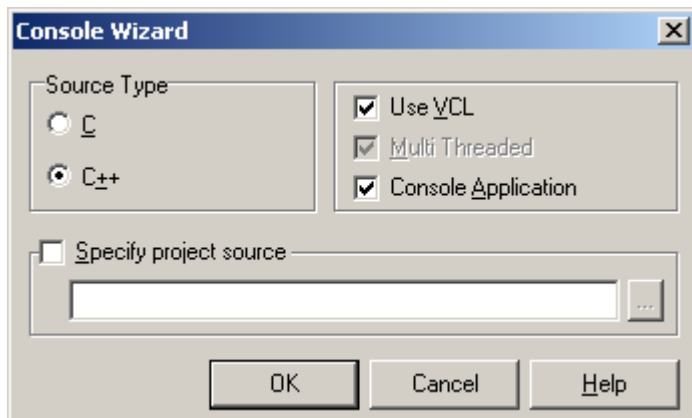
        WriteStringCr("\" is found in your sentence");
    }
else
{
    WriteString("No, the letter \"");
    WriteChar(Letter);
    WriteStringCr("\" is not found in your sentence");
}

getchar(); // to keep the display on until you press Enter key
return 0;
}

```

How to get the code to work and compile on your computer

- 1) load C++ Builder
- 2) Click on **File** | **New** then click on **Console Wizard**
- 3) Make sure the Use VCL and Console Application are checked as below.



- 4) Click OK
- 5) Type the C++ code above in the file
- 6) Click on **File** | **Save Project As** then give it a name e.g. counter click OK
- 7) Click on **Run** | **Run** (or press F9 key) to run the program