NAME			SURNAME			
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QUESTION 1	*Resultant*
Given the following integers N1, N2, N3, N4, expressed in two's complement 8-bit, indicate which is larger and justify the steps N1= 11110001 N3= 11100011 N2= 11111101 N4= 11100111	Greater: N1 N2 N3 N4

Steps

QUESTION 2

For which combinations of values of the binary constants K1 and K2, the following Boolean functions are equivalent:
$f1(A,B) = (A \cdot \bar{A}) \cdot K2 + (B \cdot \bar{B}) \cdot K1$, $f2(A,B) = (A \cdot \bar{A}) \cdot K1 + (B \cdot \bar{B}) \cdot K2$

Response

QUESTION 3

Explain the function of the linker inside a programming environment

Response

QUESTION 4 (PROGRAMMING)

Write a program in C that performs the decoding of a series of codewords stored in a text file in ASCII format. The encoding in question is called COD32 and uses the symbols: **digits** 0 through 9, and the **letters** of the alphabet from A to Z (except I and O):

Then, the string of symbols is: 0123456789ABCDEFGHJKLMNPQRSTUVWXYZ.

The decoding is done by transforming every one of the symbols taken in COD32 to a decimal value DEC. In particular, each symbol is decoded into a decimal number associated with its position in the string of symbols, previously reported by COD32 encoding (the first symbol position is equal to 0). For example a COD32 2 symbol is decoded into the number 2, A is decoded into the number 10, and Z in the number 33. An example of a complete decoding is:

$(9AJ4D)_{COD32}$ -> $(91018413)_{DEC}$

The file with the encoded words in COD32 called "COD32.txt" is of **unknown length** and consists of one word for each line:

<codeword1>
<codeword2>
…

Where <codeword> is a **string of maximum 30 characters**. The program must perform the decoding from COD32 to DEC, producing a file named "**decimal.txt**". In the new file, each row contains a word decoded in DEC corresponding to the decode process, and separated by a space, a string that represents the decryption key. This description key is a sequence of characters "L" and "N", where N means that the decimal number is derived from a COD32 digit, while L indicates that the decimal number is derived from a COD32 letter. In this way, the lines of the file decoding result to be:

<decimalword> <key1>
<decimalword> <key2 >
…

where <decimalword> is a **string of 60 characters maximum**, and <key> is a string composed of the two possible characters L and N. **The program must produce in the console output the shortest length codeword and the average length (with two digits decimal places) of the codewords.** Assume that the files are always in the correct format.

Example of files COD32 and decimal.txt:

COD32.txt	decimal.txt
9AJ4D	91018413 NLLNL
456F	45615 NNNL
FFD34	15151334 LLLNN

In the example, the produced key NLLNL in the first line of decimal.txt indicates that the first symbol represents a number (9) in the first line of the COD32.txt file, and therefore should be considered as a single digit, while the second is a letter (A) and therefore should be considered as two consecutive digits corresponding (10) and so on.

Example of a sequence coding for (COD32.txt is the input file and the output file is decimal.txt)
```
C:\> codec32
Encoded shorter string: 456F
Average length codewords: 4.66
```

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MATRICULATION	**S**							**A/2**

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QUESTION 1	*Resultant*
Given the following integers N1, N2, N3, N4, expressed in two's complement 8-bit, indicate which is larger and justify the steps N1= 10110001 N3= 11000011 N2= 11101101 N4= 10100111	Greater: ☐ N1 ☐ N2 ☐ N3 ☐ N4

Steps

QUESTION 2

For which combinations of values of the binary constants K1 and K2, the following Boolean functions are equivalent:
$f1(A,B) = (B \cdot \bar{B}) \cdot K2 + (A \cdot \bar{A}) \cdot K1, \ f2(A,B) = (B \cdot \bar{B}) \cdot K1 + (A \cdot \bar{A}) \cdot K2$

Response

QUESTION 3

Explain what are libraries and how are they used in a programming environment

Response

QUESTION 4 (PROGRAMMING)

Write a program in C that performs the decoding of a series of code words stored in a text file in ASCII format. The encoding in question is called COD32 and uses symbols such as the digits 0 through 9 and the letters of the alphabet from A to Z (except I and O): 0123456789ABCDEFGHJKLMNPQRSTUVWXYZ. The decoding is done by transforming each of the symbols taken individually by a COD32 decimal. In particular, each symbol is translated into a decimal number associated with its position in the string of symbols, previously reported by COD32 encoding (the first symbol position is equal to 0). For example 2 is translated into the number 2, A is translated into the number 10, and Z in the number 33 An example of a complete decoding is: $(9AJ4D)_{COD32}$ -> $(91018413)_{DEC}$

The file with the encoded words is passed as the first argument on the command line and is of unknown length and consists of one word for each line:
<codeword1>
<codeword2>
…

Where <codeword> is a **string of maximum 30 characters**. The decoder must **produce a file whose name is specified as the second argument on the command** line in which each line contains a word decoded and separated by a space, a string that represents the decryption key. This key is a sequence of characters "L" and "N" where N is the decimal number is derived from a figure COD32 while L indicates that the decimal number is derived from a COD32 letter. In this way, the lines of the file decoding result to be:
<decimalword1> <key1>
<decimalword2> <key2 >
…

where <decimalword> is a **string of 60 characters maximum** and <key> is a string composed of the two possible characters "L" and "N". **The program must produce as output on the console (in coded format that is decoded) the codeword of the maximum value (in alphabetic sense) and the number of words decoded**. In case there are more words than the maximum value will be enough to print one. Assume that the files are always in the correct format.

Example of file encoding(input) and decoding(output):

COD32.txt (input)	decimal.txt (output)
9AJ4D	91018413 NLLNL
456F	45615 NNNL
FFD34	15151334 LLLNN

NOTE: In the example the sequence NLLNL in the first line indicates that the first symbol represents a number (9), while the second is a letter (A).

Execution example:
```
C:\> codec32 COD32.txt decimal.txt
Decoding 3 words.
String of maximum value: FFD34 – 15151334.
```