EE2003 Computer Organization and Assembly Language

Semester Project Report

NUMBER SYSTEM CONVERTOR

Batch 2020

Degree BS (AI)

Group Members

• HAMZA JAFRI	20K-1669
• UMER VOHRA	20K-1677
• BILAL MAMJI	20K-1702

Course Teacher

Muhammad Nadeem

Department of Computer Science

National University of Computer and Emerging Sciences-FAST

Karachi Campus

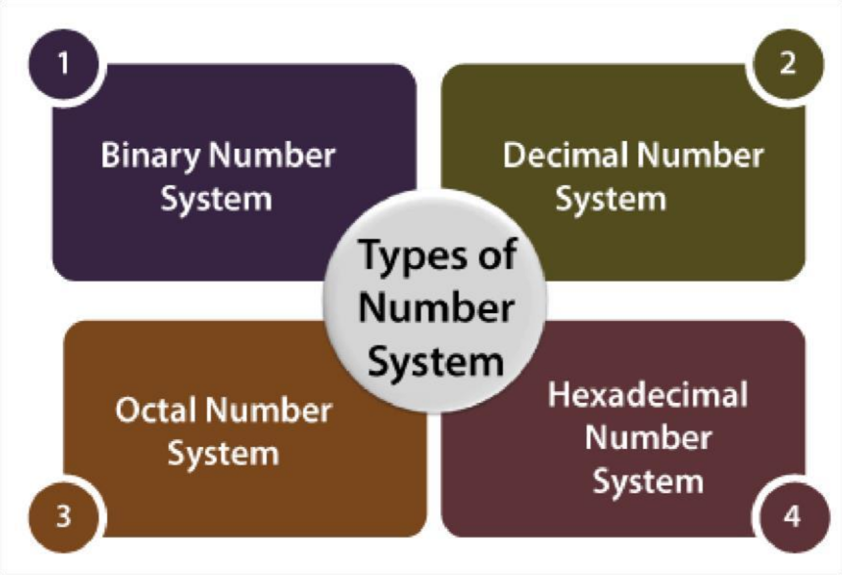
INTRODUCTION:

A number system is defined as **a system of writing to express numbers**. It is the mathematical notation for representing numbers of a given set by using digits or other symbols in a consistent manner. It provides a unique representation of every number and represents the arithmetic and algebraic structure of the figures.

TYPES OF NUMBER SYSTEM:

Computer architecture support following number system

1. Binary number system
2. Octal number system
3. Decimal number system
4. Hexadecimal number system



Binary number system:

A **binary number system** is one of the four types of **number system**. In **computer** applications, where **binary numbers** are represented by only two symbols or digits, i.e., 0 (zero) and 1(one). The binary numbers here are expressed in the base-2 numeral system. For example, $(1001)_2$ is a binary number. Each digit in this system is said to be a bit

Octal number system:

Octal Number System has a base of eight and uses the number from 0 to 7. The octal numbers, in the number system , are usually represented by binary numbers when they are grouped in pairs of three. For example, 12_8 is expressed as $001\ 010_2$, where 1 is equivalent to 001 and 2 is equivalent to 010.

Decimal number system:

In the **decimal number system**, the numbers are represented with base 10. The way of denoting the decimal numbers with base 10 is also termed as decimal notation. This number system is widely used in computer applications. It is also called the base-10 number system which consists of 10 digits, such as, 0,1,2,3,4,5,6,7,8,9.

.

Hexadecimal number system:

Hexadecimal Number System is one the type of Number Representation techniques, in which their value of base is 16. That means there are only 16 symbols or possible digit values, there are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F. Where A, B, C, D, E and F are single bit representations of decimal value 10, 11, 12, 13, 14 and 15 respectively. It requires only 4 bits to represent value of any digit.

CONVERSIONS:

- Decimal into Binary/Hex number system
- Binary into Decimal/Hex number system
- Hexadecimal into Binary/Decimal number system
- Octal into binary/decimal

Decimal to Binary:

Steps to convert decimal to binary:

a) Take decimal number as dividend.

b) Divide this number by 2 (2 is base of binary so divisor here).

c) Store the remainder in an array (it will be either 0 or 1 because of divisor 2).

d) Repeat the above two steps until the number is greater than zero.

e) Print the array in reverse order (which will be equivalent binary number of given decimal number).

For Example:

- Convert decimal number 112 into binary number.
-

Division	Remainder (R)
112 / 2 = 56	0
56 / 2 = 28	0
28 / 2 = 14	0
14 / 2 = 7	0
7 / 2 = 3	1
3 / 2 = 1	1
1 / 2 = 0	1

This will be 1110000 which is equivalent binary number of decimal integers 112.

Decimal to Hexadecimal:

Steps to convert decimal to hexadecimal:

a) Take decimal number as dividend.

b) Divide this number by 16 (16 is base of hexadecimal so divisor here).

c) Store the remainder in an array (it will be: 0 to 15 because of divisor 16, replace 10, 11, 12, 13, 14, 15 by A, B, C, D, E, F respectively).

d) Repeat the above two steps until the number is greater than zero.

e) Print the array in reverse order (which will be equivalent hexadecimal number of given decimal number).

For Example :

- Convert decimal number 540 into hexadecimal number

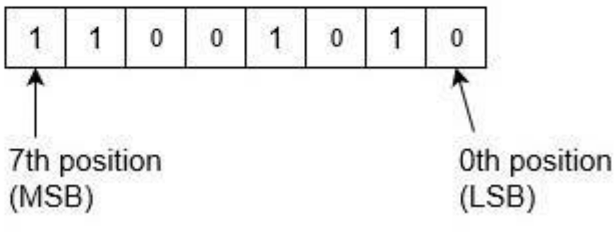
Division	Remainder (R)
540 / 16 = 33	12 = C
33 / 16 = 2	1
2 / 16 = 0	2
0 / 16 = 0	0

This will be 021C (or only 21C) which is equivalent hexadecimal number of decimal integers 540.

Binary to Decimal:

For Example :

Convert binary number 11001010 into decimal number.



$= (11001010)_2$

$= 1x2^7+1x2^6+0x2^5+0x2^4+1x2^3+0x2^2+1x2^1+0x2^0$

$= 128+64+0+0+8+0+2+0 = (202)_{10}$

Binary to Hexadecimal:

For Example :

Convert binary number 1101010 into hexadecimal number.

First convert this into decimal number:

$= (1101010)_2$

$= 1x2^6+1x2^5+0x2^4+1x2^3+0x2^2+1x2^1+0x2^0$

$= 64+32+0+8+0+2+0$

$= (106)_{10}$

Then, convert it into hexadecimal number

$= (106)_{10}$

$= 6x16^1+10x16^0$

$= (6A)_{16}$ which is answer.

Hexadecimal to Binary :

Steps to convert hexadecimal to binary:

a) Take given hexadecimal number

b) Find the number of digits in the decimal.

c) If it has n digits, multiply each digit with 16^{n-1} where the digit is in the nth position.

d) Add the terms after multiplication.

e) The result is the decimal number equivalent to the given hexadecimal number. Now we must convert this decimal to binary number.

f) Divide the decimal number with 2.

g) Note the remainder.

h) Do the above 2 steps for the quotient till the quotient is zero.

i) Write the remainders in the reverse order.

j) The result is the required binary number.

For Example:

Convert $A2B_{16}$ to an equivalent binary number.

Solution: Given hexadecimal number = $A2B_{16}$

First, convert the given hexadecimal to the equivalent decimal number.

$A2B_{16} = (A \times 16^2) + (2 \times 16^1) + (B \times 16^0)$

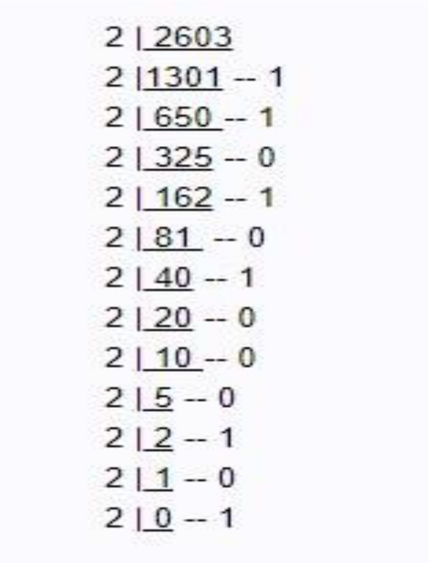
$= (A \times 256) + (2 \times 16) + (B \times 1)$

$= (10 \times 256) + 32 + 11$

$= 2560 + 43$

= 2603(Decimal number)

Now we must convert 2603_{10} to binary



```
2 | 2603
2 |1301 -- 1
2 | 650 -- 1
2 | 325 -- 0
2 | 162 -- 1
2 | 81  -- 0
2 | 40 -- 1
2 | 20 -- 0
2 | 10 -- 0
2 | 5 -- 0
2 | 2 -- 1
2 | 1 -- 0
2 | 0 -- 1
```

Hexadecimal to Decimal:

To convert a hexadecimal to a decimal manually, you must **start by multiplying the hex number by 16**. Then, you raise it to a power of 0 and increase that power by 1 each time according to the hexadecimal number equivalent.

For Example:

Convert hexadecimal number F1 into decimal number.

$(F1)_{16}$
$= (1111\ 0001)_{2}$ or $(011\ 110\ 001)_{2}$
Because in binary, value of F and 1 are 1111 and 0001 respectively.
Then convert it into decimal number multiplying power of its position of base.
$= (1x2^{7}+1x2^{6}+1x2^{5}+1x2^{4}+0x2^{3}+0x2^{2}+0x2^{1}+1x2^{0})_{10}$
$=(241)_{10}$

Octal to Decimal Conversion:

a) Count the number of digits present in the given number. Let the number of digits be ‘n’.

b) Now multiply each digit of the number with 8^{n-1}, when the digit is in the nth position from the right end of the number. If the number has a decimal part, multiply each digit in the decimal part by `$8^{-m}$` when the digit is in the m^{th} position from the decimal point.

c) The obtained value is the equivalent decimal number.

d) Add all the terms after multiplication.

Octal to Binary Conversion:

e) Take the above-produced decimal number and divide it by 2.

f) Note down the remainder

g) Continue the above two steps for the quotient till the quotient is zero.

h) Write the remainder in the reverse order.

i) The received number is the equivalent binary number for the given octal number.

For Example :

Convert 41_8 to a binary number.

Solution: Given number is 41_8

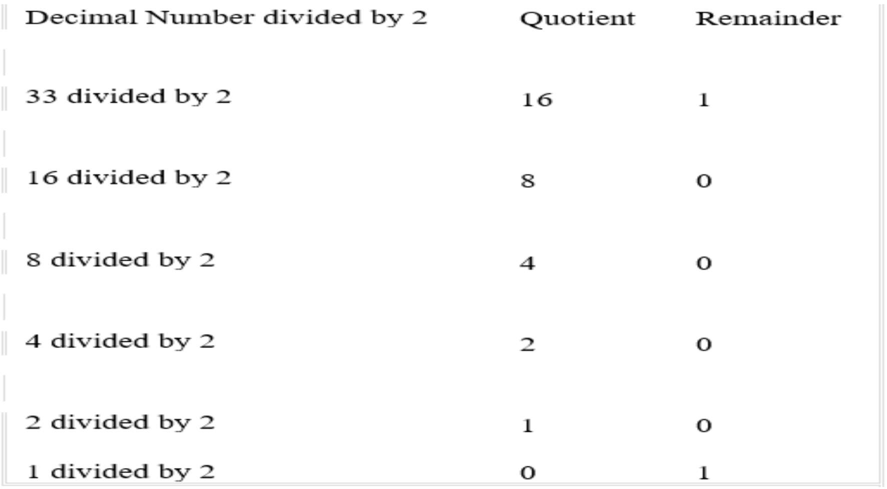
$41_8 = (4 * 8^1) + (1 * 8^0)$

$= 4 * 8 + 1 * 1$

$= 32+1$

$= 33$(Decimal number)

Now convert this decimal number into its equivalent binary number. Let us draw a table to show the conversion of decimal to binary as given below.



Decimal Number divided by 2	Quotient	Remainder
33 divided by 2	16	1
16 divided by 2	8	0
8 divided by 2	4	0
4 divided by 2	2	0
2 divided by 2	1	0
1 divided by 2	0	1

Therefore, the equivalent binary number is 100001_2.

Hence, $41_8 = 100001_2$

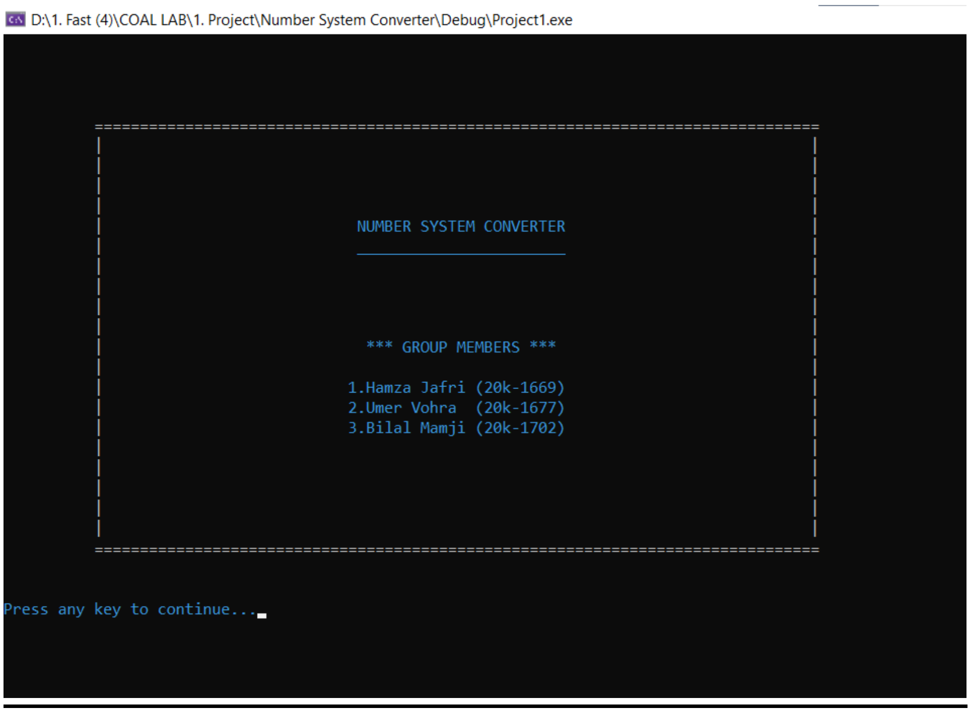
Source Code:

```
INCLUDE Irvine32.inc

.data
        Heading byte "                              NUMBER SYSTEM CONVERTER",0dh,0ah,0
        main_heading byte "                                        NUMBER SYSTEM CONVERTER",0dh,0ah,0
        line byte       "                                    _______________________",0ah,0dh,0
        line1 byte    "                     -----------------------",0ah,0
        line2 byte   "        ______________________________________",0dh,0ah,0
        newline byte "------------------------------------------------------------------------",0dh,0ah,0

        Group_Members byte "                                              *** GROUP MEMBERS ***",0dh,0ah
                                byte " ",0dh,0ah
                                byte "                              1.Hamza Jafri (20k-1669) ",0dh,0ah
                                byte "                              2.Umer Vohra  (20k-1677) ",0dh,0ah
                                byte "                              3.Bilal Mamji (20k-1702) ",0dh,0ah,0

        OPTIONS byte "Select the type of conversion you want to perform from the following 4 ",0dh,0ah
                                byte " ",0dh,0ah
                                byte "1. Convert Binary to Hexadecimal and Decimal ",0dh,0ah
                                byte "2. Convert Decimal to Hexadecimal and Binary ",0dh,0ah
                                byte "3. Convert Hexadecimal to Binary and Decimal ",0dh,0ah
                                byte "4. Convert Octal to Hexadecimal and Decimal ",0dh,0ah
                                byte "5. Exit ",0dh,0ah,0

        SELECT_OPTION byte "Please enter the conversion you want to perform: ",0
        OPTION_TEMP dword ?

        THANK_YOU_MESSAGE byte "              | THANK YOU FOR USING OUR CALCULATOR |",0dh,0ah,0

        ERROR_OPTIONS byte "        | Please select from the given options |",0dh,0ah,0

        DECIMAL_NUMBER_CONVERTED BYTE "      --> DECIMAL Number : ",0
        HEXADECIMAL_NUMBER_CONVERTED BYTE "  --> HEXADEC Number : ",0
        BINARY_NUMBER_CONVERTED BYTE "       --> BINARY Number : ",0

        ;-------------------------------*****------------------------------
        ;---------------------------BINARY DATA----------------------------
        BINARY_INPUT byte "Enter the BINARY number you want to convert: ",0

        ;Binaryinputs proto, BINARY_LENGTH:DWORD, BASE:DWORD, DECIMAL_NUMBER:DWORD, COUNT:DWORD /////////
PROTO

        ERROR_NOT_BINARY_NUMBER BYTE "       | Invalid Binary can only contain 0 and 1 |",0ah,0dh,0
        BINARY_NUMBER_ARRAY BYTE 33 DUP(?)
        BINARY_LENGTH DWORD 0
        BASE DWORD 2
        DECIMAL_NUMBER DWORD ?
        COUNT DWORD 0

        ;-------------------------------*****------------------------------
        ;---------------------------DECIMAL DATA----------------------------
        DECIMAL_INPUT byte "Enter the DECIMAL number you want to convert: ",0

        DECIMAL_TEMP dword ?

        ;-------------------------------*****------------------------------
        ;---------------------------HEXADECIMAL DATA----------------------------
        HEXADECIMAL_INPUT byte "Enter the HEXADECIMAL number you want to convert: ",0

        HEXADECIMAL_TEMP dword ?

        ;-------------------------------*****------------------------------
        ;---------------------------OCTAL DATA----------------------------
        OCTAL_INPUT byte "Enter the OCTAL number you want to convert: ",0

        ERROR_NOT_OCTAL_NUMBER BYTE "        | Invalid OCTAL Number can contain 0 - 7 |",0ah,0dh,0
        OCTAL_NUMBER BYTE 33 DUP(?)
        OCTAL_LENGTH DWORD 0
        BASE_OCTAL DWORD 8
        DECIMAL_NUMBER_OCTAL DWORD ?
        COUNT_OCTAL DWORD 0

.code
main PROC
;invoke binaryinputs, 33 DUP(?),0,2,0,0 //////////// INVOKE

        INTRO:
        mov eax,0
        call Box
  call SetTextColor
        mov ecx,4
  FR:
  call crlf
  LOOP FR
        mov edx,offset main_heading
        call writestring
        mov edx,offset line
        call writestring
        mov ecx,4
  ER:
  call crlf
  LOOP ER
        mov edx,offset Group_Members
        call writestring
        mov ecx,8
  CR:
  call crlf
  LOOP CR
  call waitmsg


        MAIN_LABEL_FOR_CONVERTER:
                call clrscr
                mov edx,offset Heading
                call writestring
                mov edx,offset line1
                call writestring
                ;mov edx,offset newline
                ;call writestring
                call crlf
                mov edx,offset OPTIONS
                call writestring
                call crlf
                mov edx,offset SELECT_OPTION
                call writestring
                call readdec
                call crlf
                mov OPTION_TEMP,eax

                COMPARE_1_LABEL:
                        mov eax,OPTION_TEMP
                        cmp eax,1
                        JE OPTION_1_LABEL
                        JL ERROR_LABEL

                COMPARE_2_LABEL:
                        mov eax,OPTION_TEMP
                        cmp eax,2
                        JE OPTION_2_LABEL

                COMPARE_3_LABEL:
                        mov eax,OPTION_TEMP
                        cmp eax,3
                        JE OPTION_3_LABEL

                COMPARE_4_LABEL:
                        mov eax,OPTION_TEMP
                        cmp eax,4
                        JE OPTION_4_LABEL

                COMPARE_5_LABEL:
                        mov eax,OPTION_TEMP
                        cmp eax,5
                        JE QUIT_LABEL_OPTION_5
                        JGE ERROR_LABEL

                OPTION_1_LABEL:
                        mov eax,0
                        mov edx, OFFSET BINARY_INPUT
                        call WriteString
                        mov edx,OFFSET BINARY_NUMBER_ARRAY
                        mov ecx,SIZEOF BINARY_NUMBER_ARRAY
                        call ReadString
                        mov BINARY_LENGTH,eax
                        mov ecx, BINARY_LENGTH
                        mov eax,0
                        mov esi,0
                        call BINARY_TO_DECIMAL_CONVERT_PROCEDURE
                        jmp MAIN_LABEL_FOR_CONVERTER

                OPTION_2_LABEL:
                        mov edx,offset DECIMAL_INPUT
                        call writestring
                        call readdec
                        mov DECIMAL_TEMP,eax
                        call DISPLAY_DECIMAL_TO_BINARY_AND_HEXADECIMAL
                        jmp MAIN_LABEL_FOR_CONVERTER

                OPTION_3_LABEL:
                        mov edx,offset HEXADECIMAL_INPUT
                        call writestring
                        call readhex
                        mov HEXADECIMAL_TEMP,eax
                        call DISPLAY_HEXADECIMAL_TO_BINARY_AND_DECIMAL
                        jmp MAIN_LABEL_FOR_CONVERTER

                OPTION_4_LABEL:
                        mov edx, OFFSET OCTAL_INPUT
                        call WriteString
                        mov edx,OFFSET OCTAL_NUMBER
                        mov ecx,SIZEOF OCTAL_NUMBER
                        call ReadString
                        mov OCTAL_LENGTH,eax
                        mov eax,0
                        mov esi,0
                        mov ecx, OCTAL_LENGTH
                        call OCTAL_TO_DECIMAL_CONVERT_PROCEDURE
                        jmp MAIN_LABEL_FOR_CONVERTER

                ERROR_LABEL:
                        mov edx,offset line2
                        call writestring
                        call crlf
                        mov edx,offset ERROR_OPTIONS
                        call writestring
                        mov edx,offset line2
                        call writestring
                        mov ecx,11
                        BR:
                        call crlf
                        LOOP BR
                        call waitmsg
                        jmp MAIN_LABEL_FOR_CONVERTER

    QUIT_LABEL_OPTION_5:
    call crlf
    call crlf
    mov edx,offset line2
    call writestring
    call crlf
    mov edx,offset THANK_YOU_MESSAGE
    call writestring
    mov edx,offset line2
    call writestring
    mov ecx,7
    DR:
    call crlf
    LOOP DR
    EXIT
    main ENDP

    ;BINARY_TO_DECIMAL_CONVERT_PROCEDURE     PROC,     BINARY     BINARY_LENGTH:DWORD,     BASE:DWORD,
    DECIMAL_NUMBER:DWORD, COUNT:DWORD ///////// PROC

    BINARY_TO_DECIMAL_CONVERT_PROCEDURE PROC
        ;LOCAL BASE:DWORD        ////////// Local Directive
        ;mov BASE,2

        OUTER_CONVERSION_LABEL:
                cmp ecx,0

                je DISPLAY_BINARY_TO_DECIMAL_AND_HEXADECIMAL
                mov COUNT,ecx

                CONDITION_1:
                        cmp BINARY_NUMBER_ARRAY[esi],'0'
                        je INCRMENT_LABEL

                CONDITION_2:
                        cmp BINARY_NUMBER_ARRAY[esi],'1'
                        jne NOT_BINARY_ERROR

                        mov ecx, BINARY_LENGTH
                        sub ecx,esi
                        dec ecx

                        mov eax,1
                        ;.while(ecx >= 0)

                        top:
                            cmp ecx,0
                            jge L1

                            jmp L2

                            L1:
                                cmp ecx,0
                                je stop

                                mov ebx,BASE
                                mul ebx
                                dec ecx
                                jmp top
                        ;.endw

                        L2:

                        stop:
                            add DECIMAL_NUMBER,eax
                            jmp INCRMENT_LABEL

                NOT_BINARY_ERROR:
                        call crlf
                        mov edx,offset line2
                        call writestring
                        call crlf
                        mov edx, OFFSET ERROR_NOT_BINARY_NUMBER
                        call WriteString
                        mov edx,offset line2
                        call writestring
                        mov ecx,9
                        AR:
                        call crlf
                        LOOP AR
                        call waitmsg
                        ret
                        ;exit

        INCRMENT_LABEL:
                inc esi
                mov ecx,COUNT
                dec ecx
                jmp OUTER_CONVERSION_LABEL

        call DISPLAY_BINARY_TO_DECIMAL_AND_HEXADECIMAL
        ret
    BINARY_TO_DECIMAL_CONVERT_PROCEDURE ENDP

    DISPLAY_BINARY_TO_DECIMAL_AND_HEXADECIMAL PROC
        call Box2
        call crlf
        call crlf
        mov edx, OFFSET DECIMAL_NUMBER_CONVERTED
        call WriteString
        mov eax, DECIMAL_NUMBER
        call WriteDec
        call Crlf
        call crlf
        mov edx,offset HEXADECIMAL_NUMBER_CONVERTED
        call WriteString
        mov eax, DECIMAL_NUMBER
        call writehex
        mov DECIMAL_NUMBER,0
        mov ecx,8
        CR:
        call crlf
        LOOP CR
        call waitmsg
        ret
    DISPLAY_BINARY_TO_DECIMAL_AND_HEXADECIMAL ENDP

    DISPLAY_DECIMAL_TO_BINARY_AND_HEXADECIMAL PROC
        call Box2
        call crlf
        call crlf
        mov eax,DECIMAL_TEMP
        mov edx,offset BINARY_NUMBER_CONVERTED
        call writestring
        call writebin
        call crlf
        call crlf
        mov eax,DECIMAL_TEMP
        mov edx,offset HEXADECIMAL_NUMBER_CONVERTED
        call writestring
        call writehex
        mov ecx,8
        CR:
        call crlf
        LOOP CR
        call waitmsg
        ret
    DISPLAY_DECIMAL_TO_BINARY_AND_HEXADECIMAL ENDP


    DISPLAY_HEXADECIMAL_TO_BINARY_AND_DECIMAL PROC
        call Box2
```

```
		call crlf
		call crlf
		mov eax,HEXADECIMAL_TEMP
		mov edx,offset BINARY_NUMBER_CONVERTED
		call writestring
		call writebin
		call crlf
		call crlf
		mov eax,HEXADECIMAL_TEMP
		mov edx,offset DECIMAL_NUMBER_CONVERTED
		call writestring
		call writedec
		mov ecx,8
		CR:
		call crlf
		LOOP CR
		call waitmsg
		ret
	DISPLAY_HEXADECIMAL_TO_BINARY_AND_DECIMAL ENDP


	OCTAL_TO_DECIMAL_CONVERT_PROCEDURE PROC
		OUTER_CONVERSION_LABEL:
			cmp ecx,0
			je DISPLAY_OCTALL_TO_HEXADECIMAL_AND_DECIMAL
			mov COUNT_OCTAL,ecx

			CONDITION_1:
				cmp OCTAL_NUMBER[esi],'0'
				je INCRMENT_LABEL

			CONDITION_2:
				cmp OCTAL_NUMBER[esi],'1'
				jge CONDITION_3
				mov ecx, OCTAL_LENGTH
				sub ecx,esi
				dec ecx
				mov eax,0
				jmp INNER_CONVERSION_LABEL

			CONDITION_3:
				cmp OCTAL_NUMBER[esi],'2'
				jge CONDITION_4
				mov ecx, OCTAL_LENGTH
				sub ecx,esi
				dec ecx
				mov eax,1
				jmp INNER_CONVERSION_LABEL

			CONDITION_4:
				cmp OCTAL_NUMBER[esi],'3'
				jge CONDITION_5
				mov ecx, OCTAL_LENGTH
				sub ecx,esi
				dec ecx
				mov eax,2
				jmp INNER_CONVERSION_LABEL

			CONDITION_5:
				cmp OCTAL_NUMBER[esi],'4'
				jge CONDITION_6
				mov ecx, OCTAL_LENGTH
				sub ecx,esi
				dec ecx
				mov eax,3
				jmp INNER_CONVERSION_LABEL

			CONDITION_6:
				cmp OCTAL_NUMBER[esi],'5'
				jge CONDITION_7
				mov ecx, OCTAL_LENGTH
				sub ecx,esi
				dec ecx
				mov eax,4
				jmp INNER_CONVERSION_LABEL

			CONDITION_7:
				cmp OCTAL_NUMBER[esi],'6'
				jge CONDITION_8
				mov ecx, OCTAL_LENGTH
				sub ecx,esi
				dec ecx
				mov eax,5
				jmp INNER_CONVERSION_LABEL

			CONDITION_8:
				cmp OCTAL_NUMBER[esi],'7'
				jge CONDITION_9
				mov ecx, OCTAL_LENGTH
				sub ecx,esi
				dec ecx
				mov eax,6
				jmp INNER_CONVERSION_LABEL

			CONDITION_9:
				cmp OCTAL_NUMBER[esi],'8'
				jge NOT_OCTAL_ERROR
				mov ecx, OCTAL_LENGTH
				sub ecx,esi
				dec ecx
				mov eax,7
				jmp INNER_CONVERSION_LABEL


			INNER_CONVERSION_LABEL:
				cmp ecx,0
				je stop
				mov ebx,BASE_OCTAL
				mul ebx
				dec ecx
				jmp INNER_CONVERSION_LABEL

			stop:
				add DECIMAL_NUMBER_OCTAL,eax
				jmp INCRMENT_LABEL

			NOT_OCTAL_ERROR:
				call crlf
				mov edx,offset line2
				call writestring
				call crlf
				mov edx, OFFSET ERROR_NOT_OCTAL_NUMBER
				call WriteString
				mov edx,offset line2
				call writestring
				mov ecx,9
				CR:
				call crlf
				LOOP CR
				call waitmsg
				ret
				;exit

		INCRMENT_LABEL:
			inc esi
			mov ecx,COUNT_OCTAL
			dec ecx
			jmp OUTER_CONVERSION_LABEL

		call DISPLAY_OCTALL_TO_HEXADECIMAL_AND_DECIMAL
```

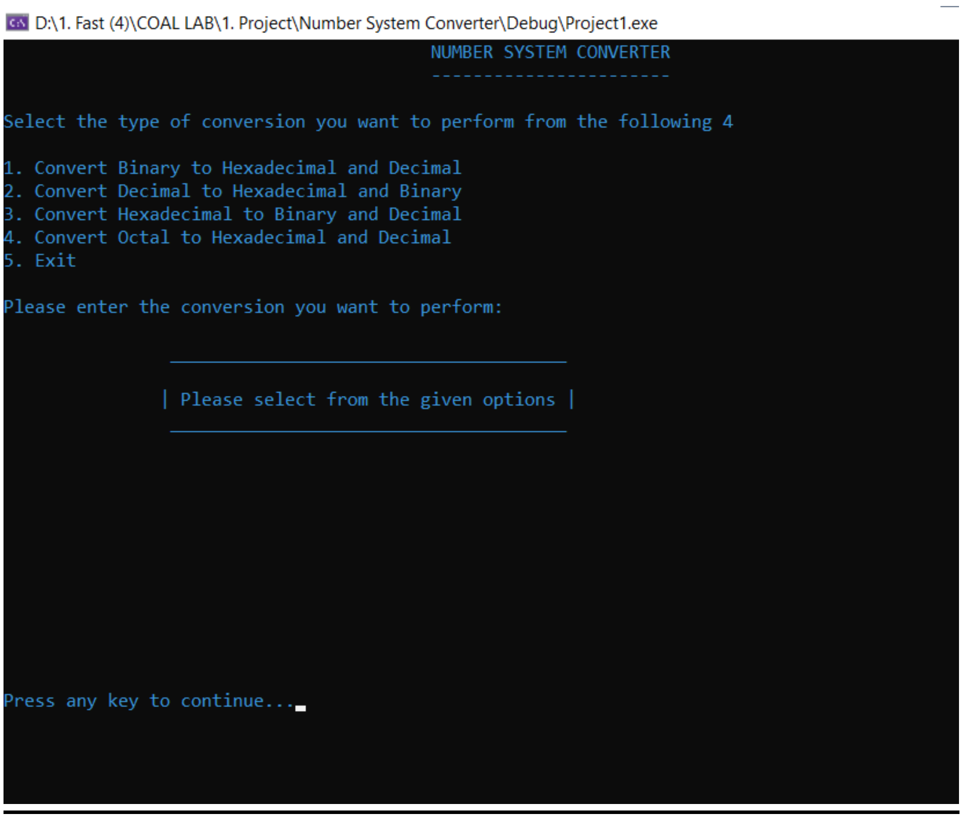
```
        ret
OCTAL_TO_DECIMAL_CONVERT_PROCEDURE ENDP

DISPLAY_OCTALL_TO_HEXADECIMAL_AND_DECIMAL PROC
        call Box2
        call crlf
        mov edx, OFFSET DECIMAL_NUMBER_CONVERTED
        call WriteString
        mov eax, DECIMAL_NUMBER_OCTAL
        call WriteDec
        call Crlf
        call crlf
        mov edx, OFFSET HEXADECIMAL_NUMBER_CONVERTED
        call WriteString
        mov eax, DECIMAL_NUMBER_OCTAL
        call WriteHex
        call crlf
        call crlf
        mov edx, OFFSET BINARY_NUMBER_CONVERTED
        call WriteString
        mov eax, DECIMAL_NUMBER_OCTAL
        call WriteBin
        mov DECIMAL_NUMBER_OCTAL,0
        mov ecx,6
        CR:
        call crlf
        LOOP CR
        call waitmsg
        ret
DISPLAY_OCTALL_TO_HEXADECIMAL_AND_DECIMAL ENDP

Box PROC
  mov ecx,80
  mov dl,10          ; dl = x-axis column
              ; dh = y-axis row
  mov dh,4            ;row
  LOOPS:
  call gotoxy
  mov al,61         ;Ascii
  call writechar
  mov eax , 3
  call delay
  inc dl
  LOOP LOOPS

  mov ecx,20
  dec dl
  inc dh
  LOOPSS:
  call gotoxy
  mov al,124
  call writechar
  mov eax , 3
  call delay
  inc dh
  LOOP LOOPSS

  mov ecx,80
  LOOPPSS:
  call gotoxy
  mov al,61
  call writechar
  mov eax , 3
  call delay
  dec dl
  LOOP LOOPPSS


  mov ecx,20
  inc dl
  dec dh
  LOOPPSSS:
  call gotoxy
  mov al,124
  call writechar
  mov eax , 3
  call delay
  dec dh
  LOOP LOOPPSSS
  ret
Box endp

Box2 PROC
  mov ecx,65
  mov dl, 5       ; dl = x-axis column
                ; dh = y-axis row
  mov dh,15          ;row
  LOOPS:
  call gotoxy
  mov al,61       ;Ascii
  call writechar
  mov eax , 3
  call delay
  inc dl
  LOOP LOOPS

  mov ecx,8
  dec dl
  inc dh
  LOOPSS:
  call gotoxy
  mov al,124
  call writechar
  mov eax , 3
  call delay
  inc dh
  LOOP LOOPSS

  mov ecx,65
  LOOPPSS:
  call gotoxy
  mov al,61
  call writechar
  mov eax , 3
  call delay
  dec dl
  LOOP LOOPPSS


  mov ecx,8
  inc dl
  dec dh
  LOOPPSSS:
  call gotoxy
  mov al,124
  call writechar
  mov eax , 3
  call delay
  dec dh
  LOOP LOOPPSSS
  ret
Box2 endp

END main
```

Output:



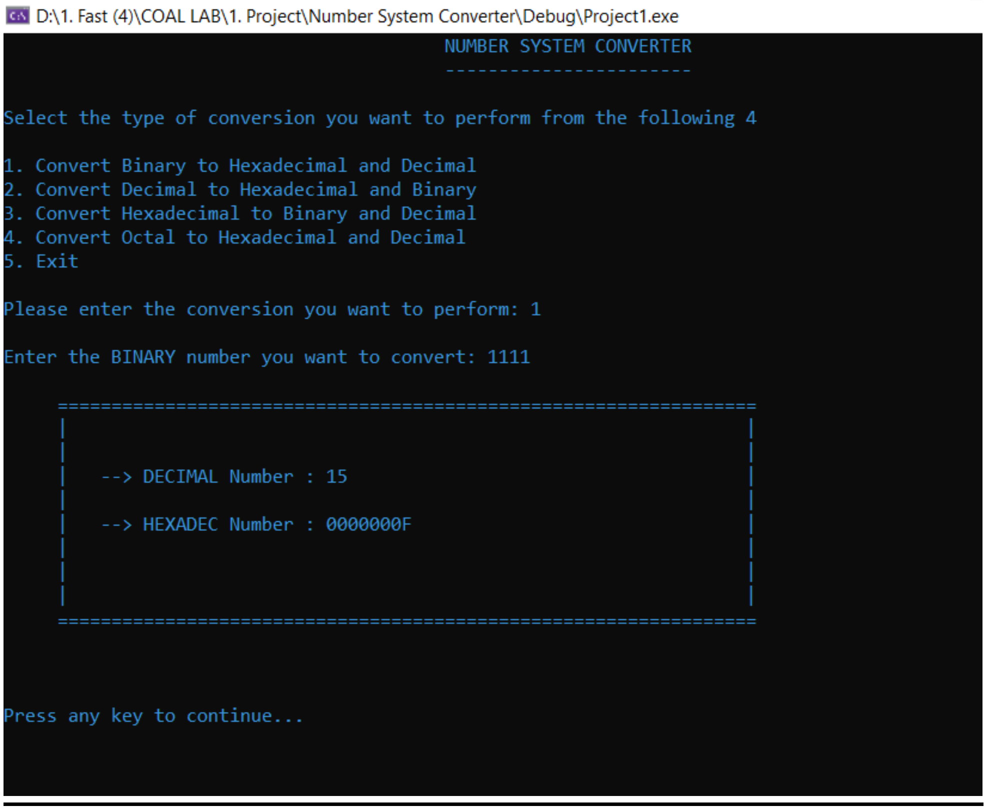
D:\1. Fast (4)\COAL LAB\1. Project\Number System Converter\Debug\Project1.exe

```
          ================================================================================
          |                                                                              |
          |                                                                              |
          |                                                                              |
          |                         NUMBER SYSTEM CONVERTER                              |
          |                         _______________________                              |
          |                                                                              |
          |                                                                              |
          |                                                                              |
          |                          *** GROUP MEMBERS ***                               |
          |                                                                              |
          |                        1.Hamza Jafri (20k-1669)                              |
          |                        2.Umer Vohra  (20k-1677)                              |
          |                        3.Bilal Mamji (20k-1702)                              |
          |                                                                              |
          |                                                                              |
          |                                                                              |
          |                                                                              |
          ================================================================================


Press any key to continue...
```



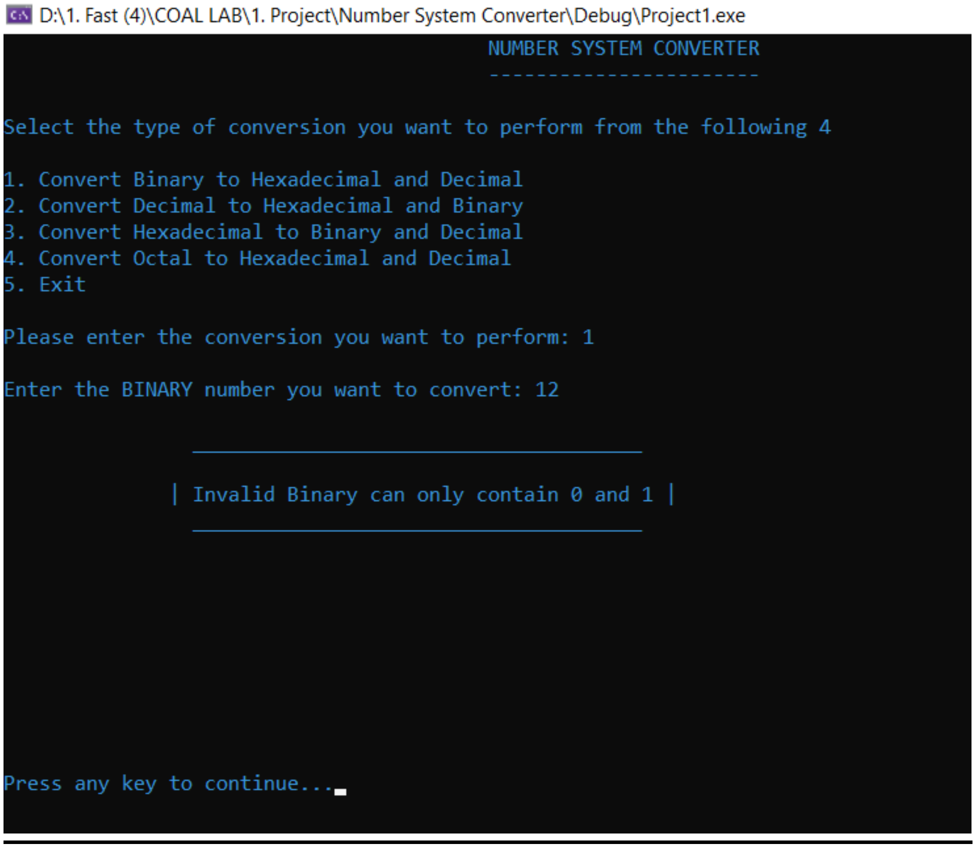
D:\1. Fast (4)\COAL LAB\1. Project\Number System Converter\Debug\Project1.exe

```
                                         NUMBER SYSTEM CONVERTER
                                         -----------------------

Select the type of conversion you want to perform from the following 4

1. Convert Binary to Hexadecimal and Decimal
2. Convert Decimal to Hexadecimal and Binary
3. Convert Hexadecimal to Binary and Decimal
4. Convert Octal to Hexadecimal and Decimal
5. Exit

Please enter the conversion you want to perform:

                 ______________________________________

                | Please select from the given options |
                 ______________________________________








Press any key to continue...
```



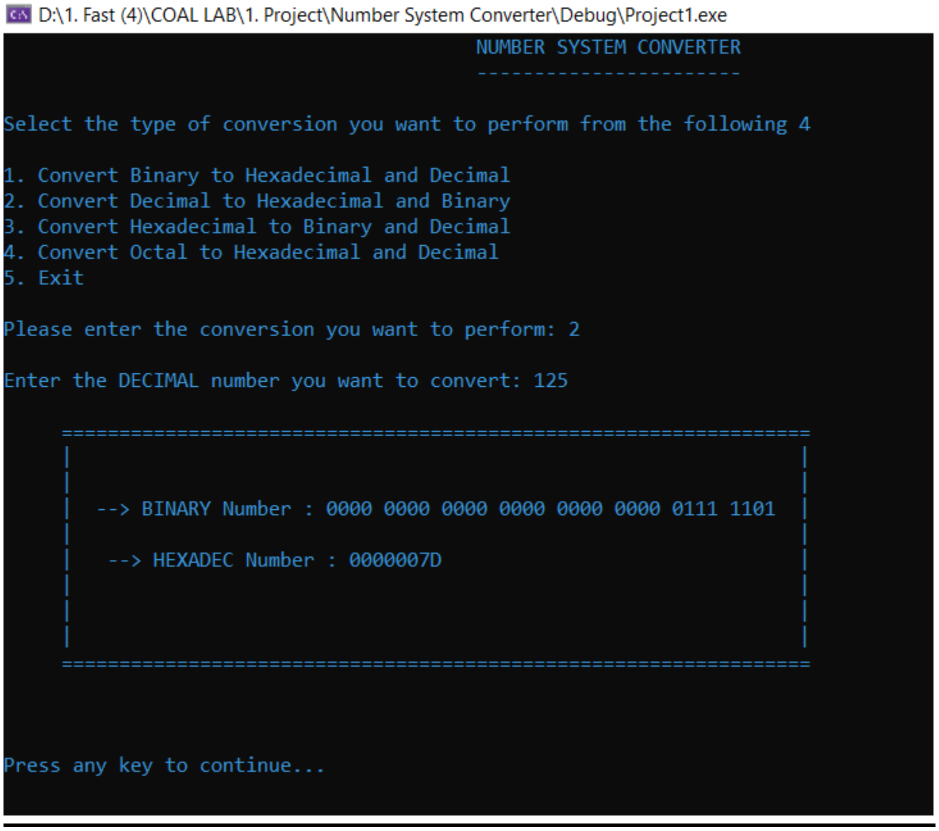
D:\1. Fast (4)\COAL LAB\1. Project\Number System Converter\Debug\Project1.exe

```
                                         NUMBER SYSTEM CONVERTER
                                         -----------------------

Select the type of conversion you want to perform from the following 4

1. Convert Binary to Hexadecimal and Decimal
2. Convert Decimal to Hexadecimal and Binary
3. Convert Hexadecimal to Binary and Decimal
4. Convert Octal to Hexadecimal and Decimal
5. Exit

Please enter the conversion you want to perform: 1

Enter the BINARY number you want to convert: 1111

     =================================================================
     |                                                               |
     |                                                               |
     |   --> DECIMAL Number : 15                                     |
     |                                                               |
     |   --> HEXADEC Number : 0000000F                               |
     |                                                               |
     |                                                               |
     |                                                               |
     =================================================================



Press any key to continue...
```



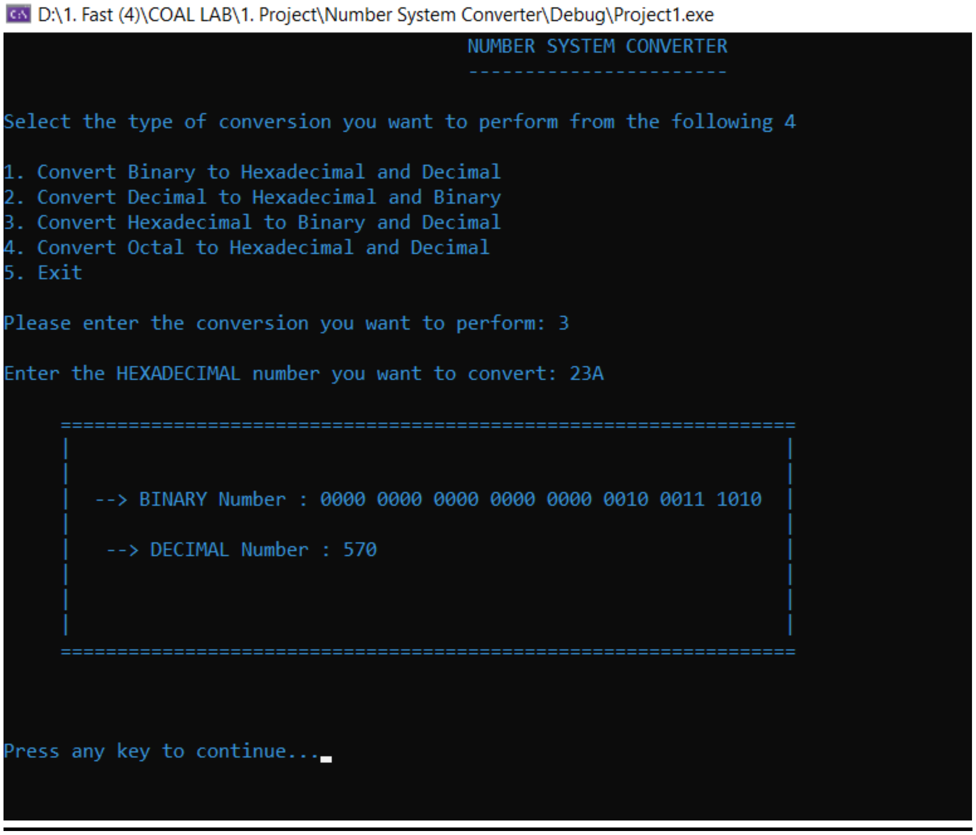
D:\1. Fast (4)\COAL LAB\1. Project\Number System Converter\Debug\Project1.exe

```
                                         NUMBER SYSTEM CONVERTER
                                         -----------------------

Select the type of conversion you want to perform from the following 4

1. Convert Binary to Hexadecimal and Decimal
2. Convert Decimal to Hexadecimal and Binary
3. Convert Hexadecimal to Binary and Decimal
4. Convert Octal to Hexadecimal and Decimal
5. Exit

Please enter the conversion you want to perform: 1

Enter the BINARY number you want to convert: 12

                ______________________________________

              | Invalid Binary can only contain 0 and 1 |
                ______________________________________







Press any key to continue...
```



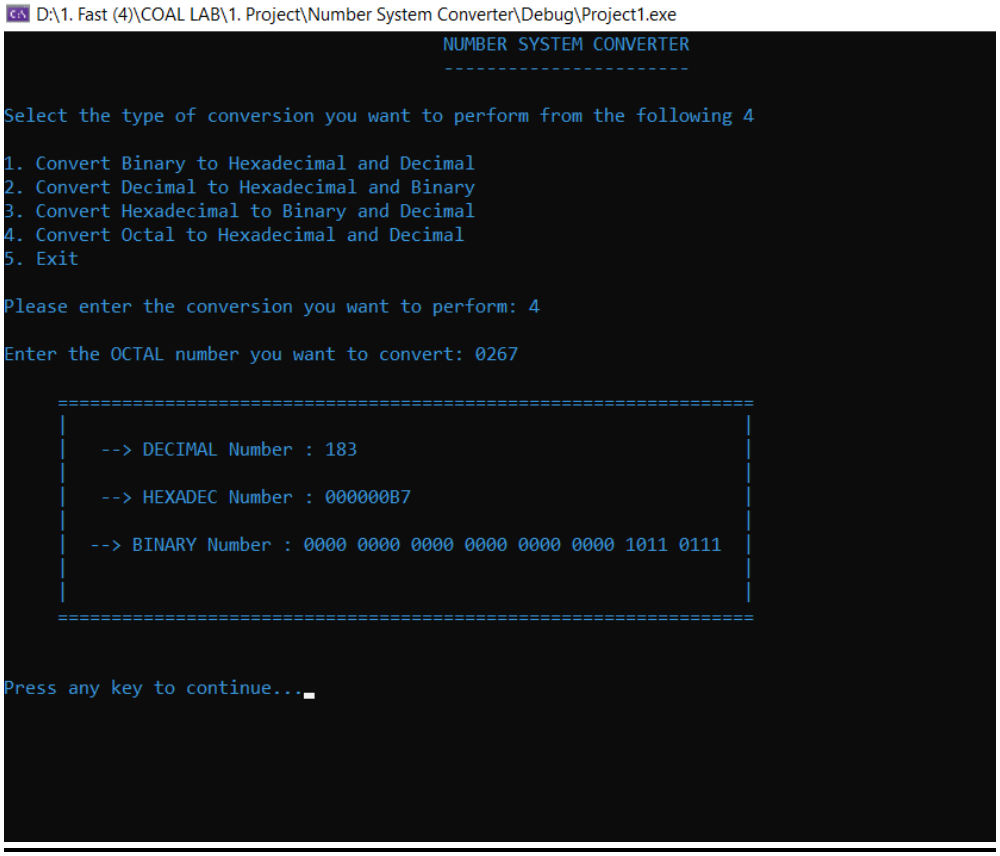
D:\1. Fast (4)\COAL LAB\1. Project\Number System Converter\Debug\Project1.exe

```
                                         NUMBER SYSTEM CONVERTER
                                         -----------------------

Select the type of conversion you want to perform from the following 4

1. Convert Binary to Hexadecimal and Decimal
2. Convert Decimal to Hexadecimal and Binary
3. Convert Hexadecimal to Binary and Decimal
4. Convert Octal to Hexadecimal and Decimal
5. Exit

Please enter the conversion you want to perform: 2

Enter the DECIMAL number you want to convert: 125

     =================================================================
     |                                                               |
     |                                                               |
     |  --> BINARY Number : 0000 0000 0000 0000 0000 0000 0111 1101  |
     |                                                               |
     |   --> HEXADEC Number : 0000007D                               |
     |                                                               |
     |                                                               |
     |                                                               |
     =================================================================



Press any key to continue...
```



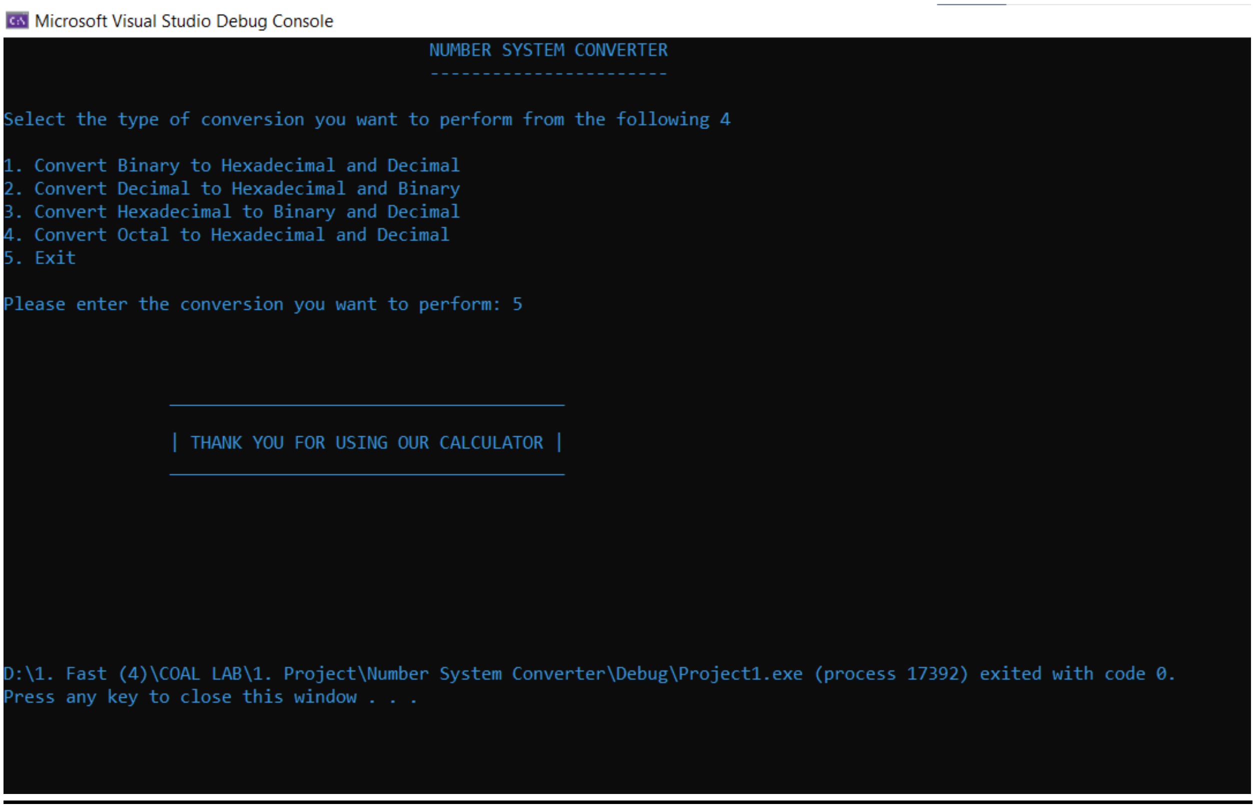
D:\1. Fast (4)\COAL LAB\1. Project\Number System Converter\Debug\Project1.exe

```
                                         NUMBER SYSTEM CONVERTER
                                         -----------------------

Select the type of conversion you want to perform from the following 4

1. Convert Binary to Hexadecimal and Decimal
2. Convert Decimal to Hexadecimal and Binary
3. Convert Hexadecimal to Binary and Decimal
4. Convert Octal to Hexadecimal and Decimal
5. Exit

Please enter the conversion you want to perform: 3

Enter the HEXADECIMAL number you want to convert: 23A

     =================================================================
     |                                                               |
     |                                                               |
     |  --> BINARY Number : 0000 0000 0000 0000 0000 0010 0011 1010  |
     |                                                               |
     |   --> DECIMAL Number : 570                                    |
     |                                                               |
     |                                                               |
     |                                                               |
     =================================================================



Press any key to continue...
```



D:\1. Fast (4)\COAL LAB\1. Project\Number System Converter\Debug\Project1.exe

```
                                         NUMBER SYSTEM CONVERTER
                                         -----------------------

Select the type of conversion you want to perform from the following 4

1. Convert Binary to Hexadecimal and Decimal
2. Convert Decimal to Hexadecimal and Binary
3. Convert Hexadecimal to Binary and Decimal
4. Convert Octal to Hexadecimal and Decimal
5. Exit

Please enter the conversion you want to perform: 4

Enter the OCTAL number you want to convert: 0267

     =================================================================
     |                                                               |
     |   --> DECIMAL Number : 183                                    |
     |                                                               |
     |   --> HEXADEC Number : 000000B7                               |
     |                                                               |
     |  --> BINARY Number : 0000 0000 0000 0000 0000 0000 1011 0111  |
     |                                                               |
     |                                                               |
     =================================================================


Press any key to continue...
```



Microsoft Visual Studio Debug Console

```
                                         NUMBER SYSTEM CONVERTER
                                         -----------------------

Select the type of conversion you want to perform from the following 4

1. Convert Binary to Hexadecimal and Decimal
2. Convert Decimal to Hexadecimal and Binary
3. Convert Hexadecimal to Binary and Decimal
4. Convert Octal to Hexadecimal and Decimal
5. Exit

Please enter the conversion you want to perform: 5



                ______________________________________

                | THANK YOU FOR USING OUR CALCULATOR |
                ______________________________________






D:\1. Fast (4)\COAL LAB\1. Project\Number System Converter\Debug\Project1.exe (process 17392) exited with code 0.
Press any key to close this window . . .
```