Expt No.: 3
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CYCLE SHEET 3
(Based on Functions)

Aim:
To solve the given problem using C.

Q. Design a number converter system

Code:

```c
// Number converter system in C
// Cycle sheet 3 program
// Maximum 50 digits for each representation
// Doesn't convert decimals

# include <stdio.h>
# include <stdlib.h>
# include <math.h>
# define N 50

int m_to_decimal(char arr[], int m, int l);
void decimal_to_n(int num, int n);
int valid(char arr[], int m, int l);

int main()
{
    int m, n, l = 0, status, QW;
   char number[N];

    printf("\n------ PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N ------\n");
    printf("2 <= m,n <= 16\n\n");

    printf("Enter m: ");
    status = scanf("%d", &m);
    fflush(stdin);

    while (status == 0 || m < 2 || m > 16)
    {
        printf("Invalid input! Enter m: ");
        status = scanf("%d", &m);
        fflush(stdin);
    }

    printf("\nEnter n: ");
    status = scanf("%d", &n);
    fflush(stdin);

    while (status == 0 || n < 2 || n > 16)
    {
        printf("Invalid input! Enter n: ");
        status = scanf("%d", &n);
        fflush(stdin);
    }
```

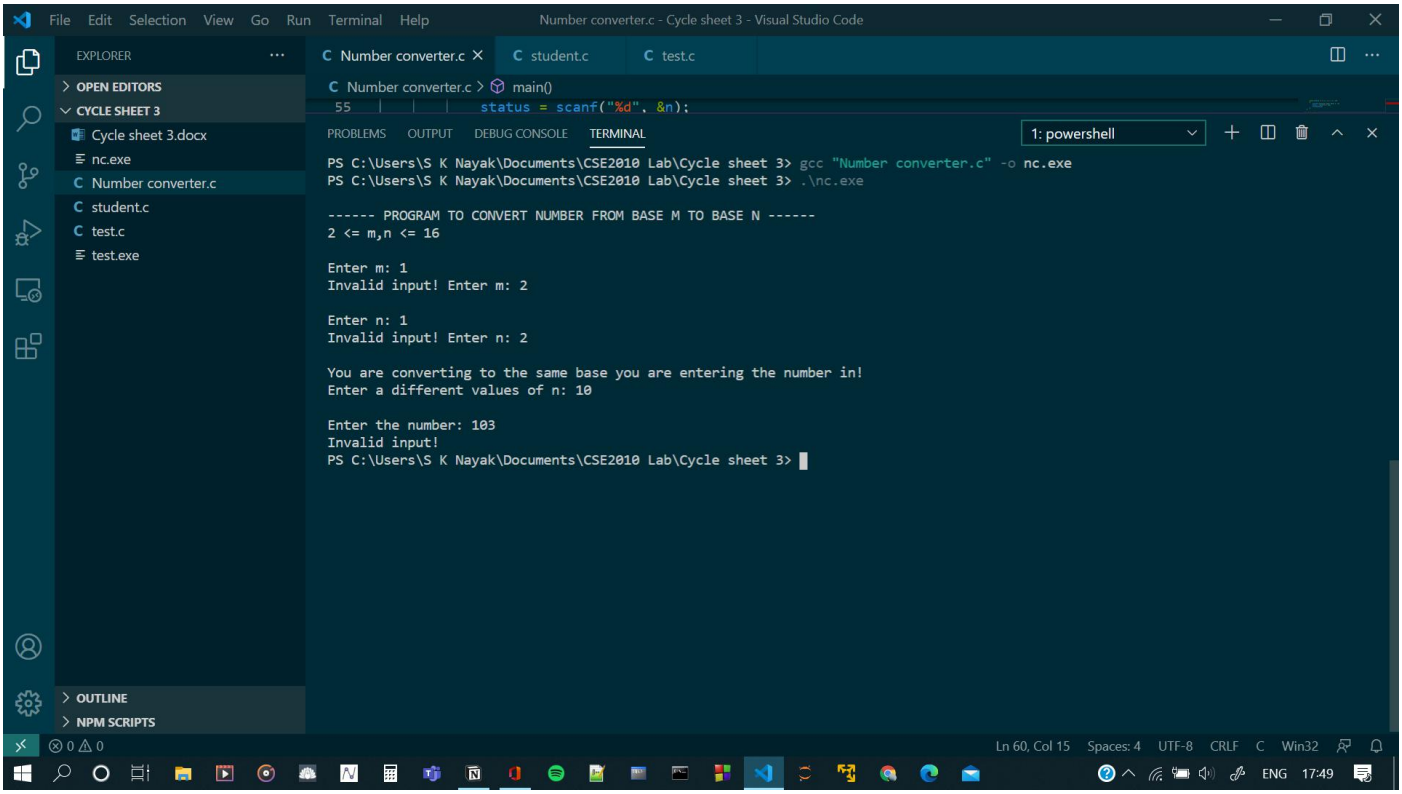
```c
    while(m == n)
    {
        printf("\nYou are converting to the same base you are entering the number in!\
n");
        printf("Enter a different values of n: ");
        status = scanf("%d", &n);
        fflush(stdin);

        while (status == 0 || n < 2 || n > 16)
        {
            printf("\nInvalid input! Enter n: ");
            status = scanf("%d", &n);
            fflush(stdin);
        }
    }

    printf("\nEnter the number: ");
    fgets(number, N - 1, stdin);

    for(l = 0; number[l] != '\n'; l++);

    //printf("%d\n", l);

    if(valid(number, m, l) == 0)
    {
        printf("Invalid input!\n");
        return -1;
    }
    else
    {
        QW = m_to_decimal(number, m, l);
        //printf("%d\n", QW);
        printf("\nThe resulting number is: \n");
        decimal_to_n(QW, n);
        return 0;
    }
}

// Function to convert between base m and decimal
// Where 1 < m <= 16
// Input is character array of length l
int m_to_decimal(char arr[], int m, int l)
{
    char residue[16] = { '0', '1', '2', '3', '4', '5', '6', '7', '8', '9', 'A', 'B', '
C', 'D', 'E', 'F'};
    int weight[N];
    int i, j, num = 0;

    // Getting the weights
    for(i = 0; i < l; i++)
    {
        for(j = 0; j < 16; j++)
        {
            if(arr[i] == residue[j])
            {
                weight[i] = j;
            }
        }
```

```
    }

    // Converting the number to decimal
    for(i = 0; i < l; i++)
    {
        num += weight[i]*pow(m, l-1-i);
    }

    return num;
}

// Function to convert the number from base 10 to base n
// Where 1 < n <= 16
// Input is decimal number n
void decimal_to_n(int num, int n)
{
    char residue[16] = { '0', '1', '2', '3', '4', '5', '6', '7', '8', '9', 'A', 'B', '
C', 'D', 'E', 'F'};
    char c[N], converted[N];
    int i = 0, j, rem, temp;

    while (num != 0)
    {
        rem = num % n;
        c[i] = residue[rem];
        num /= n;
        i++;
    }

    c[i] = '\0';
    converted[i] = '\0';

    for(j = 0; c[j] != '\0'; j++)
    {
        converted[i-1-j] = c[j];
    }

    printf("%s\n\n", converted);
}

// Function to check is input is valid
// Takes input of given character array, length of string and base n and returns outpu
t.

int valid(char arr[], int m, int l)
{
    char residue[16] = { '0', '1', '2', '3', '4', '5', '6', '7', '8', '9', 'A', 'B', '
C', 'D', 'E', 'F'};
    int i, j, flag = 0;

    for(i = 0; i < l; i++)
    {
        for(j = 0; j < m; j++)
        {
            if(arr[i] == residue[j])
            {
                flag = 1;
                break;
            }
```

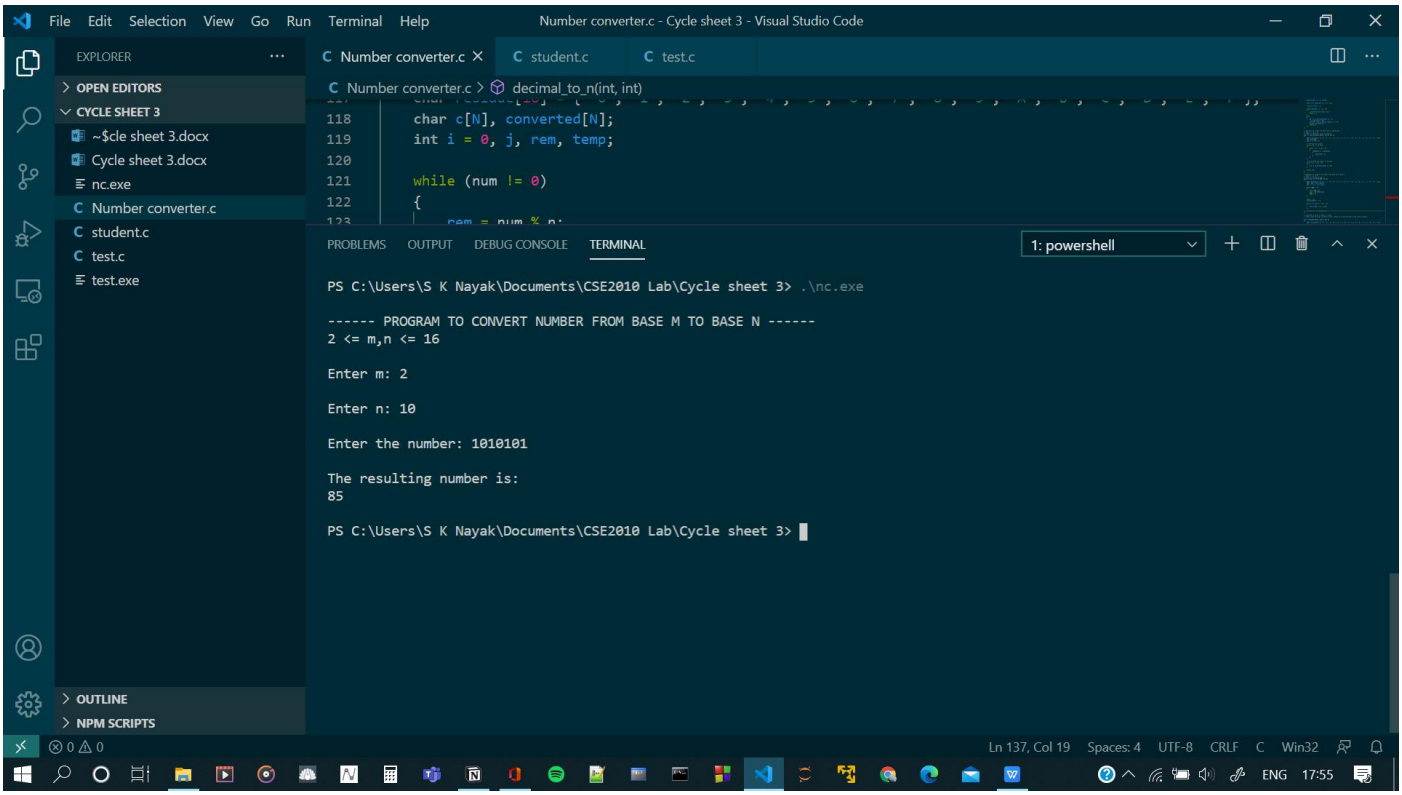
```
        }
        if(flag == 0)
        {
            return flag;
        }
        if (i != l-1)
        {
            flag = 0;
        }
    }
    return flag;
}
```

Output:

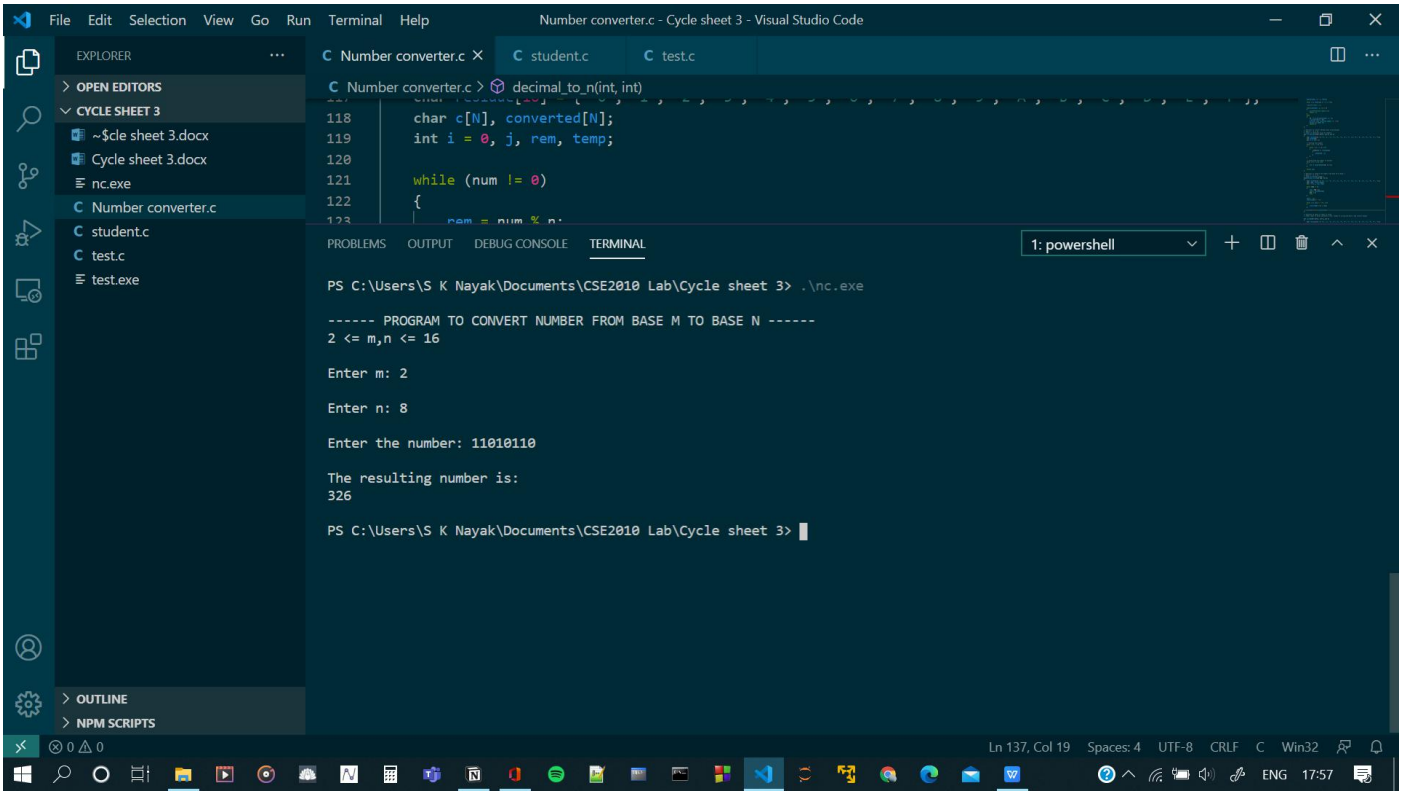
Input validation :-



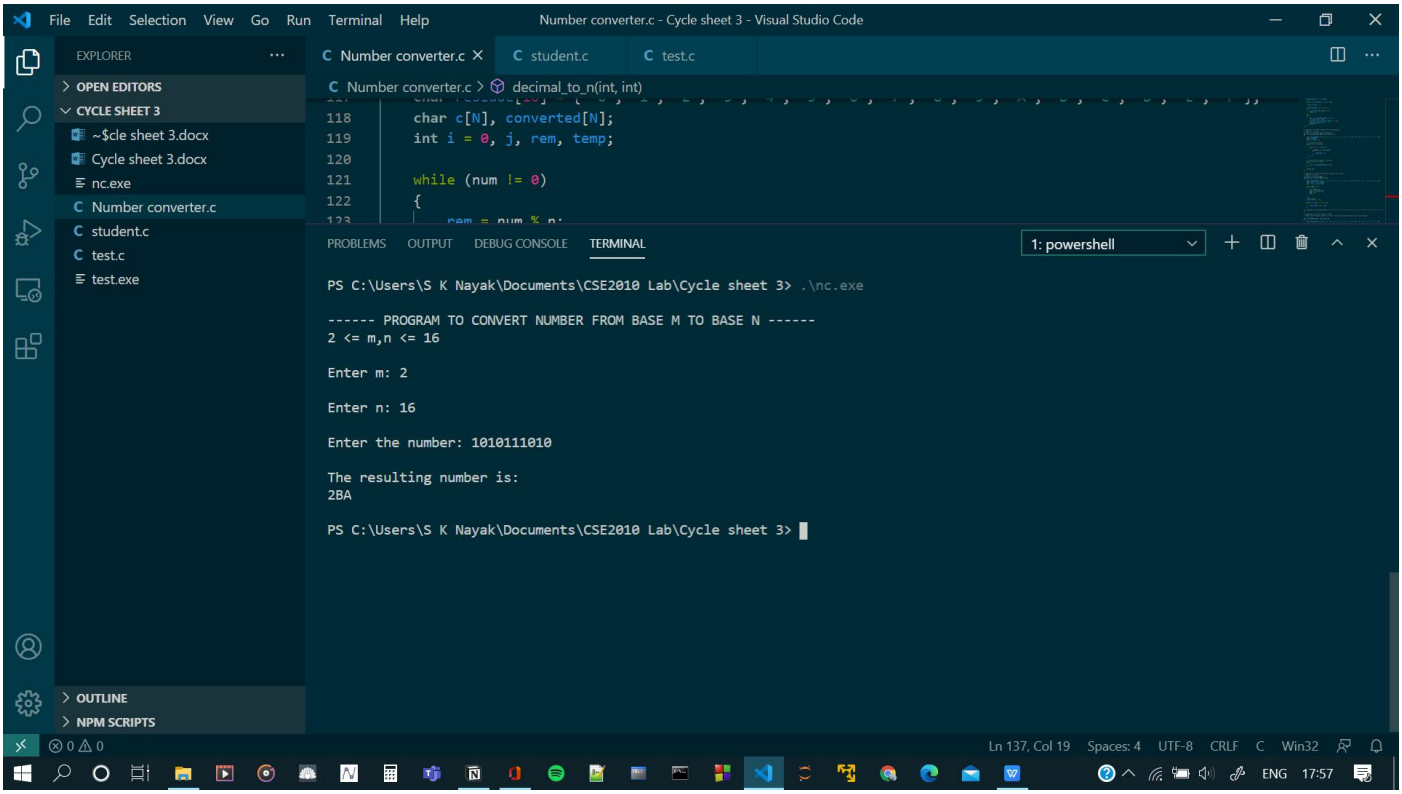
1. Binary to Decimal



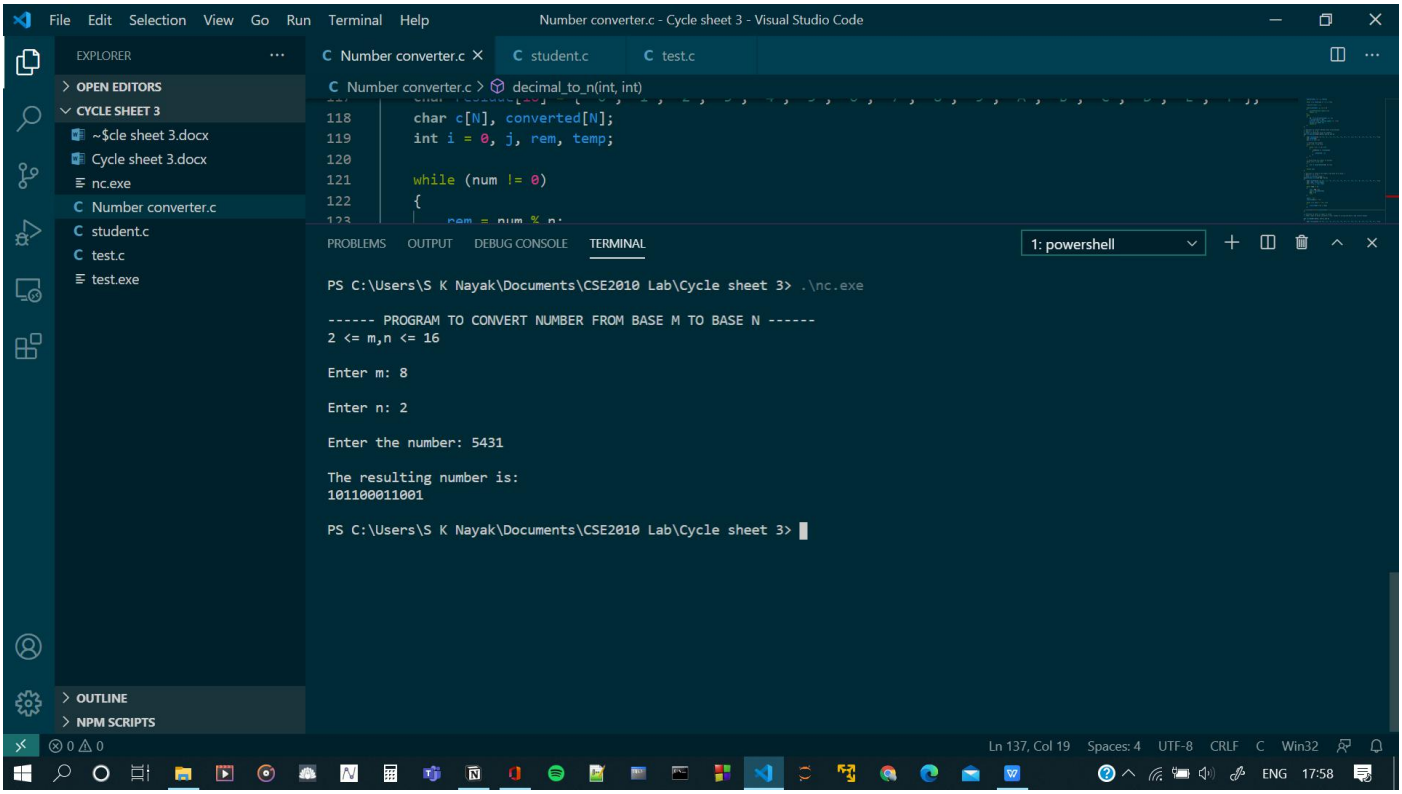
2. Binary to Octal



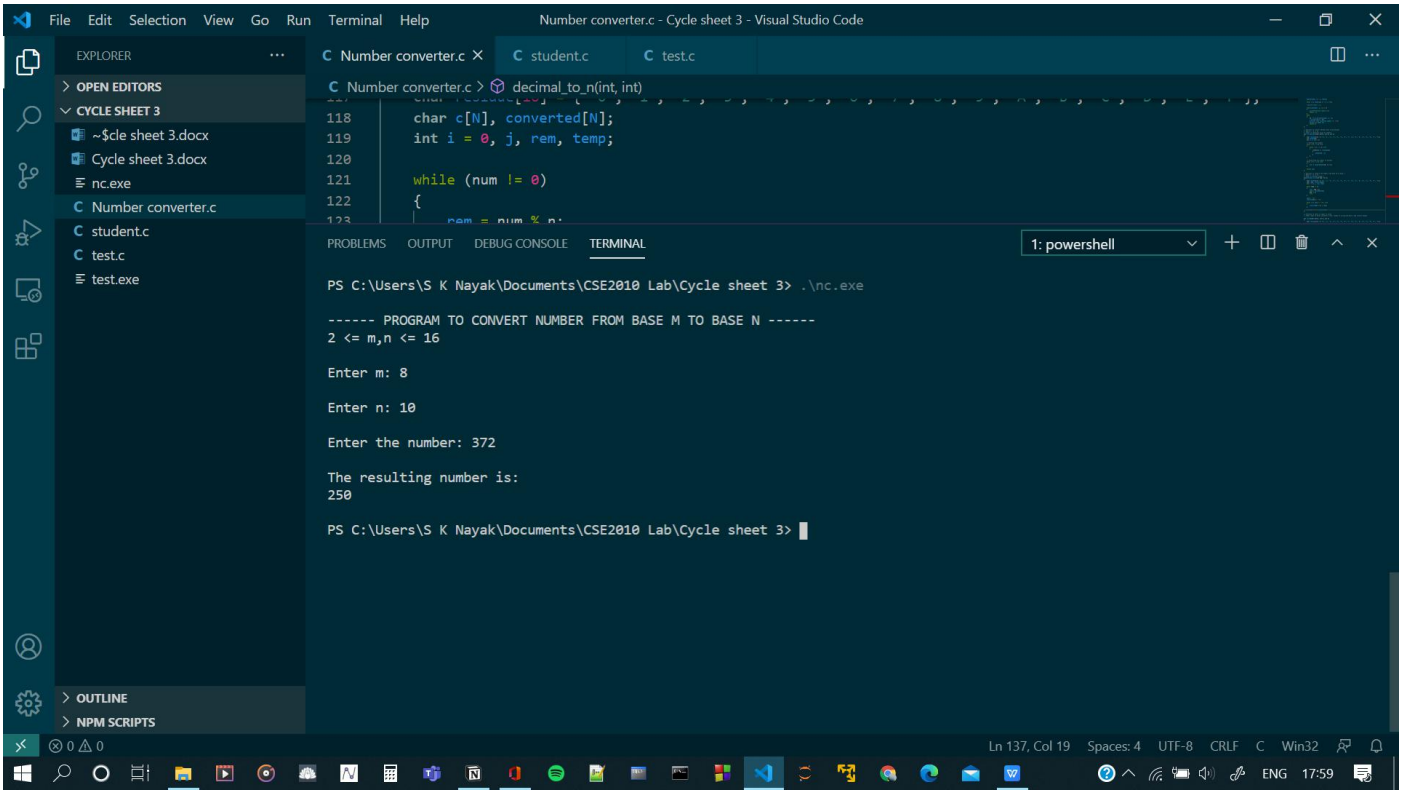
3. Binary to Hexadecimal



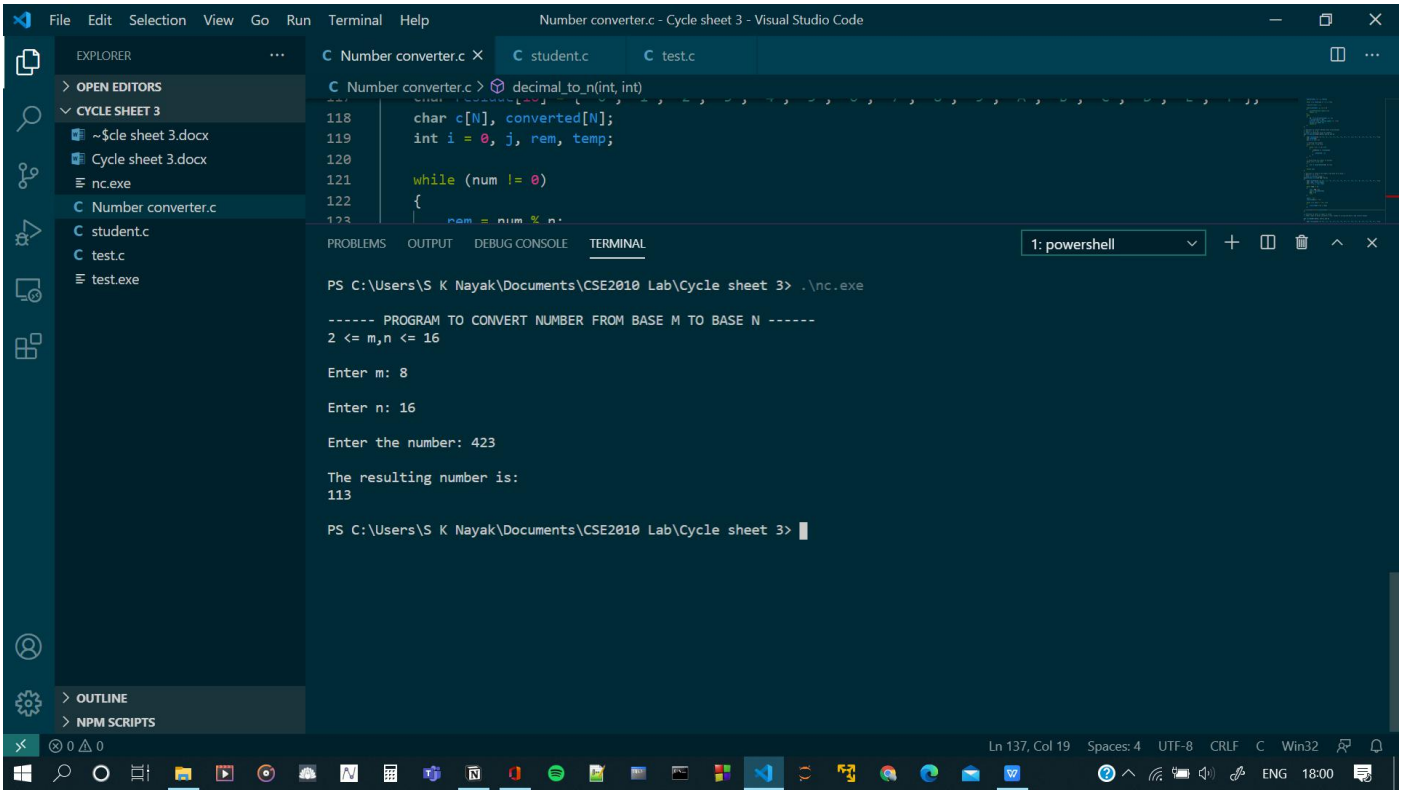
4. Octal to Binary



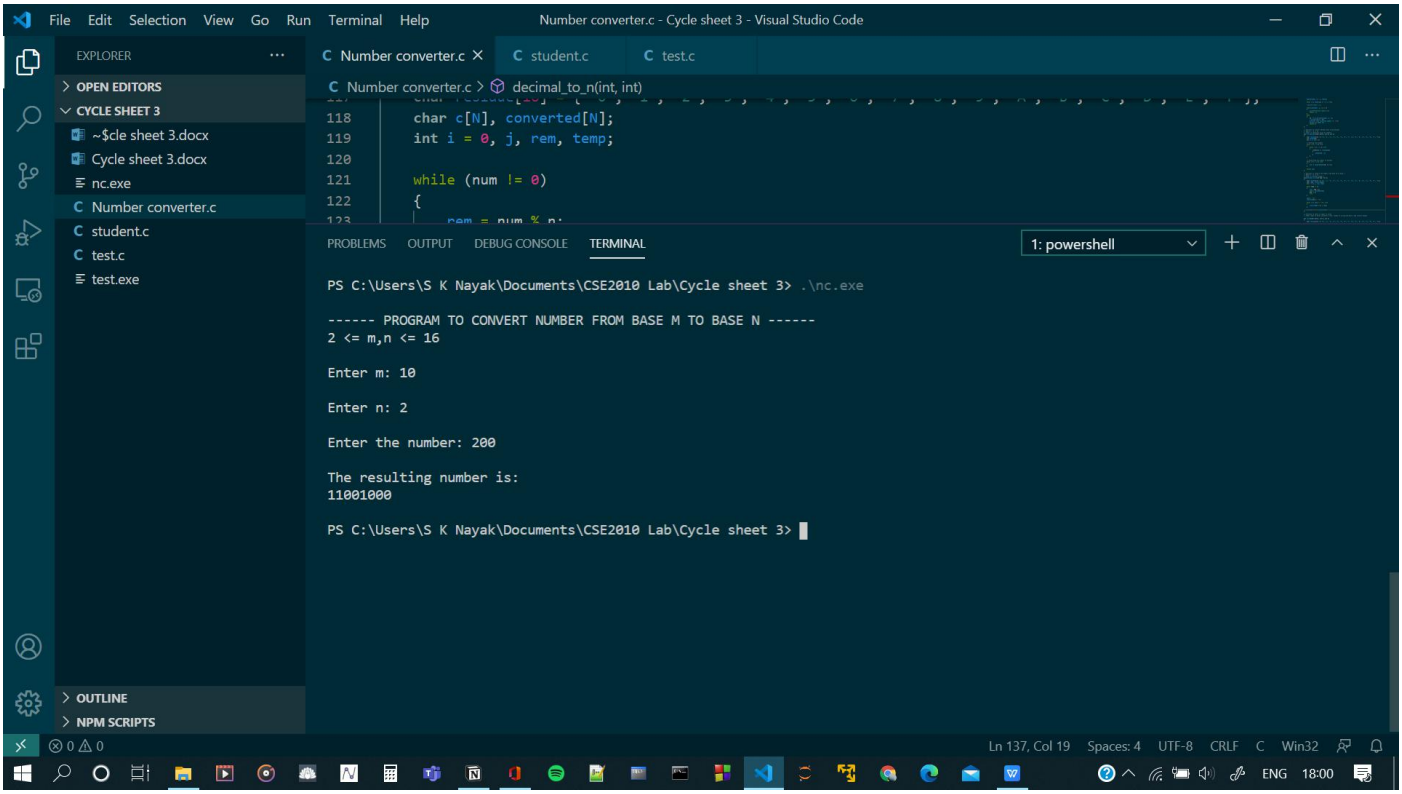
5. Octal to Decimal



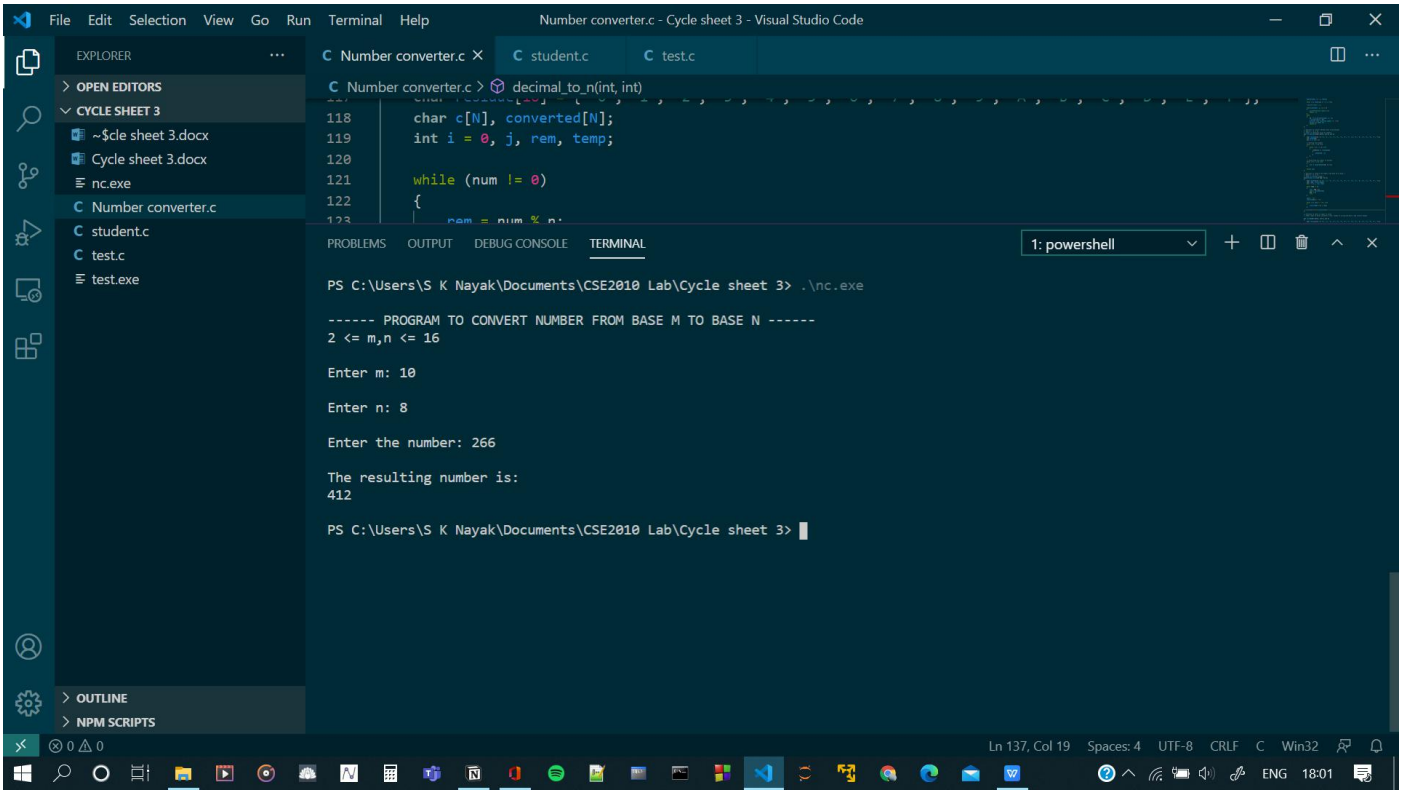
6. Octal to Hexadecimal



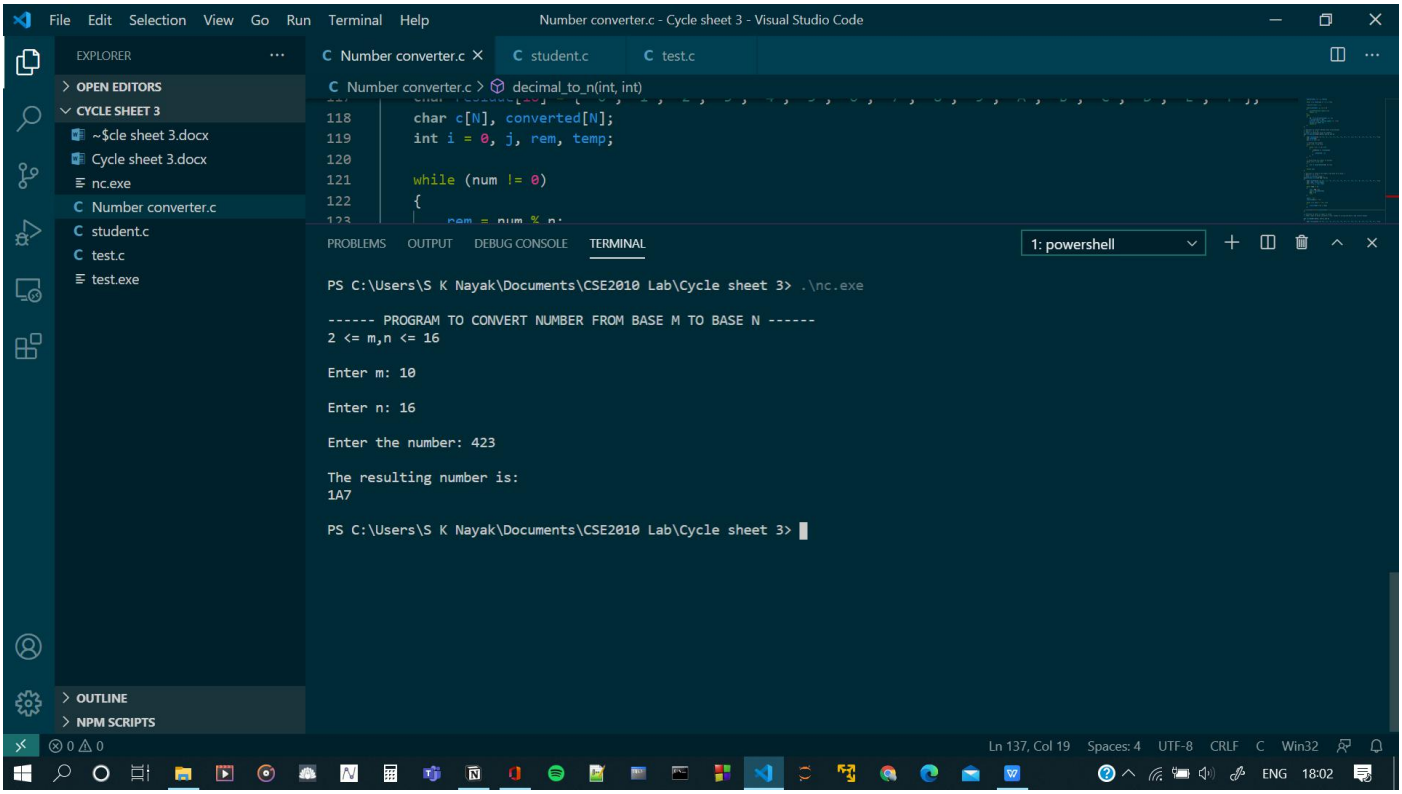
7. Decimal to Binary



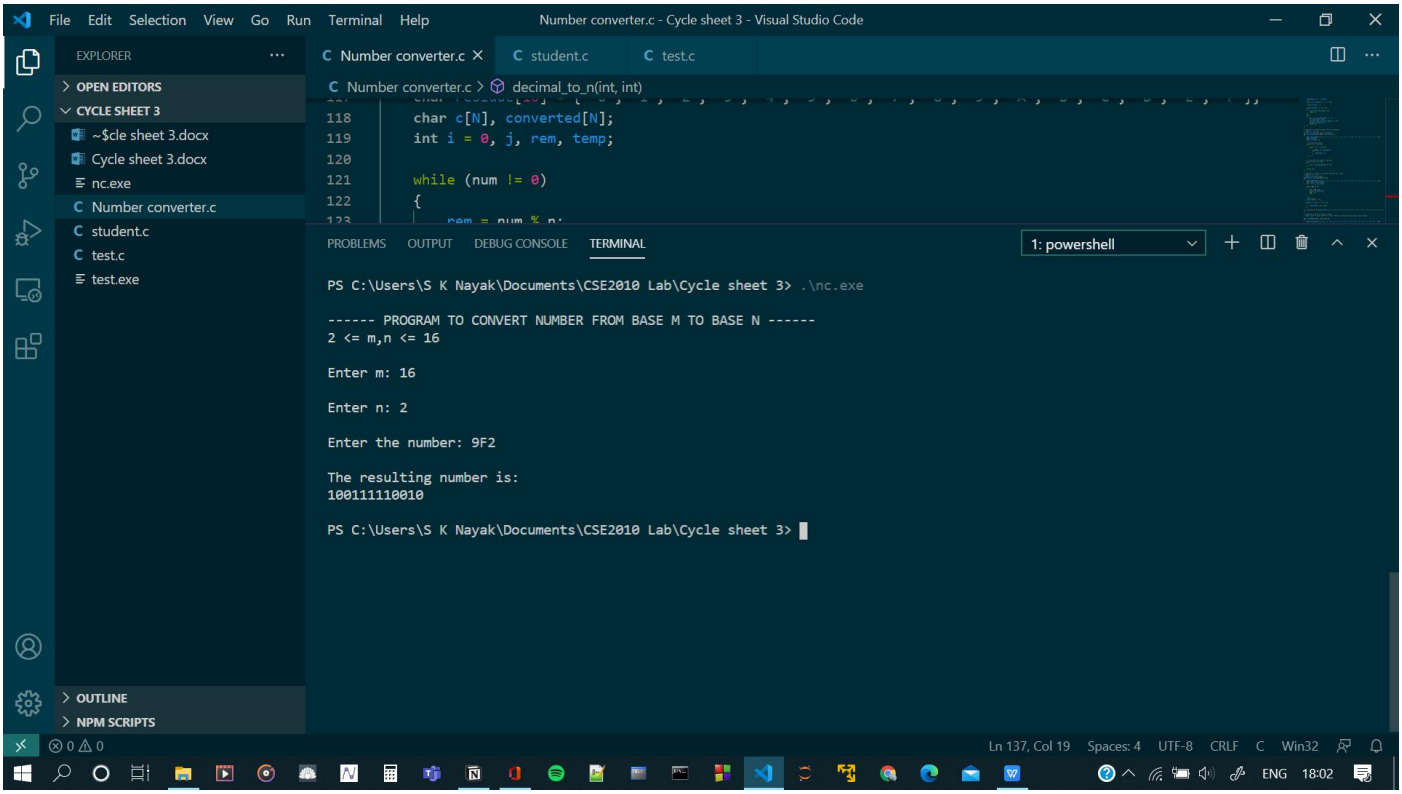
8. Decimal to Octal



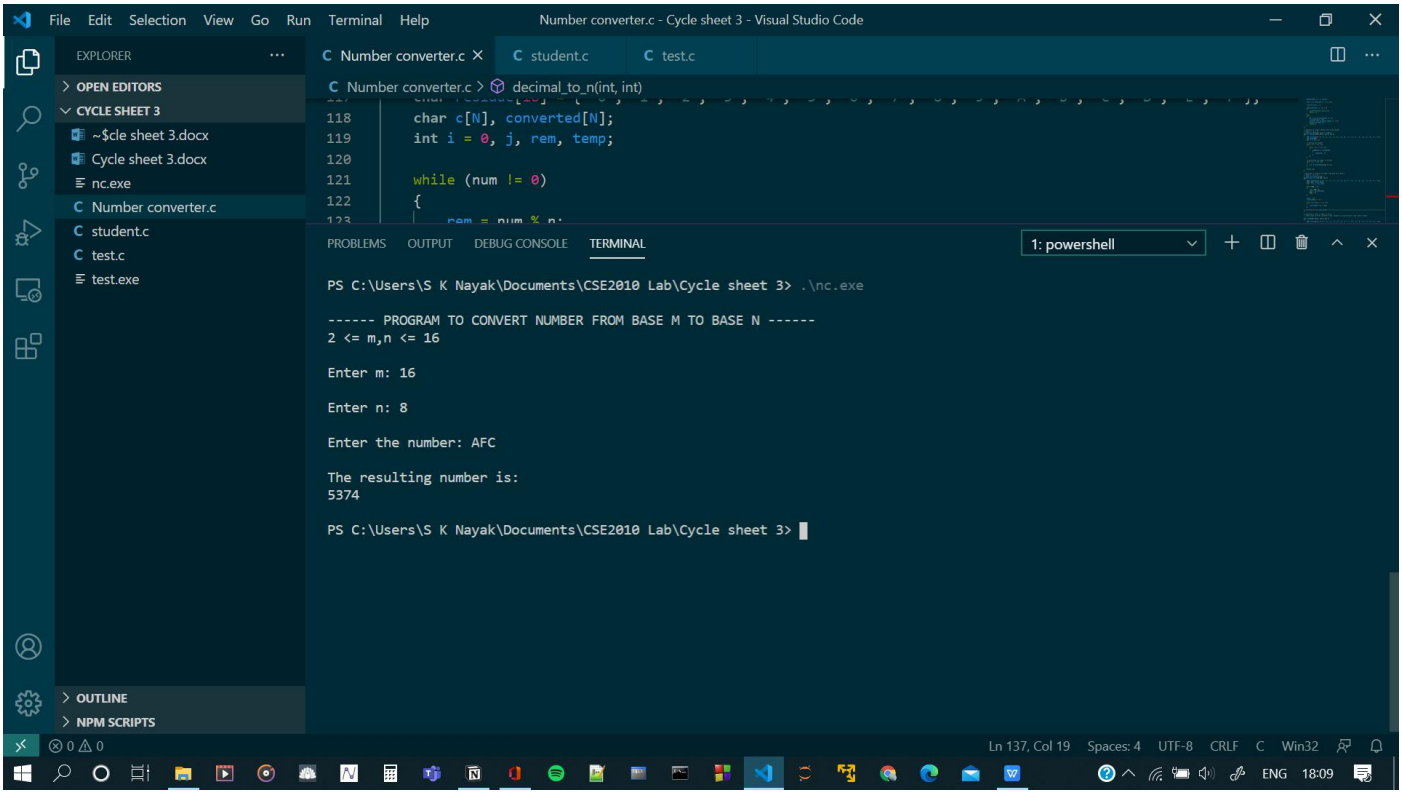
9. Decimal to Hexadecimal



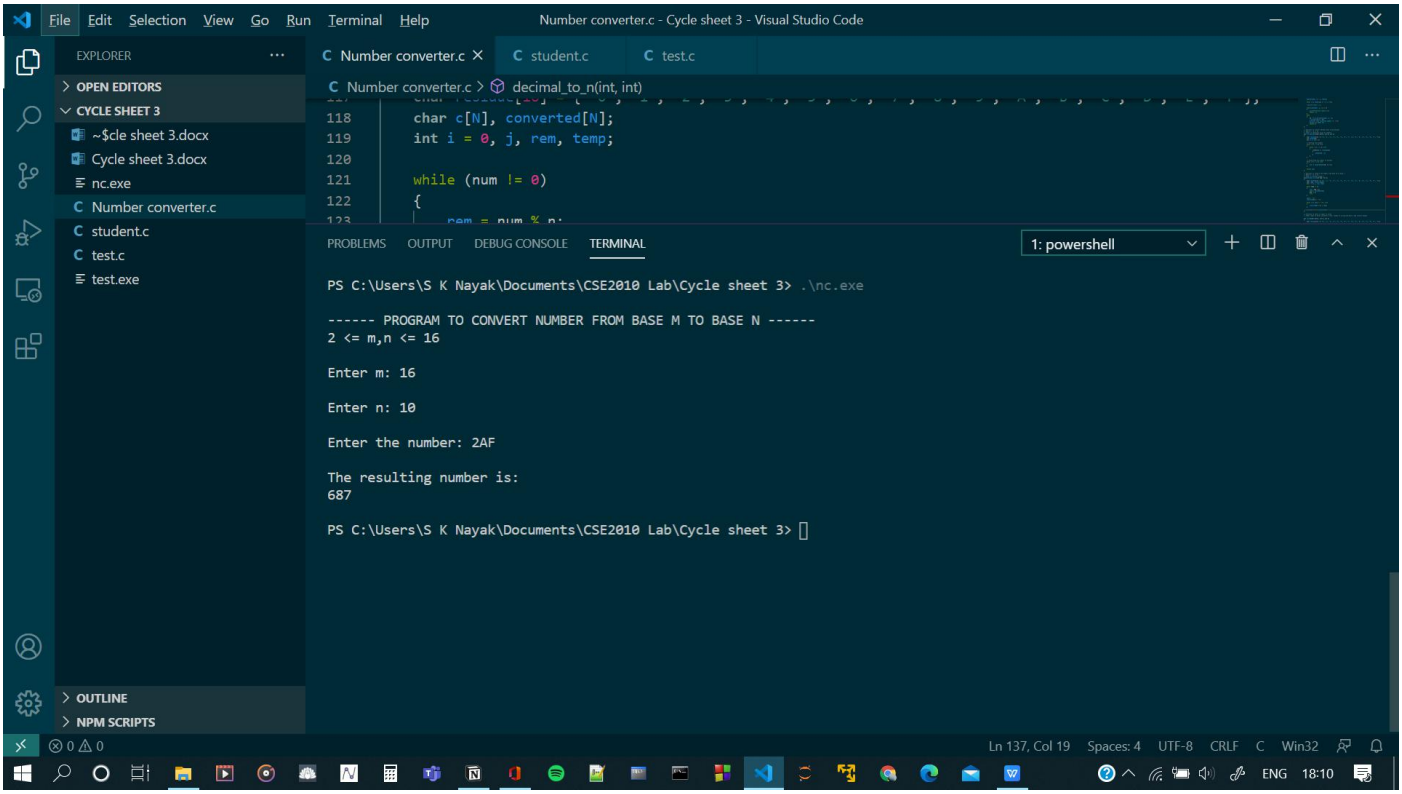
10. Hexadecimal to Binary



11. Hexadecimal to Octal



12. Hexadecimal to Decimal



13. General Conversions (base less than 16)