

Expt No.: 3
Date: 28/08/2020

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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:

```
// 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);
    }
}
```

```

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 output.
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 :-

```

C Number converter.c X  C student.c  C test.c
C Number converter.c > main()
55 | status = scanf("%d", &n);
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> gcc "Number converter.c" -o nc.exe
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe

----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 1
Invalid input! Enter m: 2

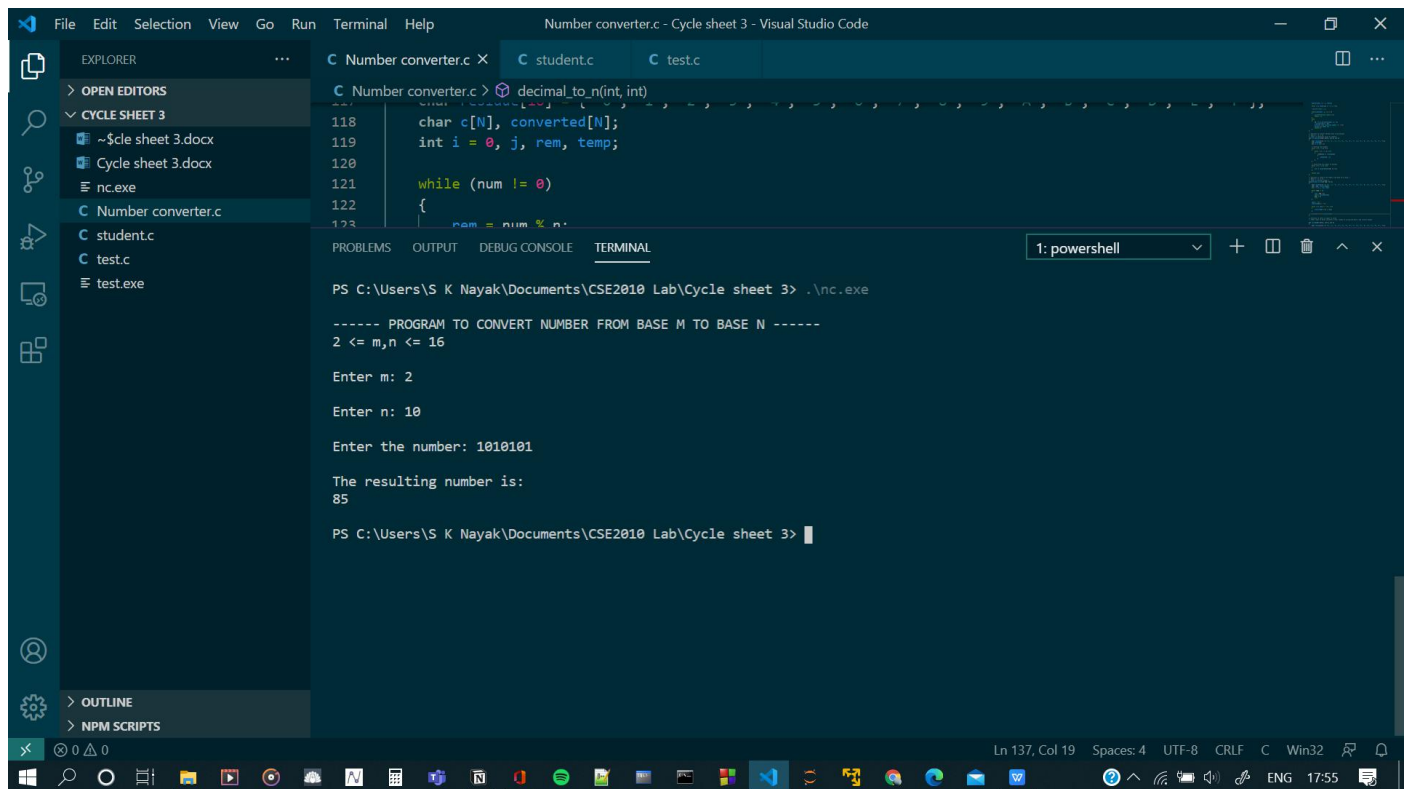
Enter n: 1
Invalid input! Enter n: 2

You are converting to the same base you are entering the number in!
Enter a different values of n: 10

Enter the number: 103
Invalid input!
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>

```

1. Binary to Decimal



```
File Edit Selection View Go Run Terminal Help
Number converter.c - Cycle sheet 3 - Visual Studio Code

EXPLORER
  OPEN EDITORS
  CYCLE SHEET 3
    ~$cle sheet 3.docx
    Cycle sheet 3.docx
    nc.exe
    Number converter.c
  student.c
  test.c
  test.exe

OUTLINE
NPM SCRIPTS

C Number converter.c X C student.c C test.c
C Number converter.c > decimal_to_n(int, int)
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;
124     converted[i] = c[rem];
125     i++;
126     num = num / n;
127 }
128 converted[i] = '\0';
129 for (j = i - 1; j >= 0; j--)
130     printf("%c", converted[j]);
131 printf("\n");
132 }
```

```
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe

----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 2

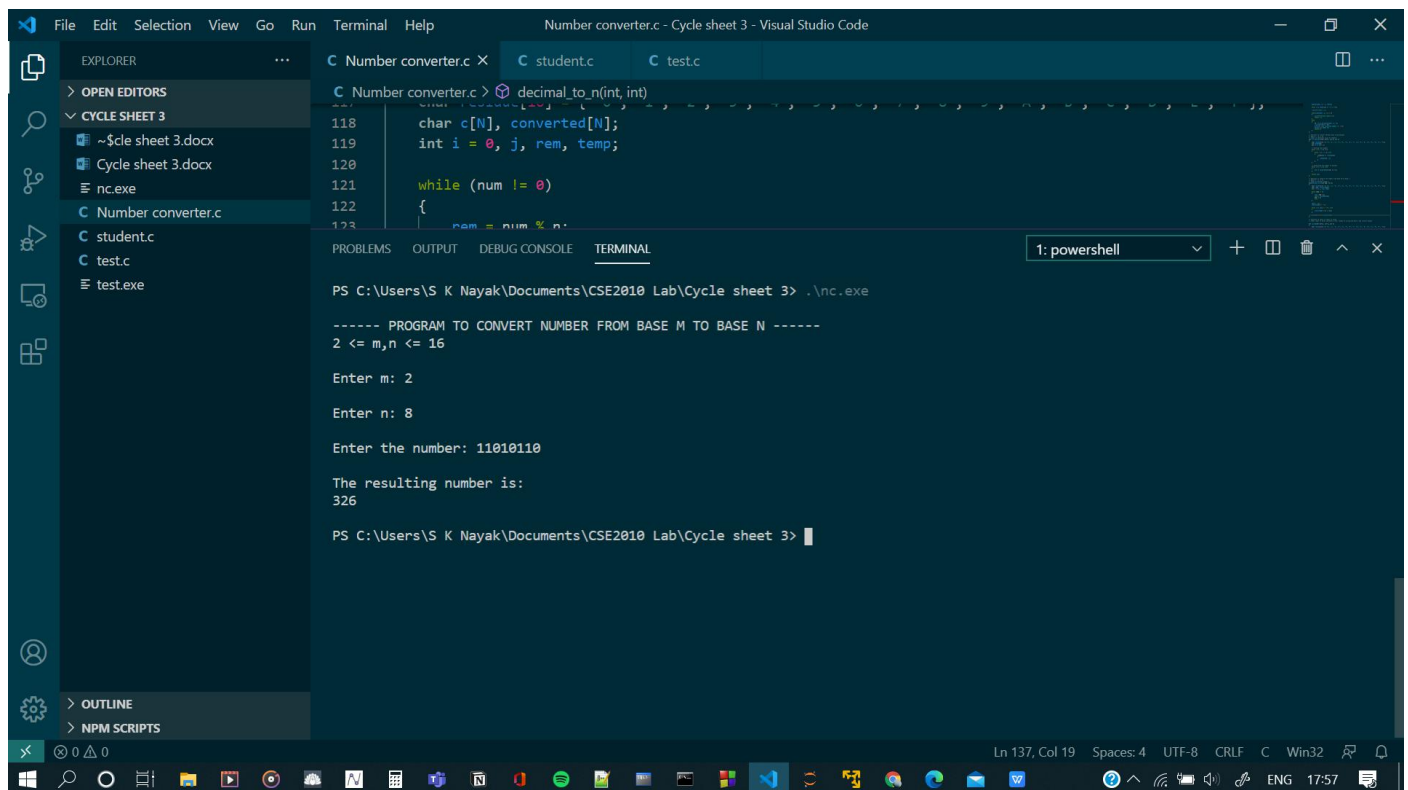
Enter n: 10

Enter the number: 1010101

The resulting number is:
85

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```

2. Binary to Octal



```
File Edit Selection View Go Run Terminal Help
Number converter.c - Cycle sheet 3 - Visual Studio Code

EXPLORER
  OPEN EDITORS
  CYCLE SHEET 3
    ~$cle sheet 3.docx
    Cycle sheet 3.docx
    nc.exe
    Number converter.c
  student.c
  test.c
  test.exe

OUTLINE
NPM SCRIPTS

C Number converter.c X C student.c C test.c
C Number converter.c > decimal_to_n(int, int)
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;
124     converted[i] = c[rem];
125     i++;
126     num = num / n;
127 }
128 converted[i] = '\0';
129 for (j = i - 1; j >= 0; j--)
130     printf("%c", converted[j]);
131 printf("\n");
132 }
```

```
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe

----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 2

Enter n: 8

Enter the number: 11010110

The resulting number is:
326

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```

3. Binary to Hexadecimal

```
File Edit Selection View Go Run Terminal Help
Number converter.c - Cycle sheet 3 - Visual Studio Code

EXPLORER
  OPEN EDITORS
  CYCLE SHEET 3
    ~$cle sheet 3.docx
    Cycle sheet 3.docx
    nc.exe
    Number converter.c
    student.c
    test.c
    test.exe

OUTLINE
NPM SCRIPTS

C Number converter.c X C student.c C test.c
C Number converter.c > decimal_to_n(int, int)
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
1: powershell

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe

----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 2

Enter n: 16

Enter the number: 1010111010

The resulting number is:
2BA

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```

4. Octal to Binary

```
File Edit Selection View Go Run Terminal Help
Number converter.c - Cycle sheet 3 - Visual Studio Code

EXPLORER
  OPEN EDITORS
  CYCLE SHEET 3
    ~$cle sheet 3.docx
    Cycle sheet 3.docx
    nc.exe
    Number converter.c
    student.c
    test.c
    test.exe

OUTLINE
NPM SCRIPTS

C Number converter.c X C student.c C test.c
C Number converter.c > decimal_to_n(int, int)
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
1: powershell

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe

----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 8

Enter n: 2

Enter the number: 5431

The resulting number is:
101100011001

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```

5. Octal to Decimal

The screenshot shows the Visual Studio Code interface with the following components:

- EXPLORER:** Lists files including `~$cle sheet 3.docx`, `Cycle sheet 3.docx`, `nc.exe`, `Number converter.c`, `student.c`, `test.c`, and `test.exe`.
- EDITOR:** Displays the source code for `Number converter.c`. The visible code includes:

```
118     char c[N], converted[N];  
119     int i = 0, j, rem, temp;  
120  
121     while (num != 0)  
122     {  
123         rem = num % n;
```
- TERMINAL:** Shows the execution of `nc.exe` in a PowerShell session. The output is:

```
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe  
  
----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----  
2 <= m,n <= 16  
  
Enter m: 8  
  
Enter n: 10  
  
Enter the number: 372  
  
The resulting number is:  
250  
  
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```
- STATUS BAR:** Indicates the current line is 137, column 19, with 4 spaces, UTF-8 encoding, CRLF line endings, and Win32 architecture. The system clock shows 17:59.

6. Octal to Hexadecimal

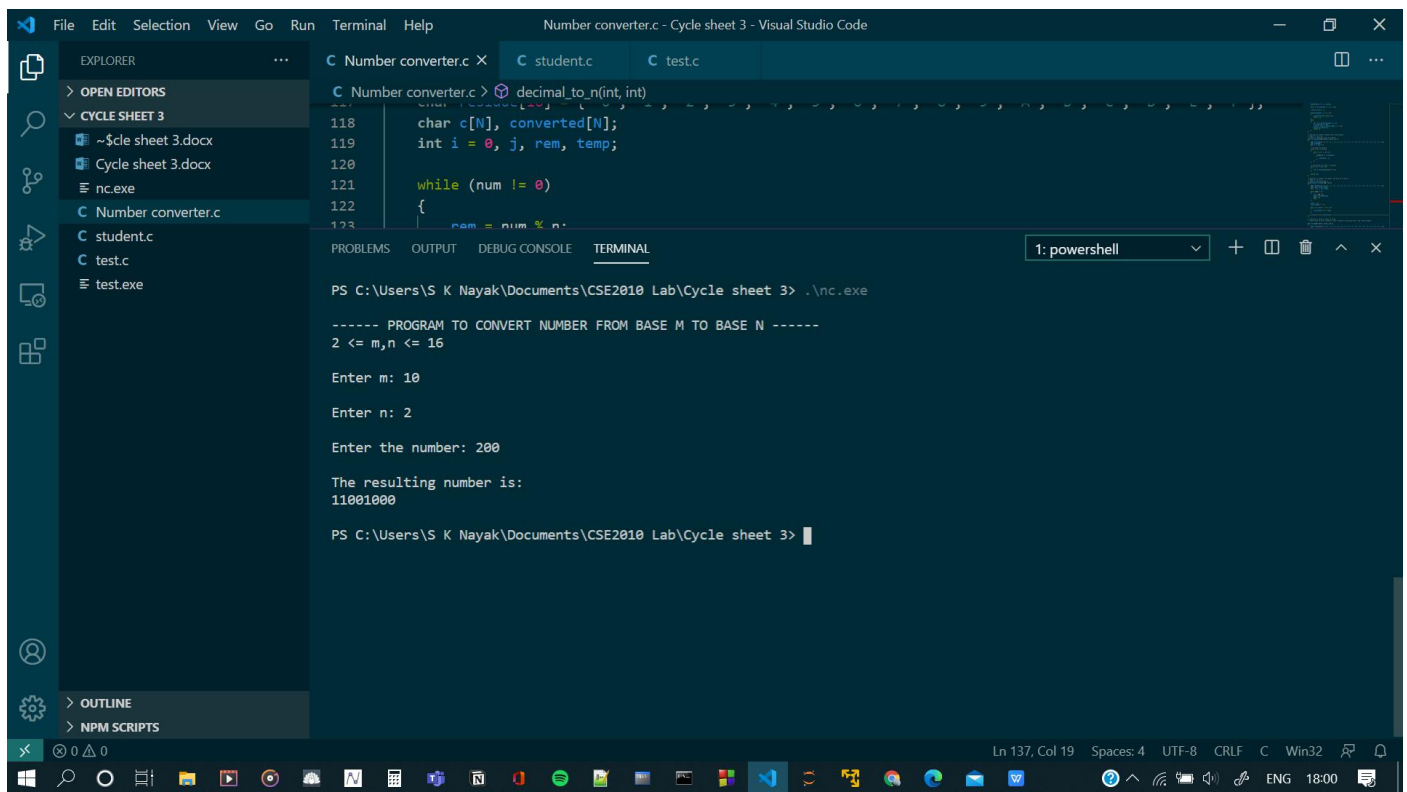
The screenshot shows the Visual Studio Code interface with the following components:

- EXPLORER:** Lists files including `~$cle sheet 3.docx`, `Cycle sheet 3.docx`, `nc.exe`, `Number converter.c`, `student.c`, `test.c`, and `test.exe`.
- EDITOR:** Displays the source code for `Number converter.c`. The visible code includes:

```
118     char c[N], converted[N];  
119     int i = 0, j, rem, temp;  
120  
121     while (num != 0)  
122     {  
123         rem = num % n;
```
- TERMINAL:** Shows the execution of `nc.exe` in a PowerShell session. The output is:

```
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe  
  
----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----  
2 <= m,n <= 16  
  
Enter m: 8  
  
Enter n: 16  
  
Enter the number: 423  
  
The resulting number is:  
113  
  
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```
- STATUS BAR:** Indicates the current line is 137, column 19, with 4 spaces, UTF-8 encoding, CRLF line endings, and Win32 architecture. The system clock shows 18:00.

7. Decimal to Binary



The screenshot shows the Visual Studio Code interface with the following components:

- EXPLORER:** Lists files including `Cycle sheet 3.docx`, `nc.exe`, `Number converter.c`, `student.c`, `test.c`, and `test.exe`.
- EDITOR:** Displays the source code for `Number converter.c`. The visible code includes:

```
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;
```
- TERMINAL:** Shows the execution of the program. The output is:

```
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe
----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

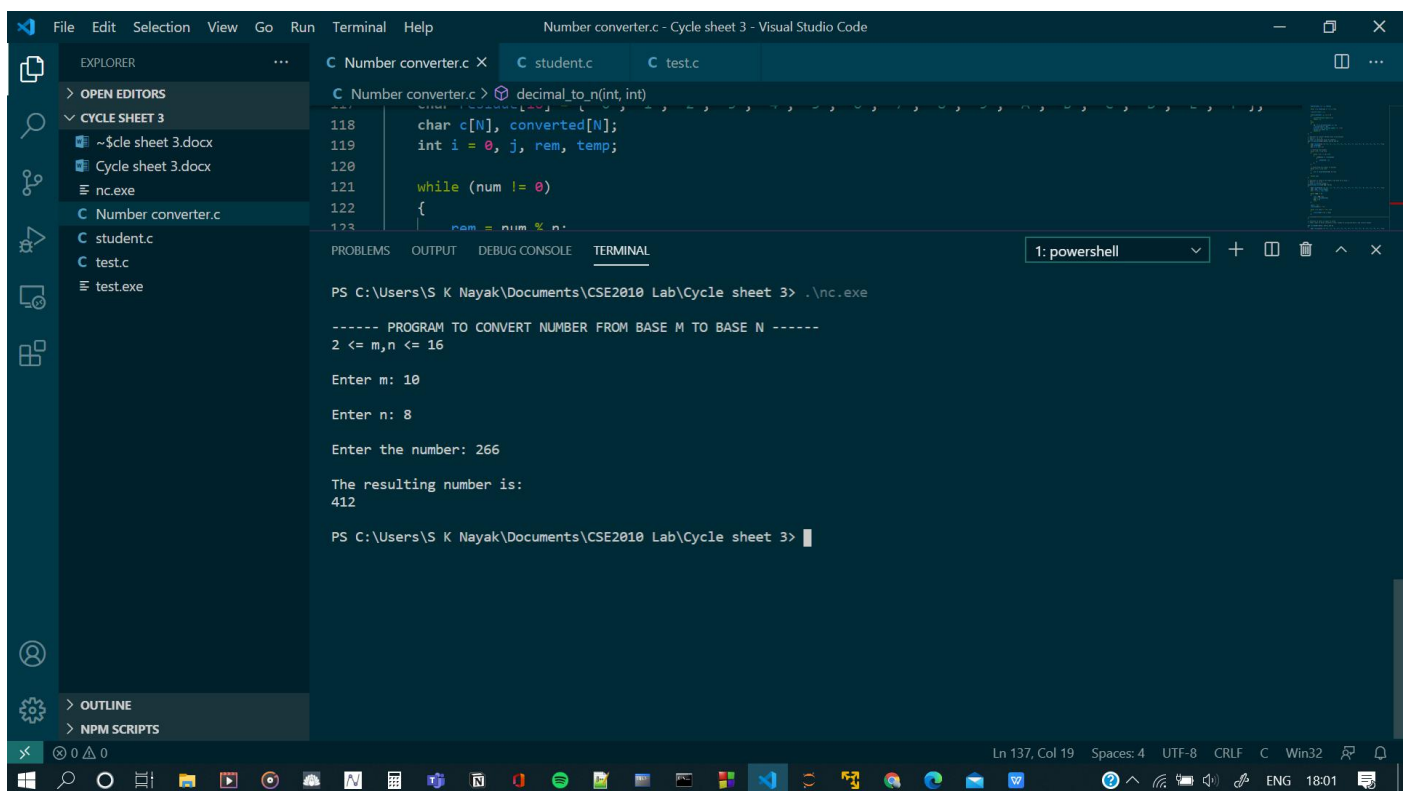
Enter m: 10
Enter n: 2

Enter the number: 200

The resulting number is:
11001000

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```

8. Decimal to Octal



The screenshot shows the Visual Studio Code interface with the following components:

- EXPLORER:** Lists files including `Cycle sheet 3.docx`, `nc.exe`, `Number converter.c`, `student.c`, `test.c`, and `test.exe`.
- EDITOR:** Displays the source code for `Number converter.c`. The visible code includes:

```
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;
```
- TERMINAL:** Shows the execution of the program. The output is:

```
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe
----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

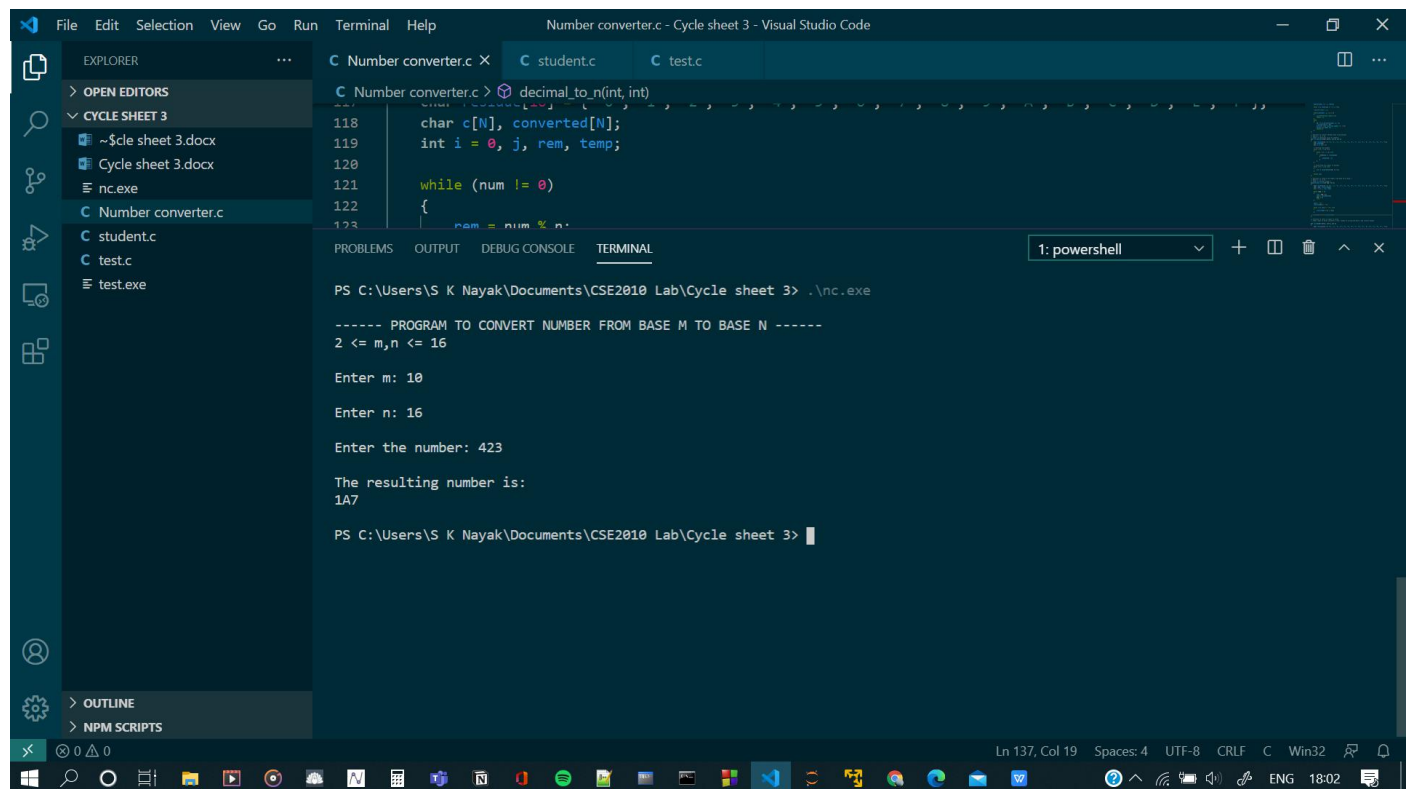
Enter m: 10
Enter n: 8

Enter the number: 266

The resulting number is:
412

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```


9. Decimal to Hexadecimal



The screenshot shows the Visual Studio Code interface with the following components:

- EXPLORER:** Lists files including `Cycle sheet 3.docx`, `nc.exe`, `Number converter.c`, `student.c`, `test.c`, and `test.exe`.
- EDITOR:** Displays the source code for `Number converter.c`. The visible code includes:

```
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;
```
- TERMINAL:** Shows the execution of `nc.exe` in a PowerShell session. The output is:

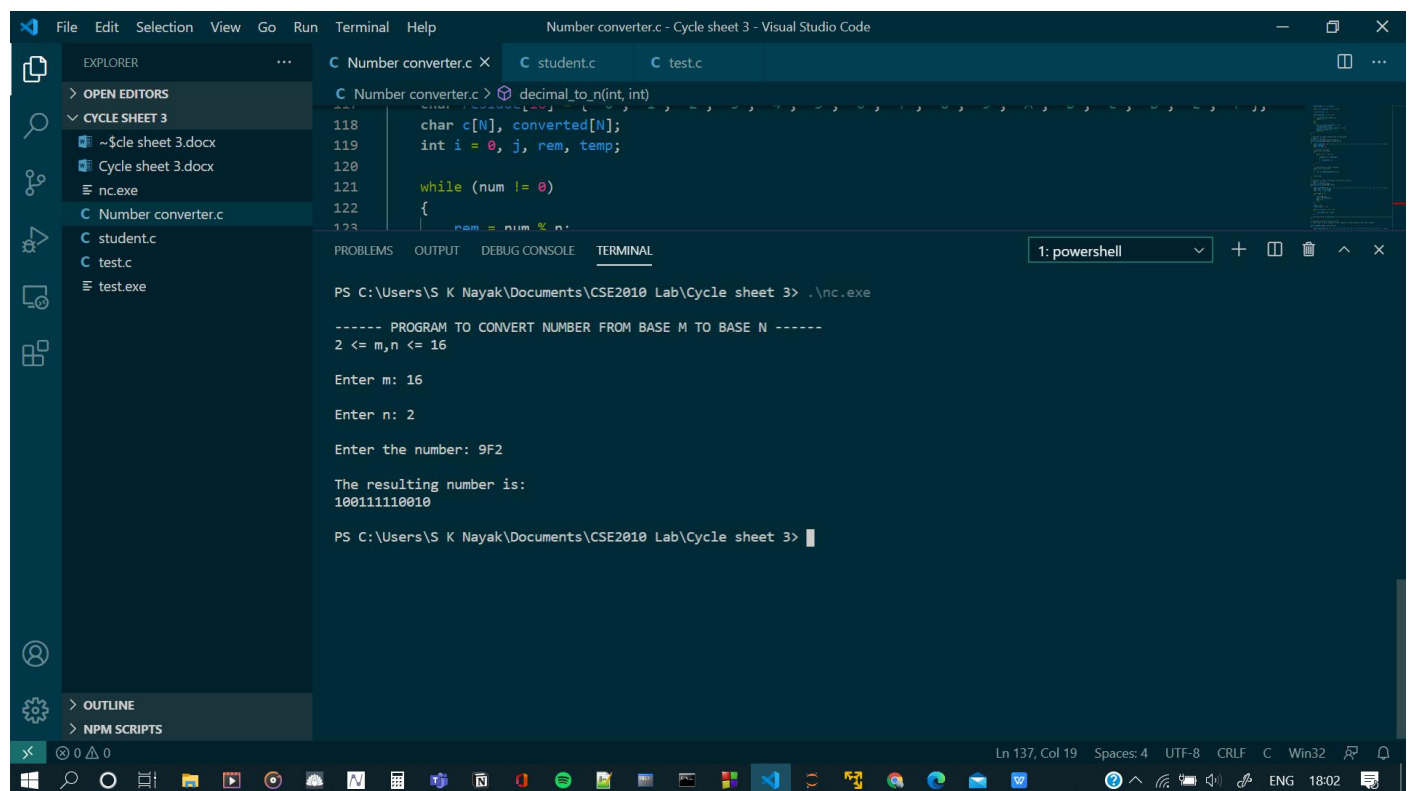
```
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe
----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 10
Enter n: 16
Enter the number: 423

The resulting number is:
1A7

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```

10. Hexadecimal to Binary



The screenshot shows the Visual Studio Code interface with the following components:

- EXPLORER:** Lists files including `Cycle sheet 3.docx`, `nc.exe`, `Number converter.c`, `student.c`, `test.c`, and `test.exe`.
- EDITOR:** Displays the source code for `Number converter.c`. The visible code includes:

```
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;
```
- TERMINAL:** Shows the execution of `nc.exe` in a PowerShell session. The output is:

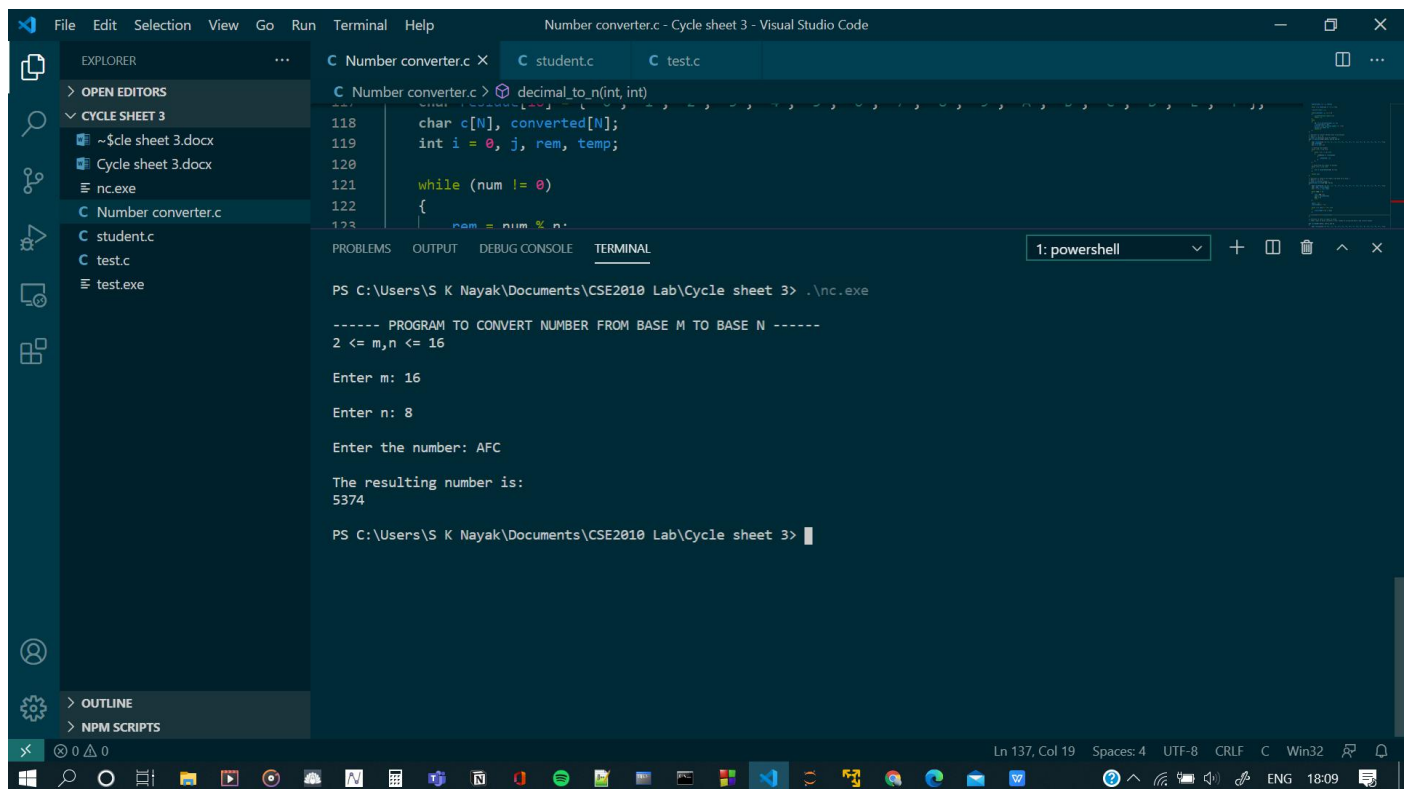
```
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe
----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 16
Enter n: 2
Enter the number: 9F2

The resulting number is:
100111110010

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```

11. Hexadecimal to Octal



The screenshot shows the Visual Studio Code interface with the 'Number converter.c' file open. The code defines a function `decimal_to_n(int, int)` that converts a number from base `m` to base `n`. The terminal output shows the program being executed with `m=16` and `n=8`, converting the hexadecimal number 'AFC' to the octal number '5374'.

```
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;
```

```
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe

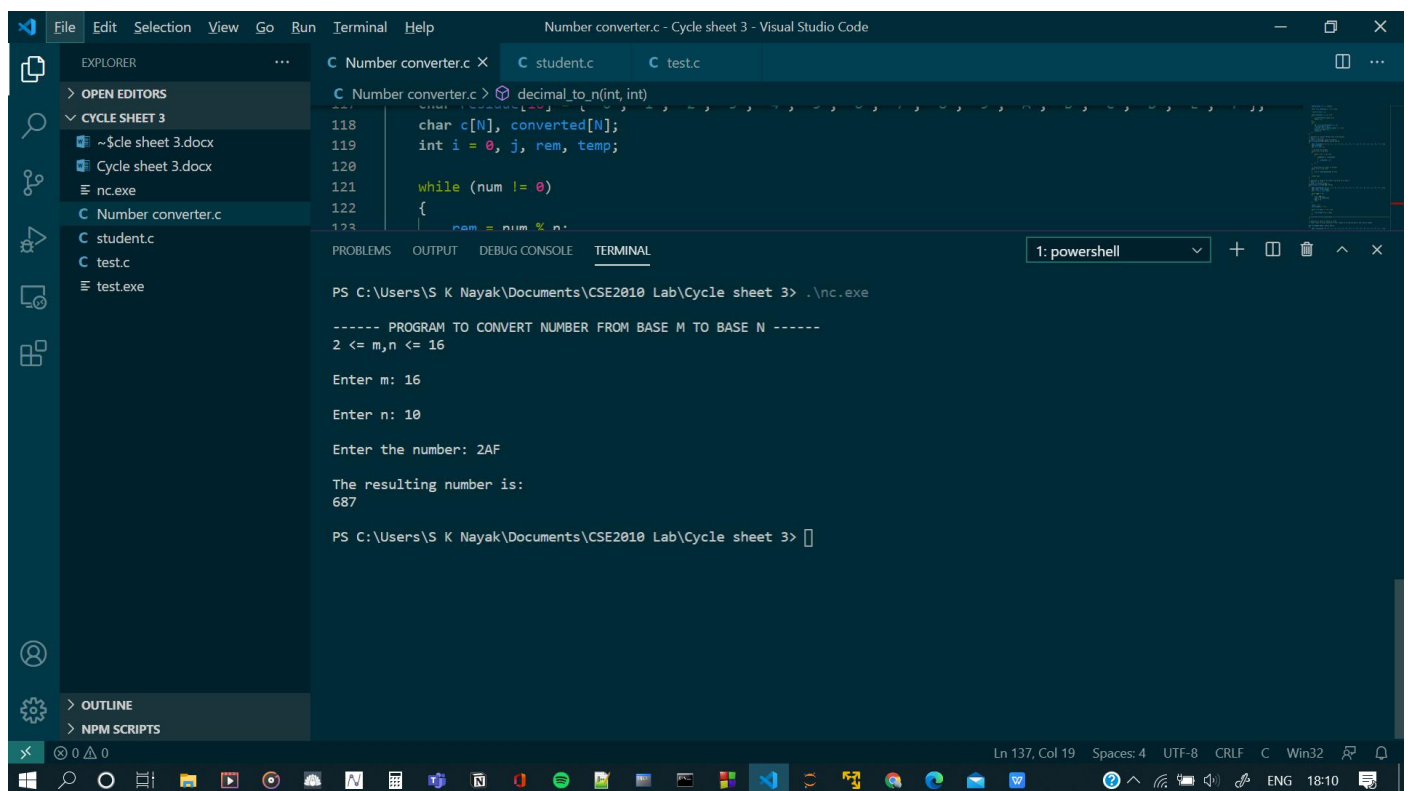
----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 16
Enter n: 8
Enter the number: AFC

The resulting number is:
5374

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```

12. Hexadecimal to Decimal



The screenshot shows the Visual Studio Code interface with the 'Number converter.c' file open. The code defines a function `decimal_to_n(int, int)` that converts a number from base `m` to base `n`. The terminal output shows the program being executed with `m=16` and `n=10`, converting the hexadecimal number '2AF' to the decimal number '687'.

```
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;
```

```
PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe

----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 16
Enter n: 10
Enter the number: 2AF

The resulting number is:
687

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3>
```

13. General Conversions (base less than 16)

The screenshot shows the Visual Studio Code interface with the following components:

- Explorer:** Displays the file structure with folders like 'CYCLE SHEET 3' and files like 'Number converter.c', 'student.c', 'test.c', 'nc.exe', and 'test.exe'.
- Editor:** Shows the source code for 'Number converter.c' with a function `decimal_to_n(int, int)`. The code includes a character array `converted[N]`, an integer `i`, and a `while` loop that processes the number digit by digit.
- Terminal:** Shows the execution of the program. It prompts the user to enter base `m` (5), base `n` (7), and the number to convert (1234). The output shows the resulting number is 365. A second execution is shown with `m=3`, `n=9`, and the number 12, resulting in 5.

```
118 char c[N], converted[N];
119 int i = 0, j, rem, temp;
120
121 while (num != 0)
122 {
123     rem = num % n;
```

----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 5

Enter n: 7

Enter the number: 1234

The resulting number is:
365

PS C:\Users\S K Nayak\Documents\CSE2010 Lab\Cycle sheet 3> .\nc.exe

----- PROGRAM TO CONVERT NUMBER FROM BASE M TO BASE N -----
2 <= m,n <= 16

Enter m: 3

Enter n: 9

Enter the number: 12

The resulting number is:
5