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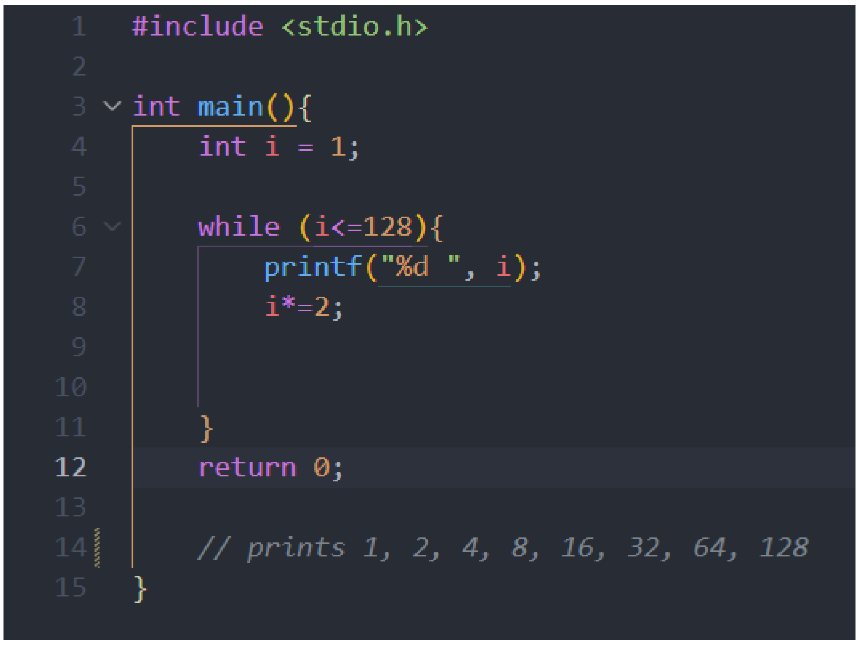
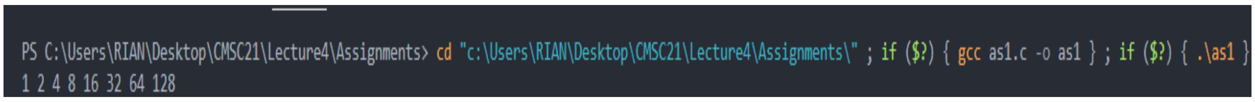
BS in Computer Science – I

1.



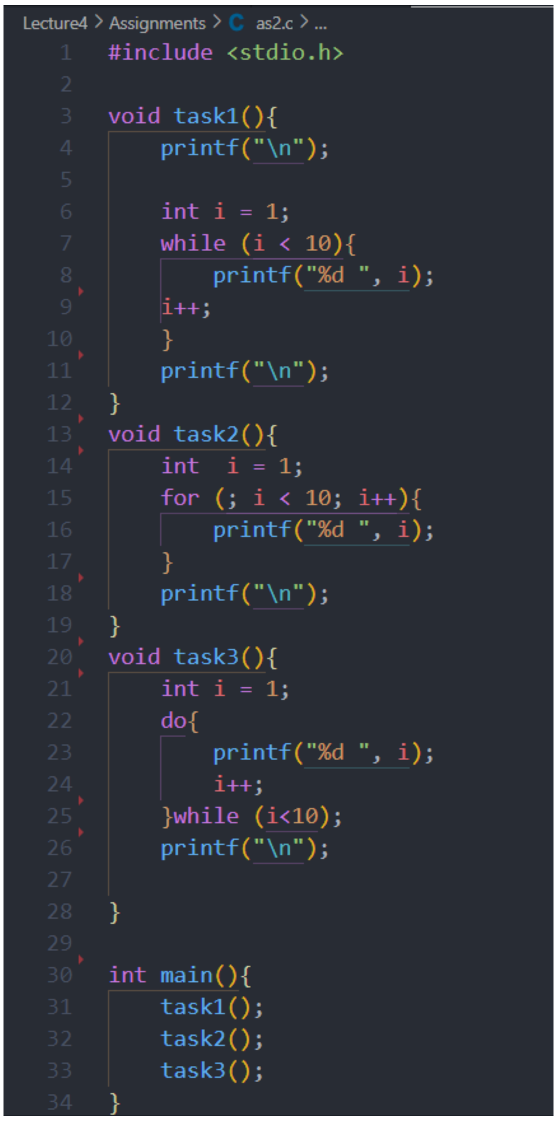
```c
#include <stdio.h>

int main(){
    int i = 1;

    while (i<=128){
        printf("%d ", i);
        i*=2;


    }
    return 0;

    // prints 1, 2, 4, 8, 16, 32, 64, 128
}
```

SAMPLE OUTPUT:



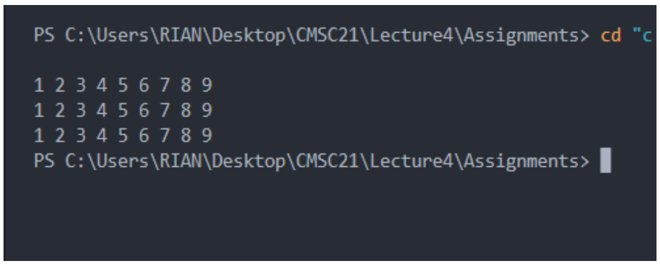
```
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> cd "c:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments\" ; if ($?) { gcc as1.c -o as1 } ; if ($?) { .\as1 }
1 2 4 8 16 32 64 128
```

2.



```c
#include <stdio.h>

void task1(){
    printf("\n");

    int i = 1;
    while (i < 10){
        printf("%d ", i);
    i++;
    }
    printf("\n");
}
void task2(){
    int  i = 1;
    for (; i < 10; i++){
        printf("%d ", i);
    }
    printf("\n");
}
void task3(){
    int i = 1;
    do{
        printf("%d ", i);
        i++;
    }while (i<10);
    printf("\n");

}

int main(){
    task1();
    task2();
    task3();
}
```

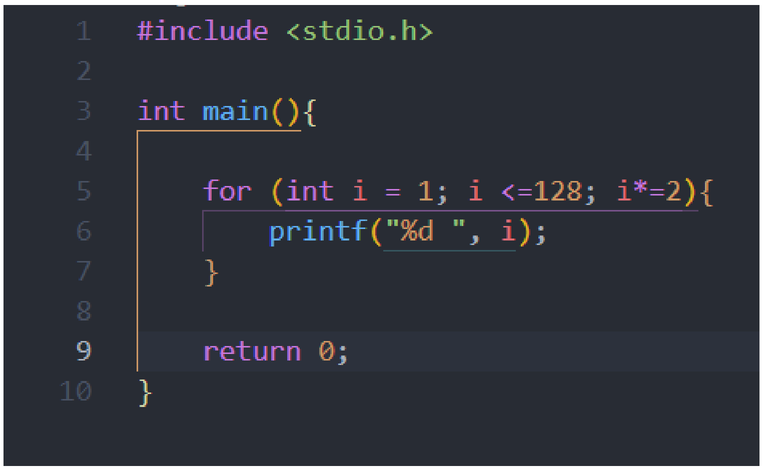
SAMPLE OUTPUT:



```
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> cd "c

1 2 3 4 5 6 7 8 9
1 2 3 4 5 6 7 8 9
1 2 3 4 5 6 7 8 9
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> █
```

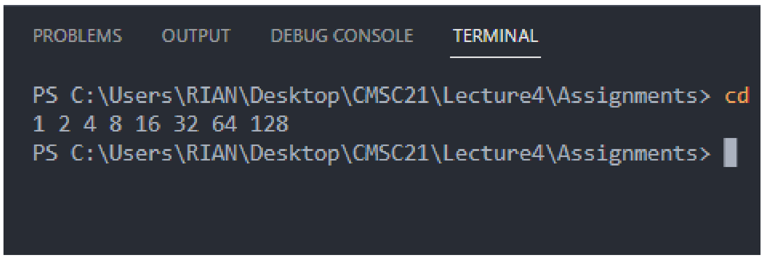
Although the outputs are the same, the do while statement is not equivalent to the other 2 because it checks the condition at the end of the iteration while the for loop and the while loop checks the condition first before iterating.

3.



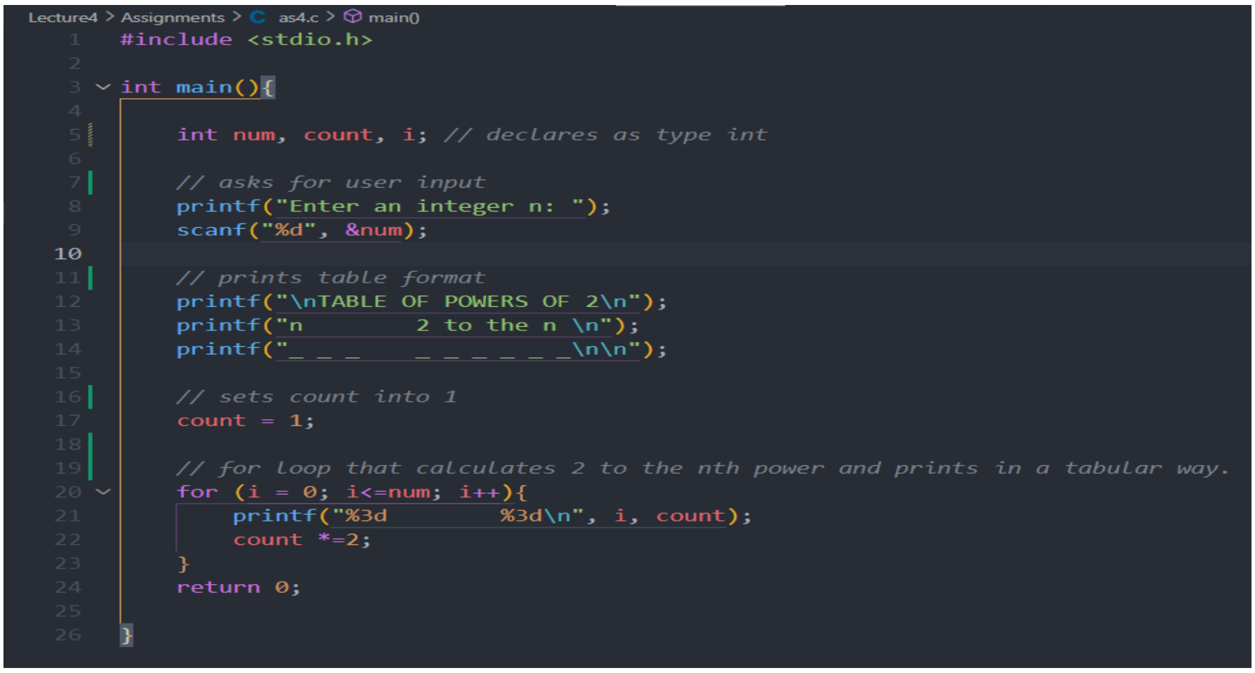
```c
#include <stdio.h>

int main(){

    for (int i = 1; i <=128; i*=2){
        printf("%d ", i);
    }

    return 0;
}
```

SAMPLE OUTPUT:



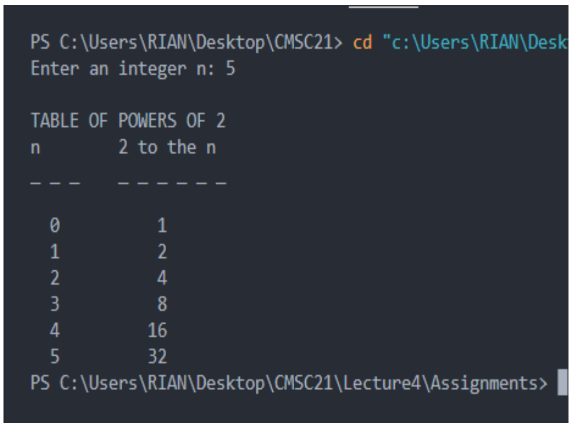
```
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> cd
1 2 4 8 16 32 64 128
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> 
```

4.

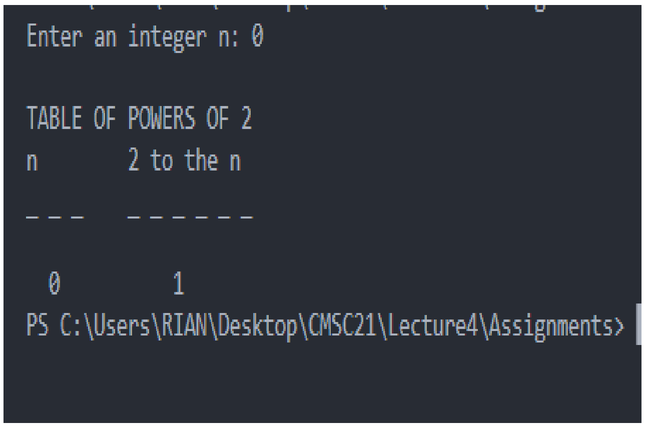


```c
#include <stdio.h>

int main(){

    int num, count, i; // declares as type int

    // asks for user input
    printf("Enter an integer n: ");
    scanf("%d", &num);

    // prints table format
    printf("\nTABLE OF POWERS OF 2\n");
    printf("n        2 to the n \n");
    printf("_ _ _    _ _ _ _ _ _\n\n");

    // sets count into 1
    count = 1;

    // for loop that calculates 2 to the nth power and prints in a tabular way.
    for (i = 0; i<=num; i++){
        printf("%3d        %3d\n", i, count);
        count *=2;
    }
    return 0;

}
```

SAMPLE OUTPUT:

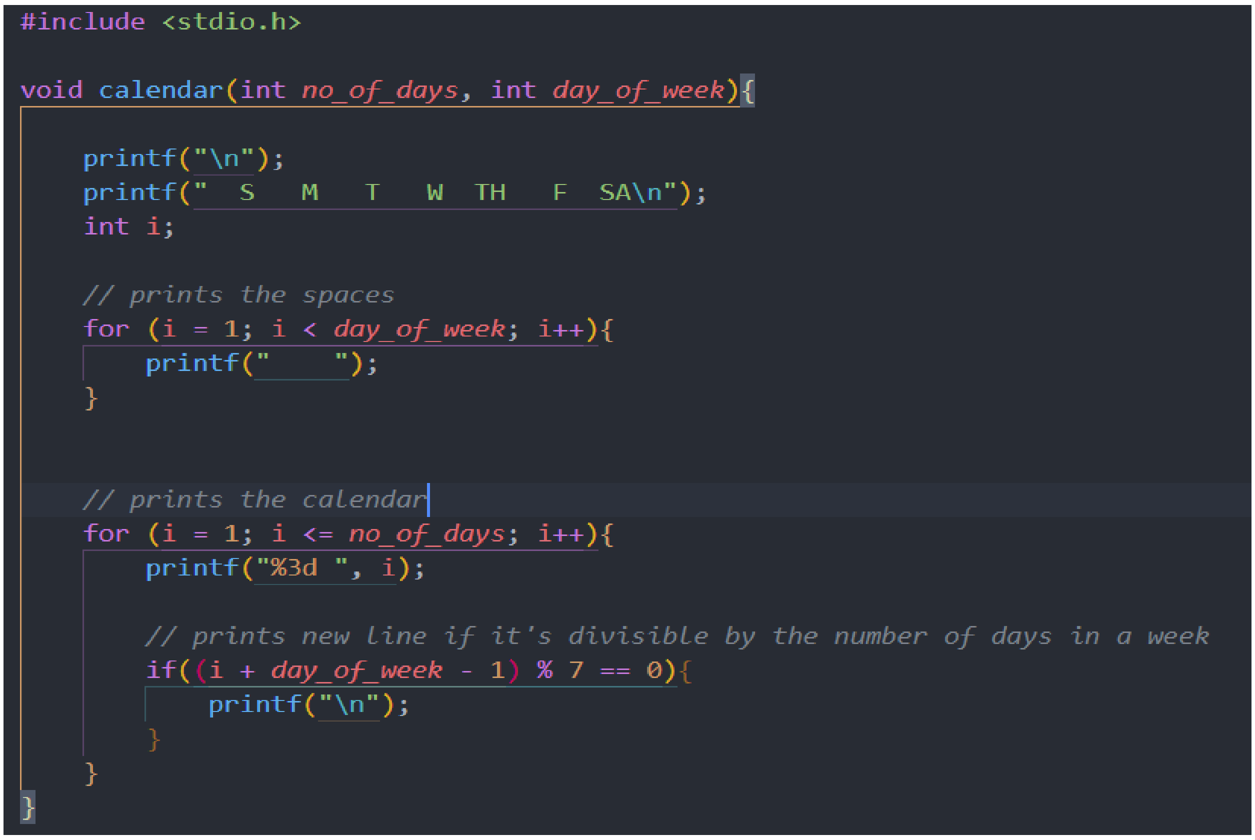


```
PS C:\Users\RIAN\Desktop\CMSC21> cd "c:\Users\RIAN\Desk
Enter an integer n: 5

TABLE OF POWERS OF 2
n        2 to the n

- - -    - - - - - -

  0          1
  1          2
  2          4
  3          8
  4         16
  5         32
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> 
```

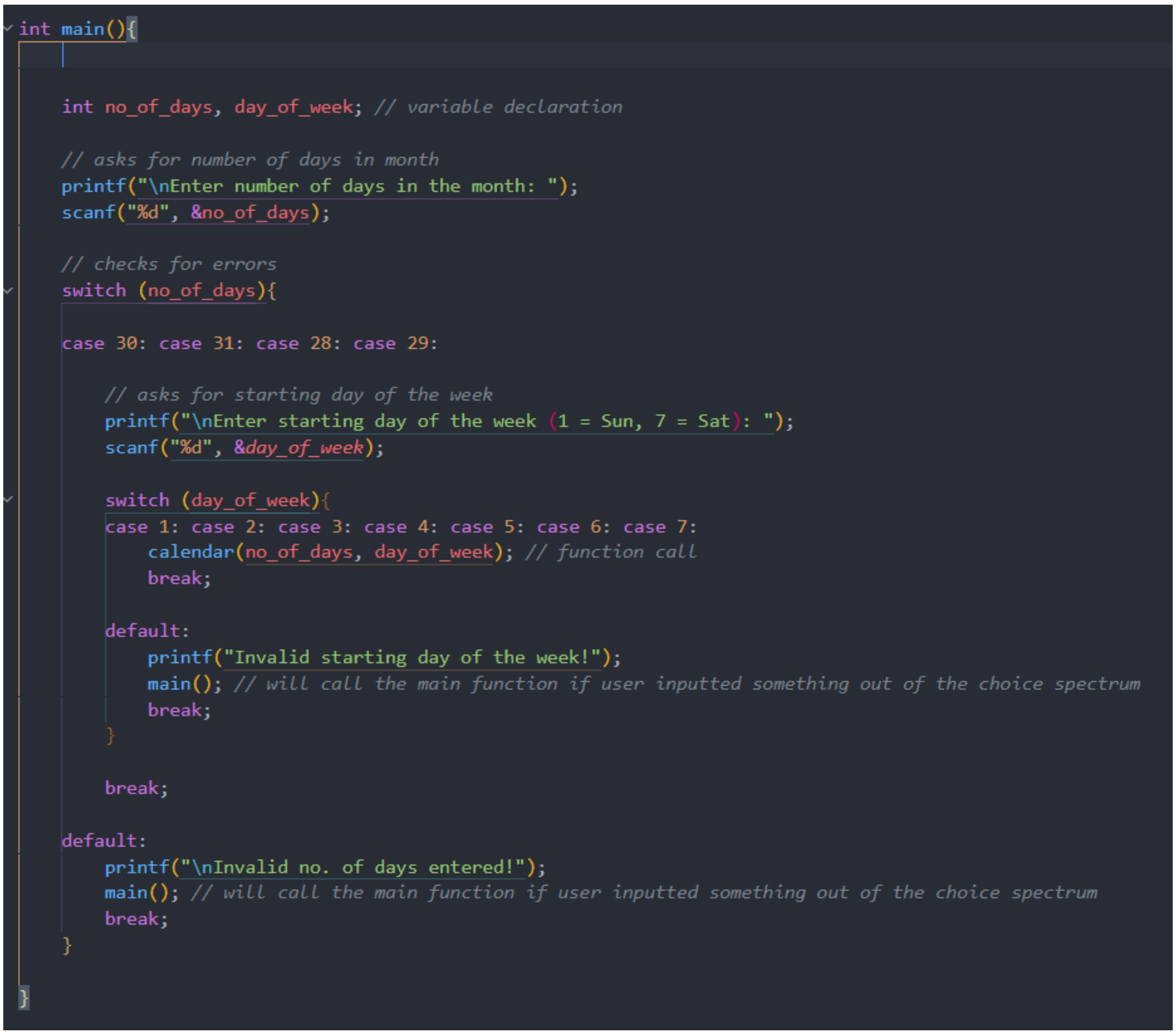


```
Enter an integer n: 0

TABLE OF POWERS OF 2
n        2 to the n

- - -    - - - - - -

  0          1
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> 
```

5.

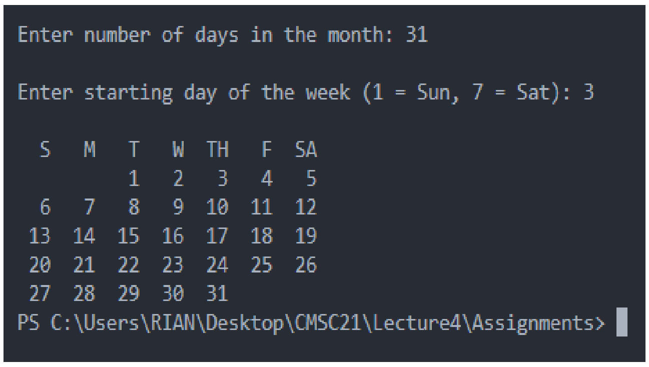


```c
#include <stdio.h>

void calendar(int no_of_days, int day_of_week){

    printf("\n");
    printf("  S   M   T   W  TH   F  SA\n");
    int i;

    // prints the spaces
    for (i = 1; i < day_of_week; i++){
        printf("    ");
    }


    // prints the calendar
    for (i = 1; i <= no_of_days; i++){
        printf("%3d ", i);

        // prints new line if it's divisible by the number of days in a week
        if((i + day_of_week - 1) % 7 == 0){
            printf("\n");
        }
    }
}
```



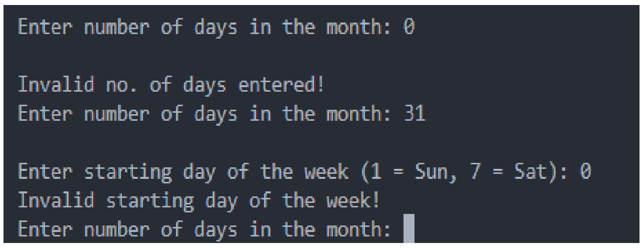
```c
int main(){


    int no_of_days, day_of_week; // variable declaration

    // asks for number of days in month
    printf("\nEnter number of days in the month: ");
    scanf("%d", &no_of_days);

    // checks for errors
    switch (no_of_days){

    case 30: case 31: case 28: case 29:

        // asks for starting day of the week
        printf("\nEnter starting day of the week (1 = Sun, 7 = Sat): ");
        scanf("%d", &day_of_week);

        switch (day_of_week){
        case 1: case 2: case 3: case 4: case 5: case 6: case 7:
            calendar(no_of_days, day_of_week); // function call
            break;

        default:
            printf("Invalid starting day of the week!");
            main(); // will call the main function if user inputted something out of the choice spectrum
            break;
        }

        break;

    default:
        printf("\nInvalid no. of days entered!");
        main(); // will call the main function if user inputted something out of the choice spectrum
        break;
    }

}
```

SAMPLE OUTPUT:



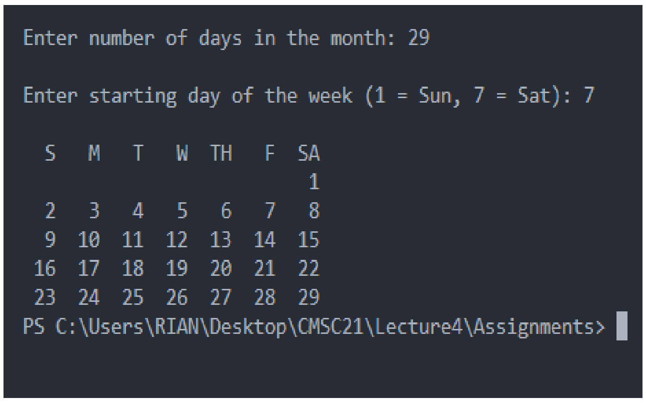
```
Enter number of days in the month: 31

Enter starting day of the week (1 = Sun, 7 = Sat): 3

   S   M   T   W  TH   F  SA
           1   2   3   4   5
   6   7   8   9  10  11  12
  13  14  15  16  17  18  19
  20  21  22  23  24  25  26
  27  28  29  30  31
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments>
```

31 days in a month



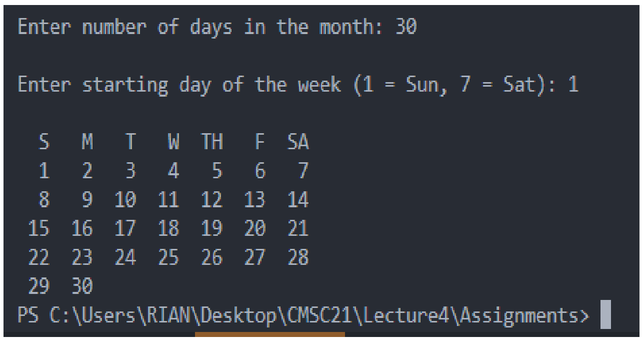
```
Enter number of days in the month: 0

Invalid no. of days entered!
Enter number of days in the month: 31

Enter starting day of the week (1 = Sun, 7 = Sat): 0
Invalid starting day of the week!
Enter number of days in the month:
```

In the case that the user input invalid options, it will ask the user again for valid input



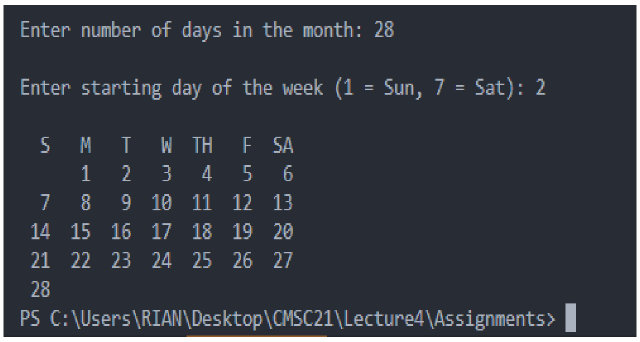
```
Enter number of days in the month: 29

Enter starting day of the week (1 = Sun, 7 = Sat): 7

   S   M   T   W  TH   F  SA
                           1
   2   3   4   5   6   7   8
   9  10  11  12  13  14  15
  16  17  18  19  20  21  22
  23  24  25  26  27  28  29
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments>
```

29 days in a month



```
Enter number of days in the month: 30

Enter starting day of the week (1 = Sun, 7 = Sat): 1

   S   M   T   W  TH   F  SA
   1   2   3   4   5   6   7
   8   9  10  11  12  13  14
  15  16  17  18  19  20  21
  22  23  24  25  26  27  28
  29  30
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments>
```

30 days in a month

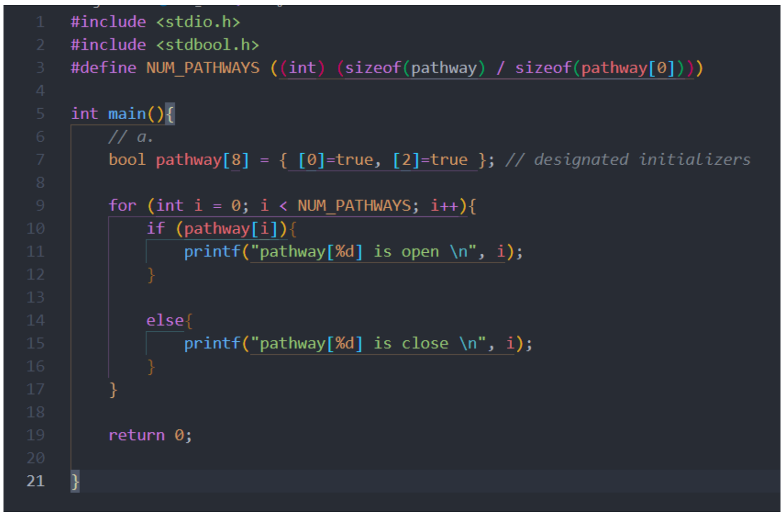


```
Enter number of days in the month: 28

Enter starting day of the week (1 = Sun, 7 = Sat): 2

   S   M   T   W  TH   F  SA
       1   2   3   4   5   6
   7   8   9  10  11  12  13
  14  15  16  17  18  19  20
  21  22  23  24  25  26  27
  28
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments>
```

28 days in a month

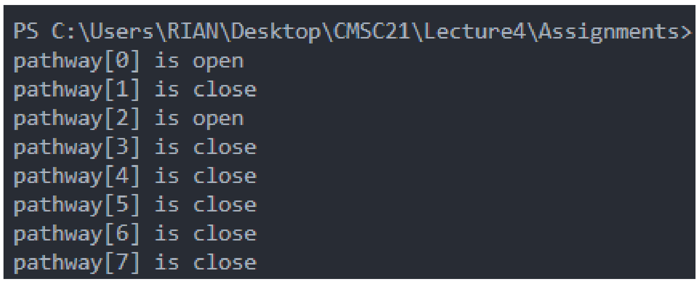
6.

a. bool pathway[8] = { [0] = true, [2] = true };



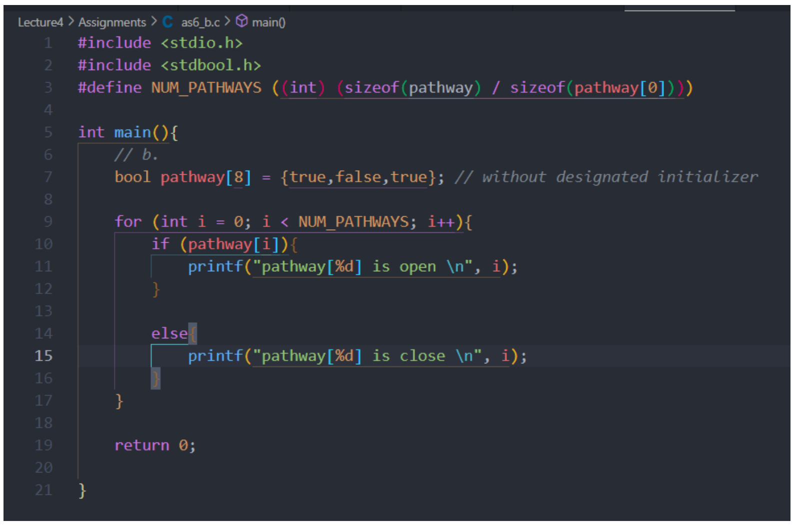
```c
#include <stdio.h>
#include <stdbool.h>
#define NUM_PATHWAYS ((int) (sizeof(pathway) / sizeof(pathway[0])))

int main(){
    // a.
    bool pathway[8] = { [0]=true, [2]=true }; // designated initializers

    for (int i = 0; i < NUM_PATHWAYS; i++){
        if (pathway[i]){
            printf("pathway[%d] is open \n", i);
        }

        else{
            printf("pathway[%d] is close \n", i);
        }
    }

    return 0;

}
```

SAMPLE OUTPUT:



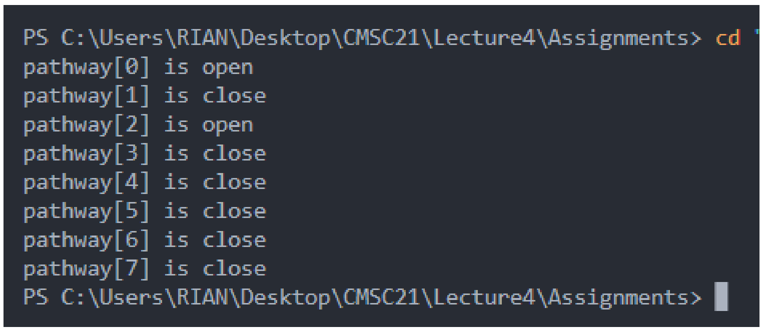
```
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments>
pathway[0] is open
pathway[1] is close
pathway[2] is open
pathway[3] is close
pathway[4] is close
pathway[5] is close
pathway[6] is close
pathway[7] is close
```

b. bool pathway[8] = { true, false, true};



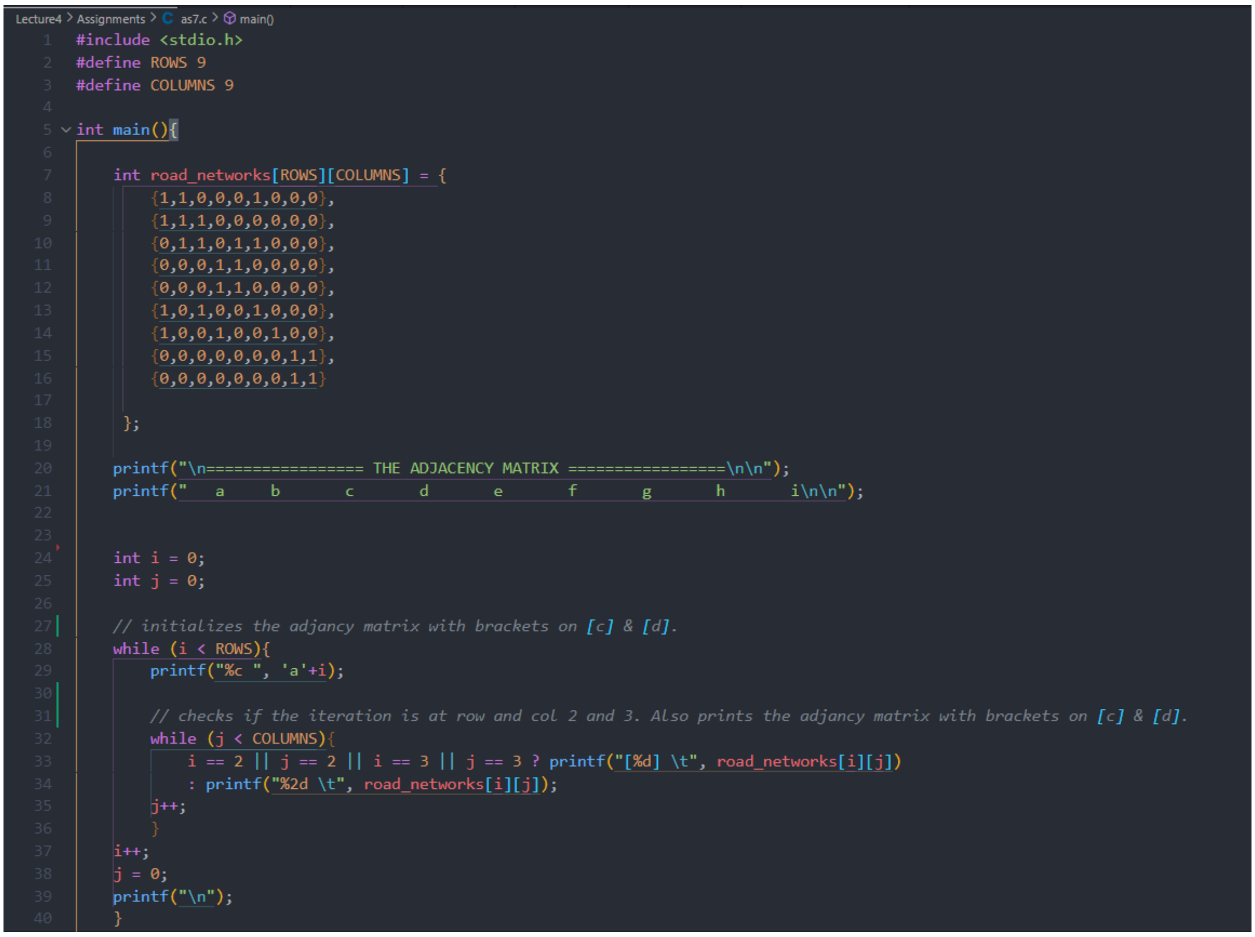
```c
#include <stdio.h>
#include <stdbool.h>
#define NUM_PATHWAYS ((int) (sizeof(pathway) / sizeof(pathway[0])))

int main(){
    // b.
    bool pathway[8] = {true,false,true}; // without designated initializer

    for (int i = 0; i < NUM_PATHWAYS; i++){
        if (pathway[i]){
            printf("pathway[%d] is open \n", i);
        }

        else{
            printf("pathway[%d] is close \n", i);
        }
    }

    return 0;

}
```

SAMPLE OUTPUT:

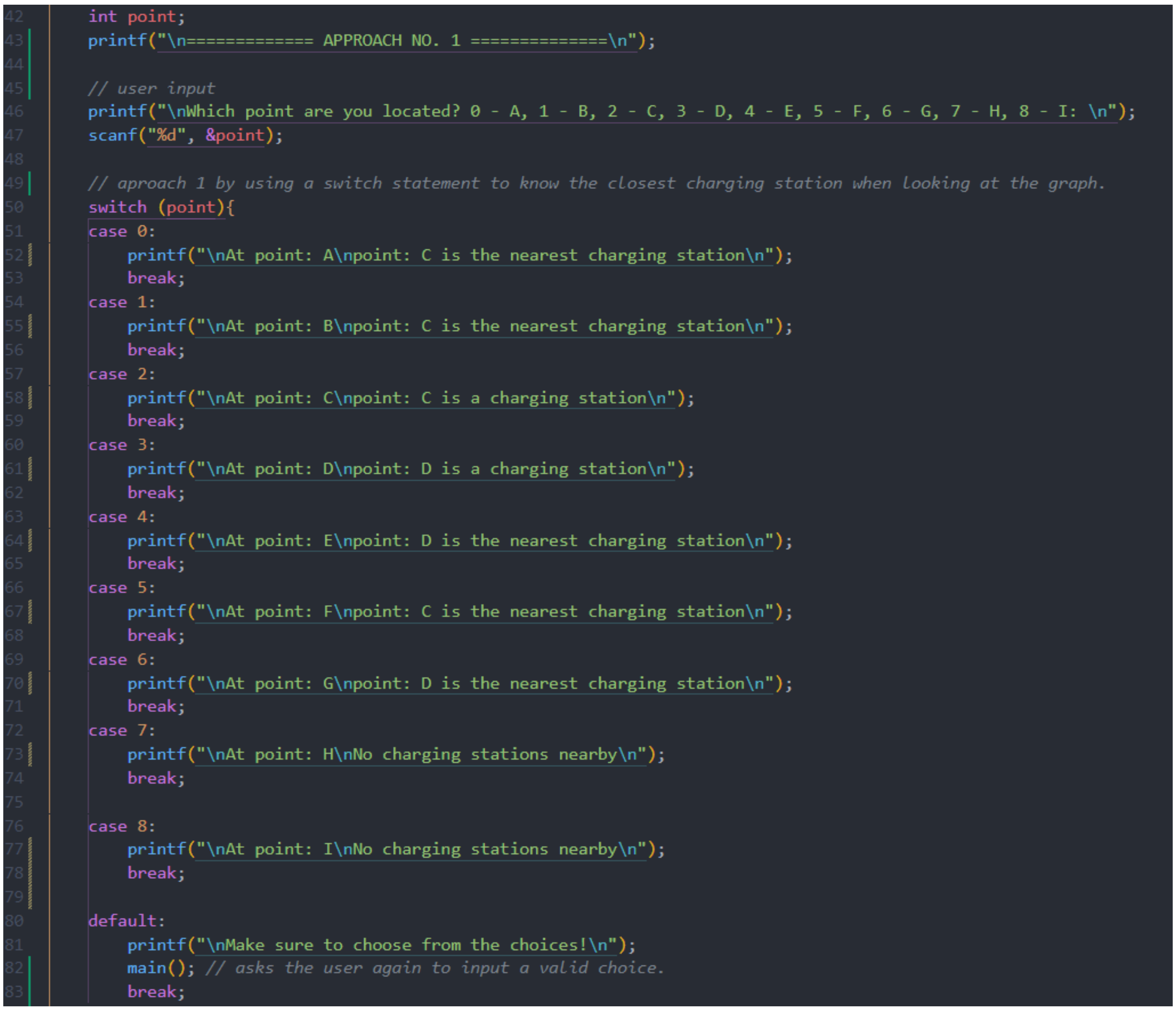


```
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> cd
pathway[0] is open
pathway[1] is close
pathway[2] is open
pathway[3] is close
pathway[4] is close
pathway[5] is close
pathway[6] is close
pathway[7] is close
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments>
```

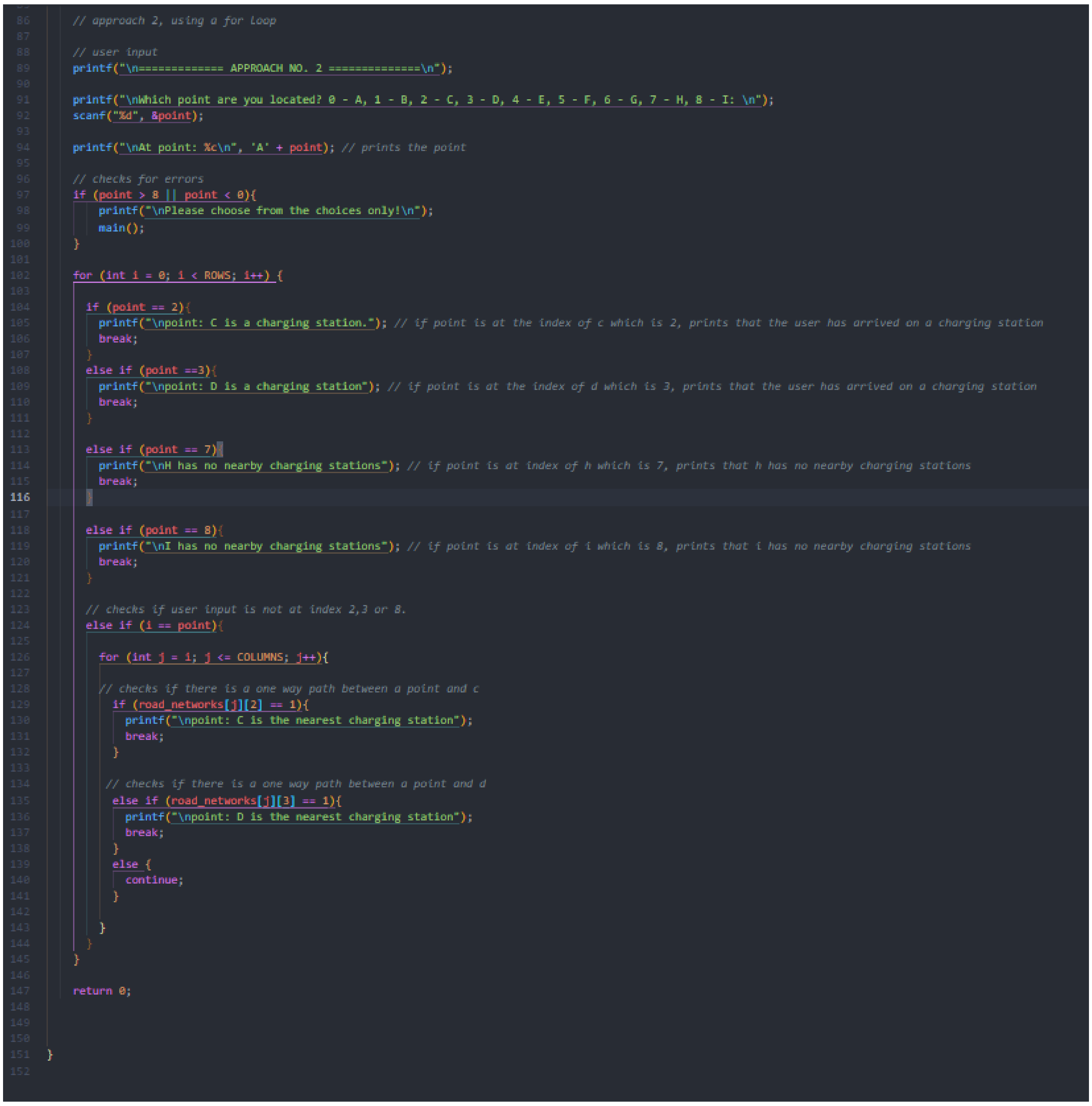
7.



```c
#include <stdio.h>
#define ROWS 9
#define COLUMNS 9

int main(){

    int road_networks[ROWS][COLUMNS] = {
        {1,1,0,0,0,1,0,0,0},
        {1,1,1,0,0,0,0,0,0},
        {0,1,1,0,1,1,0,0,0},
        {0,0,0,1,1,0,0,0,0},
        {0,0,0,1,1,0,0,0,0},
        {1,0,1,0,0,1,0,0,0},
        {1,0,0,1,0,0,1,0,0},
        {0,0,0,0,0,0,0,1,1},
        {0,0,0,0,0,0,0,1,1}

     };

    printf("\n================= THE ADJACENCY MATRIX =================\n\n");
    printf("   a     b       c       d       e       f       g       h       i\n\n");


    int i = 0;
    int j = 0;

    // initializes the adjancy matrix with brackets on [c] & [d].
    while (i < ROWS){
        printf("%c ", 'a'+i);

        // checks if the iteration is at row and col 2 and 3. Also prints the adjancy matrix with brackets on [c] & [d].
        while (j < COLUMNS){
            i == 2 || j == 2 || i == 3 || j == 3 ? printf("[%d] \t", road_networks[i][j])
            : printf("%2d \t", road_networks[i][j]);
        j++;
        }
    i++;
    j = 0;
    printf("\n");
    }
```



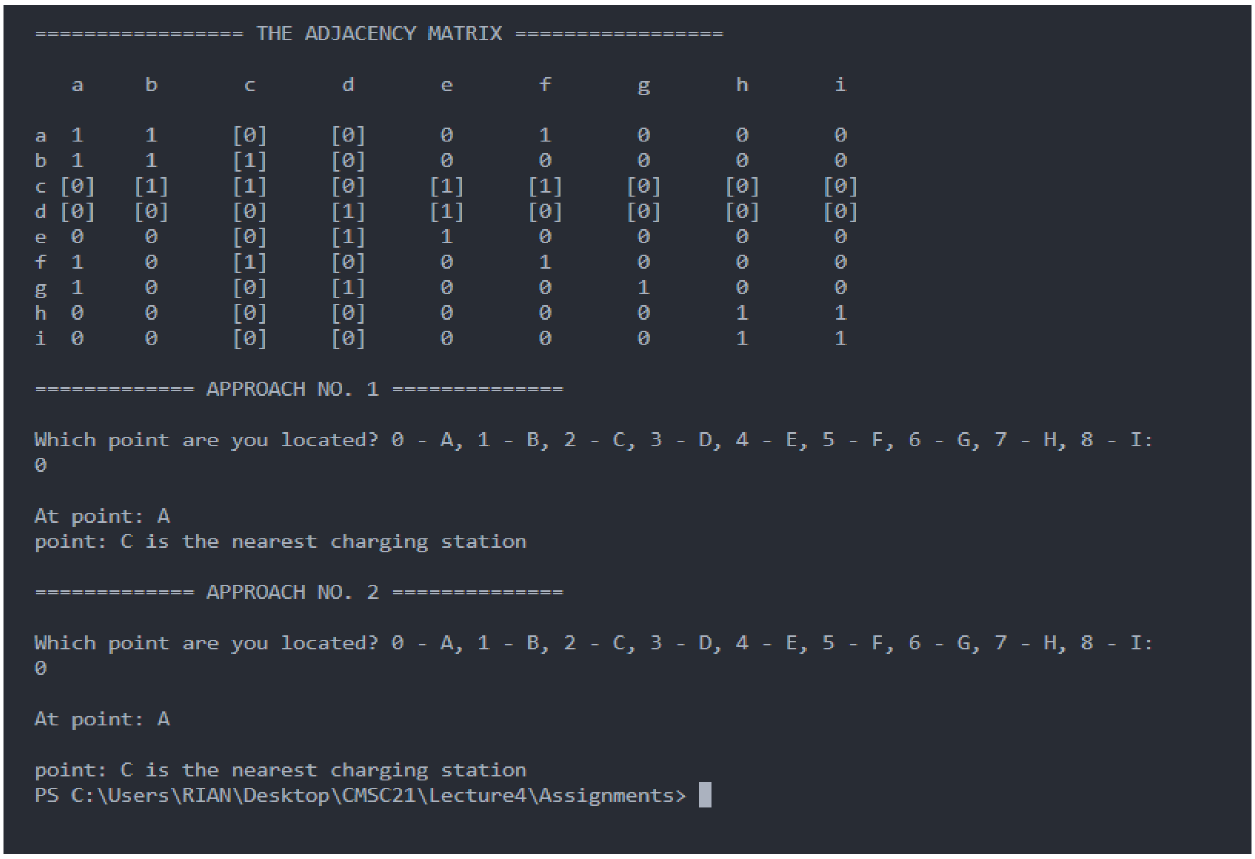
```c
    int point;
    printf("\n============= APPROACH NO. 1 ==============\n");

    // user input
    printf("\nWhich point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I: \n");
    scanf("%d", &point);

    // aproach 1 by using a switch statement to know the closest charging station when looking at the graph.
    switch (point){
    case 0:
        printf("\nAt point: A\npoint: C is the nearest charging station\n");
        break;
    case 1:
        printf("\nAt point: B\npoint: C is the nearest charging station\n");
        break;
    case 2:
        printf("\nAt point: C\npoint: C is a charging station\n");
        break;
    case 3:
        printf("\nAt point: D\npoint: D is a charging station\n");
        break;
    case 4:
        printf("\nAt point: E\npoint: D is the nearest charging station\n");
        break;
    case 5:
        printf("\nAt point: F\npoint: C is the nearest charging station\n");
        break;
    case 6:
        printf("\nAt point: G\npoint: D is the nearest charging station\n");
        break;
    case 7:
        printf("\nAt point: H\nNo charging stations nearby\n");
        break;

    case 8:
        printf("\nAt point: I\nNo charging stations nearby\n");
        break;

    default:
        printf("\nMake sure to choose from the choices!\n");
        main(); // asks the user again to input a valid choice.
        break;
```



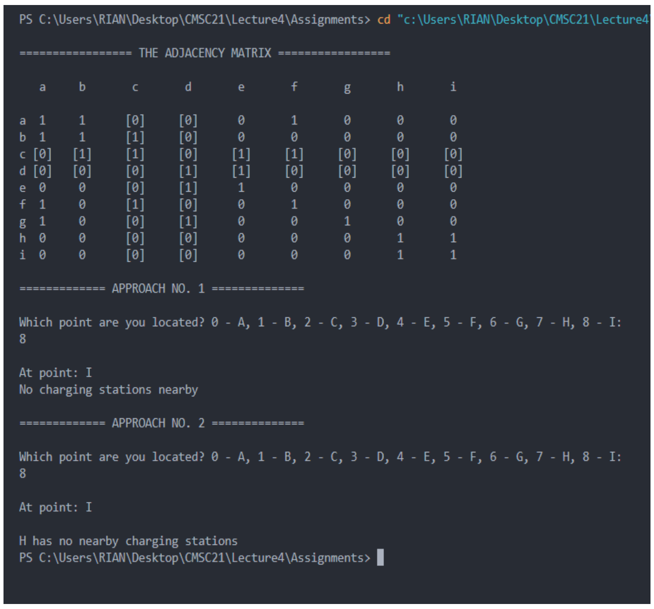
```c
    // approach 2, using a for loop

    // user input
    printf("\n============= APPROACH NO. 2 =============\n");

    printf("\nWhich point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I: \n");
    scanf("%d", &point);

    printf("\nAt point: %c\n", 'A' + point); // prints the point

    // checks for errors
    if (point > 8 || point < 0){
        printf("\nPlease choose from the choices only!\n");
        main();
    }

    for (int i = 0; i < ROWS; i++) {

      if (point == 2){
        printf("\npoint: C is a charging station."); // if point is at the index of c which is 2, prints that the user has arrived on a charging station
        break;
      }
      else if (point ==3){
        printf("\npoint: D is a charging station"); // if point is at the index of d which is 3, prints that the user has arrived on a charging station
        break;
      }

      else if (point == 7){
        printf("\nH has no nearby charging stations"); // if point is at index of h which is 7, prints that h has no nearby charging stations
        break;
      }

      else if (point == 8){
        printf("\nI has no nearby charging stations"); // if point is at index of i which is 8, prints that i has no nearby charging stations
        break;
      }

      // checks if user input is not at index 2,3 or 8.
      else if (i == point){

        for (int j = i; j <= COLUMNS; j++){

        // checks if there is a one way path between a point and c
          if (road_networks[j][2] == 1){
            printf("\npoint: C is the nearest charging station");
            break;
          }

         // checks if there is a one way path between a point and d
          else if (road_networks[j][3] == 1){
            printf("\npoint: D is the nearest charging station");
            break;
          }
          else {
            continue;
          }

        }
      }
    }

    return 0;



}
```

SAMPLE OUTPUTS:

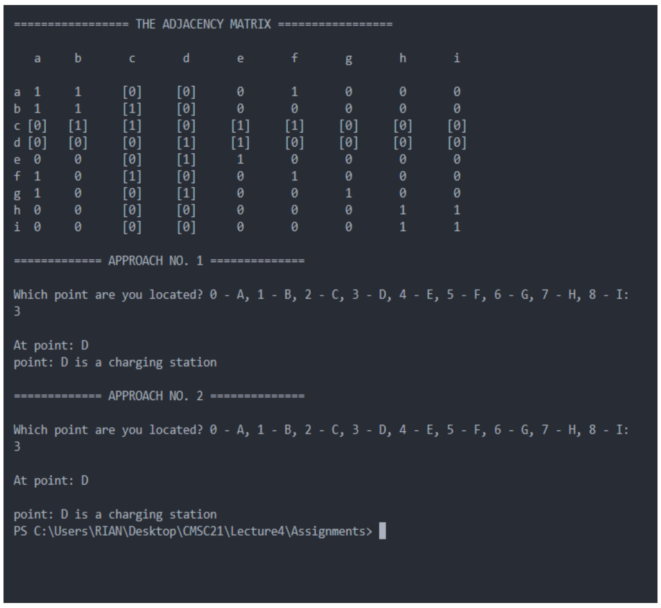
CASE OF VALID INPUTS



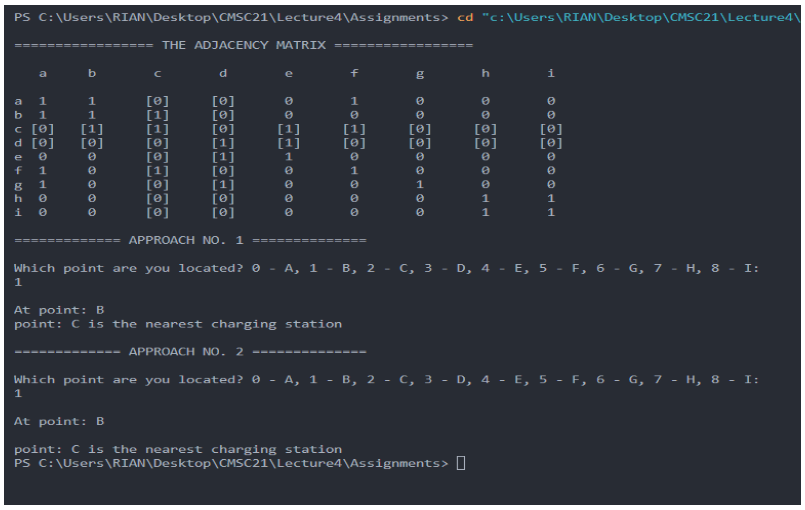
```
================= THE ADJACENCY MATRIX =================

   a     b       c       d       e       f       g       h       i

a  1     1      [0]     [0]      0       1       0       0       0
b  1     1      [1]     [0]      0       0       0       0       0
c [0]   [1]     [1]     [0]     [1]     [1]     [0]     [0]     [0]
d [0]   [0]     [0]     [1]     [1]     [0]     [0]     [0]     [0]
e  0     0      [0]     [1]      1       0       0       0       0
f  1     0      [1]     [0]      0       1       0       0       0
g  1     0      [0]     [1]      0       0       1       0       0
h  0     0      [0]     [0]      0       0       0       1       1
i  0     0      [0]     [0]      0       0       0       1       1

============= APPROACH NO. 1 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
0

At point: A
point: C is the nearest charging station

============= APPROACH NO. 2 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
0

At point: A

point: C is the nearest charging station
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments>
```



```
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> cd "c:\Users\RIAN\Desktop\CMSC21\Lecture4

================= THE ADJACENCY MATRIX =================

   a     b       c       d       e       f       g       h       i

a  1     1      [0]     [0]      0       1       0       0       0
b  1     1      [1]     [0]      0       0       0       0       0
c [0]   [1]     [1]     [0]     [1]     [1]     [0]     [0]     [0]
d [0]   [0]     [0]     [1]     [1]     [0]     [0]     [0]     [0]
e  0     0      [0]     [1]      1       0       0       0       0
f  1     0      [1]     [0]      0       1       0       0       0
g  1     0      [0]     [1]      0       0       1       0       0
h  0     0      [0]     [0]      0       0       0       1       1
i  0     0      [0]     [0]      0       0       0       1       1

============= APPROACH NO. 1 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
8

At point: I
No charging stations nearby

============= APPROACH NO. 2 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
8

At point: I

H has no nearby charging stations
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> 
```

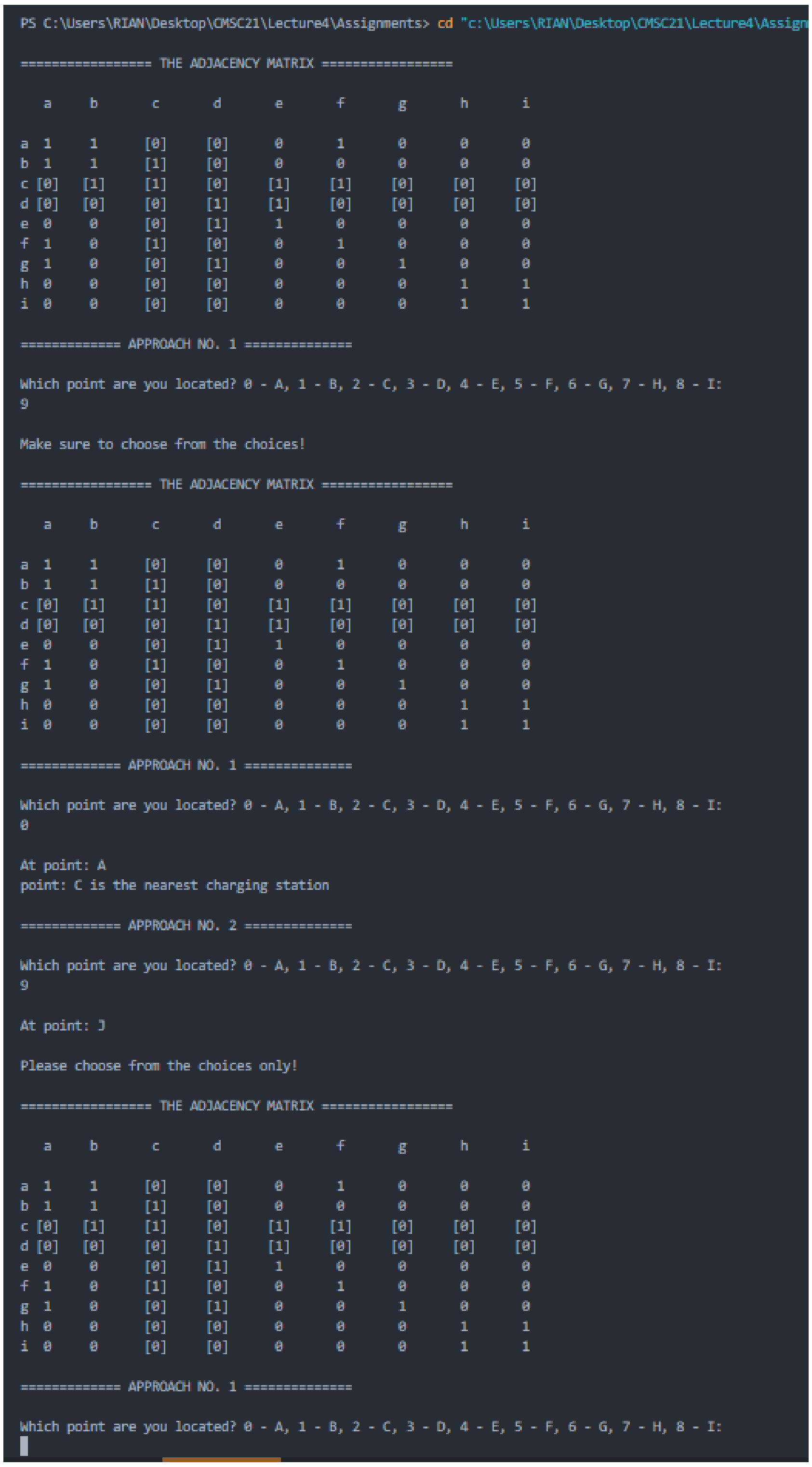


```
================= THE ADJACENCY MATRIX =================

   a     b       c       d       e       f       g       h       i

a  1     1      [0]     [0]      0       1       0       0       0
b  1     1      [1]     [0]      0       0       0       0       0
c [0]   [1]     [1]     [0]     [1]     [1]     [0]     [0]     [0]
d [0]   [0]     [0]     [1]     [1]     [0]     [0]     [0]     [0]
e  0     0      [0]     [1]      1       0       0       0       0
f  1     0      [1]     [0]      0       1       0       0       0
g  1     0      [0]     [1]      0       0       1       0       0
h  0     0      [0]     [0]      0       0       0       1       1
i  0     0      [0]     [0]      0       0       0       1       1

============= APPROACH NO. 1 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
3

At point: D
point: D is a charging station

============= APPROACH NO. 2 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
3

At point: D

point: D is a charging station
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> 
```



```
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> cd "c:\Users\RIAN\Desktop\CMSC21\Lecture4\

================= THE ADJACENCY MATRIX =================

   a     b       c       d       e       f       g       h       i

a  1     1      [0]     [0]      0       1       0       0       0
b  1     1      [1]     [0]      0       0       0       0       0
c [0]   [1]     [1]     [0]     [1]     [1]     [0]     [0]     [0]
d [0]   [0]     [0]     [1]     [1]     [0]     [0]     [0]     [0]
e  0     0      [0]     [1]      1       0       0       0       0
f  1     0      [1]     [0]      0       1       0       0       0
g  1     0      [0]     [1]      0       0       1       0       0
h  0     0      [0]     [0]      0       0       0       1       1
i  0     0      [0]     [0]      0       0       0       1       1

============= APPROACH NO. 1 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
1

At point: B
point: C is the nearest charging station

============= APPROACH NO. 2 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
1

At point: B

point: C is the nearest charging station
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> 
```

CASE OF INVALID INPUT (Will ask the user to go on again from the top)



```
PS C:\Users\RIAN\Desktop\CMSC21\Lecture4\Assignments> cd "c:\Users\RIAN\Desktop\CMSC21\Lecture4\Assign

================= THE ADJACENCY MATRIX =================

   a     b       c       d       e       f       g       h       i

a  1     1      [0]     [0]      0       1       0       0       0
b  1     1      [1]     [0]      0       0       0       0       0
c [0]  [1]    [1]     [0]     [1]     [1]     [0]     [0]     [0]
d [0]  [0]    [0]     [1]     [1]     [0]     [0]     [0]     [0]
e  0     0      [0]     [1]      1       0       0       0       0
f  1     0      [1]     [0]      0       1       0       0       0
g  1     0      [0]     [1]      0       0       1       0       0
h  0     0      [0]     [0]      0       0       0       1       1
i  0     0      [0]     [0]      0       0       0       1       1

============= APPROACH NO. 1 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
9

Make sure to choose from the choices!

================= THE ADJACENCY MATRIX =================

   a     b       c       d       e       f       g       h       i

a  1     1      [0]     [0]      0       1       0       0       0
b  1     1      [1]     [0]      0       0       0       0       0
c [0]  [1]    [1]     [0]     [1]     [1]     [0]     [0]     [0]
d [0]  [0]    [0]     [1]     [1]     [0]     [0]     [0]     [0]
e  0     0      [0]     [1]      1       0       0       0       0
f  1     0      [1]     [0]      0       1       0       0       0
g  1     0      [0]     [1]      0       0       1       0       0
h  0     0      [0]     [0]      0       0       0       1       1
i  0     0      [0]     [0]      0       0       0       1       1

============= APPROACH NO. 1 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
0

At point: A
point: C is the nearest charging station

============= APPROACH NO. 2 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
9

At point: J

Please choose from the choices only!

================= THE ADJACENCY MATRIX =================

   a     b       c       d       e       f       g       h       i

a  1     1      [0]     [0]      0       1       0       0       0
b  1     1      [1]     [0]      0       0       0       0       0
c [0]  [1]    [1]     [0]     [1]     [1]     [0]     [0]     [0]
d [0]  [0]    [0]     [1]     [1]     [0]     [0]     [0]     [0]
e  0     0      [0]     [1]      1       0       0       0       0
f  1     0      [1]     [0]      0       1       0       0       0
g  1     0      [0]     [1]      0       0       1       0       0
h  0     0      [0]     [0]      0       0       0       1       1
i  0     0      [0]     [0]      0       0       0       1       1

============= APPROACH NO. 1 ==============

Which point are you located? 0 - A, 1 - B, 2 - C, 3 - D, 4 - E, 5 - F, 6 - G, 7 - H, 8 - I:
```