

Loops / Iterations / Repetitive statements

Loops are used to repeat a block/group of statements continuously until the given condition becomes false.

Loops reduce program size and improves performance.

In loops beginning and ending points are same.

C-Language supports basically 2 types of loops.

- 1. Entry/pre controlled loops.**
- 2. Exit/post controlled loops.**

In entry control loops, condition is tested first and it is true then only statements block is executed.

Under entry control loops we are having

- i. While loop**
- ii. For loop**

In exit control loop, the statements are executed first and later condition is tested.

Under exit control loop we are having

- i. do while.**

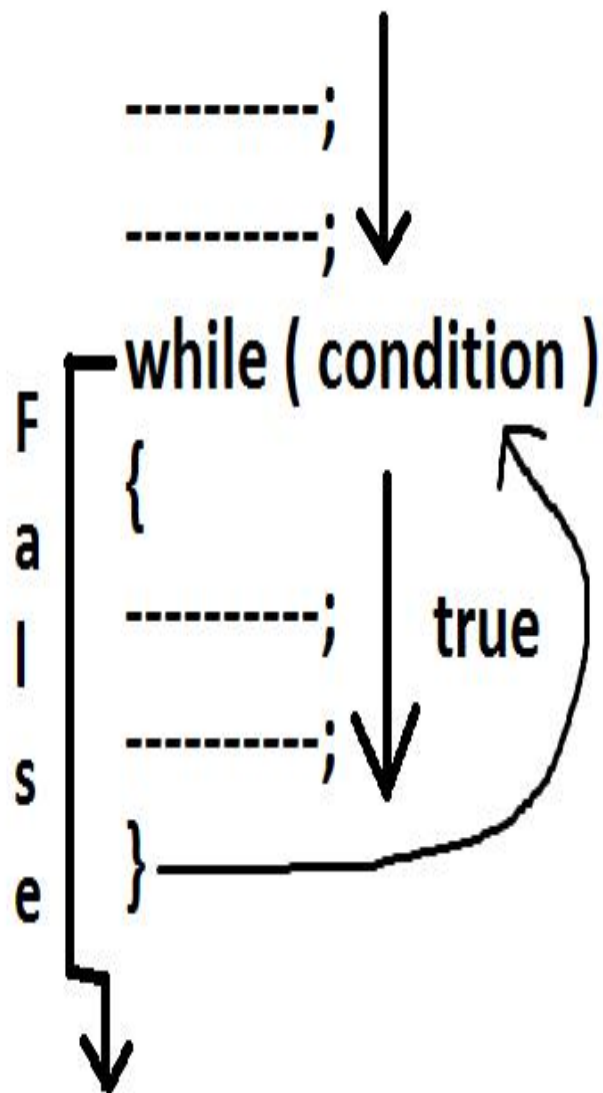
While loop:

- **while is a keyword.**
- **In while loop condition is tested first and it is true then only while block statements are executed. After executing while block statements, the program execution automatically shifted/jumped to while condition at the beginning. If it is true then once again the while block**

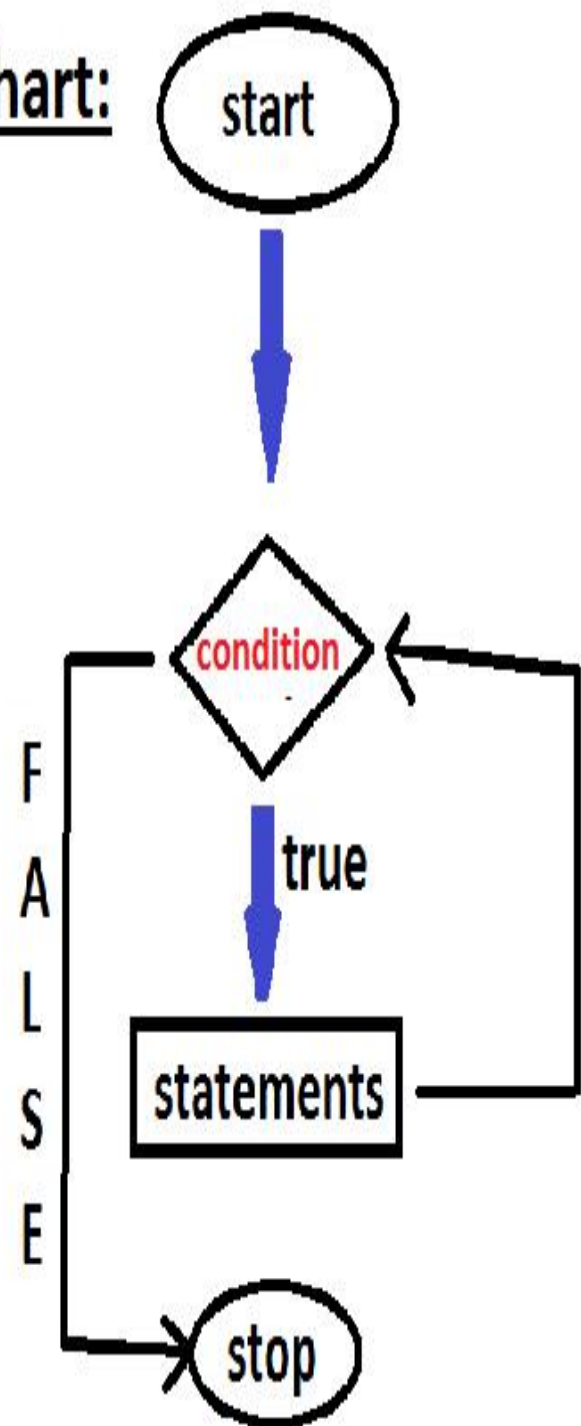
statements are repeated. Like this the process is continued until while condition becomes false.

➤ **While is entry control loop.**

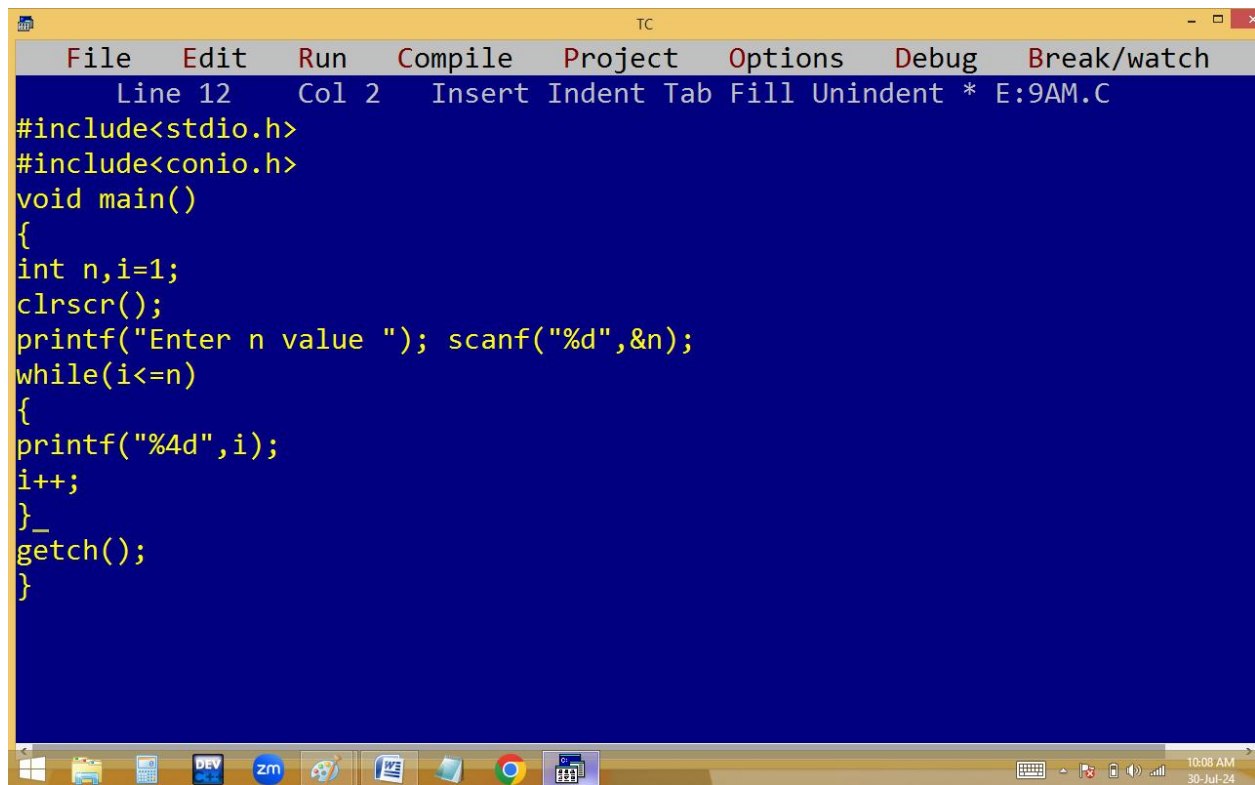
Syntax:



Flow chart:



Eg. Printing 1..n numbers.



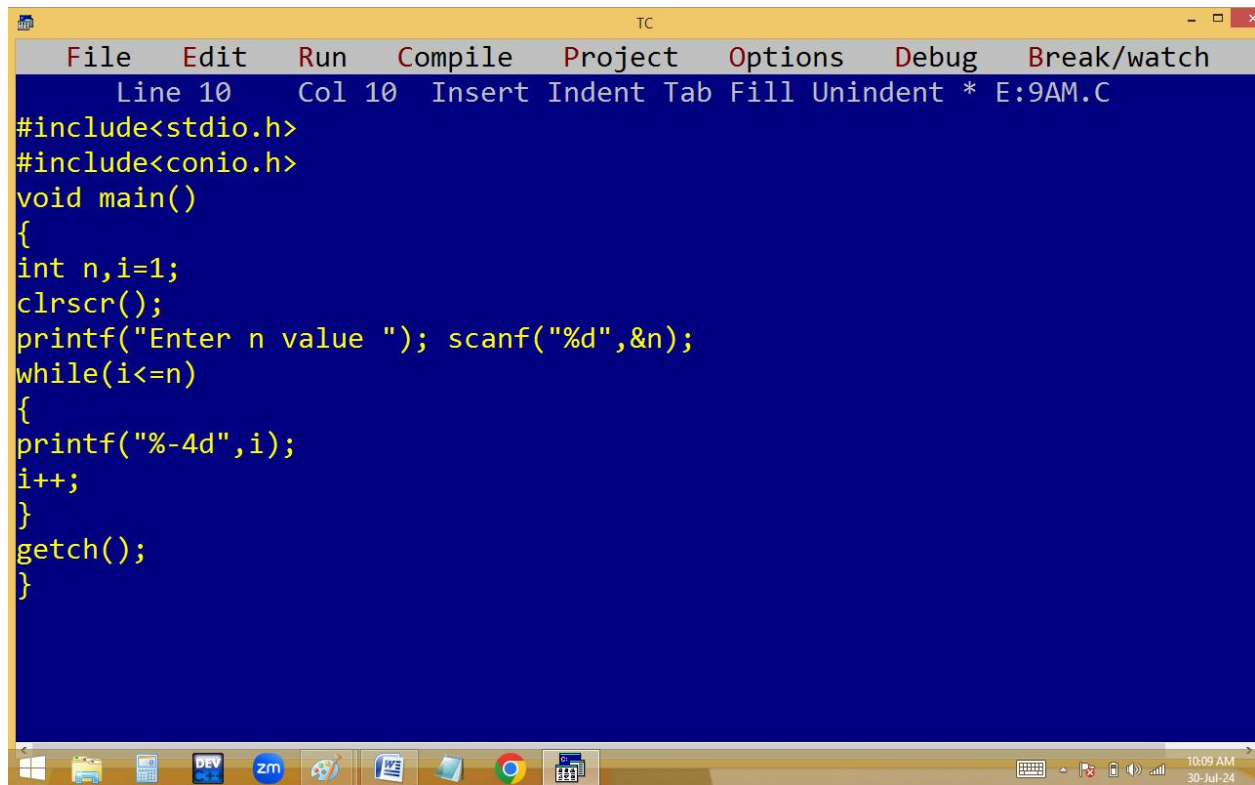
The image shows a screenshot of a Turbo C++ (TC) IDE window. The title bar reads "TC". The menu bar includes "File", "Edit", "Run", "Compile", "Project", "Options", "Debug", and "Break/watch". The status bar at the top indicates "Line 12", "Col 2", and "Insert Indent Tab Fill Unindent * E:9AM.C". The main editing area has a dark blue background with yellow text. The code is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int n,i=1;
clrscr();
printf("Enter n value "); scanf("%d",&n);
while(i<=n)
{
printf("%4d",i);
i++;
}
getch();
}
```

The Windows taskbar is visible at the bottom, showing icons for Windows Explorer, Calculator, DEV C++, Zm, and other applications. The system clock in the bottom right corner shows "10:08 AM" and "30-Jul-24".

```
TC
Enter n value 5
1 2 3 4 5_
```

```
TC
Enter n value 100
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 32 33 34 35 36 37 38 39 40
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100
```

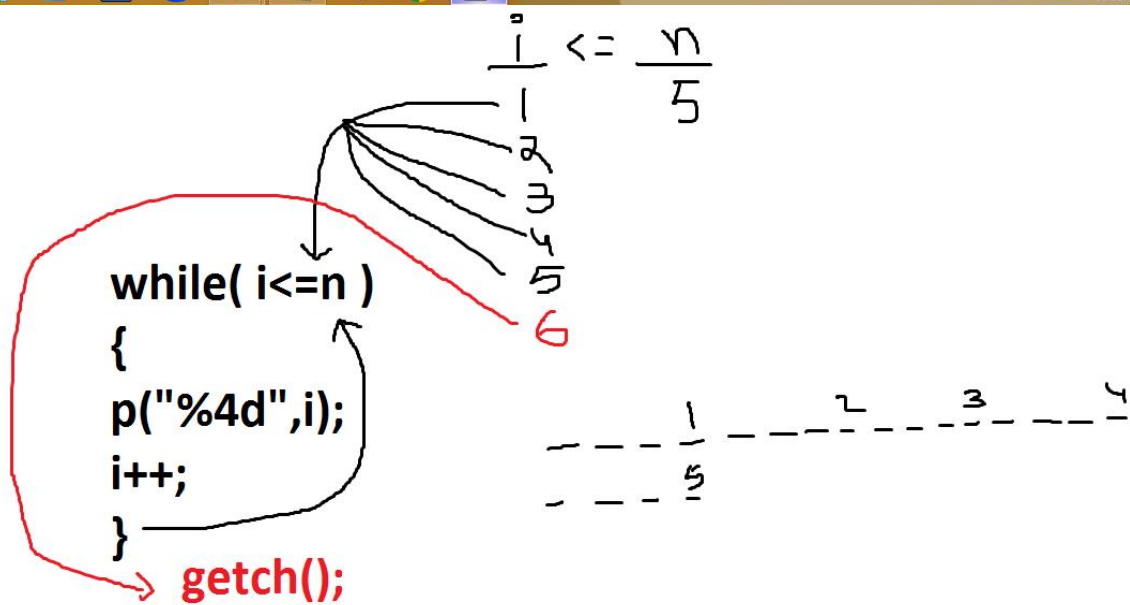


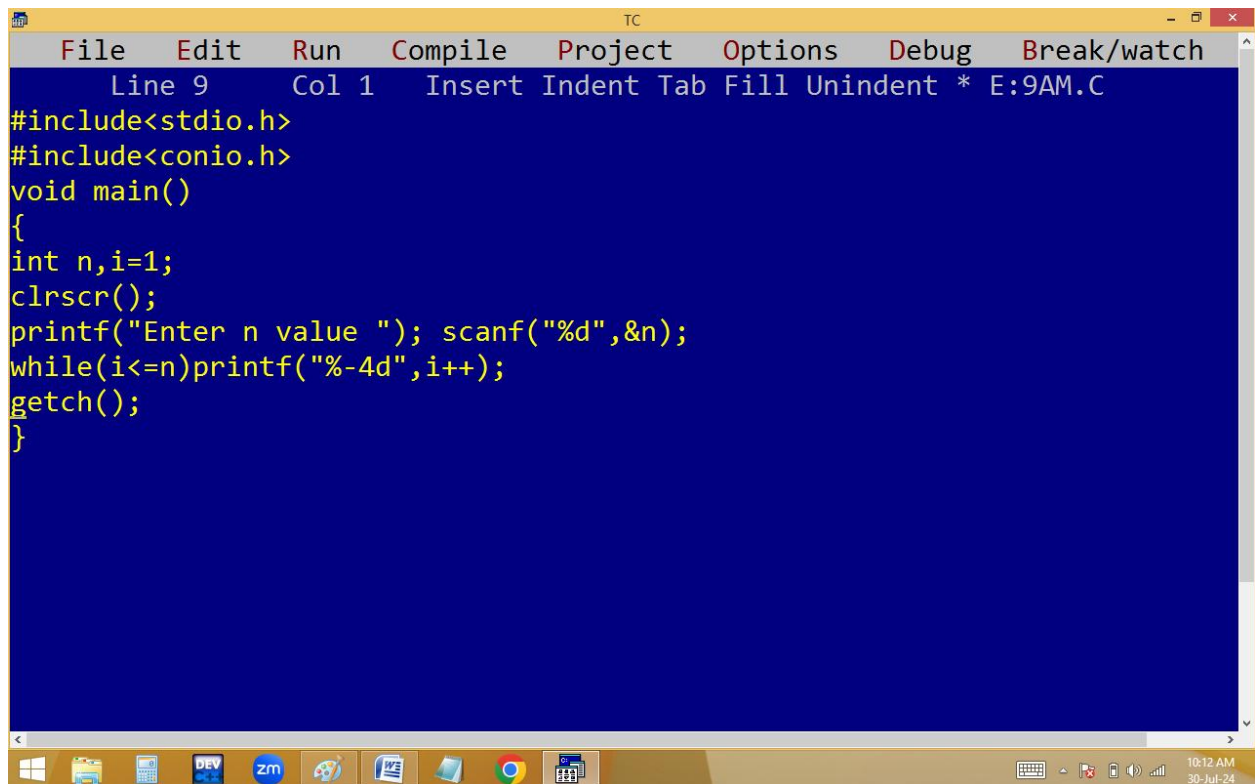
The image shows a screenshot of a Turbo C++ (TC) IDE window. The window has a yellow title bar with the text "TC" and standard window controls. Below the title bar is a menu bar with the following options: File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. Under the "Run" menu, a submenu is visible with the following options: Line 10, Col 10, Insert, Indent, Tab, Fill, Unindent, and *. The main editing area has a dark blue background and contains the following C code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int n,i=1;
clrscr();
printf("Enter n value "); scanf("%d",&n);
while(i<=n)
{
printf("%-4d",i);
i++;
}
getch();
}
```

At the bottom of the window is a Windows taskbar. It contains several icons: the Start button, a folder icon, a calculator icon, a "DEV" icon, a "zm" icon, a network icon, a printer icon, a file explorer icon, a Google Chrome icon, and a task manager icon. On the right side of the taskbar, the system clock shows "10:09 AM" and the date "30-Jul-24".

```
Enter n value 100
1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99
```

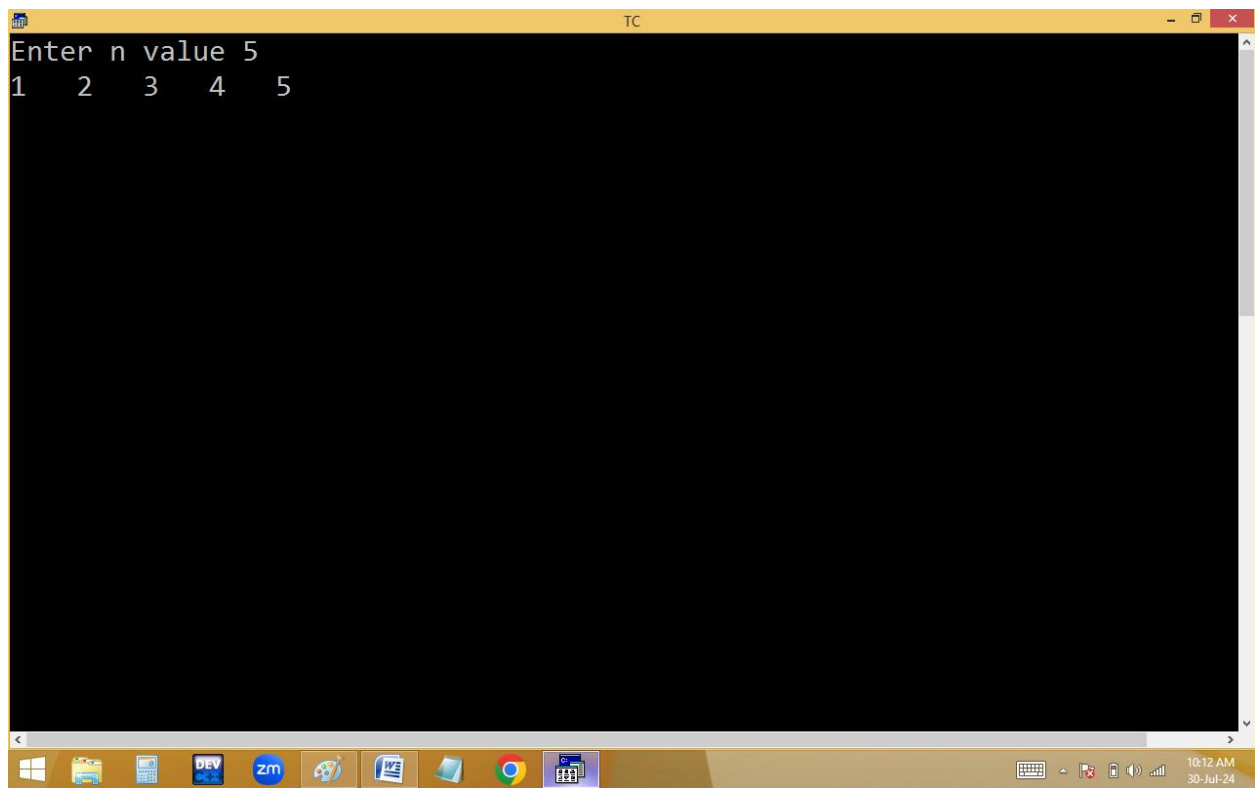




The screenshot shows the Turbo C++ (TC) IDE with a blue background. The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 9 Col 1' and 'Insert Indent Tab Fill Unindent * E:9AM.C'. The code in the editor is as follows:

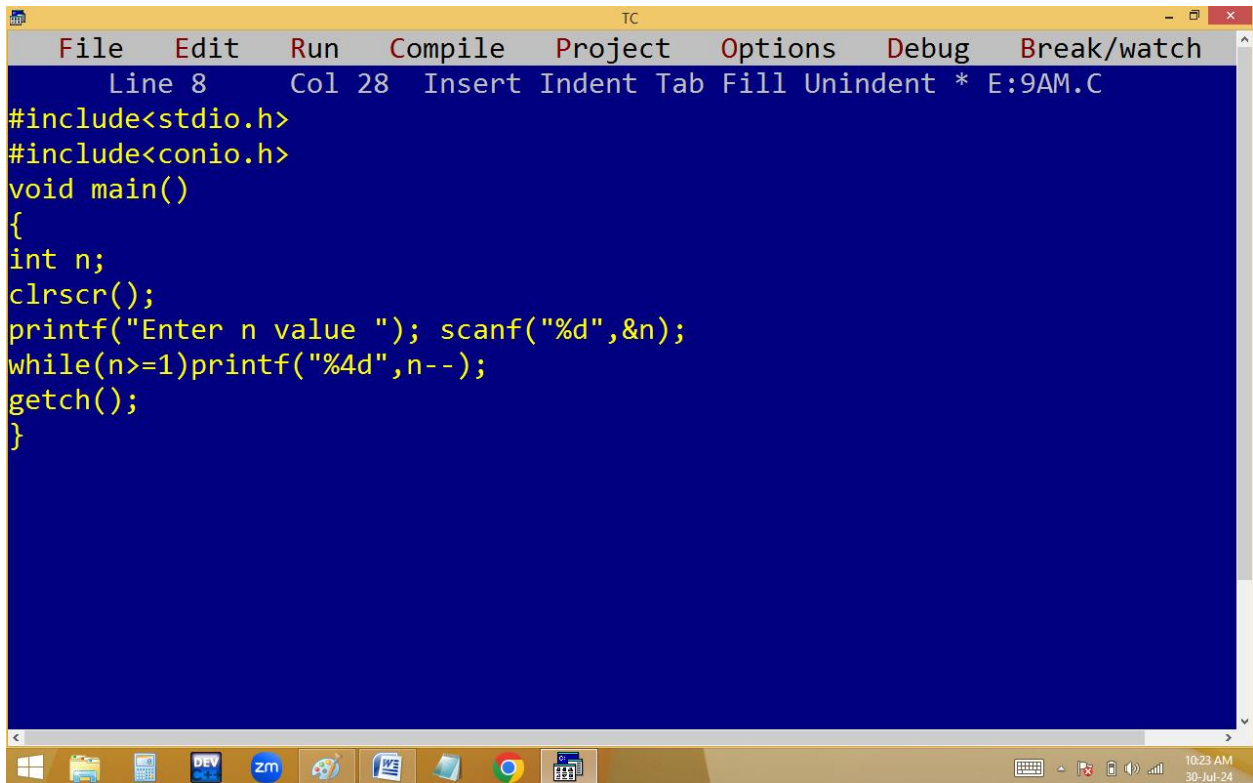
```
#include<stdio.h>
#include<conio.h>
void main()
{
int n,i=1;
clrscr();
printf("Enter n value "); scanf("%d",&n);
while(i<=n)printf("%-4d",i++);
getch();
}
```

The Windows taskbar at the bottom shows various icons including the Start button, File Explorer, DEV C++, ZOOM, and others. The system clock in the bottom right corner displays '10:12 AM 30-Jul-24'.



The screenshot shows the Turbo C++ (TC) IDE with a black background, displaying the output of the program. The text 'Enter n value 5' is on the first line, and the numbers '1 2 3 4 5' are printed on the second line, each separated by a space. The status bar at the top is not visible in this screenshot. The Windows taskbar at the bottom is identical to the first screenshot, showing the same icons and system clock.

Printing 1..n no's in reverse order.

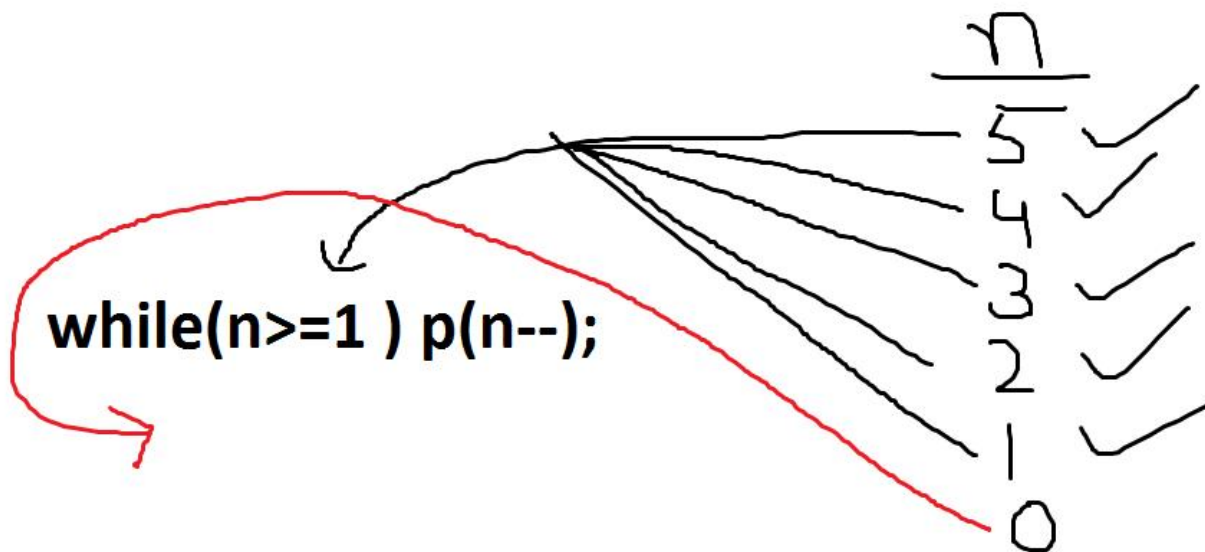


The image shows a screenshot of a Turbo C++ (TC) IDE window. The title bar reads "TC". The menu bar includes "File", "Edit", "Run", "Compile", "Project", "Options", "Debug", and "Break/watch". The status bar at the top indicates "Line 8", "Col 28", and "Insert Indent Tab Fill Unindent * E:9AM.C". The main editing area has a dark blue background with yellow text. The code is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int n;
clrscr();
printf("Enter n value "); scanf("%d",&n);
while(n>=1)printf("%4d",n--);
getch();
}
```

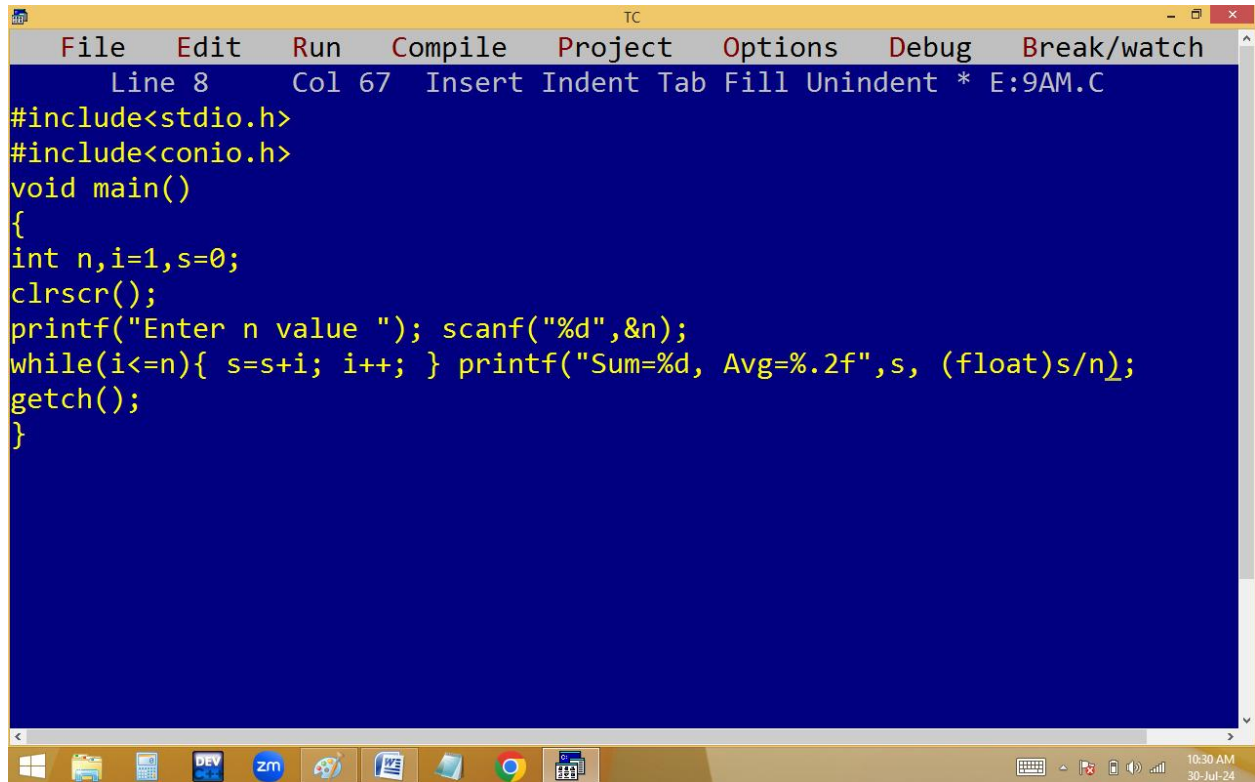
The Windows taskbar is visible at the bottom, showing icons for the Start menu, File Explorer, Calculator, DEV C++, Zoho Mail (zm), a network icon, a printer icon, a folder icon, Google Chrome, and a calendar icon. The system clock in the bottom right corner shows "10:23 AM" and "30-Jul-24".

```
TC
Enter n value 5
5 4 3 2 1_
```



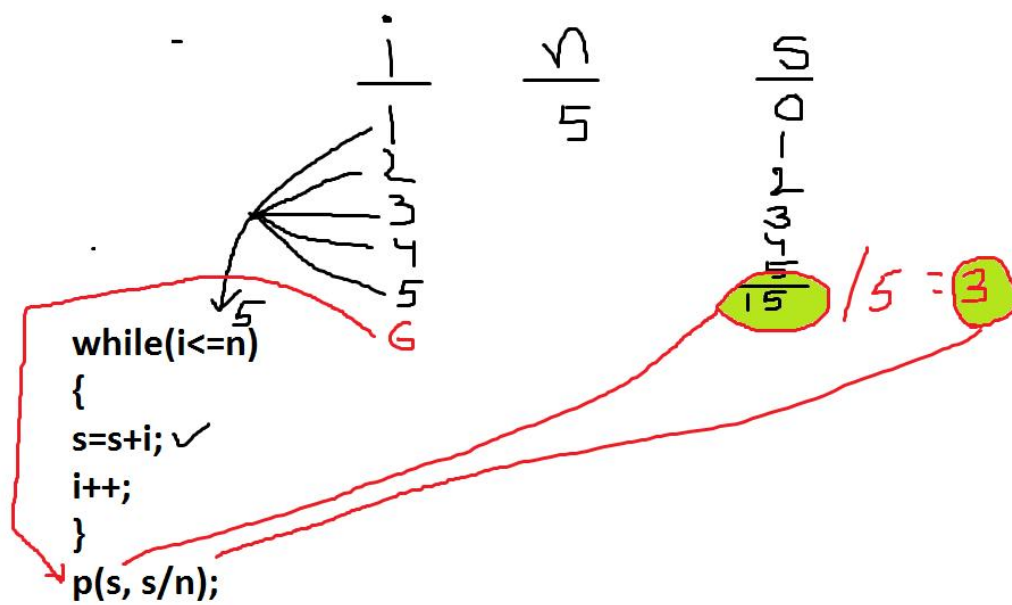
Finding 1..n number sum and avg[mean]

$n=4 \Rightarrow 1+2+3+4=10 \Rightarrow 10/4=2.5 \leftarrow \text{avg}$

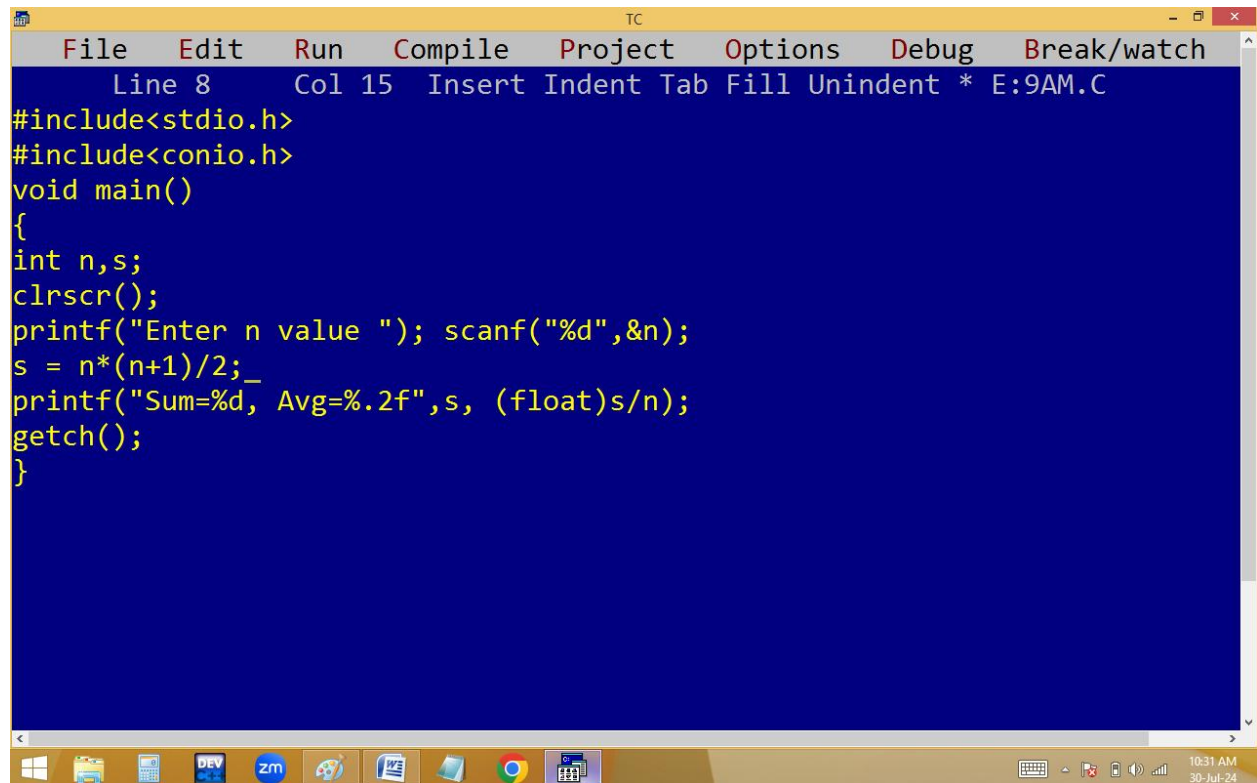


```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 8 Col 67 Insert Indent Tab Fill Unindent * E:9AM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int n,i=1,s=0;
clrscr();
printf("Enter n value "); scanf("%d",&n);
while(i<=n){ s=s+i; i++; } printf("Sum=%d, Avg=%.2f",s, (float)s/n);
getch();
}
```

```
Enter n value 4
Sum=10, Avg=2.50_
```



Without using loop/goto label:



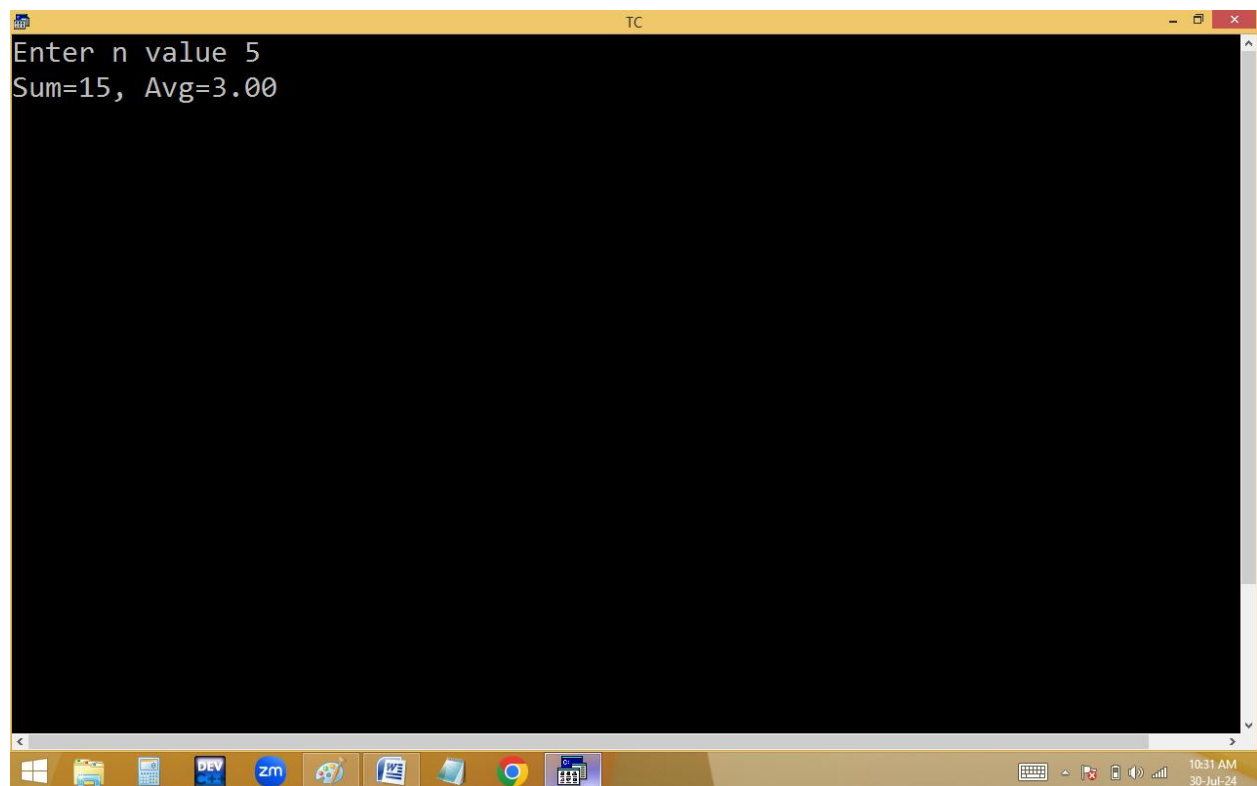
```
TC
File Edit Run Compile Project Options Debug Break/watch
Line 8 Col 15 Insert Indent Tab Fill Unindent * E:9AM.C
#include<stdio.h>
#include<conio.h>
void main()
{
int n,s;
clrscr();
printf("Enter n value "); scanf("%d",&n);
s = n*(n+1)/2;_
printf("Sum=%d, Avg=%.2f",s, (float)s/n);
getch();
}
```

The screenshot shows a Turbo C++ IDE window titled 'TC'. The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 8 Col 15 Insert Indent Tab Fill Unindent * E:9AM.C'. The main editing area has a blue background and contains the following C code: `#include<stdio.h>`, `#include<conio.h>`, `void main()`, `{`, `int n,s;`, `clrscr();`, `printf("Enter n value "); scanf("%d",&n);`, `s = n*(n+1)/2;_`, `printf("Sum=%d, Avg=%.2f",s, (float)s/n);`, `getch();`, and `}`. The Windows taskbar at the bottom shows various icons including Windows, File Explorer, DEV, zm, a game controller, a document, Google Chrome, and a calculator. The system clock in the bottom right corner shows '10:31 AM 30-Jul-24'.

```
TC
Enter n value 6
Sum=21, Avg=3.50
```



```
TC
Enter n value 5
Sum=15, Avg=3.00
```

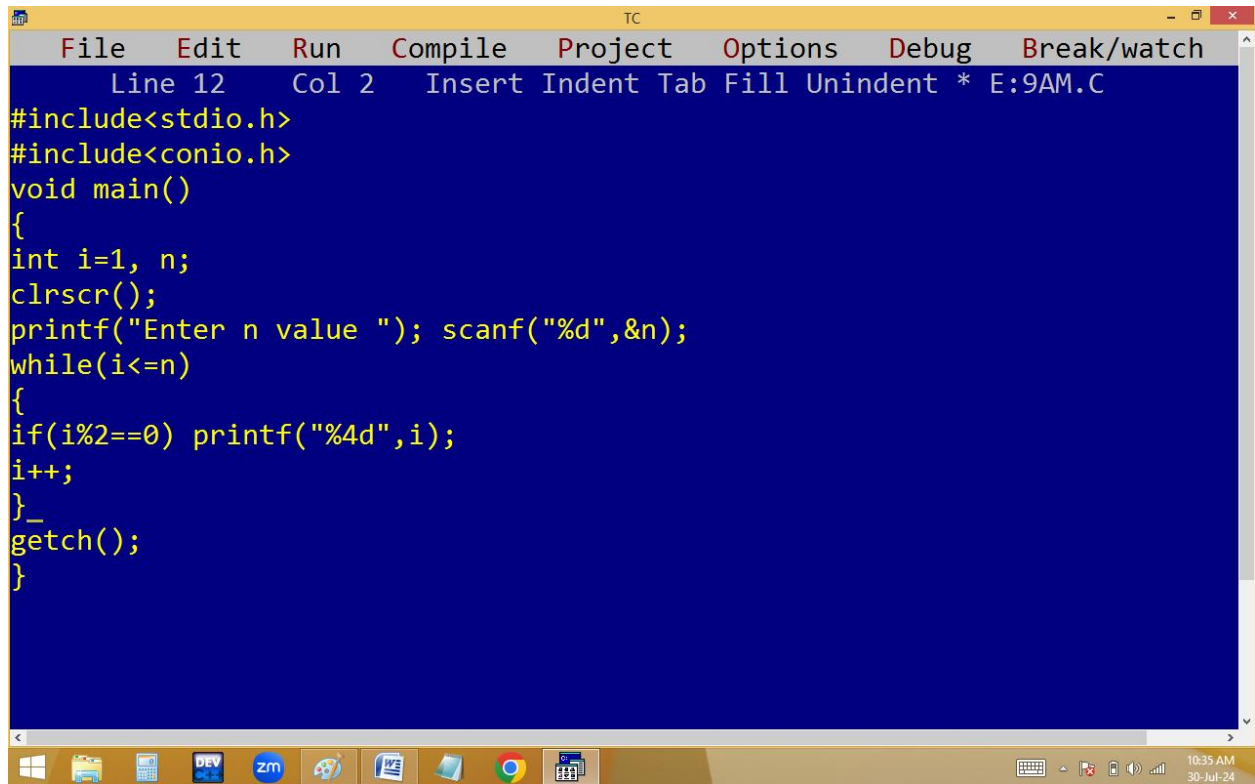


n=4

s = n*(n+1)/2;

s = 4*(4+1)/2 ==> 4*5/2=10/4=2.5

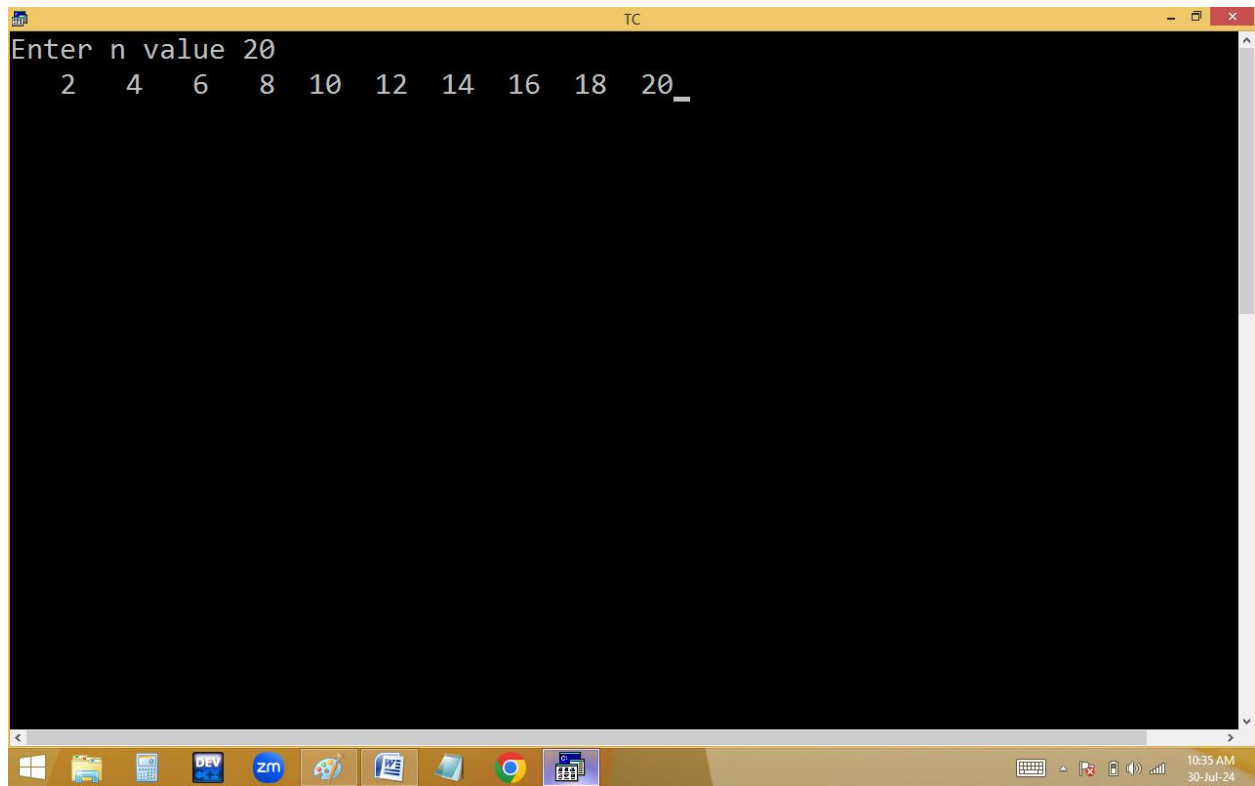
Printing 1..n even numbers.



The screenshot shows the Turbo C++ (TC) IDE with a yellow title bar and menu bar. The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 12 Col 2' and 'Insert Indent Tab Fill Unindent * E:9AM.C'. The main editing area has a blue background and contains the following C code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int i=1, n;
clrscr();
printf("Enter n value "); scanf("%d",&n);
while(i<=n)
{
if(i%2==0) printf("%4d",i);
i++;
}_
getch();
}
```

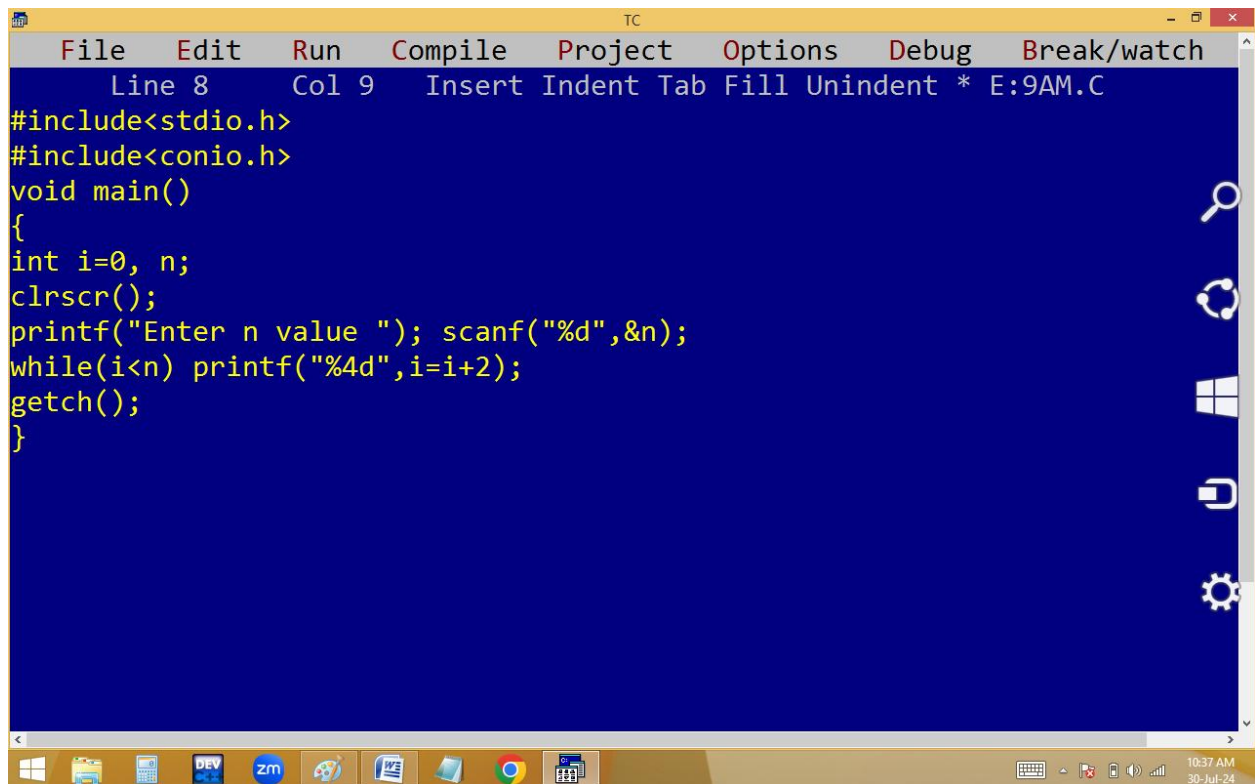
The Windows taskbar at the bottom shows various icons including Windows, File Explorer, DEV, zm, and others. The system clock in the bottom right corner displays '10:35 AM 30-Jul-24'.



The screenshot shows the Turbo C++ (TC) IDE with a yellow title bar. The main editing area has a black background and displays the output of the program:

```
Enter n value 20
 2  4  6  8 10 12 14 16 18 20_
```

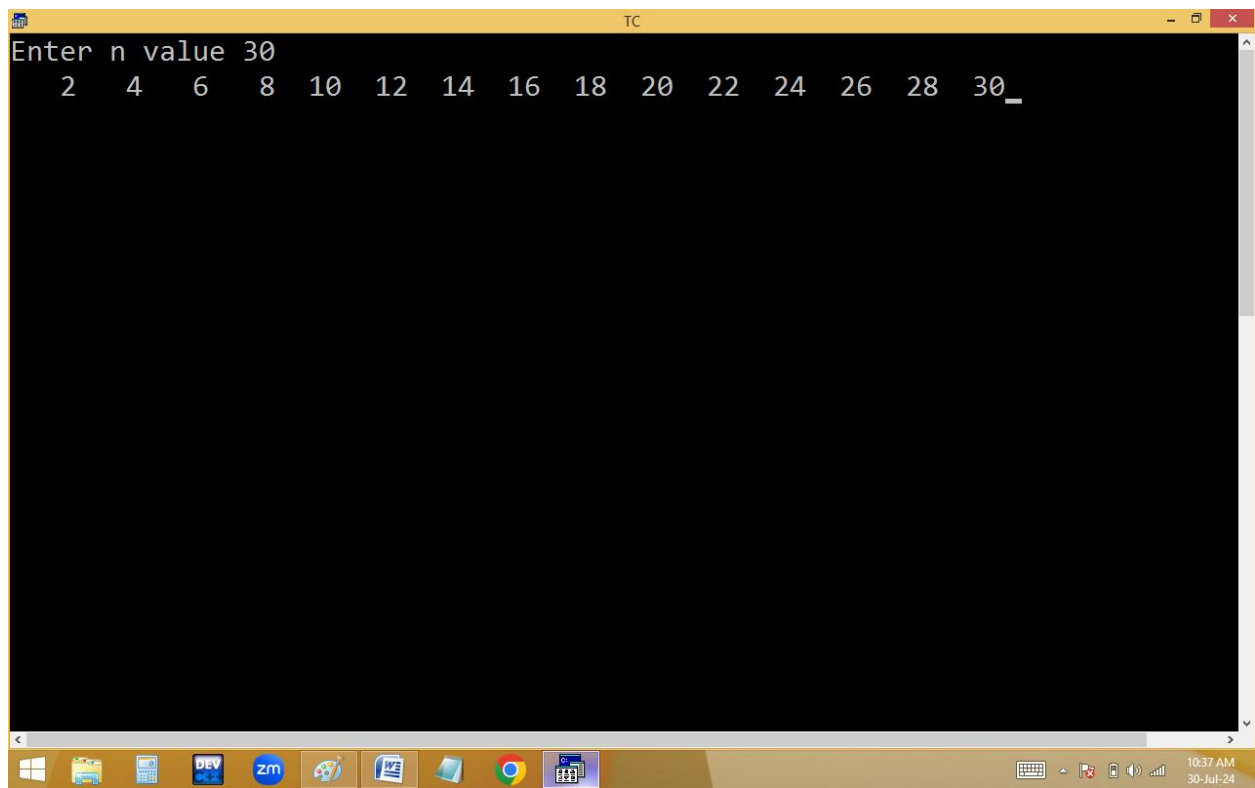
The Windows taskbar at the bottom is identical to the first screenshot, showing the same icons and system clock ('10:35 AM 30-Jul-24').



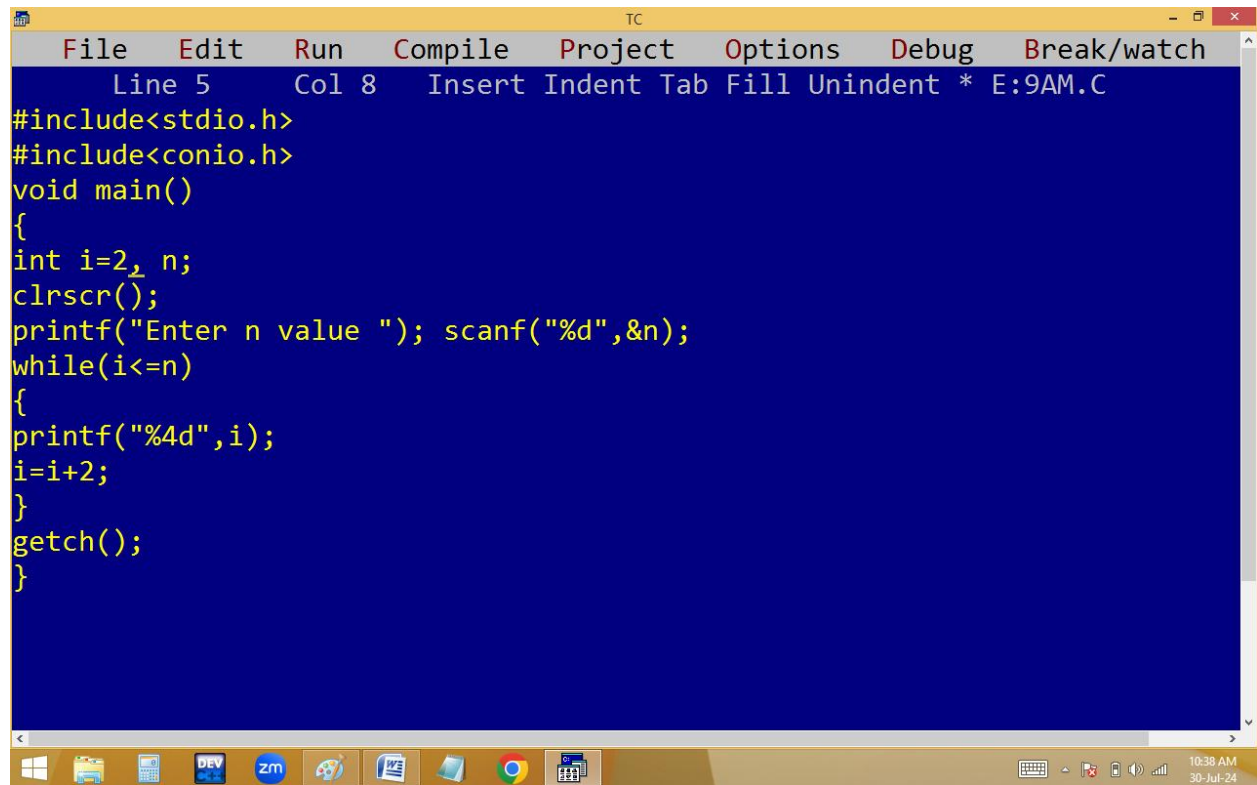
The screenshot shows the Turbo C++ (TC) IDE with a blue background. The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 8 Col 9 Insert Indent Tab Fill Unindent * E:9AM.C'. The code in the editor is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int i=0, n;
clrscr();
printf("Enter n value "); scanf("%d",&n);
while(i<n) printf("%4d",i=i+2);
getch();
}
```

On the right side of the editor, there are icons for search, refresh, window, and settings. The Windows taskbar at the bottom shows various application icons and the system clock indicating 10:37 AM on 30-Jul-24.



The screenshot shows the same Turbo C++ IDE after execution. The output window displays the text 'Enter n value 30' followed by a series of even numbers from 2 to 30, each formatted with a width of 4 characters: 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30_. The cursor is positioned at the end of the output line. The Windows taskbar at the bottom remains the same, showing the system clock at 10:37 AM on 30-Jul-24.



The image shows a screenshot of a Turbo C++ (TC) IDE window. The title bar reads "TC". The menu bar includes "File", "Edit", "Run", "Compile", "Project", "Options", "Debug", and "Break/watch". The status bar at the top indicates "Line 5", "Col 8", and "Insert Indent Tab Fill Unindent * E:9AM.C". The main editing area has a dark blue background with yellow text. The code is as follows:

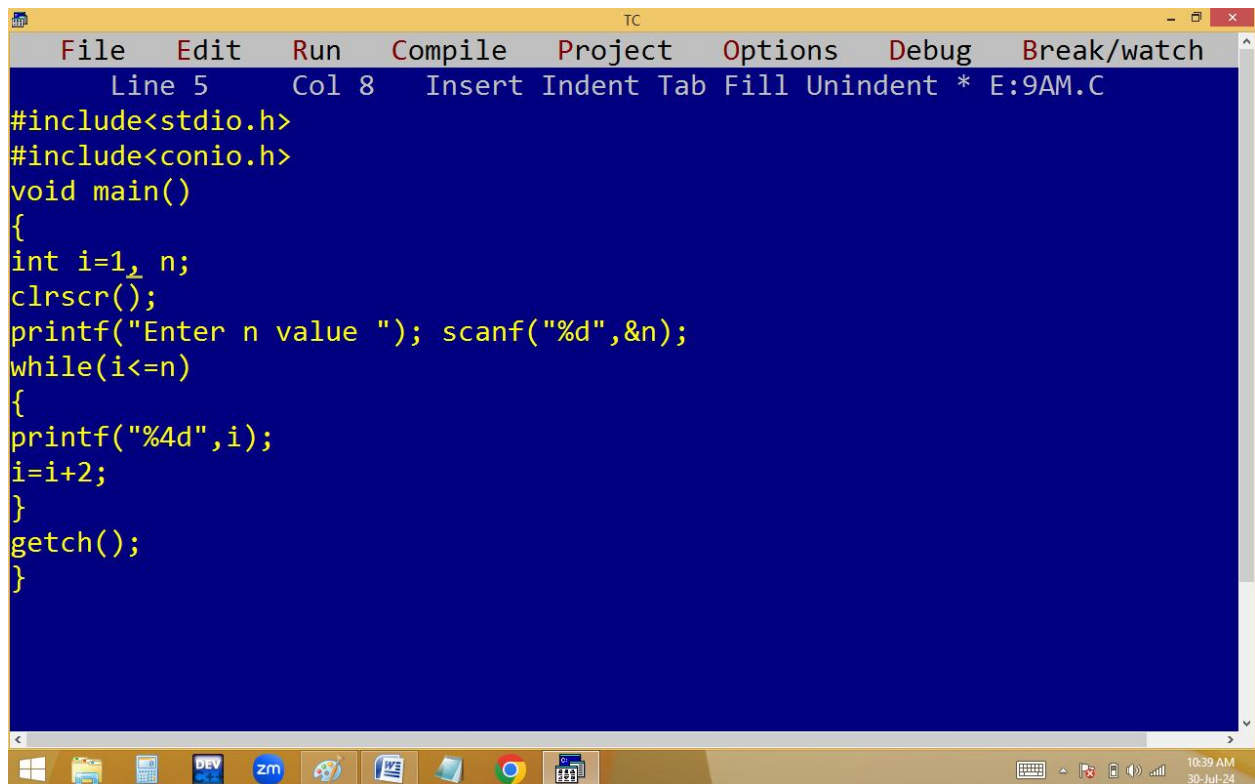
```
#include<stdio.h>
#include<conio.h>
void main()
{
int i=2, n;
clrscr();
printf("Enter n value "); scanf("%d",&n);
while(i<=n)
{
printf("%4d",i);
i=i+2;
}
getch();
}
```

The Windows taskbar is visible at the bottom, showing icons for Windows, File Explorer, a calculator, DEV C++, Zoom, a game controller, a document, Google Chrome, and a task manager. The system clock in the bottom right corner shows "10:38 AM" and "30-Jul-24".

```
TC
Enter n value 25
 2  4  6  8 10 12 14 16 18 20 22 24_
```

The screenshot shows a Turbo C++ (TC) window with a black background and white text. The prompt "Enter n value 25" is displayed at the top left. Below it, a sequence of even numbers from 2 to 24 is printed, followed by a cursor. The window's title bar is yellow and contains the text "TC". The Windows taskbar is visible at the bottom, showing various application icons and the system clock indicating 10:38 AM on 30-Jul-24.

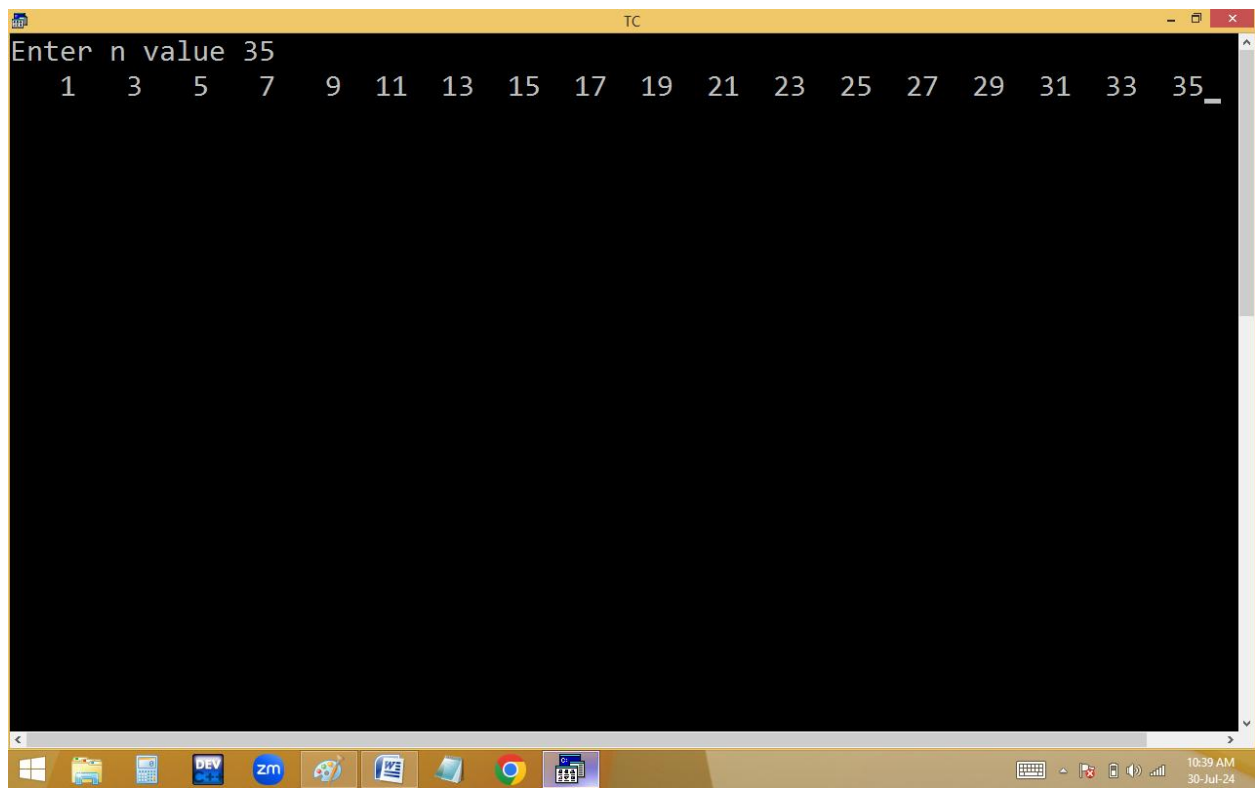
Odd numbers:



The screenshot shows the Turbo C++ (TC) IDE with a yellow title bar and menu bar. The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 5', 'Col 8', and 'Insert Indent Tab Fill Unindent * E:9AM.C'. The main editing area has a blue background and contains the following C code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int i=1, n;
    clrscr();
    printf("Enter n value "); scanf("%d",&n);
    while(i<=n)
    {
        printf("%4d",i);
        i=i+2;
    }
    getch();
}
```

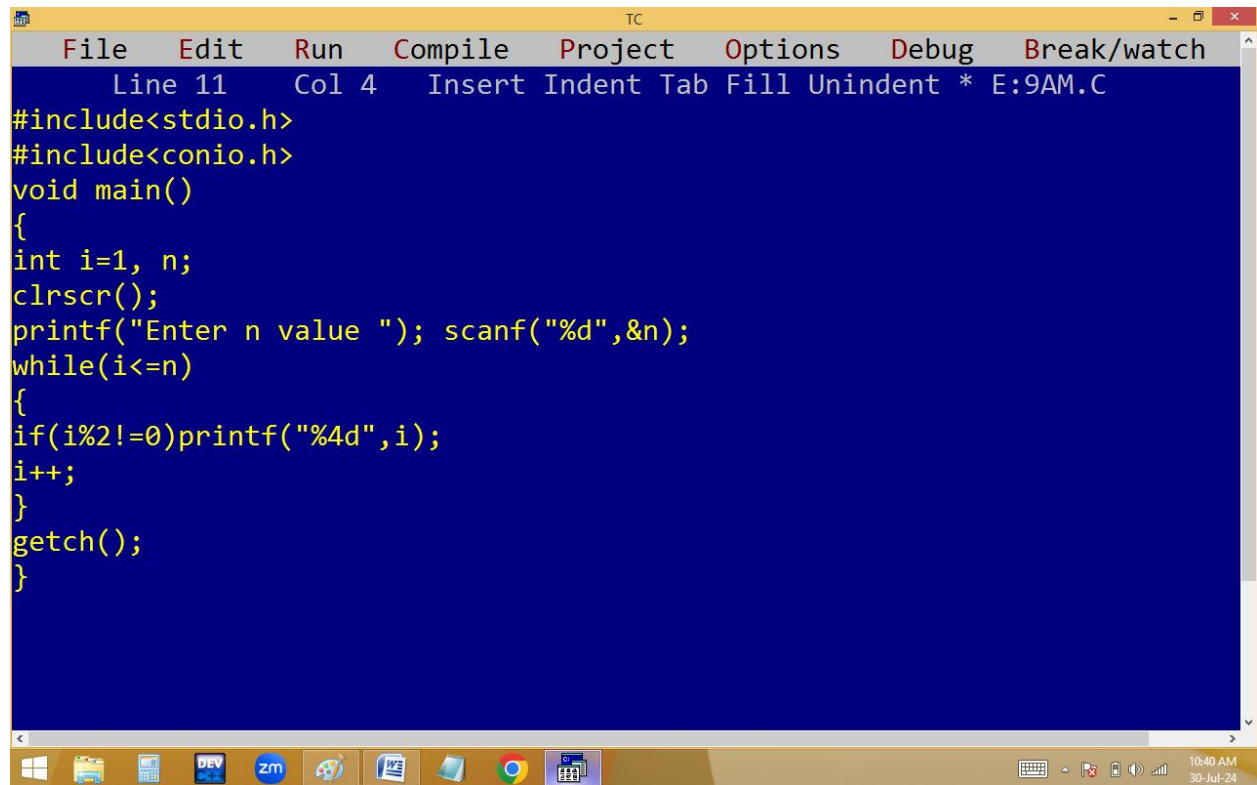
The Windows taskbar at the bottom shows various icons including Windows, File Explorer, DEV, zm, and system tray icons for keyboard, network, and volume. The system clock shows 10:39 AM on 30-Jul-24.



The screenshot shows the Turbo C++ (TC) IDE with a black background. The output of the program is displayed in the main editing area:

```
Enter n value 35
1  3  5  7  9 11 13 15 17 19 21 23 25 27 29 31 33 35_
```

The Windows taskbar at the bottom is identical to the first screenshot, showing the same icons and system clock (10:39 AM on 30-Jul-24).

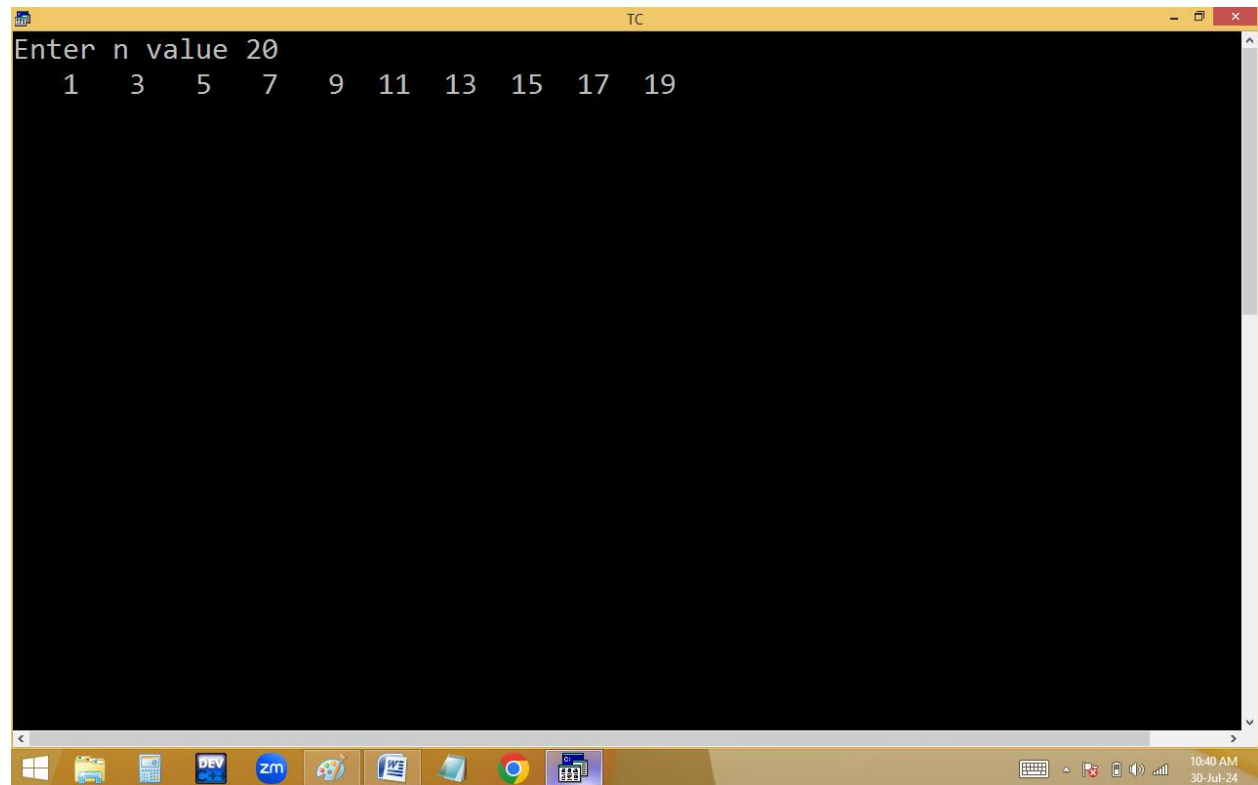


The image shows a screenshot of the Turbo C++ (TC) IDE. The window title is "TC". The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates "Line 11 Col 4 Insert Indent Tab Fill Unindent * E:9AM.C". The main editing area has a dark blue background with yellow text. The code is as follows:

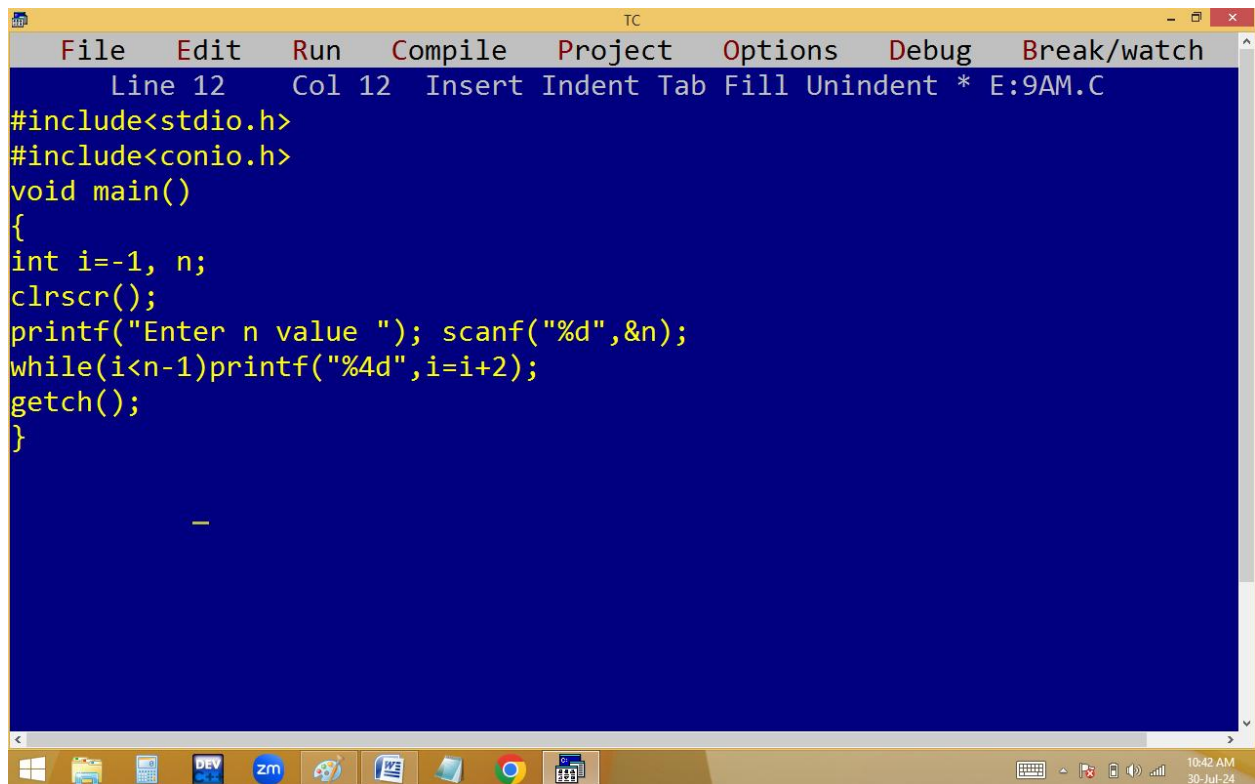
```
#include<stdio.h>
#include<conio.h>
void main()
{
int i=1, n;
clrscr();
printf("Enter n value "); scanf("%d",&n);
while(i<=n)
{
if(i%2!=0)printf("%4d",i);
i++;
}
getch();
}
```

The Windows taskbar is visible at the bottom, showing icons for Windows, File Explorer, DEV C++, zm, a game icon, a document icon, Google Chrome, and a calculator. The system clock in the bottom right corner shows "10:40 AM 30-Jul-24".

```
TC
Enter n value 20
1 3 5 7 9 11 13 15 17 19
```



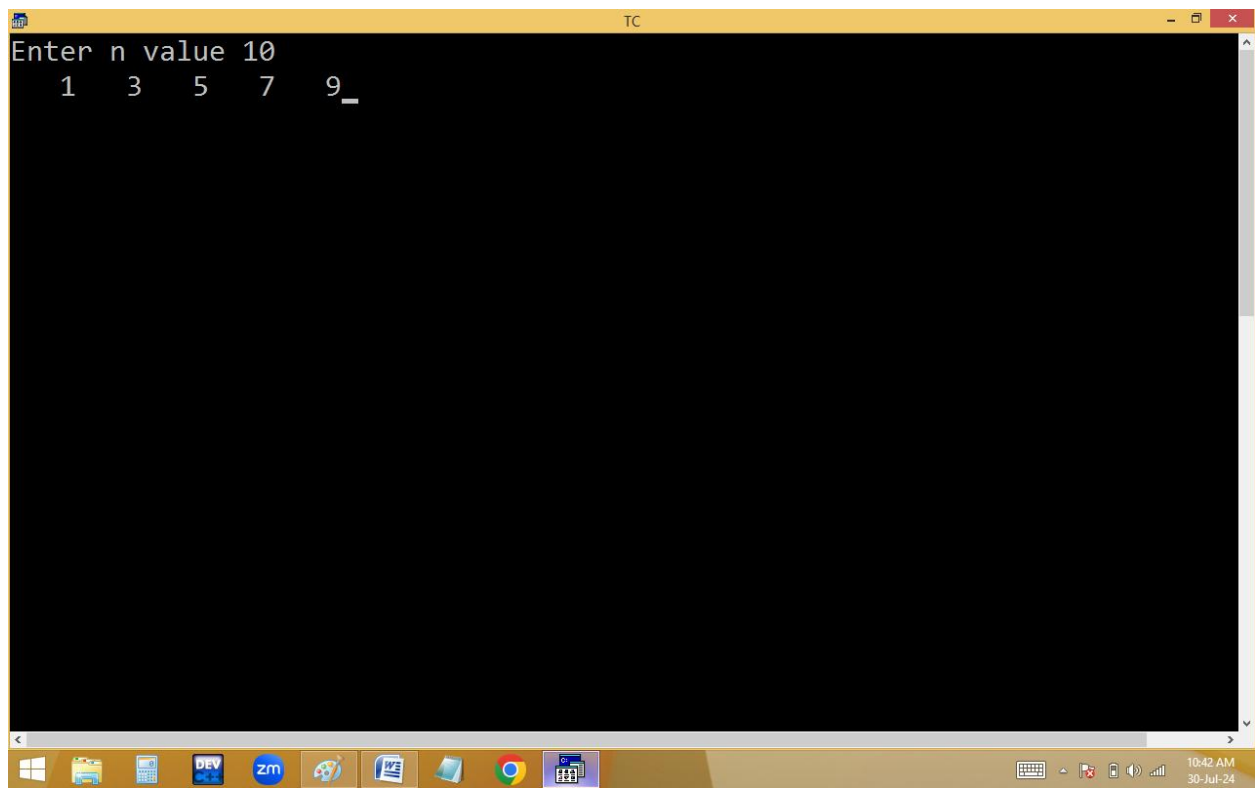
The image shows a Windows desktop environment. A Turbo C++ (TC) window is open, displaying the text "Enter n value 20" and a sequence of odd numbers: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19. The window has a yellow title bar with the text "TC". The Windows taskbar is visible at the bottom, showing various application icons including Windows Explorer, DEV C++, Zm, Paint, Word, and Google Chrome. The system tray on the right shows the time as 10:40 AM and the date as 30-Jul-24.



The screenshot shows the Turbo C++ (TC) IDE with a blue background. The menu bar includes File, Edit, Run, Compile, Project, Options, Debug, and Break/watch. The status bar at the top indicates 'Line 12 Col 12 Insert Indent Tab Fill Unindent * E:9AM.C'. The code in the editor is as follows:

```
#include<stdio.h>
#include<conio.h>
void main()
{
int i=-1, n;
clrscr();
printf("Enter n value "); scanf("%d",&n);
while(i<n-1)printf("%4d",i=i+2);
getch();
}
```

The Windows taskbar at the bottom shows various icons including Windows, File Explorer, DEV, zm, and others. The system clock in the bottom right corner displays '10:42 AM 30-Jul-24'.



The screenshot shows the Turbo C++ (TC) IDE with a black background, displaying the output of the program. The text 'Enter n value 10' is on the first line. The second line shows the output of the while loop: '1 3 5 7 9_'. The underscore indicates that the program is waiting for a key press to continue.

```
Enter n value 10
1 3 5 7 9_
```

The Windows taskbar at the bottom is identical to the first screenshot, showing the same icons and system clock.

Home work:

Finding 1..n even , odd numbers sum

$$\begin{array}{lcl} 1 & + & 10 & 5 \\ & & & \swarrow \searrow \\ & & 2 + 4 = 6 & \text{even sum} \\ & & 1 + 3 + 5 = 9 & \text{odd sum} \end{array}$$