Ch7: Multi-Dimentional Arrays

305171 Computer Programming
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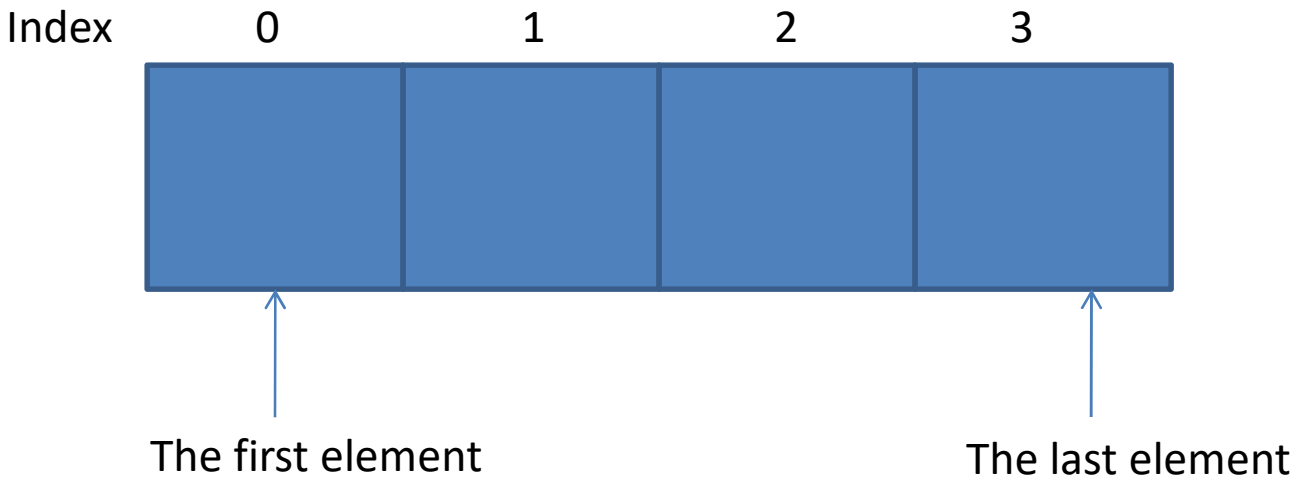
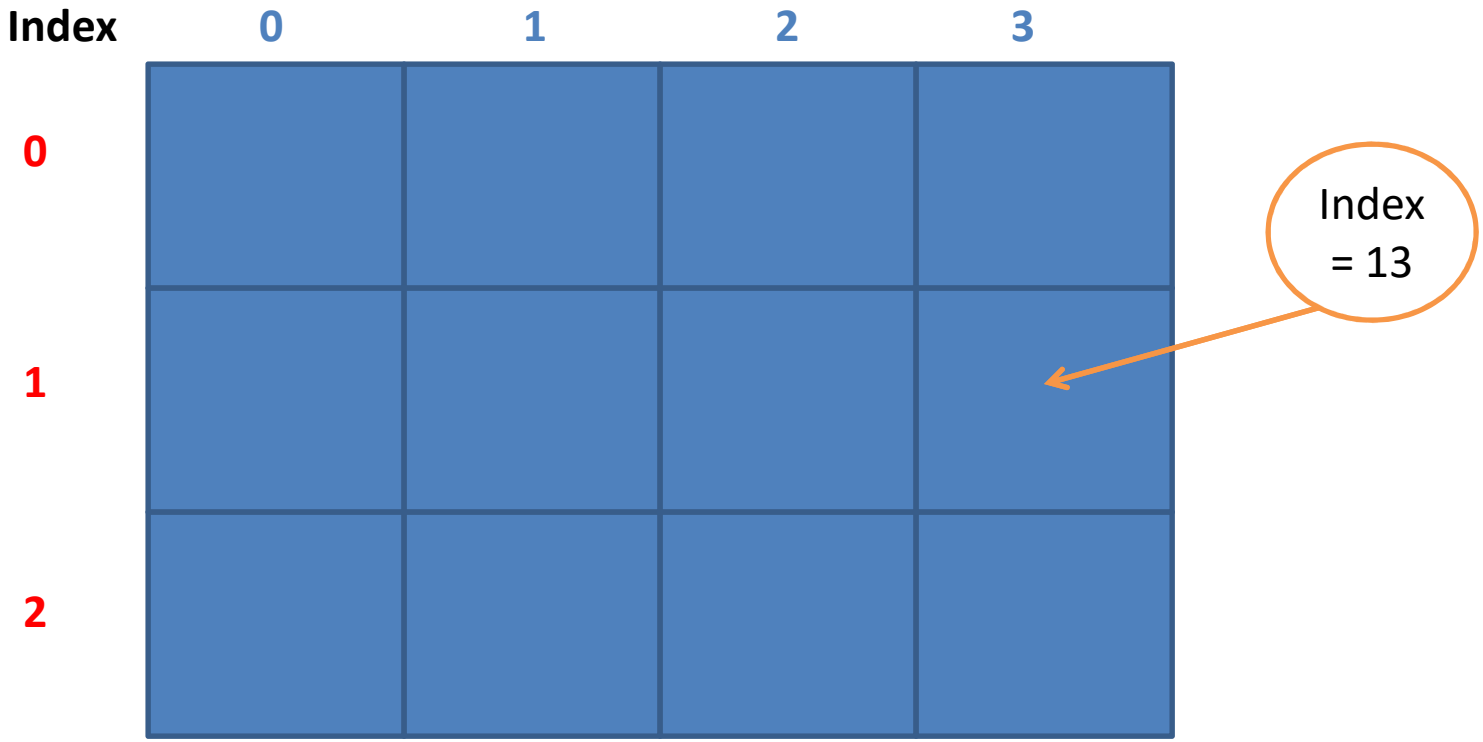
Arrays

- Arrays is a type of data structure that can store fixed-size elements of the same type.
- Arrays using index as an address to indicate each value in a collection.



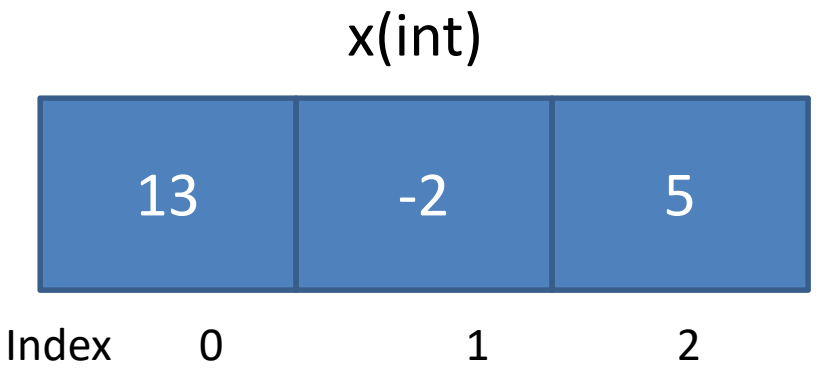
2-Dimentional Arrays

- Each dimension has its own index. To indicate each cell, we need to call index of all dimensions.

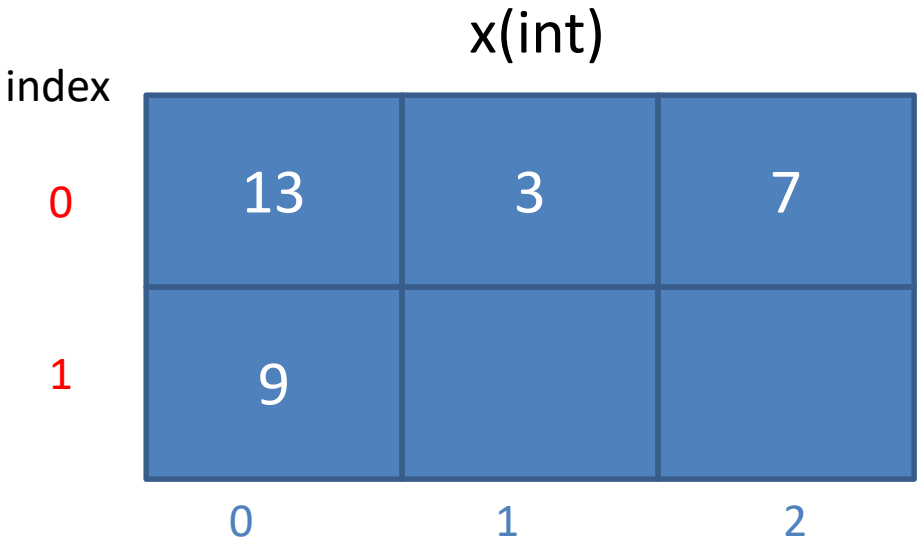


Arrays vs 2-Dimentional Arrays

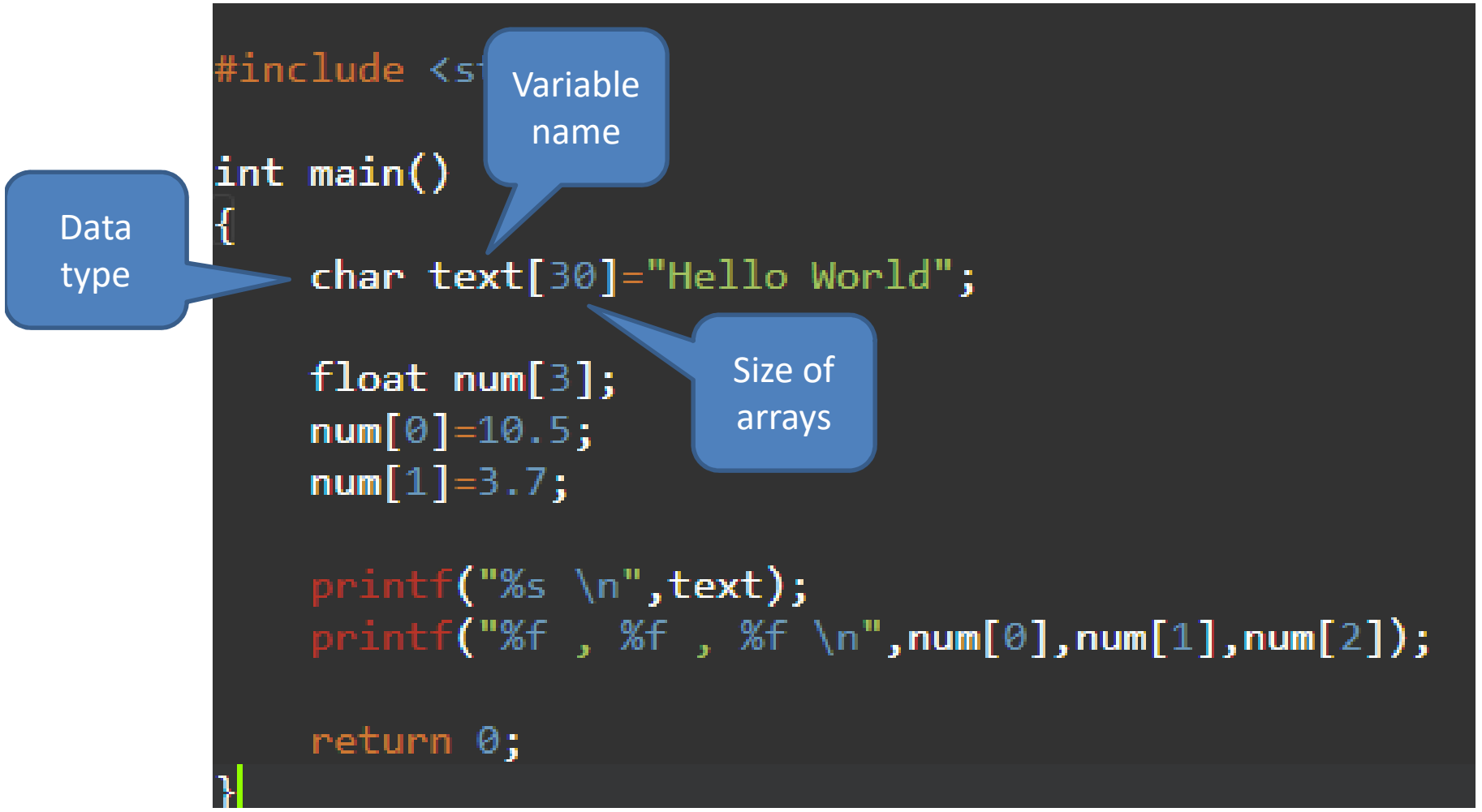
```
int x[3];
x[0]=13;
x[1]=-2;
x[2]=5;
```




```
int x[2][3];
x[0][0]= 13;
x[0][1]= 3;
x[0][2]= -7;
x[1][0]= 9;
```



How to declare arrays?



How to declare arrays?

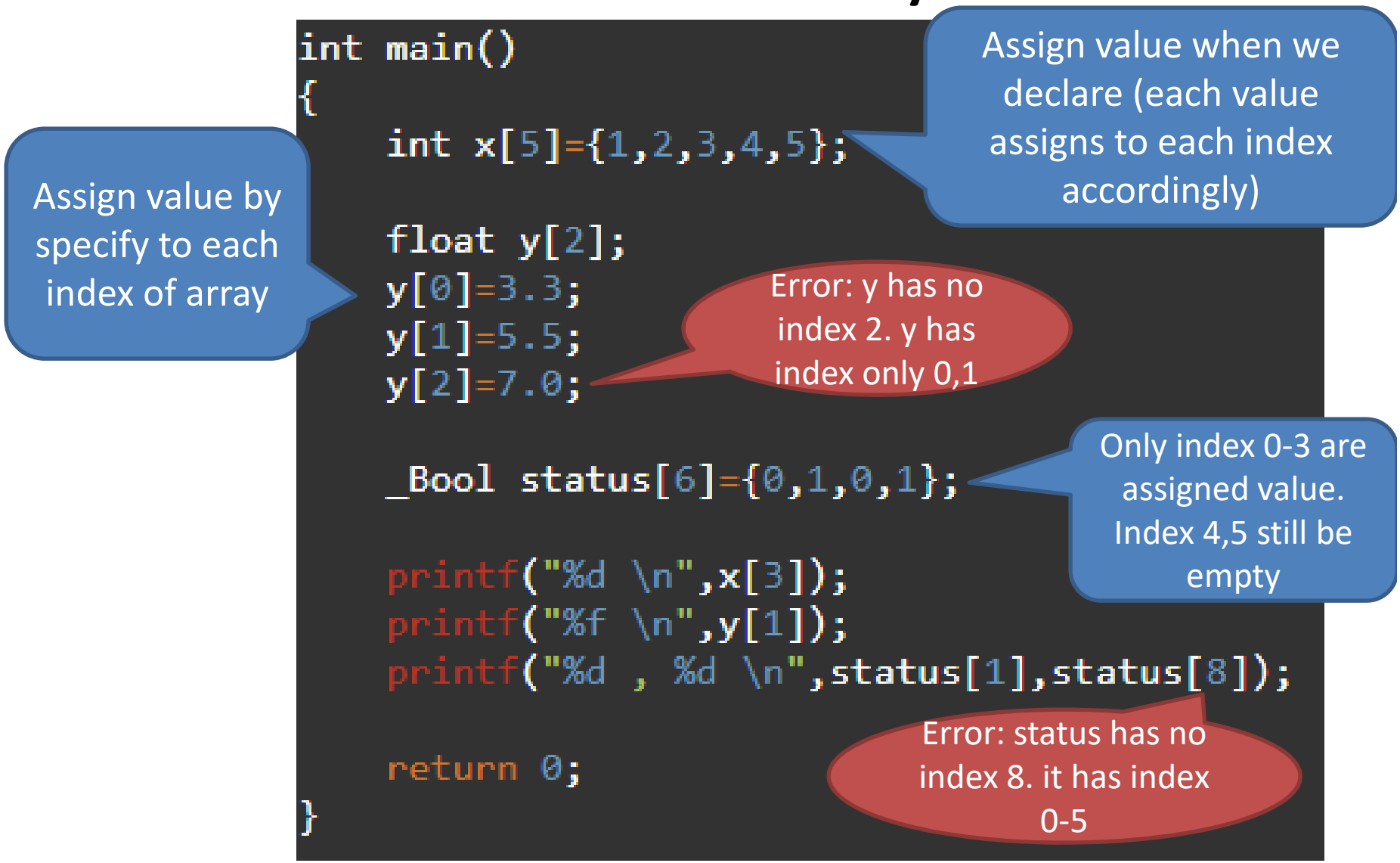
```c
#include <stdio.h>

int main()
{
    char text[2][30]={"Hello","World"};

    int num[2][2]={{1,2},{3,4}};

    float n[1][3];
    n[0][0]=2.3;
    n[0][1]=3.4;
    n[0][2]=-5.6;

    printf("%s %s \n",text[0],text[1]);
    printf("%d %d %d %d\n",num[0][0],num[0][1],num[1][0],num[1][1]);
    printf("%f %f %f \n",n[0][0],n[0][1],n[0][2]);

    return 0;
}
```

Variable name

Data type

Size of arrays

How to use arrays?



How to use arrays?

```c
int main()
{
    char text[2][30]={"Hello","World"};

    int num[2][2]={{1,2},{3,4,5}};

    float n[1][3];
    n[0][0]=2.3;
    n[0][1]=3.4;
    n[0][2]=-5.6;
    n[0][3]=4.4;

    printf("%s %s \n",text[0],text[1]);
    printf("%d %d %d %d\n",num[0][0],num[0][1],num[1][0],num[1][1]);
    printf("%f %f %f \n",n[0][0],n[0][1],n[0][2],n[0][3]);

    return 0;
}
```

Assign value when we declare (each value assigns to each index accordingly)

Assign value by specify to each index of array

Error: n has no index 3 in 2nd dimension . It has index 0-2

Practice with Loop 1

Receive 5 integer numbers from keyboard

```
int main()
{
    int x[5];
    printf("Enter a number: ");
    scanf("%d",&x[0]);
    printf("Enter a number: ");
    scanf("%d",&x[1]);
    printf("Enter a number: ");
    scanf("%d",&x[2]);
    printf("Enter a number: ");
    scanf("%d",&x[3]);
    printf("Enter a number: ");
    scanf("%d",&x[4]);
    return 0;
}
```

Exercise: Receive 8 floating numbers from keyboard

Practice with Loop 1

Receive 4 integer numbers from keyboard

```c
int main()
{
    int num[2][2];

    printf("Enter a number: ");
    scanf("%d",&num[0][0]);
    printf("Enter a number: ");
    scanf("%d",&num[0][1]);
    printf("Enter a number: ");
    scanf("%d",&num[1][0]);
    printf("Enter a number: ");
    scanf("%d",&num[1][1]);

    return 0;
}
```

Exercise: Receive 8 floating numbers from keyboard

Practice with Loop 1

Receive 5 integer numbers and find the summation

```c
int main()
{
    int x[5];
    printf("Enter a number: ");
    scanf("%d",&x[0]);
    printf("Enter a number: ");
    scanf("%d",&x[1]);
    printf("Enter a number: ");
    scanf("%d",&x[2]);
    printf("Enter a number: ");
    scanf("%d",&x[3]);
    printf("Enter a number: ");
    scanf("%d",&x[4]);

    printf("Summation = %d\n",x[0]+x[1]+x[2]+x[3]+x[4]);
    return 0;
}
```

Practice with Loop 1

Receive 4 integer numbers and find the summation

```c
int main()
{
    int num[2][2];

    printf("Enter a number: ");
    scanf("%d",&num[0][0]);
    printf("Enter a number: ");
    scanf("%d",&num[0][1]);
    printf("Enter a number: ");
    scanf("%d",&num[1][0]);
    printf("Enter a number: ");
    scanf("%d",&num[1][1]);

    printf("summation = %d \n",num[0][0]+num[0][1]+num[1][0]+num[1][1]);
    return 0;
}
```

Practice with Loop 1

Receive 5 integer numbers and find the summation

```
int main()
{
    int x[5];
    int i;
    for(i=0;i<5;i++)
    {
    printf("Enter a number: ");
    scanf("%d",&x[i]);
    }
    printf("Summation = %d\n",summation(x));
    return 0;
}
```

Practice with Loop 1

Receive 5 integer numbers and find the summation

```
int summation(int num[]){
    int i=0,sum=0;
    while(i<5){
        sum=sum+num[i];
    i++;
    }
    return sum;
}
```

Practice with Loop 1

Receive 4 integer numbers and find the summation

```c
int main()
{
    int num[2][2];
    int i=0;
    while(i<2){
        int j=0;
        while(j<2){
            printf("Enter a number: ");
            scanf("%d",&num[i][j]);
            j++;
        }
        i++;
    }

    printf("summation = %d \n",summation(num));
    return 0;
}
```

Practice with Loop 1

Receive 4 integer numbers and find the summation

```
int summation(int x[][2]){
    int i,j,sum=0;
    for(i=0;i<2;i++){
        for(j=0;j<2;j++){
            sum=sum+x[i][j];
        }
    }
    return sum;
}
```

Practice with Loop 2

Receive 10 integers and count the number of odd numbers

```
int count(int num[]){
    int i=0,count=0;
    while(i<10){
        if(num[i]%2!=0){
            count=count+1;
        }
    i++;
    }
    return count;
}

int main()
{
    int x[10];
    int i;
    for(i=0;i<10;i++)
    {
    printf("Enter a number: ");
    scanf("%d",&x[i]);
    }
    printf("The number of odd = %d\n",count(x));
    return 0;
}
```

Exercise: Receive 10 floating numbers and count the number of positive numbers

Practice with Loop 2

Receive 4 integers and count the number of odd numbers

Exercise: Receive 10 floating numbers and count the number of positive numbers

```c
int countOdd(int x[][2]){
    int i,j,count=0;
    for(i=0;i<2;i++){
        for(j=0;j<2;j++){
            if(x[i][j]%2!=0){
                count++;
            }
        }
    }
    return count;
}
int main()
{
    int num[2][2];
    int i=0;
    while(i<2){
        int j=0;
        while(j<2){
            printf("Enter a number: ");
            scanf("%d",&num[i][j]);
            j++;
        }
        i++;
    }

    printf("The number of odd = %d \n",countOdd(num));
    return 0;
}
```

Practice with Tic-Tac-Toe

Exercise : To find …..Does X/O win?
Receive the input number can be only 1 or 2 (1=X, 2=O)
and check whether there exists the same 3 numbers in one of 8 directions.