


```

for(i=0; i<cn; i++) {
    for(j=0; j<12; j++) {
        printf("%d", c[i][j]);
    }
    printf("\n");
}
else {
    printf("Multiplication is not possible\n");
}
getch();

```

P-81 Write a C program to read sales of 5 salesmen in 12 months and print the total sales made by each salesman.

```

#include <stdio.h>
#include <math.h>
#include <conio.h>
void main()
{
    float sales[5][12]; i, j, sales[5][12];
    printf("Enter the sales\n");
    for(i=0; i<5; i++)
        for(j=0; j<12; j++)
            scanf("%d", &sales[i][j]);
    for(i=0; i<5; i++)
        for(j=0; j<12; j++)
            if(sales[i][j] > 0)

```

```

sum = 0;
for(j=0; j<12; j++)
    sum = sum + sales[i][j];
printf("%d", sum);
getch();

```

P-82 Sorting of array : Selection Sort

```

#include <stdio.h>
#include <math.h>
#include <conio.h>
void main()
{
    int n, arr[100], i, j, min, temp;
    printf("Enter the value of n\n");
    scanf("%d", &n);
    printf("Enter the values of arr\n");
    for(i=0; i<n; i++)
        scanf("%d", &arr[i]);
    for(i=0; i<n; i++)
    {
        min = arr[i];
        for(j=i+1; j<n; j++)
            if(arr[j] < min)
                min = arr[j];
        temp = arr[i];
        arr[i] = min;
        arr[j] = temp;
    }
    for(i=0; i<n; i++)
        printf("%d ", arr[i]);
}

```

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```

min = i;
for (j = i+1; j < n; j++) {
    if (a[j] < a[min])
        min = j;
}
if (min != i)
    printf("%d", a[min]);
getch();
temp = a[min];
a[min] = a[i];
a[i] = temp;
}

```

What is a function?

A function is a self-contained program, capable of performing a particular task.

What is Modularity? It is a property of functions, which divides a larger program into several smaller segments/modules.

Note: when a function calls itself, it is known as recursion.

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P-56

~~formal arguments~~

```

#include <cs50.h>
#include <math.h>
#include <conio.h>
void add (int x, int y); → // (function declaration) / Function
void main ()
{
    int a, b;
    printf ("Enter the values of a and b\n");
    scanf ("%d %d", &a, &b);
    add (a, b); → function call : (dotted line)
    getch(); → actual argument : (dotted line)
}

```

(dotted line)

formal arguments

```

void add (int x, int y)
{
    int sum;
    sum = x + y;
    printf ("%d", sum);
}

```

P-57

#include <cs50.h>
#include <math.h>
#include <conio.h>
void starbar ();
void main ()
{
 for (int i = 0; i < 50; i++)
 starbar ();
 getch();
}

starbar ()

```

printf ("\n");
printf ("\n");
printf ("\n");
printf ("\n");
printf ("\n");

```

```

P-58
#include <stdio.h>
#include <math.h>
#include <conio.h>
int add (int, int);
int multiply (int, int);
void main ()
{
    clrscr();
    int a, b, sum;
    printf ("Enter the value of a and b\n");
    scanf ("%d %d", &a, &b);
    sum = add (a, b);
    printf ("sum = %d", sum);
    getch();
}

int add (int x, int y)
{
    float z;
    z = exp (x);
    y = sqrt (x);
    return (z);
}

```

printf ("Enter the value of a and b\n");
scanf ("%d %d", &a, &b); // Enter 15 and 10
c = multiply (a, b);
printf ("c = %d", c);
getch();

multiply (c) = $e^{15+10} = e^{25} \approx 128.5$ or $c = 128.5$

int multiply (int x, int y)
{
 float z;
 z = exp (x + y);
 return (z);
}

After running the program we get the output as 128.5.

m = x * y;

return (m);

WAP in C to find the leap year using function.

#include <conio.h>
void leap-year (int);

void main ()
{

int year;

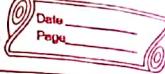
printf ("Enter the year\n");
scanf ("%d", &year);

leap-year (year);

getch();

wid leap-year (int year)

E 1 14



```

{ if (year % 4 == 0 && (year % 100 != 0 || year % 400 == 0)) {
    int item1, item2, item3; // (d, o, s) is 100x100 - 999
    item1 = year % 4;
    item2 = year % 100;
    item3 = year % 400;
    if ((item1 == 0) && ((item2 == 0) || (item3 == 0))) {
        printf("The given year is a leap year", year);
    } else {
        printf("Not a leap year");
    }
}

```

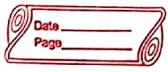
(P-6) WAP in C to find the absolute value of
given data using function.

```

int a, b, c;
printf("Enter the value of a, b, & c\n");
scanf("%d %d %d", &a, &b, &c);
absolute(a, b, c);
getch();

```

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```

void absolute(int x, int y, int z); // standardized
{
    int a1, a2, a3; // (d, o, s) is 100x100 - 999
    a1 = abs(x);
    a2 = abs(y);
    a3 = abs(z);
    printf("%d %d %d", a1, a2, a3);
}

```

#include <math.h> // for std::abs of multiple numbers in same line

~~int absolute(int, int, int)~~

```

int absolute (int);
void main()
{
    int a, b, c, d, e, f;
    a=10;
    b=0;
    c=-20;
    d=absolute(a);
    e=absolute(b);
    f=absolute(c);
    printf("%d %d %d\n", d, e, f);
    getch();
}

```

```

int absolute(int x)
{
    if (x > 0)
        return (x);
    if (x == 0)
        return (0);
    if (x < 0)
        return (-x);
}

```

P-62
Write a C program to evaluate the following expression:
 $B_{nm} = \frac{(n-m)!}{m! n!}$
 (Binomial coefficient)

```

# include <iostream.h>
# include <math.h>
int binomial (int m, int n);
void main()
{
    int m, n;
    cout << "Enter the value of m, n ";
    cin >> m >> n;
    cout << endl;
    cout << "B<sub>nm</sub> = ";
    cout << binomial (m, n);
    cout << endl;
}
int binomial (int m, int n)
{
    if (m < n)
        return 0;
    if (m == n)
        return 1;
    if (m > n)
        return (m * binomial (m-1, n));
}

```

```

# include <iostream.h>
# include <math.h>
int factorial (int n);
void main()
{
    int n, m, f1, f2, f3, Bnm;
    cout << "Enter the value of n and m ";
    cin >> n >> m;
    cout << endl;
    f1 = factorial (n);
    f2 = factorial (m);
    f3 = factorial (n-m);
    Bnm = f1 / (f2 * f3);
    cout << "B<sub>nm</sub> = " << Bnm;
    getch();
}

```

```

int factorial (int k)
{
    int i, fact;
    fact = 1;
    for (i=1; i <= k; i++)
        fact = fact * i;
    return (fact);
}

```

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(P-13) WAP in C to calculate the power of a given number using function.

```
#include <stdio.h>
int power(int a, int b);
void main()
{
    int y, x, b;
    printf("Enter the value of x and b\n");
    scanf("%d %d", &x, &b);
    y = power(x, b);
    printf("y = %d", y);
    getch();
}

int power (int a, int b)
{
    int c, i;
    c = 1;
    for (i = 1; i <= b; i++) {
        c = c * a;
    }
    return(c);
}
```

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(P-14) WAP in C to find the sum and avg. of n given numbers using function.

```
#include <stdio.h>
int sum (int a[], int m);
float avg (float s);
void main()
{
    int a[100], n, i, s;
    float avg;
    printf("Enter the value of n\n");
    scanf("%d", &n);
    printf("Enter the value of a\n");
    for (i = 0; i < n; i++)
        scanf("%d", &a[i]);
    s = sum(a, n);
    avg = s/n;
    printf("sum = %d", s);
    printf("avg = %f", avg);
    getch();
}

int sum (int a[], int m)
{
    int sum1, i;
    sum1 = 0;
    for (i = 0; i < m; i++)
        sum1 = sum1 + a[i];
    return(sum1);
}
```

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P-65

$$SD = \sqrt{\frac{1}{n} \sum (x_i - \bar{x})^2}$$

P-65 WAP in C to find standard deviation $SD = \sqrt{\frac{1}{n} \sum (x_i - \bar{x})^2}$

```
#include <stdio.h>
#include <math.h>
#include <conio.h>
int sum(int x[], int n);
int stdv(int x[], int n, float avg);
int main()
{
    clrscr();
    int n, a[10], $, i, j;
    float SD, avg;
    printf("Enter the value of n\n");
    scanf("%d", &n);
    printf("Enter the value of a[n]\n");
    for(i=0; i<n; i++)
        scanf("%d", &a[i]);
    $ = sum(a, n);
    avg = $/n;
    SD = stdv(a, avg, n);
    printf("SD = %.2f", SD);
    getch();
}
int sum(int x[], int n)
{
    int i, sum = 0;
    for(i=0; i<n; i++)
        sum += x[i];
    return sum;
}
int stdv(int x[], int n, float avg)
{
    int sum, i, avg;
    sum = 0;
    for(i=0; i<n; i++)
        sum += (x[i] - avg) * (x[i] - avg);
    avg = sum/n;
    return sqrt(avg);
}
```

```
int sum, i, avg;
sum = 0;
for(i=0; i<n; i++)
    sum += a[i];
return sum;
```

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P-66 WAP in C to read the matrix and display it

```
#include <stdio.h>
int matrix(int [[ ]], int, int);
void main()
{
    int a[10][10], i, j, m, n;
    printf("Enter the value of a[m][n]\n");
    for(i=0; i<m; i++)
        for(j=0; j<n; j++)
            a[i][j] = j + 1;
    matrix(a, m, n);
}
int matrix(int a[10][10], int m, int n)
{
    int i, j;
    for(i=0; i<m; i++)
        for(j=0; j<n; j++)
            printf("%d ", a[i][j]);
    getch();
}
```

P-66 WAP in C to read the matrix and display it

```
#include <stdio.h>
int matrix(int [[ ]], int, int);
void main()
{
    int a[10][10], i, j, m, n;
    printf("Enter the value of a[m][n]\n");
    for(i=0; i<m; i++)
        for(j=0; j<n; j++)
            a[i][j] = j + 1;
    matrix(a, m, n);
}
int matrix(int a[10][10], int m, int n)
{
    int i, j;
    for(i=0; i<m; i++)
        for(j=0; j<n; j++)
            printf("%d ", a[i][j]);
    getch();
}
```

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```
#include <stdio.h>
#include <conio.h>
void display (int x[10][10], int, int); //function declaration
void main()
{
    int a[10][10], m, n, i, j;
    clrscr();
    printf ("Enter the value of m and n\n");
    scanf ("%d %d", &m, &n);
    for (i=0; i<m; i++)
        for (j=0; j<n; j++)
            a[i][j] = i+j;
    display (a, m, n);
    getch();
}

void display (int x[10][10], m, n)
{
    int i, j;
    for (i=0; i<m; i++)
        for (j=0; j<n; j++)
            printf ("%d ", x[i][j]);
    printf ("\n");
}
```

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```
(P 67) WAP in C to find addition and subtraction of 2 matrices
#include <stdio.h>
#include <conio.h>
void addition (int x[10][10], int y[10][10], int z[10][10]);
void subtraction (int x[10][10], int y[10][10], int z[10][10]);
void main()
{
    int a[10][10], b[10][10], m, n, i, j;
    clrscr();
    printf ("Enter the value of m and n\n");
    scanf ("%d %d", &m, &n);
    printf ("Enter the value of a\n");
    for (i=0; i<m; i++)
        for (j=0; j<n; j++)
            scanf ("%d", &a[i][j]);
    printf ("Enter the value of b\n");
    for (i=0; i<m; i++)
        for (j=0; j<n; j++)
            scanf ("%d", &b[i][j]);
    addition (a, b, m, n);
    subtraction (a, b, m, n);
    getch();
}

void addition (int x[10][10], int y[10][10], int z[10][10])
{
    int i, j;
    for (i=0; i<10; i++)
        for (j=0; j<10; j++)
            z[i][j] = x[i][j] + y[i][j];
}
```

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```

for (i=0; i<m; j++) {
    for (j=0; j<n; j++) {
        z[i][j] = x[i][j] + y[i][j];
        printf ("%d", z[i][j]);
    }
}
void subtraction (int x[10][10], int y[10][10], int m, int n) {
    int d[10][10], i, j;
    for (i=0; i<m; i++) {
        for (j=0; j<n; j++) {
            d[i][j] = x[i][j] - y[i][j];
        }
    }
    for (i=0; i<m; i++) {
        for (j=0; j<n; j++) {
            printf ("%d", d[i][j]);
        }
    }
    printf ("\n");
}

```

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```

void subtraction (int x[10][10], int y[10][10], int m, int n) {
    int d[10][10], i, j;
    for (i=0; i<m; i++) {
        for (j=0; j<n; j++) {
            d[i][j] = x[i][j] - y[i][j];
        }
    }
    for (i=0; i<m; i++) {
        for (j=0; j<n; j++) {
            printf ("%d", d[i][j]);
        }
    }
    printf ("\n");
}

P-68 WAP in C to find largest no. out of 3 given nos.
#####
int largest (int a, int b, int c);
int main () {
    int a, b, c, largest;
    printf ("Enter the value of a, b and c\n");
    scanf ("%d %d %d", &a, &b, &c);
    largest = a;
    if (b > a) largest = b;
    if (c > a) largest = c;
    if (b > c) largest = b;
    printf ("Largest no. is %d", largest);
}

```

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```

P-67
longest = largest(a, b, c);
printf("%d", longest);
getch();
}

int largest(int x, int y, int z) {
    if ((x > y) && (x > z)) {
        return (x);
    }
    if ((y > x) && (y > z)) {
        return (y);
    }
    if ((z > x) && (z > y))
        return (z);
}

```

(P-68)

WAP in C to swap 2 nos. using function.

```

#include <iostream.h>
#include <math.h>
#include <conio.h>

void swap (int, int);
void main() {
    (ans, m, n) swap();
    int a, b;
    printf("Enter the value of a and b\n");
    scanf("%d %d", &a, &b), (m, n) +;
    printf("%d %d", a, b);
}

```

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```

swap (a,b);
printf("%d %d", a, b);
getch();
void swap (int x, int y) {
    int temp;
    temp = x;
    x = y;
    y = temp;
    printf("%d %d", x, y);
}

```

(P-70)

WAP in C to find multiplication of 2 given matrices using function

```

#include <iostream.h>
#include <math.h>
#include <conio.h>
void multiplication ( int a[10][10], int b[10][10], int p, int q, int r, int s );
void main() {
    int a[10][10], b[10][10], m, n, i, j, p, q, r, s;
    printf ("Enter the value of m and n\n");
    printf ("Enter the value of m, n, p and q\n");
    scanf ("%d %d", &m, &n), (p, q) +;
    scanf ("%d %d", &m, &n, &p, &q);
    printf ("Enter the value of a\n");
}

```

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```

for(i=0; i<m; i++)
    for(j=0; j<n; j++)
        cout << a[i][j] << " ";
    cout << endl;
cout << "Enter the value of b\ln"; cin >> b;
for(i=0; i<p; i++)
    for(j=0; j<q; j++)
        cout << b[i][j] << " ";
    cout << endl;
cout << "Multiplication (a,b,m,n,p,q);";
getchar();
int *p1, *q1;
void multiplication (int x[m][n], int y[n][q], int m, int n, int p, int q)
{
    int z[u][v];
    for(i=0; i<m; i++)
        for(j=0; j<q; j++)
            z[i][j] = 0;
    for(k=0; k<n; k++)
        for(i=0; i<m; i++)
            for(j=0; j<q; j++)
                z[i][j] += x[i][k]*y[k][j];
    cout << endl;
    for(i=0; i<m; i++)
        for(j=0; j<q; j++)
            cout << z[i][j] << " ";
    cout << endl;
    cout << "Value of a and b before swapping\n";
    cout << a << " " << b << endl;
    cout << "Value of a and b after swapping\n";
    cout << b << " " << a << endl;
}

```

Recursion

Pointers - It is an entity which contains memory address.

$\text{int } * \text{ptr, quantity}$; $\text{quantity} = \&\text{quantity}$; $\text{value} = * \text{ptr}$; $\text{value} = \text{quantity}$

WAP in C to print the value of pointer variable.

```

# include <iostream.h>
# include <conio.h>
void main()
{
    int *ptr, quantity, value;
    quantity = 15;
    ptr = &quantity;
    value = *ptr;
    cout << value << endl;
}

```

$\text{int } * \text{ptr, quantity, value};$
 $\text{quantity} = 15;$
 $\text{ptr} = \&\text{quantity};$
 $\text{value} = * \text{ptr}$
 $\text{printf("value = \%d", value);}$
 getch();

WAP in C to swap two numbers using pointers.

```

# include <iostream.h>
# include <conio.h>
void swap (int a, int b);
void main()
{
    int a, b;
    a = 10, b = 20;
    swap(a, b);
    cout << "The value of a and b before swapping\n";
    cout << a << " " << b << endl;
}

```

$\text{int } a, b;$
 $a = 10, b = 20;$
 $\text{swap}(a, b);$
 $\text{cout} << "The value of a and b before swapping\n";$
 $\text{cout} << a << " " << b << endl;$

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$$\begin{cases} a = a + b \\ b = a - b \\ a = a - b \end{cases}$$

for swapping

```

30) write a program to swap two numbers without using third variable.
    swap(x,y);
    printf("The value of x and y after swapping\n");
    printf("%d %d",x,y);
    getch();
}

3. Write a program to swap two numbers without using third variable.
void swap(int *x, int *y)
{
    int temp;
    temp = *x;
    *x = *y;
    *y = temp;
    printf("%d %d", *x, *y);
}
    
```

P-72) Write a C program to print the address and value of 2 variables.

```

int x, y, a, b, *ptr1, *ptr2;
x = 5;
a = 10;
b = 20;
y = *ptr1;
    
```

(a) print address of x and value of x
 (b) print address of y and value of y

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Recitation

bt+2=&a;

b= *bt+2;

printf ("%d %d", y, b);

getch(); printf ("%d %d", bt+2, bt+2);

getch();

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```

int m;
m = 1;
while (*y >= 1)
{
    if (*x == 0)
        break;
    m = m * (*x);
    x++;
    y--;
}
return(m);

```

(P.T.B) Q. WAP in C to find the smallest no. in an array using pointers.

```

int i, n, small, *ptr, a[100];
printf("Enter the value of n\n");
scanf("%d", &n);
printf("Enter the value of array elements\n");
for (i = 0; i < n; i++)
    scanf("%d", &a[i]);
ptr = &a[0];
small = *ptr;
for (i = 1; i < n; i++)
{
    if (a[i] < small)
        small = a[i];
}

```

small = *ptr;

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```

printf("small = %d", small);
getch();

```

Q. WAP in C to input x and y. Find x^y using pointers.

```

int power (int*x, int*y);
main()
{

```

```

int x, y, z;
printf("Enter the value of x and y\n");
scanf("%d%d", &x, &y);
z = power (x, y);

```

```

printf("z = %d", z);
getch();

```

```

int power (int*x, int*y)
{

```

```

int c, i;
c = 1;

```

```

for (i = 1; i <= *y; i++)

```

```

c = c * (*x);

```

```

return(c);
}

```