

GAZİ UNIVERSITY

ENGINEERING FACULTY

ELECTRICAL AND ELEKTRONICS ENGINEERING
DEPARTMENT

EEE103

COMPUTER PROGRAMMING

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Experiment1- Introduction to C Programming Language, Variables, Operators

```
// 1.1
#include<stdio.h>
int main()
{
    printf("The first program \n"); // The first program
return 0;
}
```

```
//1.2
#include<stdio.h>
int main()
{
    int x;
    float yy;

    x=10/3;
    yy=10/3;
    printf("x=%d    ",x); // x=3    yy=3.000000
    printf("yy=%f\n\n",yy);

    x=10./3;
    yy=10./3;
    printf("x=%d    ",x); // x=3    yy=3.333333
    printf("yy=%f\n",yy);

    return 0;
}
```

```

//1.3
#include<stdio.h>
int main()
{
    int a=2,b=4,c;

    printf("%d ",a); // 2 a=2
    printf("a=%d\n",a);

    b=b*b;
    printf("b=%d\n\n",b); // b=16

    c=a+b;
    printf("c=%d\n",c); // c=18

    c=a*b+5;
    printf("c=%d\n",c); // c=37

    c=a+b/2;
    printf("c=%d\n",c); // c=10

    c=(a+b)/2;
    printf("c=%d\n",c); // c=9

    b=a;
    printf("b=%d\n",b); // b=2

    return 0;
}

```

```

//1.4
#include<stdio.h>
int main()
{
    int a=40,b=20, add,sub,mul,div,mod;
    add = a+b;
    sub = a-b;
    mul = a*b;
    div = a/b;
    mod = a%b;
    printf("Addition of a, b is : %d\n", add); // 60
    printf("Subtraction of a, b is : %d\n", sub); // 20
    printf("Multiplication of a, b is : %d\n", mul); // 800
    printf("Division of a, b is : %d\n", div); // 2
    printf("Modulus of a, b is : %d\n", mod); // 0

    return 0;
}

```

```
//1.5
#include<stdio.h>

int main( void )
{
int number1; // first integer entered by the user
int number2; // second integer entered by the user
int number3,number4;
    printf( "Enter two integers: "); // Enter two integer :16 3
    scanf("%d%d", &number1, &number2);

number3=number1>>2;
number4=number2<<3;

    printf("number3=%d\n", number3); // number3=4
    printf("number4=%d ", number4); // number4=24

return 0;
}
```

```
//1.6
#include<stdio.h>
int main()
{
int a , s;
    printf ( "Enter one integer number: "); // Enter one integer number : 4
    scanf("%d ",&a); // scanf("%d",&a); try leaving a space after %d
    s = a*a ;
    printf("Number of square :%d\n", s); // Number of square :16

return 0;
}
```

```
//1.7
#include<stdio.h>
int main()
{
int integer1;
int integer2;
int sum;
    printf( "Enter first integer\n" ); // Enter first integer
    scanf( "%d", &integer1 ); // 5
    printf( "Enter second integer\n" ); // Enter second integer
    scanf( "%d", &integer2 ); // 15
    sum = integer1 + integer2;

    printf( "Sum is %d\n", sum ); // Sum is 20

return 0;
}
```

```

// 1.8
#include<stdio.h>
#include<math.h>
int main()
{
int x=9,m=-9,s;
int y=0,z=0,t=1,k=1;
x=sqrt(x);
s=sqrt(m); // !! m<0
printf(" x=%d\n",x); // x=3
printf(" s=%d\n\n",s); // s=-2147483648
y=y(++t); //
z=z+(k++); // !!
printf(" t=%d y=%d\n",t,y); // t=2 y=2
printf(" k=%d z=%d\n\n",k,z); // k=2 z=1
return 0;
}

```

QUESTIONS:

1.1 If the value of the variable number is 20, write the c program that gives the following screen output

```

20
number = 20

number/2 = 10

```

1.2 Enter a three-digit positive number from the keyboard.

- a) find the digits of the number
- b) printing an average of one and a hundred steps on the screen.

1.3 Write a program that finds the number of sides of a regular polygon whose exterior angle is entered by the user.

1.4 Write a program that finds 2 different label prices of the product by adding 8% and 18% KDV to a product whose cost value is entered by the user.

1.5 Write the program that finds the grade point average of two courses by entering the midterm and final grades of these courses by the user.

1.6 Write a program to find the perimeter and area of a circle whose radius is entered by the user.

1.7 Write a program that finds the arithmetic and geometric mean of two numbers entered by the user and rounds these values to an integer.

Experiment2- Control Structures (if, if ... else and if ... else if selection Satatement)

```
// 2.1
#include<stdio.h>

int main( void )
{
    int x;

    printf ( "Please enter a poztitive number is: " ); //Please enter a poztitive number is : 5

    scanf("%d",&x);

    if (x < 0)
        printf("Number negative :%d\n",x);

    if (x > 0)
        printf("Number poztitive :%d\n",x);           //Number poztitive : 5

    return 0;
}
```

```
// 2.2
#include<stdio.h>

int main( void )
{
    int x;

    printf ( "Please enter a poztitive number is: " ); // Please enter a poztitive number is : 8

    scanf("%d",&x);

    if (x < 0)
        printf("Number negative :%d\n",x);           // Number negatif : 8

    if (x > 0)
        printf("Number poztitive :%d\n",x);           // Number poztitive :8

    return 0;
}
```

```
//2.3
#include<stdio.h>
int main ()
{
    int x;
    printf("Enter a number to:");          // Enter a number to : 0
    scanf ("%d",&x);

    if (x == 0)
        printf("Entered number is zero\n"); // Entered number is zero
    else
        printf("Entered number is not zero\n");

    return 0;
}
```

```
// 2.4.a
#include<stdio.h>
int main ()
{
    int x;
    printf( "Enter a number to: " );      // Enter a number to : 0

    scanf ( "%d",&x);

    if (x == 0)
        printf("Entered number is zero\n"); //Entered number is zero

    if(x>0)

        printf("Entered number is poztive \n");
    else
        printf("Entered number is negative \n"); //Entered number is negative. !!
    return 0;
}
```



```
// 2.4.b

#include<stdio.h>

int main ()
{
    int x;
    printf( "Enter a number to : " );      // Enter a number to : 0

    scanf ( "%d",&x);

    if (x == 0)
        printf( "Entered number is zero\n" ); //Entered number is zero

    else if(x>0)

        printf(" Entered number is poztive \n" );
    else
        printf(" Entered number is negative \n" );

    return 0;
}
```

```
// 2.5
#include<stdio.h>
int main ()
{
    int x;

    printf("Enter a number to : ");      // Enter a number to : 6

    scanf ( "%d",&x);

    if (x==1)
    {
        x=x+1;
        printf("x=%d\n",x);
    }
    else if(x>2 && x<8)

    {
        printf("2 < %d < 8  \n",x);      // 2 < 6 < 8
    }

    else

        printf("x=%d\n",x);

    return 0;
}
```

```
// 2.6
#include<stdio.h>
int main( void )
{
    int num=7;
    if(num%2==1) //What is the result if if (number% 2) is replaced by if (number% 2 == 1)?
    {
        printf( " * %d odd number \n " ,num); /* 7 odd number
    }
    else
        printf(" * %d even number . ",num);
        printf(" %d even number !!. \n\n",num ); // 7 even number !!. Attention: {} no parentheses

    if(num%2==1)
    {
        printf( " ** %d odd number." ,num); /** 7 odd number.
    }

    else
    {
        printf(" *** %d ",num);
        printf( " even number. " ); // Attention: {} parentheses
    }
    return 0;
}
```

```
//2.7
#include<stdio.h>
int main()
{
    int m=40,n=20;
    int o=20,p=30;
    if ((m>n && m)!=0)
    {
        printf("&& Operator : Both conditions are true\n");// && Operator : Both conditions are true
    }
    if (o>p || p!=20)
    {
        printf("|| Operator : Only one condition is true\n"); // || Operator : Only one condition is true
    }
    if (!(m>n && m !=0))
    {
        printf("! Operator : Both conditions are true\n");
    }
    else
    {
        printf("! Operator : Both conditions are true. " // ! Operator : Both conditions are true
        "But, status is inverted as false\n"); // But, status is inverted as false
    }

    return 0;
}
```

QUESTIONS :

2.1 The edge lengths of a triangle from the keyboard are entered.

We write c program that prints the triangle on the screen (isosceles, equilateral, diverse).

2.2 Assume that the coefficients of the second degree equation are entered from the keyboard by the user. Write a program that finds the roots of that equation.

Note: You can use square root function, `sqrt()`, which is in `<math.h>` library.

2.3 Write a program that detects whether the year entered by the user is a leap year.

2.4 Write a program that sorts three integers entered by the user from lowest to greatest.

2.5 When the price of two products is entered on the keyboard, if the total price is more than 200 ₺, write a program that shows the amount to be paid by making a 25% discount on the second product.

2.6 Write a program that displays how many digits a maximum 3 digit number entered by the user is.

2.7 Write a program that prints the digits in each digit of the 4-digit number entered by the user in order of digits

Experiment3- C program Control (While, do ... while and for iteration statement)

```
// 3.1
#include<stdio.h>
int main (void)
{
    int x=1;
    // int total; error
    int total=0;
    while(x<=5)// loop 5 times
    {
        total+=x*x;// perform calculation
        printf("%d*d =%2d\n",x,x,x*x);
        ++x; // increment counter x
    } // end while
    printf("\nTotal is %d\n ",total);
    return 0;
}
```

//	1*1	=	1	
//	2*2	=	4	
//	3*3	=	9	
//	4*4	=	16	
//	5*5	=	25	
//	Total=55			

```
//3.2
#include<stdio.h> //Do-While loop*/
int main ()
{
    int k=0;
    do
    {
        printf("k=%d ",k);
        k++;
    }
    while (k <=3);
    printf("\nk=%d(Do While loop output) ",k); // k=4(do while loop output)
    return 0;
}
```

```

//3.3
#include<stdio.h> // while and Do-While loop
int main ()
{
    int k=0,t;
    float x=20,y=3;

    while(k>0)
    { printf("while loop \n"); // !
      printf(" [1] Multiplication \n");

      printf(" [2] Division\n");
      k++;
    }
    printf("\ndid not enter while loop \n \n");

    // did not enter while loop

    do
    {printf("      do loop \n"); //      do loop
      printf(" [1] Multiplication\n"); // [1] Multiplication
      printf(" [2] Division \n"); // [2] Division
      printf(" Choice [1,2] :"); // Choice [1,2]:1
      k++;
      scanf("%d",&t);
    }
    while ( k!=1);

    if(t==1)
        printf(" Mul=%.1f \n",x*y); // Mul:60.0
    if(t==2)
        printf(" Div =%.1f\n",x/y);

    return 0;
}

```

```

//3.4
#include<stdio.h>
int main ()
{
    int s;
    for (s=0 ; s<=4; s++)

    printf("s= %d ",s); // s=0 s=1 s=2 s=3 s=4
    printf("\n");

    return 0;
}

```

```
// 3.5
#include<stdio.h>
int main( void )
{
    int i;
    for (i = 1; i<=5; i++) {
        if (i == 2 || i == 3) {
            printf(" i= %d *** \n" , i); // i= 2 ***
            continue;                     // i= 3 ***
        }
        printf(" i= %d\n", i);           // i= 1
    }
    return 0;                           // i= 4
}
```

```
//3.6
#include<stdio.h>
int main ()
{
    int x,y;
    for (x=0 ; x<=5; x=x+2)
    {printf("x=%d\n ",x); // x=0
    for (y=1 ; y<3; y++) // y=1 y=2
    { // x=2
    printf(" y=%d ",y); // y=1 y=2
    } // x=4
    printf("\n"); // y=1 y=2
    }
    return 0;
}
```

```
// 3.7
#include<stdio.h>
int main ()
{
    int i=0,k;
    printf( "1.for loop\n"); // 1.for loop
    for (k=4 ; k<3 ; k++)
    // {
        printf("2.for loop ");
    for (i=2 ; i<8 ; i++)
    {
        i=i*2; // !
        printf(" i=%d\t",i); // i=4 i=10 k=4
    }
    printf("k=%d\n",k);
    // }
    printf( "\n3.for loop\n"); // 3.for loop

    for(i=0;k;i++) { k=i<3;
        printf(" i=%d k=%d\n",i,k); // i=0 k=1
    } // i=1 k=1
    // i=2 k=1
    // i=3 k=0

    printf("\n");
    return 0;
}
```

```
//3.8
#include<stdio.h>
int main ()
{
int s,sum=1;
for (s=1 ; s<=3; s++)
{
sum=sum*s;
printf("sum= %d ",sum); // sum=1
printf("\n");           // sum=2
}                         // sum=6
printf("3 != %d ",sum);  // 3 !=6
}
```

```
//3.9
#include<stdio.h>
int main ()
{
int x,y,sum=1;
for(x=1;x<=3;x++)
{
for (y=1 ; y<=x; y++)
{
sum=sum*y;
}
printf("%d!= %d ",x,sum); // 1!=1
sum=1;                   // 2!=2
printf("\n");             // 3!=6
}
}
```

```
//3.10
#include<stdio.h>
int main ()
{
int x;
for (x=0 ; x<=8; x++)
{
if(x==2)
{
continue;//skip remaining code in loop body
}

if(x==6)
{
break;//break loop only if x is 6
}
printf("x=%d ",x); // x=0 x=1 x=3 x=4 x=5
}
printf("\n");
}
```

```

// 3.11
#include<stdio.h>

int main() {

    int number;
    printf("enter a number: ");
    scanf("%d",&number);//    number=1 ise    number=2 ise    number=4 ise
    switch (number) {
        case 1:
            printf("Number : 1 \n");// Number : 1

        case 2:
            printf("Number : 2 \n");// Number : 2    Number : 2
            break;

        case 3:
            printf("Number : 3 \n");
            break;

        default:
            printf(" The number is different from 1,2,3\n");// The number is different from 1,2,3
    }

}

```

QUESTIONS

3.1 We write programs that calculate the values of the following mathematical formulas.

a) $\sum_{n=1}^{50} \frac{1}{n} = ?$ Answer: 4.499

b) $\sum_{k=1}^6 \sum_{i=1}^{10} \frac{1}{i+k} = ?$ Answer: 8.1037

3.2 Write a program that finds and prints the sum of the numbers divisible by 5 between two numbers entered from the keyboard.

3.3 The factorial of a nonnegative integer n is written as $n!$

- a) Write a program that estimates the value of the mathematical constant **e** by using the formula:

$$e = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots + \frac{1}{N!} \quad e \approx 2.71$$

- b) Write a program that computes the value of **e^x** by using formula:
Note: $a^b = \text{pow}(a, b)$

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots + \frac{x^N}{N!}$$

3.4 Write a program that finds the combination of 2 entered positive numbers. If a negative number is entered, another number will be entered with the warning "You must enter a positive number." Enter a zero in one of the numbers to terminate the program.

3.5 Write a program that finds the first 10 elements of the Fibonacci series using loops, finds the sum of these elements, and prints it on the screen.

Fibonacci series: 0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

3.6 Write the program that creates a 5-line pyramid using the * character.

```
*
***
*****
*****
*****
```

3.7 An integer is entered from the main program. The entered number is the base character number of the triangle. Accordingly, write a program that prints triangle A if the number entered in the function is odd, and triangle B if it is even.

Triangle A	Triangle B
1	11
121	1221
12321	123321
1234321	12344321

Experiment4- Functions

```
// 4.1
#include<stdio.h>

int cubeByValue(int n); // prototype

int main()
{
    int number = 5;

    printf("The original value of number is %d", number);
    // The original value of number is 5
    number = cubeByValue(number);

    printf("\nThe new value of number is %d\n", number);
    // The new value of number is 125
}

int cubeByValue(int n)
{
    return n*n*n;
}
```

```
//4.2
#include<stdio.h>

int sum(int n); // prototype

int main(void)
{
    int i;
    for(i=1;i<=6;i=i+2)
    {
        printf("%d+5 : %d\n",i,sum(i));
        // 1+5 : 6
        // 3+5 : 8
        // 5+5 : 10
    }
}

int sum(int i)
{
    return i+5;
}
```

```

//4.3
#include<stdio.h>

int f(int a); // prototype

int main(void)
{
    int a=2;
    printf(" a = %d \n",a);           // a = 2
    printf(" f(a) = %d \n",f(a));     // f(a) = 4
    printf(" a = %d \n",a);           // a = 2
}

int f(int a)
{
    a=a*a;
    printf("Function a = %d \n",a);   //Function a=4
return a;
}

```

```

// 4.4
#include<stdio.h>
int main()
{
    int a=0,b=5;
    a++;
    if(a>0)
    {
        int b;
        b=a+7;
        printf("b=%d\n",b);         // b=8
    }
    b=b-2;
    printf("b=%d !!\n",b);         // b=3 !!
}

```

```

// 4.5
#include<stdio.h>
float fuc(float a, float b)
{
    a = a + 1;
    b = b + 2;
    printf("                2 a=%.3f    b=%.3f\n",a,b);    // 2    a=2.000    b=4.000
                                                         // 2    a=1.500    b=4.000
    return a/b;
}

int main()
{
    float a=1.0, b=2.0;
    printf("1 a=%.3f    b=%.3f\n",a,b);    // 1    a=1.000    b=2.000

    a=fuc(a,b);
    printf("3 a=%.3f    b=%.3f\n",a,b);    // 3    a=0.500    b= 2.000

    b=fuc(a,b);
    printf("4 a=%.3f    b=%.3f\n",a,b);    // 4    a=0.500    b= 0.375
}

```

```

// 4.6
#include<stdio.h>

int f(int x);
int main ()
{
    int x;
    printf("Enter number to: ");
    scanf("%d",&x);    // 8
    printf("f(x) : %d",f(x));    //f(x) : 20
    printf("\n");
    return 0;
}

int f(int x)
{
    int i,tsum=0;
    for(i=0;i<=x;i++)
    {
        if(!(i%2))
            tsum=tsum+i;
    }
    return tsum;
}

```

```
//4.7 Recursive Function
#include<stdio.h>
int gizem(int x,int y );
int main(void)
{
    int number1,number2;
    printf("Enter two integers: ");           // Enter two integers:5 6
    scanf("%d%d", &number1, &number2);
    printf("Multiplication : %d\n", gizem(number1, number2));
                                           //Multiplication:30 (5+5+5+5+5+5=30)
}
int gizem(int x, int y)
{
    if(y==1)
    return x;
    else
    return x+gizem(x,y-1);    // Recursive function
}
```

//4.8 Find the digits of a number entered with the recursive function

```
#include<stdio.h>
int basamak(int x);
int main(void)
{
    int number;
    printf("Enter integer: ");           // Enter integer: 123
    scanf("%d", &number);
    printf("%d ", basamak(number));    // 3 2 1
}
int basamak(int x)
{
    if(x<10)
    return x;
    else
    printf("%d ",x%10);
    return basamak(x/10);    // Recursive function
}
```

```

//4.8.1 Find the digits of a number entered with the for loop
#include<stdio.h>
int basamak(int x)
{
    int i;
    for(i=1;i<=10;i++)
    { if(x==0) break;
      printf("%2d",x%10);
      x=x/10;
    }
}
int main()
{
    int number;
    printf("Enter integer: ");    // Enter integer: 123
    scanf("%d", &number);
    basamak(number);            // 3 2 1
}

//4.8.2 Find the digits of a number entered with the recursive function
#include<stdio.h>
int basamak(int x)
{
    if(x<10)
    return x;
    else
    printf("%d ",x%10);
    return basamak(x/10); // recursive function
}
int main()
{
    int number;
    printf("Enter integer: ");    // Enter integer: 123
    scanf("%d", &number);
    printf("%d ", basamak(number)); // 3 2 1
}

```

QUESTIONS

4.1 Assume that the edge lengths of rectangle are entered by the user from the keyboard. Write calculates the area of the rectangle. Call this function in your main program and print area in the main program.

Repeat this program until user enters 0 for one of the edges.

4.2 Apply the cosine theorem for 2 sides 1 angle entered by the user, and write a program that displays the side lengths and the opposite angle in the function. (use the math.h library).

4.3 Write a program that takes midterm and final grades of 2 courses for 3 different students entered by the user, finds GPA of these students using GPA function for each student and prints it in the main program.

4.4 Write a program that finds whether a number entered by the user is prime in the 1st function, prints it in the main program if it is prime, and if the number is not prime, finds the sum of its factors in the 2nd function and prints it in the main program. (The program will terminate when the number zero is entered.)

4.5 A parking lot business charges a minimum of 2 TL for parks made up to 3 hours. If 3 hours are exceeded, 0.5 TL is charged for each hour. The maximum amount taken is 10 TL in case of parking for 24 hours. Assume that no vehicle is parked for more than 24 hours. Write a program that calculates the payments of 3 customers who parked in this parking lot yesterday in a function and prints them in the main program. (The user must enter the parking time of each customer and the output should be in neat tabular form and program should calculate their total revenue). The program has to calculate the fee for each customer in a function called **calculatepayment**. (1st customer is 1.5 hours, 2nd customer is 4 hours, 3rd customer is 24 hours left)

4.6 Assume the user inputs two integers from the keyboard. Find the totals of the odd numbers between these numbers in the function, and print total in the main program.

4.7 In this question you are required to write 2 functions and a main program.

- first function should compute factorial of a number,

- second function should calculate the value of $\sin(x)$ and $\cos(x)$ by using formula:

a)
$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots + \frac{x^N}{N!} \dots$$
 Assume N=11.

b)
$$\cos(x) = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots + \frac{x^N}{N!}$$
 Assume N=12.

Use your first function (factorial) and pow() library function (which is in math.h) in your sinus function.

Note: in formula x is in radian. Which means, it should be float or double.

Use your first function (factorial) and pow() library function (which is in math.h) in your sinus function.

Experiment 5–Arrays

```
// 5.1
#include<stdio.h>
int main()
{
    int i, a[3], b[3]={5,6,7};
    for(i=0; i<3; i++)
    {
        printf("a[%d]: ", i);           // a[0]: 10
        scanf("%d",&a[i]);              // a[1]: 15
    }                                   // a[2]: 20
    for(i=0; i<3; i++)
        printf("a[%d]=%d \t", i, a[i]); // a[0]= 10  a[1]= 15  a[2]= 20
    printf("\n");
    for(i=0; i<4; i++)
        printf("b[%d]=%d \t", i, b[i]); // b[0]= 5  b[1]= 6  b[2]= 7  b[3]=-8589993460!!
                                           // or b[3]=0!!
}
```

```
//5.2
// #include<stdio.h> buradan 15.12.22
int square(int b[],int k)
{
    int i;
    k=k*k;
    for(i=0;i<3;i++)
    {
        b[i]=b[i]*b[i];
    }
    return k;
}
#include<stdio.h> // buraya alındı(15.12.22)
int main()
{ int a[3], i,k=6;
    for(i=0;i<3;i++)
    { printf(" a[%d] : ",i); // a[0]:2
      scanf("%d",&a[i]);    // a[1]:3
    }                       // a[2]:4
    square(a,k);
    printf("\n k=%2d    ",k);
    for(i=0;i<3;i++)
    {
        printf("a[%d]=%3d  ",i,a[i]);
    }                       // k=6  a[0]= 4  a[1]= 9  a[2]= 16
                             // k=36 a[0]= 16 a[1]= 81 a[2]= 256
    printf("\n k=%2d    ",square(a,k));
    for(i=0;i<3;i++)
    {
        printf("a[%d]=%3d  ",i,a[i]);
    }
}
```



```
// 5.3
#include<stdio.h>
#define SIZE 5
int main()
{   int j,total=0;
    int s[SIZE]; // array s has SIZE elements
    for ( j = 0; j <SIZE; ++j)
    {
        s[j] = 2 + 2 * j;
        total+=s[j];
    }
    printf( "Element   Value\n");
    for ( j = 0; j <SIZE; ++j)
    {
        printf(" s[%d]   = %3d\n", j, s[j]);
    }
    printf("Total of array element values is %d\n", total);
}

//      Element Value
//      s[0]   =  2
//      s[1]   =  4
//      s[2]   =  6
//      s[4]   =  8
//      s[5]   = 10
// Total of array element values is 30
```

```
// 5.4
#include<stdio.h>
#define SIZE 5
int whatIsThis(const int b[], int p); // function prototype
int main(void)
{
    int x;
    int a[SIZE] = { 1, 2, 3, 4, 5 };
    x = whatIsThis(a, SIZE);
    printf("Result is %d\n", x);
}

// Result is 15

int whatIsThis(const int b[], int p)
{
    printf("p=%d ",p);
    // b[3]=40; Error (const int b[])
    if (p == 1)
    {
        printf("\n");
        return b[0];
    }
    else
    {
        printf("b[%d]=%d\n", (p-1), b[p-1]);
        return b[p - 1] + whatIsThis(b, p - 1);
    }
}

// p=5 b[4]=5
// p=4 b[3]=4
// p=3 b[2]=3
// p=2 b[1]=2
// p=1
```

```

// 5.5
# include<stdio.h>
int f(int y);
int Array( int b[]);

// int f(const int y);
// int ArrayConstant(const int b[]);

int main(void)
{ int i,y=50;
int a[3] = { 10, 20, 30 };
printf (" y = %d ",y); // y = 50 a[0]=10 a[1]=20 a[2]=30
for(i=0;i<3;i++)
{ printf("a[%d] =%d ",i, a[i]);}
printf("\n");
printf ("\nf(y)= %d ",f(y)); // f(y) = 100 a[0]=12 a[1]=18 a[2]=60

Array(a);
for(i=0;i<3;i++)

{ printf("a[%d] =%d ",i, a[i]);}

}
int f( int y)
{ y=y*2;
return y;}

int Array( int b[])
{
b[0]+= 2;
b[1]-= 2;
b[2]*= 2;

}
/*
int f(const int y)
{ y=y*2; error
return y;}

int ArrayConstant(const int b[])
{
b[0]+= 2; error
b[1]-= 2; error
b[2]*= 2; error

}
*/

```

```

//5.6
#include<stdio.h>

int sumline(int matrix[][4], int vector[])
{ int top,i,j;
  for(i=0;i<3;i++)
  {
    top=0;
    for(j=0;j<4;j++)
    { top+=matrix[i][j]; }
    vector[i]=top;
  }
}

int main()
{
  int i,j,vector[3];
  int matrix[3][4]={1,2,3,4, 1,2,3,5, 1,2,3,6};
  printf(" Matrix ");

  sumline(matrix,vector);
  for(i=0;i<3;i++)
  {
    printf("\n");
    for(j=0;j<4;j++)
    { printf("%2d",matrix[i][j]); }
  }
  printf("\n\n Vector  : ");
  for(j=0;j<3;j++)
  { printf("%2d ",vector[j]); }
  printf("\n");
}

```

// Matrix
 // 1 2 3 4
 // 1 2 3 5
 // 1 2 3 6

// Vector : 10 11 12

```

//5.7
#include<stdio.h>
#include<ctype.h>
#define SIZE 15

int main(void)
{
  char name[]="derYA";
  char surname[]="SaMANYolu";
  int i;
  printf("%s %s\n",name,surname);
  for ( i = 0; i <SIZE&&name[i] != '\0'; ++i)
  { name[i]=toupper(name[i]); }
  printf("%s \n",name);
  for ( i = 1; i <SIZE&&surname[i] != '\0'; ++i)
  { surname[i]=tolower(surname[i]); }
  printf("%s %s \n ",name,surname);
}

```

//derYA SaMANYolu
 // DERYA
 // DERYA Samanyolu

```

//5.8
#include<stdio.h>
#include<ctype.h>
#define SIZE 15
int main()
{
char name[SIZE];
char surname[SIZE];
char num[SIZE];
int control,i;
do
{
control=1;
printf("Enter number : "); // Enter number : 161110*20
scanf("%s",num); // Enter number : 161110020
for ( i = 0; i <SIZE&& num[i] != '\0'; ++i) {
if(!isdigit(num[i])){
printf("You entered the wrong number %c not figure.Enter again. \n", num[i]);
//You entered the wrong number * not figure.Enter again.

control=0;

}

}

}while(control==0);

do
{
control=1;
printf("Enter name : "); // Enter name : Ahm9t
scanf("%s",name); // Enter name : Ahmet

for ( i = 0; i <SIZE&& name[i] != '\0'; ++i) {
if(!isalpha(name[i])){
printf("You entered the wrong %c not letter.Enter again. \n", name[i]);
//You entered the wrong number 9 not letter.Enter again.

control=0;

}

}

}while(control==0);

do
{
control=1;
printf("Enter surname : "); // Enter surname : Dolun*ay
scanf("%s",surname); // Enter surname : Dolunay
for ( i = 0; i <SIZE&& surname[i] != '\0'; ++i)
{
if(!isalnum(surname[i]))
{ printf("You have entered your last name incorrectly.%c not letter ,not a figure.
Enter again. \n", surname[i]);
//You have entered your last name incorrectly.* not letter ,not a figure. Enter again.

control=0;

}

}

}while(control==0);
printf(" Number Name Surname\n"); // Number Name Surname
printf("%10s %10s %10s ",num,name,surname); // 161110020 Ahmet Dolunay

}

```

QUESTIONS:

5.1 Write a program that finds the average of the elements of an array.

5.2 Find the sum of three elements in the middle of an one dimensional array.

5.3 Write a program that prints asterisk (*) on the screen according to the value of the array element.

Example:

```
int main(void)
{ int i,j;

int n[SIZE] = {5, 7, 9, 11};

Element Value Histogram
0      5      *****
1      7      *******
2      9      *********
3     11     ***********
```

5.4 Write a program that gives the following output:

```
1      1
  1    1
    1
  1    1
1      1
```

5.5 Write a function that collects two vectors of N elements. You can express vectors as a one- dimensional array.

5.6 Write two functions that find the largest and smallest elements of a one-dimensional N element array and a main program that you can use these functions.

5.7 Write a program that orders a one-dimensional N element array from small to large.

Experiment6—Pointers,Pointer arithmetics

```
// 6.1
#include<stdio.h>
int main()
{
    int i=24;
    int *p;
    p = &i;
    printf(" i : %d\n", i);           // i=24
    printf("*p : %d\n\n", *p);       // *p=24
    printf("i's address &i : %p\n",&i); // i's address &i = 00EFFD54
    printf("p's address p : %p\n",p);  // p's address p = 00EFFD54
}
```

```
// 6.2
#include<stdio.h>
int main()
{
    int i = 15;
    int *p;
    p = &i;
    printf("i =%d ", i);           // i=15      p=00FAFDD0      *p=15
    printf("p =%p ", p);
    printf("*p=%d \n", *p);

    i = 50;
    printf("i =%d ", i);           // i=50      p=00FAFDD0      *p=50
    printf("p =%p ", p);
    printf("*p=%d \n", *p);

    *p = 70;
    printf("i =%d ", i);           // i=70      p=00FAFDD0      *p=70
    printf("p =%p ", p);
    printf("*p=%d \n", *p);
}
```

```
// 6.3
#include<stdio.h>
void f(int *xPtr);
int main(void)
{
    int y=5;
    f(&y);
    printf( "y : %d" ,y);    // y=25
}
void f(int *xPtr)
{ *xPtr = 25; } //void f(const int *xPtr); error: cannot modify a const object
```

```
//6.4
#include <stdio.h>
int main(void)
{
    int x,y;
    int * const ptr = &x;

    *ptr = 10; // allowed: *ptr is not const
    // ptr = &y; error: ptr is const; cannot assign new address
    printf( "*ptr : %d " ,*ptr); // *ptr : 10
}
```

```
// 6.5
#include<stdio.h>
//void f(int x); // Error
int f(int x);
int main()
{
    int y=5,s;
    s=f(y);
    printf(" s : %d " ,s);    // s: 25
}
//void f(int x)//Error
int f(int x)
{
    x = x*x;
    return x;
}
```

```

// 6.6
#include<stdio.h>

int carries_address (int a,int *b)
{
printf("Function : &a=%p ",&a); //Function &a=0x7ffc9be4458c &b=0x7ffc9be445a4
printf(" &b=%p \n\n",&(*b));
a=a*3;
*b=*b+30; // !! no return
}

int main(void)
{
int a=20,b=50;
printf("main program : &a=%p ",&a) ; // main program &a=0x7ffc9be445a0 &b=0x7ffc9be445a4
printf(" &b=%p \n\n",&b);
carries_address (a,&b);
printf("main program : a=%d ",a); //main program a= 20 b=80
printf(" b=%d \n",b);
}

```



```
// 6.7
#include<stdio.h>
#define N 3
int main()
{
    int d[N] = {10,20,30};
    int i;

    printf("d 's address: %p, *d value at this address : %d\n", d, *d);

    printf("      &d[0] : %p,                d[0] : %d\n\n", &d[0], d[0]);
    //d 's address: 6487568, *d value at this address : 10
    //      &d[0]: 6487568,                d[0] : 10

    printf("The first element of the array: %d\n\n", *(d+1)); //The first element of the array: 20

    printf("Array elements :");
    //Array elements : 10    20    30

    for (i=0;i<N;i++)
        printf("%d\t", d[i]);

    printf("\nPointer values :");
    //Pointer values: 10    20    30
    for (i=0;i<N;i++)
        printf("%d\t", *(d+i));

    printf("\n\nAddresses of array elements :");
    for (i=0;i<N;i++)
        printf("%p ", (d+i));
    //Addresses of array elements : 6487568    6487572    6487576
    printf("\n\n");

}
```

```
// 6.8
#include<stdio.h>
int cube(int *nPtr);

int main(void)
{
    int number = 2; // initialize number

    printf("The original value of number is %d", number); //The original value of number is 2

    cube(&number);

    printf("\nThe new value of number is %d\n", number); //The new value of number is 8
}

int cube(int *nPtr)
{
    *nPtr = *nPtr * *nPtr * *nPtr; // cube *nPtr
}
```

QUESTIONS:

6.1 What is the output of the following program.

```
#include<stdio.h>
int fonksiyon(int x,int *y,int *z)
{
    x*=(*y);
    (*y)=(*y)*(*y)*x+(*z);
    (*z)=(*y)+x-(*z);
}

void main()
{
    int a,b,c;
    a=1,b=2,c=3;
    fonksiyon(a,&b,&c);
    printf("a=%d    b=%d    c=%d\n",a,b,c);
}
```

6.2 The user enters 3 integers. You find the product and the sum of the squares of these numbers in a single function and write them in the main program.

6.3 The user enters the coefficients of the 2nd degree equation from the main program. Find the roots of the equation in a single function and print it in the main program.

6.4 Create an array with n terms entered by the user. Find the maximum and minimum value of this array and the mean of the array in a single function and print it in the main program.

6.5 The number of rows and columns of two matrices and element values are entered by the user. In the functions, find the sum and difference of these matrices and print them in the main program.

6.6 Write a program that sorts the elements of an array whose element number and values are entered by the user, from smallest to largest, and prints the resulting new array to the screen.

6.7 The user enters the elements of an array with n elements. Write a program that creates a new array from the even elements of this array in the function and prints this array in the main program.

Experiment7—Dynamic Memory Management and Structs

```
// 7_1
//average calculating program
#include<stdio.h>
#include<malloc.h>          // for dynamic memory management commands
#include<stdlib.h>          // for the exit () command
int main()
{
    int i,n,*a,b=0;
    printf("how many numbers would you like to average : ");
    scanf("%d",&n);          // how many numbers would you like to average : 2

    a=malloc(n*sizeof(int)); // The value of malloc is void
    if(a==NULL) {
        printf("not enough memory ( a=%p )\n",a);
        exit(1);
    }
    for(i=0;i<n;i++) {
        printf("%d.num : ",i+1);          // 1.num : 3
        scanf("%d",&a[i]);                // 2.num : 4
    }
    for(i=0;i<n;i++)
        b+=a[i];
    printf("\nAveraga=%5.2f\n",1.0*b/n);    //Average:3.50

}
```

```
//7_2
#include<stdio.h>
#include<malloc.h>
#include<stdlib.h>
int main()
{
    unsigned char i,*a,*b,*c;
    a=malloc(5);
    b=malloc(5);
    c=malloc(10);
    if(!(a&&b&&c)) {
        printf("not enough memory \n");
        exit(1);
    }
    for(i=0;i<3;i++) {
        *(a+i)=i*3;    // pointer
        b[i]=i*i;      // array
    }
    for(i=0;i<3;i++)
        printf("a[%d]=%2d b[%d]=%2d\n",i,a[i],i,b[i]); // a[0]=0 b[0]=0
                                                         // a[1]=3 b[1]=1
                                                         // a[2]=6 b[2]=4
}
```

```

//7_3
#include<stdio.h>
#include<malloc.h>
#include<stdlib.h>
int main()
{
    int *a;
    int i,k=-10,t=1;
    a=malloc(1);
    while(1)
    {
        printf("Enter the number of elements in the array:"); // Enter the number of elements in the array.: 3
        scanf("%d",&k);
        a=realloc(a , k*sizeof(float) );
        if(a==NULL) {
            printf("not enough memory \n");
            exit(1);
        }
        for(i=0;i<k;i++)
        {printf("%d.: ",i+1);
          scanf("%d",&a[i]);
          // 1.: 10
          // 2.: 20
          // 3.: 30
        }
        for(i=0;i<k;i++)
        printf("a[%d]=%d ",i,a[i]);
        printf("\ncontinuation=1,exit=0 enter: "); // a[0] = 10 a[1]=20 a[2]= 30
        scanf("%d",&k); // Continuation =1 , exit=0
        printf("\n"); // 0
        if(!k) break;
    }
    free(a);
}

```

```

//7_4
#include<stdio.h>
int main()
{
    int num;
    int phy,math;
    printf("num,phy_and math_:");
    scanf("%d%d%d",&num,&phy,&math); // num, phy and math. : 1 50 60
    printf("\nnum: %d\tphy: %d\tmath.: %d\n", num,phy,math);
    return 0; // num:1 phy: 50 math. : 60
}

```

```
//7.5
#include<stdio.h>
struct yap{
    int num;
    int phy;
    int math;
};
int main()
{
    struct yap student;

    printf("num fiz_math. enter:");
    scanf("%d%d%d",&student.num,&student.phy,&student.math); // num, phy ve math. enter: 1 50 60

    printf("\nstudent_no: %d\tphy: %d\tmath.: %d\n", student.num, student.phy, student.math);
    return 0;
}

// num:1 phy: 50 math. : 60
```

```
// 7.6
#include<stdio.h>
#define SAY 3
struct yap{
    int num;
    int phy;
    int math;
};
int main()
{
    int i;
    struct yap student[SAY];
    printf("%d studentenci \n",SAY); // 3 students
    for(i=0;i<SAY;i++) {
        printf("%d.student num phy, math_: ",(i+1));
        scanf("%d%d%d",&student[i].num,&student[i].phy,&student[i].math);

    }

    // 1. student num , phy math. : 120 30 40
    // 2. student num , phy math. : 130 50 60
    // 3. student num ,phy math. : 140 70 80

    for(i=0;i<SAY;i++)
        printf("\nstudent_no:%d \tphy:%d \tmath.:%d", // 1. Student_no :120 , phy :30 math.: 40
        student[i].num,student[i].phy,student[i].math); // 2. Student_no :130 , phy :50 math.: 60
    // 3. Student_no :140 , phy :70 math.: 80

    printf("\n");
}
}
```

QUESTIONS:

7.1 The number of elements of the array and array elements are entered by the user. In the function, create a new array from the odd index elements of the array and print it in the main program. Use the concept of pointers for arrays.

7.2 The number of elements of the array and array elements are entered by the user. In the function, add the even elements of the array to the end of this array. Print the new array in the main program. Use the pointer concept.