#include <stdio.h>

#include <stdlib.h>

void simpleArithmetic();

float addition(float firstNumber, float secondNumber);

float subtract(float firstNumber, float secondNumber);

float multiply(float firstNumber, float secondNumber);

float divide(float firstNumber, float secondNumber);

void matrixCalculation();

void matrixAddition();

void matrixSubraction();

void matrixMultiplication();

void factorial();

int multiplyFactorial(int input);

void exponention();

int multiplyBase(int base, int exp);

int main()

{

int numberOfCalculations;

printf("Hello, how many calculations would you like to do today?\n");

scanf("%d",&numberOfCalculations);

while(numberOfCalculations>0){

int choice;

printf("What would you like to calculate?\n");

printf("1.Simple arithmetic calculations \n2.Matrix calculation \n3.Factorial \n4.Exponentiation \n");

scanf("%d", &choice);

switch(choice){

case 1:

simpleArithmetic();

break;

case 2:

matrixCalculation();

break;

case 3:

factorial();

break;

case 4:

exponention();

break;

default :

printf("Please enter valid operation.");

}

numberOfCalculations--;

}

return 0;

}

float addition(float firstNumber, float secondNumber){

return (firstNumber + secondNumber);

}

float subtract(float firstNumber, float secondNumber){

return (firstNumber - secondNumber);

}

float multiply(float firstNumber, float secondNumber){

return (firstNumber \* secondNumber);

}

float divide(float firstNumber, float secondNumber){

return (firstNumber / secondNumber);

}

void simpleArithmetic(){

int choice;

float firstNumber = 0, secondNumber = 0, result = 0;

printf("Which operation would you like to perform?\n");

printf("1.Addition \n2.Subtraction \n3.Multiplication \n4.Division \n");

scanf("%d",&choice);

printf("Please enter the first and second numbers \n");

scanf("%f %f", &firstNumber, &secondNumber);

switch(choice){

case 1 :

result = addition(firstNumber,secondNumber);

break;

case 2 :

result = subtract(firstNumber,secondNumber);

break;

case 3 :

result = multiply(firstNumber,secondNumber);

break;

case 4 :

result = divide(firstNumber,secondNumber);

break;

default :

printf("Please enter a valid operation.");

}

printf("Result: %.2f",result);

printf("\n");

}

void matrixAddition(){

int rowA,rowB,colA,colB;

printf("\nNumber of rows for Matrix A :");

scanf("%d",&rowA);

printf("\nNumber of col for Matrix A :");

scanf("%d",&colA);

printf("\nNumber of rows for Matrix B :");

scanf("%d",&rowB);

printf("\nNumber of col for Matrix B :");

scanf("%d",&colB);

if(rowA == rowB && colA == colB){

int matA[rowA][colA], matB[rowB][colB];

//Populate matrix A

printf("Please enter elements of matrix A\n");

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

for(int j=0;j<colA;j++){

scanf("%d",&matA[i][j]);

}

}

//Populate matrix B

printf("Please enter elements of matrix B\n");

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

for(int j=0;j<colB;j++){

scanf("%d",&matB[i][j]);

}

}

//Sum of the matrix

printf("Result: \n");

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

for(int j=0;j<colA;j++){

printf("%d ", matA[i][j] + matB[i][j]);

}

printf("\n");

}

}

else{

printf("To perform matrix addition row and col have to be equal\n");

}

}

void matrixSubraction(){

int rowA,rowB,colA,colB;

printf("\nNumber of rows for Matrix A :");

scanf("%d",&rowA);

printf("\nNumber of col for Matrix A :");

scanf("%d",&colA);

printf("\nNumber of rows for Matrix B :");

scanf("%d",&rowB);

printf("\nNumber of col for Matrix B :");

scanf("%d",&colB);

if(rowA == rowB && colA == colB){

int matA[rowA][colA], matB[rowB][colB];

//Populate matrix A

printf("Please enter elements of matrix A\n");

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

for(int j=0;j<colA;j++){

scanf("%d",&matA[i][j]);

}

}

//Populate matrix B

printf("Please enter elements of matrix B\n");

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

for(int j=0;j<colB;j++){

scanf("%d",&matB[i][j]);

}

}

//Result

printf("Result: \n");

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

for(int j=0;j<colA;j++){

printf("%d ", matA[i][j] - matB[i][j]);

}

printf("\n");

}

}

else{

printf("To perform matrix subtraction row and col have to be equal\n");

}

}

void matrixMultiplication(){

int rowA,rowB,colA,colB;

printf("\nNumber of rows for Matrix A :");

scanf("%d",&rowA);

printf("\nNumber of col for Matrix A :");

scanf("%d",&colA);

printf("\nNumber of rows for Matrix B :");

scanf("%d",&rowB);

printf("\nNumber of col for Matrix B :");

scanf("%d",&colB);

if(colA == rowB){

int matA[rowA][colA], matB[rowB][colB], mat[rowA][colB];

//Populate matrix A

printf("Please enter elements of matrix A\n");

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

for(int j=0;j<colA;j++){

scanf("%d",&matA[i][j]);

}

}

//Populate matrix B

printf("Please enter elements of matrix B\n");

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

for(int j=0;j<colB;j++){

scanf("%d",&matB[i][j]);

}

}

//Result

printf("Result: \n");

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

for(int j=0;j<colB;j++){

int temp = 0;

for(int k=0;k<rowB;k++){

temp += matA[i][k] \* matB[k][j];

}

mat[i][j] = temp;

}

}

//Print result

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

for(int j=0;j<colB;j++){

printf("%d ",mat[i][j]);

}

printf("\n");

}

}

else{

printf("To perform matrix multiplication row of matrix A and col of matrix B have to be equal\n");

}

}

void matrixCalculation(){

int choice;

printf("Which operation would you like to perform \n");

printf("1.Matrix Addition \n2.Matrix Subtraction \n3.Matrix Multiplication \n");

scanf("%d", &choice);

switch(choice){

case 1:

matrixAddition();

break;

case 2:

matrixSubraction();

break;

case 3:

matrixMultiplication();

break;

default :

printf("Please enter valid operation.\n");

}

printf("\n");

}

int multiplyFactorial(int input){

if(input == 1)

return 1;

else

return input \* multiplyFactorial(input - 1);

}

void factorial(){

int input, temp=0, fact=1;

printf("Number you would like to find the factorials of : ");

scanf("%d",&input);

temp = input;

fact = multiplyFactorial(temp);

printf("Factorial of %d is : %d \n",input,fact);

}

int multiplyBase(int base, int exp){

if(exp == 0)

return 1;

else

return base \* multiplyBase(base, exp - 1);

}

void exponention(){

int base, exp, result;

printf("Enter base: ");

scanf("%d", &base);

printf("Enter exponent: ");

scanf("%d", &exp);

result = multiplyBase(base, exp);

printf("Result: %d \n",result);

}