#include <stdio.h>

#include <math.h>

// 1. Square root of a number

void square\_root() {

double num;

printf("Enter a number: ");

scanf("%lf", &num);

printf("Square root of %.2f = %.4f\n", num, sqrt(num));

}

// 2. sin(x) using series expansion

void sin\_series() {

double x, sum = 0, term;

int n, i;

printf("Enter angle in radians and number of terms: ");

scanf("%lf %d", &x, &n);

term = x;

for(i = 1; i <= n; i++) {

sum += term;

term \*= -x \* x / ((2\*i) \* (2\*i+1));

}

printf("sin(%.2f) = %.4f (using %d terms)\n", x, sum, n);

}

// 3. cos(x) using series expansion

void cos\_series() {

double x, sum = 0, term = 1;

int n, i;

printf("Enter angle in radians and number of terms: ");

scanf("%lf %d", &x, &n);

for(i = 1; i <= n; i++) {

sum += term;

term \*= -x \* x / ((2\*i-1) \* (2\*i));

}

printf("cos(%.2f) = %.4f (using %d terms)\n", x, sum, n);

}

// 4. e^x using series expansion

void exp\_series() {

double x, sum = 1, term = 1;

int n, i;

printf("Enter exponent and number of terms: ");

scanf("%lf %d", &x, &n);

for(i = 1; i <= n; i++) {

term \*= x / i;

sum += term;

}

printf("e^%.2f = %.4f (using %d terms)\n", x, sum, n);

}

// 5. Compound interest

void compound\_interest() {

double principal, rate, time, amount;

int compound\_freq;

printf("Enter principal, rate (%%), time (years), compounding frequency: ");

scanf("%lf %lf %lf %d", &principal, &rate, &time, &compound\_freq);

amount = principal \* pow(1 + rate/(100\*compound\_freq), compound\_freq\*time);

printf("Compound Interest = %.2f\n", amount - principal);

printf("Total Amount = %.2f\n", amount);

}

// 6. Simple interest

void simple\_interest() {

double principal, rate, time, interest;

printf("Enter principal, rate (%%), time (years): ");

scanf("%lf %lf %lf", &principal, &rate, &time);

interest = (principal \* rate \* time) / 100;

printf("Simple Interest = %.2f\n", interest);

printf("Total Amount = %.2f\n", principal + interest);

}

// 7. Solve quadratic equation

void quadratic\_equation() {

double a, b, c, discriminant, root1, root2;

printf("Enter coefficients a, b, c: ");

scanf("%lf %lf %lf", &a, &b, &c);

discriminant = b\*b - 4\*a\*c;

if(discriminant > 0) {

root1 = (-b + sqrt(discriminant)) / (2\*a);

root2 = (-b - sqrt(discriminant)) / (2\*a);

printf("Real and distinct roots:\n");

printf("Root 1 = %.2f\nRoot 2 = %.2f\n", root1, root2);

}

else if(discriminant == 0) {

root1 = -b / (2\*a);

printf("Real and equal roots:\n");

printf("Root = %.2f\n", root1);

}

else {

double real = -b / (2\*a);

double imag = sqrt(-discriminant) / (2\*a);

printf("Complex roots:\n");

printf("Root 1 = %.2f + %.2fi\n", real, imag);

printf("Root 2 = %.2f - %.2fi\n", real, imag);

}

}

// 8. Area and circumference of circle

void circle\_calculations() {

double radius;

const double PI = 3.14159265359;

printf("Enter radius of circle: ");

scanf("%lf", &radius);

printf("Circumference = %.2f\n", 2 \* PI \* radius);

printf("Area = %.2f\n", PI \* radius \* radius);

}

// 9. Area of triangle using Heron's formula

void triangle\_area() {

double a, b, c, s, area;

printf("Enter lengths of 3 sides of triangle: ");

scanf("%lf %lf %lf", &a, &b, &c);

s = (a + b + c) / 2;

area = sqrt(s \* (s-a) \* (s-b) \* (s-c));

printf("Area of triangle = %.2f\n", area);

}

// 10. Temperature conversion

void temperature\_conversion() {

int choice;

double temp, converted;

printf("1. Celsius to Fahrenheit\n");

printf("2. Fahrenheit to Celsius\n");

printf("Enter choice: ");

scanf("%d", &choice);

if(choice == 1) {

printf("Enter temperature in Celsius: ");

scanf("%lf", &temp);

converted = (temp \* 9/5) + 32;

printf("%.2f°C = %.2f°F\n", temp, converted);

}

else if(choice == 2) {

printf("Enter temperature in Fahrenheit: ");

scanf("%lf", &temp);

converted = (temp - 32) \* 5/9;

printf("%.2f°F = %.2f°C\n", temp, converted);

}

else {

printf("Invalid choice!\n");

}

}