#include <iostream>

#include <string>

#include <bitset>

#include <sstream>

#include <iomanip>

#include <cstdlib>

#include <ctime>

using namespace std;

// Function 1: Decimal to Binary

string decimalToBinary(int decimal) {

if (decimal == 0) return "0";

string binary = "";

while (decimal > 0) {

binary = to\_string(decimal % 2) + binary;

decimal /= 2;

}

return binary;

}

// Function 2: Binary to Decimal

int binaryToDecimal(string binary) {

int decimal = 0;

for (char bit : binary) {

decimal = decimal \* 2 + (bit - '0');

}

return decimal;

}

// Function 3: Decimal to Hexadecimal

string decimalToHexadecimal(int decimal) {

if (decimal == 0) return "0";

stringstream ss;

ss << hex << uppercase << decimal;

return ss.str();

}

// Function 4: Hexadecimal to Decimal

int hexadecimalToDecimal(string hexStr) {

int decimal;

stringstream ss;

ss << hex << hexStr;

ss >> decimal;

return decimal;

}

// Menu display

void showMenu() {

cout << "\n===== Number Conversion Menu =====\n";

cout << "1. Convert Decimal to Binary\n";

cout << "2. Convert Binary to Decimal\n";

cout << "3. Convert Decimal to Hexadecimal\n";

cout << "4. Convert Hexadecimal to Decimal\n";

cout << "5. Demo (Generate and convert random integers to binary)\n";

cout << "6. Exit\n";

cout << "Select an option (1-6): ";

}

int main() {

srand(time(0));

int choice;

do {

showMenu();

cin >> choice;

cout << endl;

if (choice == 1) {

int decimal;

cout << "Enter decimal number: ";

cin >> decimal;

cout << "Binary: " << decimalToBinary(decimal) << endl;

}

else if (choice == 2) {

string binary;

cout << "Enter binary number: ";

cin >> binary;

cout << "Decimal: " << binaryToDecimal(binary) << endl;

}

else if (choice == 3) {

int decimal;

cout << "Enter decimal number: ";

cin >> decimal;

cout << "Hexadecimal: " << decimalToHexadecimal(decimal) << endl;

}

else if (choice == 4) {

string hexStr;

cout << "Enter hexadecimal number: ";

cin >> hexStr;

cout << "Decimal: " << hexadecimalToDecimal(hexStr) << endl;

}

else if (choice == 5) {

int randomNum = rand() % 100; // 0 - 99

cout << "Generated random number: " << randomNum << endl;

cout << "Binary: " << decimalToBinary(randomNum) << endl;

}

else if (choice == 6) {

cout << "Exiting program...\n";

}

else {

cout << "Invalid option. Please try again.\n";

}

} while (choice != 6);

return 0;

}