Program 1: Compare Two Complex Numbers

```
#include <iostream>
#include <cmath>
using namespace std;

int main() {
    double real1, imag1, real2, imag2;
    cout << "Enter real part of first complex number: ";
    cin >> real1;
    cout << "Enter imaginary part of first complex number: ";
    cin >> imag1;
    cout << "Enter real part of second complex number: ";
    cin >> real2;
    cout << "Enter imaginary part of second complex number: ";
    cin >> imag2;

    double mag1 = sqrt(pow(real1, 2) + pow(imag1, 2));
    double mag2 = sqrt(pow(real2, 2) + pow(imag2, 2));

    if (mag1 > mag2) {
        cout << "First complex number has higher magnitude." << endl;
    } else if (mag2 > mag1) {
        cout << "Second complex number has higher magnitude." << endl;
    } else {
        cout << "Equal" << endl;
    }
    return 0;
}
```

Program 2: Student Grade Assignment

```
#include <iostream>
using namespace std;

int main() {
    int marks[5], total = 0, failCount = 0;
    for (int i = 0; i < 5; i++) {
        cout << "Enter marks for subject " << i+1 << ": ";
        cin >> marks[i];
        total += marks[i];
        if (marks[i] < 40) failCount++;
    }

    if (failCount > 1) {
        cout << "Repeat Year" << endl;
    } else {
        double percentage = total / 5.0;
        if (percentage >= 90)
            cout << "Grade: A" << endl;
        else if (percentage >= 75)
            cout << "Grade: B" << endl;
        else if (percentage >= 60)
            cout << "Grade: C" << endl;
        else if (percentage >= 40)
            cout << "Grade: D" << endl;
        else
            cout << "Grade: F" << endl;
    }
    return 0;
}
```

Program 3: Calculator using Conditional Operator

```
#include <iostream>
using namespace std;

int main() {
    int a, b; char op;
    cout << "Enter first number: "; cin >> a;
```

```
    cout << "Enter operator (+, -, *, /, %): "; cin >> op;
    cout << "Enter second number: "; cin >> b;

    (op == '+') ? cout << "Result = " << (a + b) << endl :
    (op == '-') ? cout << "Result = " << (a - b) << endl :
    (op == '*') ? cout << "Result = " << (a * b) << endl :
    (op == '/') ? (b == 0 ? cout << "Error: Division by zero!" << endl
                          : cout << "Result = " << (a / b) << endl) :
    (op == '%') ? (b == 0 ? cout << "Error: Modulo by zero!" << endl
                          : cout << "Result = " << (a % b) << endl) :
                  cout << "Error: Invalid operator!" << endl;
    return 0;
}
```

Program 4: Leap Year and Next 5 Leap Years

```
#include <iostream>
using namespace std;

int main() {
    int year;
    cout << "Enter a year: "; cin >> year;
    bool isLeap = false;
    if (year % 4 == 0) {
        if (year % 100 == 0) {
            if (year % 400 == 0) isLeap = true;
        } else isLeap = true;
    }
    if (isLeap)
        cout << year << " is a Leap Year." << endl;
    else {
        cout << year << " is NOT a Leap Year." << endl;
        cout << "Next 5 Leap Years: ";
        int count = 0, nextYear = year+1;
        while (count < 5) {
            bool nextLeap = false;
            if (nextYear % 4 == 0) {
                if (nextYear % 100 == 0) {
                    if (nextYear % 400 == 0) nextLeap = true;
                } else nextLeap = true;
            }
            if (nextLeap) { cout << nextYear << " "; count++; }
            nextYear++;
        }
        cout << endl;
    }
    return 0;
}
```

Program 5: Character Classification

```
#include <iostream>
using namespace std;

int main() {
    char ch;
    cout << "Enter a character: "; cin >> ch;
    switch (ch) {
        case 'a': case 'e': case 'i': case 'o': case 'u':
            cout << ch << " is a lowercase vowel." << endl; break;
        case 'A': case 'E': case 'I': case 'O': case 'U':
            cout << ch << " is an uppercase vowel." << endl; break;
        case '0': case '1': case '2': case '3': case '4':
        case '5': case '6': case '7': case '8': case '9':
            cout << ch << " is a digit." << endl; break;
        default:
            if ((ch >= 'a' && ch <= 'z') || (ch >= 'A' && ch <= 'Z'))
                cout << ch << " is a consonant." << endl;
            else
                cout << ch << " is a special character." << endl;
    }
```

```
    return 0;
}
```

Program 6: Quadratic Equation Solver

```
#include <iostream>
#include <cmath>
using namespace std;

int main() {
    double a, b, c;
    cout << "Enter coefficients a, b, and c: "; cin >> a >> b >> c;
    (a == 0) ? cout << "Invalid equation! 'a' cannot be zero." << endl :
    ([&]() {
        double d = b*b - 4*a*c;
        if (d > 0) {
            cout << "Roots are real and distinct." << endl;
            cout << "Root1 = " << (-b+sqrt(d))/(2*a)
                 << ", Root2 = " << (-b-sqrt(d))/(2*a) << endl;
        } else if (d == 0) {
            cout << "Roots are real and equal." << endl;
            cout << "Root = " << -b/(2*a) << endl;
        } else {
            cout << "Roots are imaginary." << endl;
            double realPart = -b/(2*a), imag = sqrt(-d)/(2*a);
            cout << "Root1 = " << realPart << "+" << imag << "i" << endl;
            cout << "Root2 = " << realPart << "-" << imag << "i" << endl;
        }
    })();
    return 0;
}
```

Program 7: Date Validation and Day of Week

```
#include <iostream>
using namespace std;

bool isLeap(int y) {
    if (y % 4 == 0) {
        if (y % 100 == 0) return (y % 400 == 0);
        else return true;
    }
    return false;
}

bool isValidDate(int d, int m, int y) {
    if (y < 1 || m < 1 || m > 12) return false;
    int daysInMonth;
    if (m==1||m==3||m==5||m==7||m==8||m==10||m==12) daysInMonth=31;
    else if (m==4||m==6||m==9||m==11) daysInMonth=30;
    else if (m==2) daysInMonth = isLeap(y) ? 29 : 28;
    return (d >=1 && d <= daysInMonth);
}

int getDayOfWeek(int d, int m, int y) {
    if (m<3) { m+=12; y--; }
    int k=y%100, j=y/100;
    int h=(d + 13*(m+1)/5 + k + k/4 + j/4 + 5*j) % 7;
    return h;
}

int main() {
    int d,m,y; cout<<"Enter date (DD MM YYYY): "; cin>>d>>m>>y;
    if (!isValidDate(d,m,y)) cout<<"Invalid Date!"<<endl;
    else {
        cout<<"Valid Date."<<endl;
        int h=getDayOfWeek(d,m,y);
        switch(h) {
            case 0: cout<<"Day: Saturday"<<endl; break;
            case 1: cout<<"Day: Sunday"<<endl; break;
            case 2: cout<<"Day: Monday"<<endl; break;
```

```
            case 3: cout<<"Day: Tuesday"<<endl; break;
            case 4: cout<<"Day: Wednesday"<<endl; break;
            case 5: cout<<"Day: Thursday"<<endl; break;
            case 6: cout<<"Day: Friday"<<endl; break;
        }
    }
    return 0;
}
```

Program 8: Discount Calculator

```
#include <iostream>
using namespace std;

int main() {
    double purchase, discountRate, finalPrice;
    cout << "Enter purchase amount: "; cin >> purchase;
    discountRate = (purchase < 100) ? 0 :
                   (purchase <= 500) ? 0.10 :
                   (purchase <= 1000) ? 0.15 : 0.20;
    finalPrice = purchase - (purchase*discountRate);
    cout << "Purchase Amount: Rs " << purchase << endl;
    cout << "Discount: " << discountRate*100 << "%" << endl;
    cout << "Total Price: Rs " << finalPrice << endl;
    return 0;
}
```

Program 9: Simple Banking System

```
#include <iostream>
using namespace std;

int main() {
    double balance=0, amount; int choice;
    do {
        cout<<"\n--- Banking Menu ---\n1.Deposit\n2.Withdraw\n3.Balance\n4.Exit\nChoice: ";
        cin>>choice;
        switch(choice) {
            case 1:
                cout<<"Enter deposit: "; cin>>amount;
                if(amount>0) { balance+=amount; cout<<"Deposited. Balance="<<balance<<endl; }
                else cout<<"Invalid deposit!"<<endl;
                break;
            case 2:
                cout<<"Enter withdrawal: "; cin>>amount;
                if(amount<=0) cout<<"Invalid withdrawal!"<<endl;
                else if(amount>balance) cout<<"Insufficient balance!"<<endl;
                else { balance-=amount; cout<<"Withdrew. Balance="<<balance<<endl; }
                break;
            case 3:
                cout<<"Current Balance="<<balance<<endl; break;
            case 4:
                cout<<"Exiting..."<<endl; break;
            default:
                cout<<"Invalid choice!"<<endl;
        }
    } while(choice!=4);
    return 0;
}
```

Program 10: Number Pyramid

```
#include <iostream>
using namespace std;

int main() {
    int rows; cout<<"Enter rows: "; cin>>rows;
    for(int i=1;i<=rows;i++) {
```

```
        for(int s=1;s<=rows-i;s++) cout<<" ";
        for(int j=1;j<=i;j++) cout<<j;
        for(int j=i-1;j>=1;j--) cout<<j;
        cout<<endl;
    }
    return 0;
}
```