Practice 5

Problem 1: "if" statement

- Write a program that generates two random integers (0~10) and displays the relationship between them.
- Ex) if 4 and 9 are generated, display "4 < 9".
- Ex) if 7 and 7 are generated, display "7 = 7".
- Ex) if 8 and 2 are generated, display "8 > 2".
- Refer to Program 5-3 and 5-4.

Problem 2: Multiple and compound "if"s

- Write a program that reads three integers from a user and does the following
  - Finds and prints the largest and the smallest integers.
  - Prints a message if some of them are less than 20.
  - Prints a message if all of them are between 10 and 90
- An example output is

```
Enter three integers: 3 10 20
The smallest: 3
The largest: 20
Is there a number less than 20?: Yes
Are all numbers in range (10~90)?: No
```

Problem 3: Student grade

- Write a program that determines a student's grade. It reads three scores (0~100) from a user and calculates a student's grade based on the following rules
  - If the average score is 90 or more, the grade is 'A'.
  - If the average score is 70 or more an less than 90, it checks the third score. If the third score is more than 90, the grade is 'A', otherwise, the grade is 'B'.
  - If the average score is 50 or more and less than 70, it checks the average of the second and third scores. If the average of the two is greater than 70, the grade is 'C', otherwise, it is 'D'.
  - If the average score is less than 50, then the grade is 'F'.
- The following is an execution example.

```
Enter three scores (0~100): 90 80 70
The grade is B
```

Problem 4: Quadratic equation

- Write a program to test the existence and number of real roots of a quadratic equation ($ax^2+bx+c=0$).
- The number and the existence of real roots can be determined based on the following rules
  - If both a and b are zero, there is no solution.
  - If a is zero, there is only one root ($-c/b$)
  - If the discriminant (b^2-4ac) is negative, there are no real roots.
  - For all other combinations, there are two roots.
- The program gets three constants (a, b, and c) from a user.
- Then, display the test result as the following examples.

```
Enter three constants: 1 -6 9
There is only one real root.
```

```
Enter three constants: 1 3 1
There are two real roots.
```

```
Enter three constants: 1 1 3
There are no real roots.
```

Problem 5: "Switch" statement

- The following program gets a month number (1, 2, … 12) from a user and converts it into the English month name (January, February, … , December).

```
int main () {
    int month;
    cout << "Enter month number: ";
    cin >> month;
    if(month == 1) {
        cout << "It is January\n";
    } else if(month == 2) {
        cout << "It is February\n";
    } else if(month == 3) {
        cout << "It is March\n";
    } else if(month == 4) {
        cout << "It is April\n";
    } else if(month == 5) {
        cout << "It is May\n";
    } else if(month == 6) {
        cout << "It is June\n";
    } else if(month == 7) {
        cout << "It is July\n";
    } else if(month == 8) {
        cout << "It is August\n";
    } else if(month == 9) {
        cout << "It is September\n";
    } else if(month == 10) {
        cout << "It is October\n";
    } else if(month == 11) {
        cout << "It is November\n";
    } else if(month == 12) {
        cout << "It is December\n";
    } else {
        cout << "Out of range\n";
    }
    return 0;
}
```

Execution examples

```
Enter month number: 6
It is June.
```

```
Enter month number: 5
It is May.
```

- Multiple "if" statements in this program can be effectively converted to a "switch-case" statement.
- Convert it.

Problem 6: Calculator with menu

- Extend your calculator program so that a user can now choose among four basic operations (+, -, *, /).
  - Prompt a user to enter two integer numbers.
  - Prompt the user to choose among the operations
  - Conduct the operation and print the result.
- Execution examples

```
Enter two integers: 1 4
Choose operation: +
Result: 5
```

```
Enter two integers: 4 10
Choose operation: /
Result: 0.4
```

- Hint: char type in if statement
  - The following code segment shows how to get a char-type variable using cin and how to compare it with a char-type constant.

```
char input;
cin >> input;
if(input == '+') {
    //do + operation
}
```