

Examples

The Triangle Problem

- Problem statements (Simple Version)
 - inputs are 3 integers: a, b, and c to be sides of a triangle
 - outputs are triangle type:
 - Equilateral, Isosceles, Scalene
 - or NotATriangle
- Problem statements (Improved Version)
 - the integers a, b, and c must satisfy the following conditions:
 - c1: $1 \leq a \leq 200$
 - c2: $1 \leq b \leq 200$
 - c3: $1 \leq c \leq 200$
 - c4: $a < b + c$
 - c5: $b < a + c$
 - c6: $c < a + b$

The Triangle Problem (cont.)

- Final Version: “Improved version” plus better definition of outputs
- if an input value fails any of conditions c1, c2 or c3, the program notes this with an output message,
 - for example “Value of b is not in the range of permitted values”
- if all inputs satisfy the conditions, possible outputs are
 - **Equilateral**, if all three sides are equal
 - **Isosceles**, if only one pair of sides is equal
 - **Scalene**, if no pair of sides is equal
 - **NotATriangle**, if any of conditions c1, c2, and c3 fails

The Triangle Problem

```
public class Triangle {
    public static final int OUT_OF_RANGE = -2;
    public static final int INVALID = -1;
    public static final int SCALENE = 0;
    public static final int ISOSELES = 1;
    public static final int EQUILATERAL = 2;
    public static int triangle(int a, int b, int c) {
        boolean c1, c2, c3, isATriangle;

        // Step 1: Validate Input
        c1 = (1 <= a) && (a <= 200);
        c2 = (1 <= b) && (b <= 200);
        c3 = (1 <= c) && (c <= 200);

        int triangleType = INVALID;
        if (!c1 || !c2 || !c3)
            triangleType = OUT_OF_RANGE;
        else {
            // Step 2: Is A Triangle?
            if ((a < b + c) && (b < a + c) && (c < a + b))
                isATriangle = true;
            else
                isATriangle = false;
        }
    }
}
```

The Triangle Problem (cont.)

```
// Step 3: Determine Triangle Type
if (isATriangle) {
    if ((a == b) && (b == c))
        triangleType = EQUILATERAL;
    else if ((a != b) && (a != c) && (b != c))
        triangleType = SCALENE;
    else
        triangleType = ISOSELES;
} else
    triangleType = INVALID;
return triangleType;
}
```

The NextDate Function

- Problem Statements
 - there are 3 input variables: month, date, and year
 - output: the date of the day after the input date, or “Invalid Input Date”
 - conditions:
 - c1: $1 \leq \text{month} \leq 12$
 - c2: $1 \leq \text{day} \leq 31$
 - C3: $1842 \leq \text{year} \leq 2042$
 - have to check if the year is leap year, and validate the input variables

The Commission Problem

- A rifle salesperson in the former Arizona Territory sold rifle locks, stocks, and barrels made by a gunsmith in Missouri.
 - Locks cost \$45, stocks cost \$30, and barrels cost \$25
- The salesperson had to sell at least one complete rifle per month, and production limits were such that the most the salesperson could sell in a month was 70 locks, 80 stocks, and 90 barrels.
- After each town visit, the salesperson sent a telegram to the Missouri gunsmith with the number of locks, stocks, and barrels sold in that town.
- At the end of a month, the salesperson sent a very short telegram showing -1 locks sold.
- The gunsmith then knew the sales for the month were complete and computed the salesperson's commission as follows:
 - 10% on sales up to (and including) \$1000,
 - 15% on the next \$800, and
 - 20% on any sales in excess of \$1800.
- The commission program produced a monthly sales report that gave the total number of locks, stocks, and barrels sold, the salesperson's total dollar sales, and finally, the commission.



The Foodies-Wish-List Online Shopping Application

- Foodies-Wish-List is an online shopping service for extremely rare (and expensive!) gourmet foods. It can be used either on a one-time basis as a guest, or repeatedly by members. There is no initial cost for either category, but to be a Foodies-Wish-List member, one must register with customary information, such as:
 - member name
 - address
 - shipping address
 - telephone number
 - email address
 - preferred payment method
 - member credit card
 - PayPal

The Foodies-Wish-List Online Shopping Application (cont.)

- The registration process ends with an account number being assigned to the new Foodies-Wish-List member.
- Registered Foodies-Wish-List members receive discounts based on the price of an individual order as follows:
 - orders less than \$200 receive no discount
 - orders between \$200 and \$800 (inclusive) receive a 10% discount
 - orders over \$800 receive a 15% discount
- There is no discount for any guest order.
- Foodies-Wish-List members
 - receive free shipping on any order over \$200.
 - For orders less than \$200, there is a standard shipping price of \$5.00.
- All guest orders are charged a \$10 shipping fee.



The SATM System

- Problem Statement
 - has 15 screen to communicate with bank customers
 - 3 types of transactions: deposits, withdrawals, and balance inquiries
 - 2 types of accounts: checking, and savings
 - ATM card is enclosed with Personal Account Number (PAN)
 - a customer has 3 chances to enter PIN

The SATM System (cont.)

The diagram illustrates the SATM System interface. It features a central display area with the following text:

WELCOME
to the

Simple
Automatic Teller
Machine

Please Insert your
card for service

Below the display are two output slots:

Cash Dispensing Door

Deposit Envelope Door

To the right of the display is a keypad and two input slots:

Receipts

ID Card

The keypad consists of the following buttons:

- B1, B2, B3 (vertical column)
- 1, 2, 3 (top row)
- 4, 5, 6 (middle row)
- 7, 8, 9 (bottom row)
- 0, . (bottom row)
- CANCEL (bottom right)

The SATM System (cont.)

