

Common Pitfalls and Errors

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Objectives

- To avoid common errors and pitfalls in elementary programming (§2.18).

Outline

- Discussed
 - Problem → Algorithm → Implementation
 - Design a program with input and output
 - Numeric data types and operators
 - Augmented assignment
 - Type casting
 - System time and conversion
- This lesson covers an example
 - Pitfalls and errors

Problem. Compute Loan Payment

- This program lets the user enter the interest rate, number of years, and loan amount, and computes monthly payment and total payment

$$\textit{monthlyPayment} = \frac{\textit{loanAmount} \times \textit{monthlyInterestRate}}{1 - \frac{1}{(1 + \textit{monthlyInterestRate})^{\textit{numberOfYears} \times 12}}}$$

```

import java.util.Scanner;

public class ComputeLoan {
    public static void main(String[] args) {
        // Create a Scanner
        Scanner input = new Scanner(System.in);

        // Enter yearly interest rate
        System.out.print("Enter yearly interest rate, for example 8.25: ");
        double annualInterestRate = input.nextDouble();

        // Obtain monthly interest rate
        double monthlyInterestRate = annualInterestRate / 1200;

        // Enter number of years
        System.out.print(
            "Enter number of years as an integer, for example 5: ");
        int numberOfYears = input.nextInt();

        // Enter loan amount
        System.out.print("Enter loan amount, for example 120000.95: ");
        double loanAmount = input.nextDouble();

        // Calculate payment
        double monthlyPayment = loanAmount * monthlyInterestRate / (1
            - 1 / Math.pow(1 + monthlyInterestRate, numberOfYears * 12));
        double totalPayment = monthlyPayment * numberOfYears * 12;

        // Display results
        System.out.println("The monthly payment is $" +
            (int)(monthlyPayment * 100) / 100.0);
        System.out.println("The total payment is $" +
            (int)(totalPayment * 100) / 100.0);
    }
}

```

Is there any problems in the implementation?

Problem. Monetary Units

- This program lets the user enter the amount in decimal representing dollars and cents and output a report listing the monetary equivalent in single dollars, quarters, dimes, nickels, and pennies. Your program should report maximum number of dollars, then the maximum number of quarters, and so on, in this order.
- But, ...

Common Errors and Pitfalls

- Common Error 1: Undeclared/Uninitialized Variables and Unused Variables
- Common Error 2: Integer Overflow
- Common Error 3: Round-off Errors
- Common Error 4: Unintended Integer Division
- Common Error 5: Redundant Input Objects

- Common Pitfall 1: Redundant Input Objects

Questions?

- Let's avoid common pitfalls and errors.

Common Error 1

- Undeclared/Uninitialized Variables and Unused Variables

- Example: what is the error?

```
double interestRate = 0.05;
```

```
double interest = interestrates * 45;
```

Common Error 2

- Integer Overflow
- Example: Is there any error?

```
int value1 = 2147483647 + 1;
```

```
int value2 = -2147483648 - 1
```

Common Error 3

- Unintended Integer Division
- Example: which one is correct, and why?

```
int number1 = 1;  
int number2 = 2;  
double average = (number1 + number2) / 2;  
System.out.println(average);
```

(a)

```
int number1 = 1;  
int number2 = 2;  
double average = (number1 + number2) / 2.0;  
System.out.println(average);
```

(b)

Common Pitfall 1

- Redundant Input Objects
- Example: what is the error?

```
Scanner input1 = new Scanner(System.in);
```

```
System.out.print("Enter an integer: ");
```

```
int v1 = input1.nextInt();
```

```
Scanner input2 = new Scanner(System.in);
```

```
System.out.print("Enter a double value: ");
```

```
double v2 = input2.nextDouble();
```

Common Pitfall 2

- Round-off Errors
- Is there an error?

```
System.out.println(1.0 - 0.1 - 0.1 - 0.1 - 0.1 - 0.1);
```

```
System.out.println(1.0 - 0.9);
```

Common Pitfall 3

- Violating programming convention
 - Identifiers?
 - Indentations?

Questions?

- Discussed a list of errors/pitfalls
- What are the solutions to these errors/pitfalls?