《Java SE程序设计》

实 验 指 导 手 册

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教学对象： 二年级本科生

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北京邮电大学软件学院

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# 实验一：Java程序编制（基础练习）

## 实验目的

学生通过使用Java语言进行基本程序的开发，掌握Java通用IDE，练习类的封装使用、Java基本类库的使用、Java GUI编程和事件驱动编程、利用UML进行简单建模。

## 实验内容（详见【二、实验内容说明】）

## 实验环境

1. Windows
2. Eclipse 或者 NetBeans

## 实验要求

1. 独立完成实验内容要求
2. 熟练使用Java常用 IDE 进行编程
3. 上交源程序文件（纸质版或者电子版，以课程指导教师要求为准）
4. 上交实验报告（纸质版或者电子版，以课程指导教室要求为准。标准格式见附件二）

## 实验步骤

1. 启动Java常用 IDE。
2. 建立project。
3. 编辑源程序。
4. 编译、链接并执行源程序，看结果是否正确。
5. 如果报错或告警，做必要修改，重复3－5步骤直到没有错误和告警。

# 实验内容说明

本次实验一共5个Project。

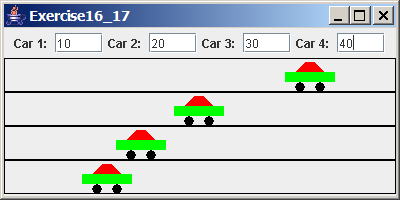
## Project #1 GUI, Graphics, and Event-Driven Programming

CSCI 1302 Introduction to Programming

Armstrong Atlantic State University

### Description

Develop a GUI application that simulates four cars racing, as shown in the following figure. You can set the speed for each car (*1 represents the highest speed*)



### Design:

Draw a sketch of the user interface that shows the components, containers, and the layout managers.

Design a class named **Car** for illustrating one racing car with appropriate data fields, constructors, and methods.

Draw a **UML diagram** that involves the main frame class, its superclass, and the Car class.

### Implementation

Implement the Car class.

Implement the main application class.

## Project #2 Tax Table (covers Chapter 3)

CSCI 1301 Introduction to Programming

Armstrong Atlantic State University

### Description

The United States federal personal income tax is calculated based on filing status and taxable income. There are four filing statuses: single filers, married filing jointly, married filing separately, and head of household. The tax rates for 2005 are shown in Table (a)-(d). If you are, say, single with a taxable income of $10,000, the first $7,300 is taxed at 10% and the other $2,700 is taxed at 15%. So your tax is 730 + 2700 \* 0.15.

Schedule X — Single

|  |  |  |
| --- | --- | --- |
| If taxable income is over-- | But not over-- | The tax is: |
| $0 | $7,300 | 10% of the amount over $0 |
| $7,300 | $29,700 | $730 plus 15% of the amount over 7,300 |
| $29,700 | $71,950 | $4,090.00 plus 25% of the amount over 29,700 |
| $71,950 | $150,150 | $14,652.50 plus 28% of the amount over 71,950 |
| $150,150 | $326,450 | $36,548.50 plus 33% of the amount over 150,150 |
| $326,450 | no limit | $94,727.50 plus 35% of the amount over 326,450 |

Schedule Y-1 — Married Filing Jointly or Qualifying Widow(er)

|  |  |  |
| --- | --- | --- |
| If taxable income is over-- | But not over-- | The tax is: |
| $0 | $14,600 | 10% of the amount over $0 |
| $14,600 | $59,400 | $1,460.00 plus 15% of the amount over 14,600 |
| $59,400 | $119,950 | $8,180 plus 25% of the amount over 59,400 |
| $119,950 | $182,800 | $23,317.50 plus 28% of the amount over 119,950 |
| $182,800 | $326,450 | $40,915.50 plus 33% of the amount over 182,800 |
| $326,450 | no limit | $88,320.00 plus 35% of the amount over 326,450 |

Schedule Y-2 — Married Filing Separately

|  |  |  |
| --- | --- | --- |
| If taxable income is over-- | But not over-- | The tax is: |
| $0 | $7,300 | 10% of the amount over $0 |
| $7,300 | $29,700 | $730 plus 15% of the amount over 7,300 |
| $29,700 | $59,975 | $4,090 plus 25% of the amount over 29,700 |
| $59,975 | $91,400 | $11,658.75 plus 28% of the amount over 59,975 |
| $91,400 | $163,225 | $20,457.75 plus 33% of the amount over 91,400 |
| $163,225 | no limit | $44,160.00 plus 35% of the amount over 163,225 |

Schedule Z — Head of Household

|  |  |  |
| --- | --- | --- |
| If taxable income is over-- | But not over-- | The tax is: |
| $0 | $10,450 | 10% of the amount over $0 |
| $10,450 | $39,800 | $1,045 plus 15% of the amount over 10,450 |
| $39,800 | $102,800 | $5,447.50 plus 25% of the amount over 39,800 |
| $102,800 | $166,450 | $21,197.50 plus 28% of the amount over 102,800 |
| $166,450 | $326,450 | $39,019.50 plus 33% of the amount over 166,450 |
| $326,450 | no limit | $91,819.50 plus 35% of the amount over 326,450 |

### Design & Output

Develop a program that prints a tax table for taxable income from $50,000 to $60,000 with intervals of $50 for all four statuses, as follows:

taxable Single Married Married Head of

Income Joint Separate a House

50000 9846 7296 10398 8506

50050 9859 7309 10411 8519...

59950 12532 9982 13190 1119260000 12546 9996 13205 11206

NOTE: the numbers in the preceding tax table are **incorrect intentionally**. You should print the correct values in the table.

### Submits

Submit the following items:

1. Analysis: Restate the problem in your own words (e.g., what is input, output if any, what needs to be computed, what data needs to be stored and their type).
2. Design: Clearly describe the steps to solve this problem using English or pseudo code.
3. Coding: Implement the solution in Java.
4. Testing: Submit the screen shots for first 20 lines in the tax table.

## Project #3 Least Common Multiple (covers Chapter 5)

CSCI 1301 Introduction to Programming

Armstrong Atlantic State University

### Description

Definition: The least common multiple (LCM) of two numbers is the smallest number that is a multiple of both. For example, the LCM for 8 and 12 is 24, for 15 and 25 is 75, and for 120 and 150 is 600.

Develop a program that prompts the user to enter two integers and finds their least common multiple.

To find the LCM of two numbers, first create a prime factor table for each number. The first column of the table consists of all the prime factors and the second column tracks the occurrence of the corresponding prime factor in the number. For example, the prime factors for 120 are 2, 2, 2, 3, 5, so the prime factor table for number 120 is shown as follows:



The prime factors for 150 are 2, 3, 5, 5, so the prime factor table for number 150 is shown as follows:



The LCM of the two numbers consists of the factors with the largest occurrence in the two numbers. So the LCM for 120 and 150 is , where 2 appears three times in 120, 3 one time in 120, and 5 two times in 150.

### Submissions

Submit the following items:

1. Analysis: Restate the problem in your own words (e.g., what is input, output if any, what needs to be computed, what data needs to be stored and their type).
2. Design: Clearly describe the steps to solve this problem using English or pseudo code.  
    (Hint: The prime factor table can be represented using a two-dimensional array. Write a method named getPrimeFactors(int number) that returns a two-dimensional array for the prime factor table.)
3. Coding: Implement the solution in Java.
4. Testing: Test your program to find the LCM for (120, 150), (7, 14), (7, 8), (1, 2), and (345, 455)

## Project #4 Design Classes (covers Chapter 6)

CSCI 1302 Introduction to Programming

Armstrong Atlantic State University

### Description

This project consists of two separate problems.

#### Design a class named Rectangle to represent a rectangle.

The class contains

1. Two double data fields named width and height that specify the width and height of the rectangle. The default values are 1 for both width and height.
2. A string data field named color that specifies the color of a rectangle. Hypothetically, assume that all rectangles have the same color. The default color is white.
3. A no-arg constructor that creates a default rectangle.
4. A constructor that creates a rectangle with the specified width and height.
5. The accessor and mutator methods for all three data fields.
6. A method named getArea() that returns the area of this rectangle.
7. A method named getPerimeter() that returns the perimeter.

Draw the UML diagram for the class. Implement the class.

Write a test program that creates two Rectangle objects. Assign width 4 and height 40 to the first object and width 3.5 and height 35.9 to the second object. Assign color red to all Rectangle objects. Display the properties of both objects and find their areas and perimeters.

#### Design a class named Time.

The class contains:

1. Data fields hour, minute, and second that represents a time.
2. A no-arg constructor that creates a Time object for the current time. (The data fields value will represent the current time)
3. A constructor that constructs a Time object with a specified elapse time since the middle night, Jan 1, 1970 in milliseconds. (The data fields value will represent this time)
4. Three get methods for the data fields hour, minute, and second, respectively.
5. Draw the UML diagram for the class. Implement the class. Write a test program that creates two Time objects (using new Time() and new Time(555550000)) and display their hour, minute, and second.

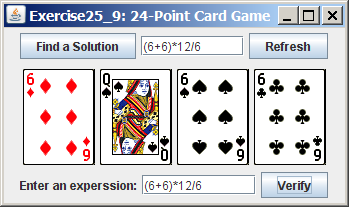
Hint: The current time can be obtained using System.currentTime(), as shown in Listing 2.8, ShowCurrentTime.java. The other constructor sets the hour, minute, and second for the specified elapse time. For example, if the elapse time is 555550000 milliseconds, the hour is 10, the minute is 19, and the second is 10.

## Project #5: 24-Point Card Game

Armstrong Atlantic State University

### Description:

The 24-point game is to pick any four cards from 52 cards, as shown in the figure below. Note that two Jokers are excluded. Each card represents a number. An Ace, King, Queen, and Jack represent 1, 13, 12, and 11, respectively. Enter an expression that uses the four numbers from the four selected cards. Each number must be used once and only once. You can use the operators (addition, subtraction, multiplication, and division) and parentheses in the expression. The expression must evaluate to 24. After entering the expression, click the Verify button to check whether the numbers in the expression are currently selected and whether the result of the expression is correct. Display the verification in a dialog box. Note that such an expression might not exist. In this case, click the Refresh button to get another set of four cards. Assume that images are stored in files named **1.png**, **2.png**, ..., **52.png**, in the order of spades, hearts, diamonds, and clubs. So, the first 13 images are for spades 1, 2, 3, ..., and 13.



Your program should also enable the computer to display the expression if one exists, as shown in the figure. Otherwise, report that the expression does not exist.

### Design

Draw the UML diagrams of the classes used in your project.

### Testing:

Describe how you test your project.

### Screen shots.

At least four screen shots to demonstrate your program.

### Self-Evaluations:

1. Can your program display the UI correctly? \_\_\_\_\_\_\_\_\_\_\_\_
2. Can your program display four cards randomly? \_\_\_\_\_\_\_\_\_\_\_\_
3. Can your program verify a user-entered expression for 24 points? \_\_\_\_\_\_\_\_\_
4. Can your program automatically find a solution or report no solution? \_\_\_\_\_\_\_\_\_

# 附件二：

实验报告模版，参见Word文档《实验报告模版》

# Project #5: 24-Point Card Game 所需图片

鼠标右键点击下面的图标，在弹出菜单中选择“复制”；然后在Windows资源管理器中打开某个文件夹，按“Ctrl+v”键或者“鼠标右键🡪粘贴”即可将该文件“card.zip”存入文件夹中。解压缩后即可使用其中图片。



图片具体如下：











