Lecture 12

- Covers
  - Nested if…else statements
  - Multiway branching statements
- Reading: Savitch 3.1

- Nested if…else statements

Nested if…else statements

- The statements in either branch of an if…else statement may contain another if…else statement
- By placing one if…else statement inside another, we can select between more than two possible branches
- This type of statement set-up is called nesting

Example

- Voting example
  - Rule: You can vote in Australia if you are an Australian citizen and 18 years of age or older.
  - Write a program that asks the user whether they are a citizen. If they are not, display "You are not eligible to vote ". Otherwise, ask for their age, and display "You are too young to vote" or "You are eligible to vote" as the case may be.

Example

- Algorithm

```
Get user's citizenship
IF  NOT Australian citizen THEN
        Display "You are not eligible to vote"
ELSE
        Get user's age
        IF younger than 18 THEN
                Display "You are too young to vote"
        ELSE
                Display "You are eligible to vote"
        ENDIF
ENDIF
```

```
public static void main(String[ ] args)
{
   Scanner keyboard = new Scanner(System.in);
   System.out.print("Are you a citizen of Australia? ");
   String citizenString = keyboard.nextLine();
   char citizen = citizenString.charAt(0);
   if  (citizen != 'y')
   {
      System.out.println("You are not eligible to vote");
   }
   else
   {
      System.out.print("How old are you? ");
      int age = keyboard.nextInt( );
      if  (age < 18)
      {
         System.out.println("You are too young to vote");
      }
      else
      {
         System.out.println("You are eligible to vote");
      }
   }
}
```

Example

- Program output

```
Are you a citizen of Australia? yes
How old are you? 31
You are eligible to vote

Are you a citizen of Australia? no
You are not eligible to vote

Are you a citizen of Australia? yes
How old are you? 16
You are too young to vote
```

Multiway if…else statements

Multiway if…else statements

- When an if…else structure is created to decide between more than two mutually exclusive paths, it is termed a multiway branching statement

Exercise

- Problem
  - Write Java code that outputs “pass” if the integer variable mark is at least 50, that outputs “special exam” if mark is less than 50 and the variable special is true, and outputs “fail” if mark is less than 50 and special is false

Exercise

- Solution

```
if (mark >= 50)
{
        System.out.println("pass");
}
else
{
        if (special == true)
                System.out.println("special  exam");
        else
                System.out.println("fail");
}
```

Exercise

- Minor improvements
  - implicit == operator and left-aligned format

```
if (mark >= 50)
{
        System.out.println("pass");
}
else if (special)
{
        System.out.println("special exam");
}
else
{
        System.out.println("fail");
}
```

Class exercise

- What is produced by this code?

```
int extra = 2;
if (extra < 0)
{
    System.out.println("small");
}
else if (extra == 0)
{
    System.out.println("medium");
}
else
{
    System.out.println("large");
}
```

- Further examples & exercises

Class exercise

- What is produced by this code?

```
int x = 2;
System.out.println("Start");
if (x <= 3)
    if (x != 0)
        System.out.println("Hello from the second if");
    else
        System.out.println("Hello from the else");
System.out.println("End");
```

Class exercise

- What is produced by this code?

```
int x = 4;
System.out.println("Start");
if (x <= 3)
    if (x != 0)
        System.out.println("Hello from the second if");
    else
        System.out.println("Hello from the else");
System.out.println("End");
```

Class exercise

- What is produced by this code?

```
int x = 4;
System.out.println("Start");
if (x <= 3)
    if (x != 0)
        System.out.println("Hello from the second if");
else
    System.out.println("Hello from the else");
System.out.println("End");
```

Matching elses

- Each else is matched with the nearest unmatched if
- It can become confusing to work out which else matches which if, especially when some if statements do not have an else part
- Always bracket your if statements for clarity and readability

Bracket for clarity

```
int x = 4;
System.out.println("Start");
if (x <= 3)
{
    if (x != 0)
    {
        System.out.println("Hello from the second if");
    }
    else
    {
        System.out.println("Hello from the else");
    }
}
System.out.println("End");
```

Class exercise

- Problem
  - Write a multiway if…else statement that classifies the value of an integer variable n into either less than 0, between 0 and 100 inclusive, and greater than 100
  - Print sensible messages

Solution

Example

- The integer variable month contains a value representing a month of the year:

  1 = January, 2 = February, …, 12 = December
- Write a multiway if…else statement to display the name of the month based on the content of the variable month
- If month does not contain an integer value between 1 and 12, an error message should be displayed instead

Example

```
import java.util.*;
public class MonthName
{
	public static void main(String[ ] args)
	{
		Scanner keyboard = new Scanner(System.in);
		int month;
		System.out.println("Enter the month [1-12]");
		month = keyboard.nextInt( );
		if (month == 1)
		{
			System.out.println("January");
		}
		else if (month == 2)
		{
			System.out.println("February");
		}
		else if (month == 3)
		{
			System.out.println("March");
		}
```

Example

```
else if (month == 4)
{
	System.out.println("April");
}
else if (month == 5)
{
	System.out.println("May");
}
else if (month == 6)
{
	System.out.println("June");
}
else if (month == 7)
{
	System.out.println("July");
}
else if (month == 8)
{
	System.out.println("August");
}
```

Example

```
        else if (month == 9)
        {
                System.out.println("September");
        }
        else if (month == 10)
        {
                System.out.println("October");
        }
        else if (month == 11)
        {
                System.out.println("November");
        }
        else if (month == 12)
        {
                System.out.println("December");
        }
        else
        {
                System.out.println("Not  a valid month");
        }
    }
}
```

Class exercise

- Write a Java code segment that outputs to screen the message “Red Dwarf”, “White Star” or “Blue Moon” depending on whether the value of the String object hue is “red”, “white” or “blue” respectively. If hue has any other value, output “Black Hole”.

Solution

Class exercise

- Write a Java code segment that checks if an integer variable key is odd or even.
  - If the variable is even and divisible by 4, output to screen the message “even again”, otherwise output “only even”.
  - If the variable is odd and negative, output to screen the message “negatively odd”, otherwise output “positively odd”.

Solution

Next lecture

- Blocks and scope
- Branching statements
  - The switch statement
  - The conditional operator