DECISIONS

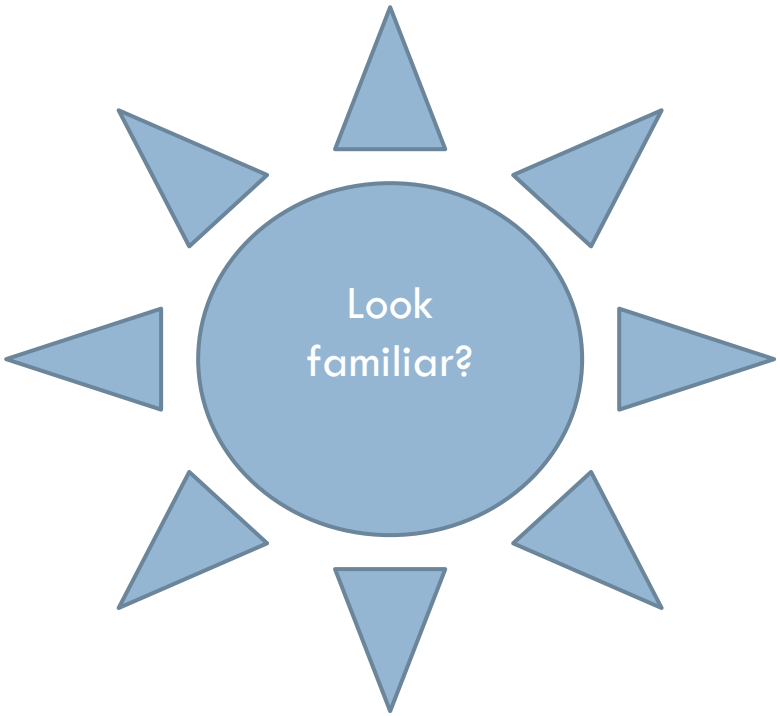
Chapter 5

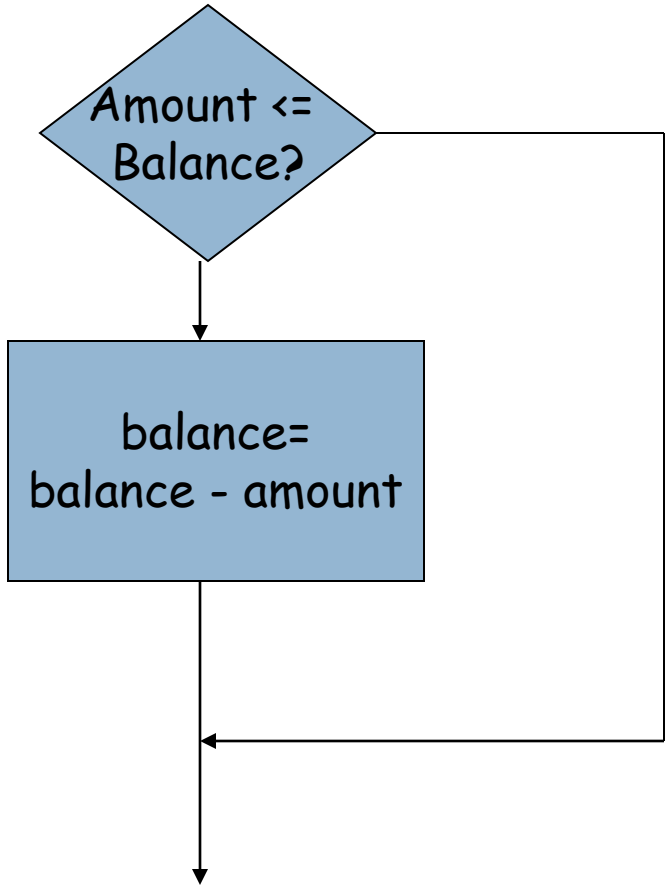
The if Statement

- Action based on a conditions
- If the condition is true, the body of the statement is executed

```
if (amount <= balance)
        balance = balance – amount;
```

Flow Chart for If Statement



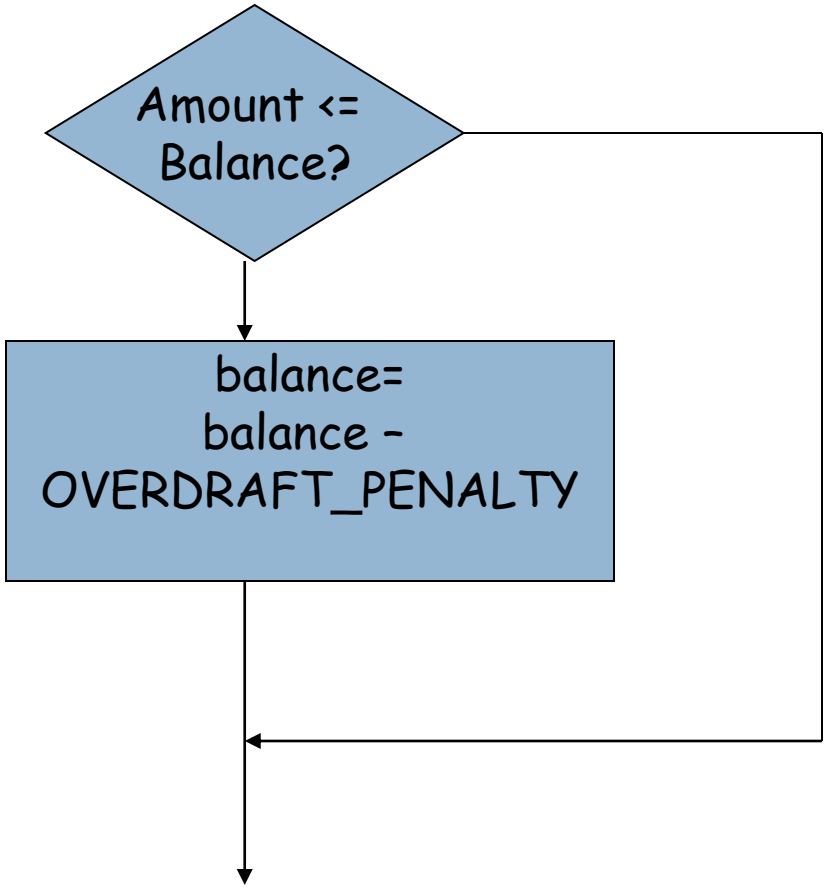


The if Statement (Java Form)

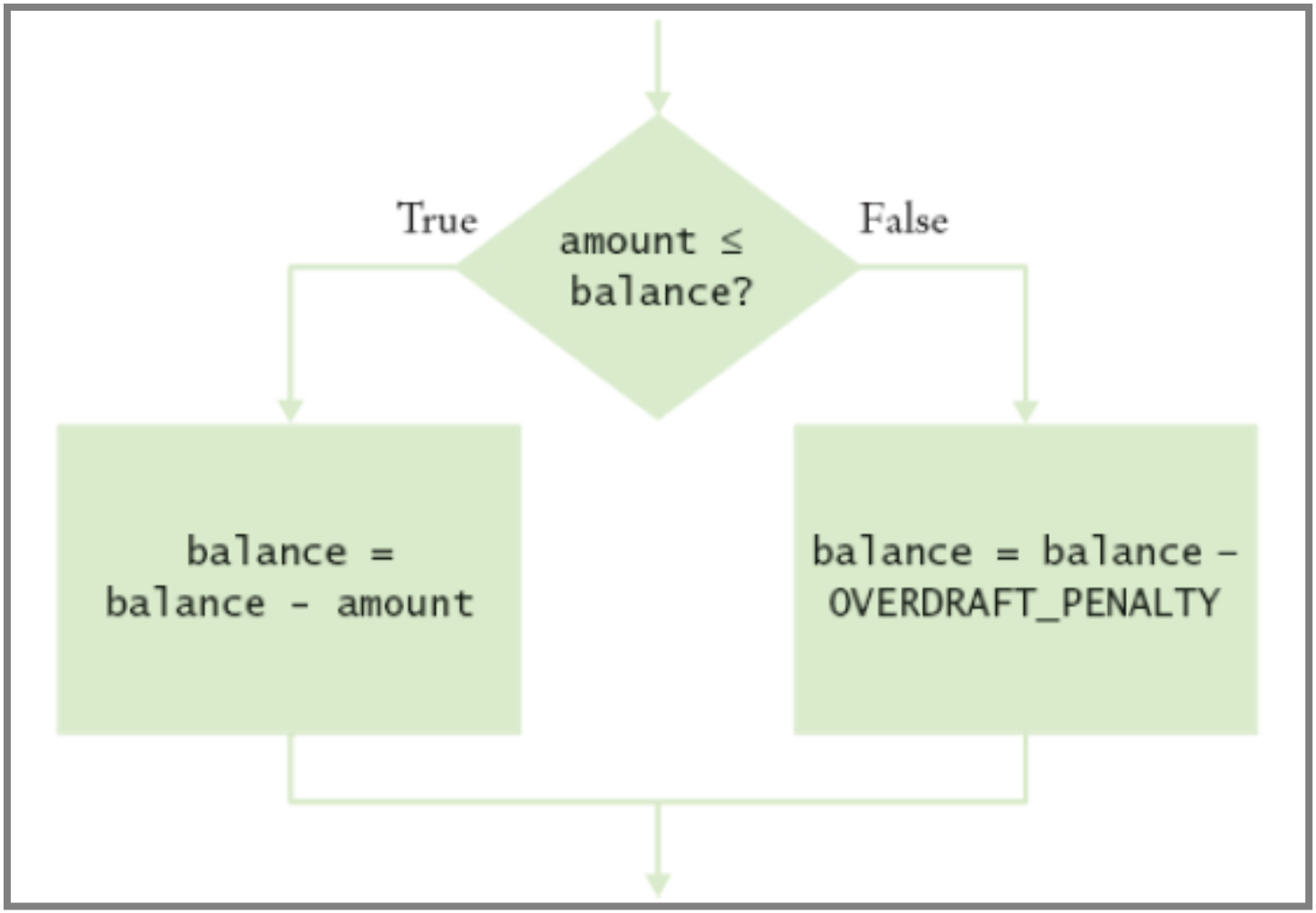
Java Statements

```
If (amount < = balance)
   balance = balance – amount;
else
   balance = balance –
   OVERDRAFT_PENALTY;
```

Visual Logic



If Else Flowchart



Java Code for If Else

```
If (amount < = balance)
   balance = balance – amount;
else
   balance = balance –
                OVERDRAFT_PENALTY;
```

The if Statement

- What if you need to execute multiple statements based on decision?

```
if (amount <= balance)
{
   double balance = balance – amount;
}
```

What Is Wrong

```
if (amount <= balance)
        newBalance = balance – amount;
balance = newBalance;


if (amount <= balance)
{
        newBalance = balance – amount;
        balance = newBalance;
}
```

Relational Operators

- Test the relationship between two values.
- Most of the operators are similar to Visual Logic
- There are some differences. A big one is equals.
- In Visual Logic equals is =. In Java ==.
- Not equal in Java is !=.

Relational Operators

Java	Description
>	Greater than
>=	Greater than or equal
<	Less than
<=	Less than or equal
==	Equal
!=	Not equal

Note: Equal and Not equal are different in Java than Visual Logic!

Comparing Floating-Point Numbers

- Must be careful in comparing
- Rounding problems

Java Example of Floating Point Comparison

Comparing floating – Point Numbers

- Need to test for close enough

```
final double EPSILON = 1E-14;
if (Math.abs(x-y) <= EPSILON)
        // x is approximately equal to y
```

Comparing Strings

- Can't use mathematical operators
- Special methods have been developed

```
if (string1.equals(string2))….
```

- Remember case matters
- Special method

```
if (string1.equalsIgnoreCase(string2))….
```

This is very different from Visual Logic

Comparing Strings

- May want to compare other than equal

  string1.compareTo(string2) < 0;

  Compares based on dictionary

- What happen if we use ==
  - We are testing the string on left with constant

  If (nickname == “Rob”)
  - Testing to see if the variable nickname value is Rob. Will be true only if it points to the string object

Remember that a string is and object and what is stored is the address. That is the problem

Comparing Strings

- String nickname = “Rob”;
- If(nickname == “Rob”); //Test is true

- String name=“Robert”;
- String nickname = name.substring(0,3);
- If(nickname == “Rob”); //Test is false

Comparing Objects

- Use == you are testing to determine if the reference of the two objects are the same.
- In other words, do they point to the same address

```
Rectangle box1 = new Rectangle(5, 10, 20, 30);
Rectangle box2 = box1;
Rectangle box3 = new Rectangle(5, 10, 20, 30);
   box1 == box2;  // true or false
   box1 == box 3; //true or false
```

Testing for Null

- Null is a special object reference
- It says no value has been set.
- The memory has been set aside or instantiated
- Null is not the same as the empty string “”
- “” assigns a blank
- Null means no assignment has been made

  if (x = null)……

Multiple Alternatives

- Require more than 1 if/else decisions
- Need to make series of related comparisons
- Use

  if ....

  else if ......

Example

```
public String getDescription()
{
        if (richter >=8.0)
            r = “Most structures fall”;
        else if (richter >= 7.0)
            r = “Many buildings destroyed”;
        …….
        else
            r= “Negative numbers are not valid”;
        return r;
}
```

Switch Statement

- Use instead of a sequence of if/else/else statements.

```
int digit;
…..
Switch (digit)
{
        case 1: System.out.print(“one”);
        case 2: System.out.print(“two”);
        default: System.out.print(“error”);
}
```

Nested Branches

- Based on the decision of one statement make another decision.

Nested Branch in Visual Logic

Nested Branches - Java

```
If (status == SINGLE)
{
   if (income <= SINGLE_BRACKET1)
         tax = Rate1 * income;
   else if (income <=       SINGLE_BRACKET2)
         tax = Rate2 * income.
```

Enumeration Types

- Think of it as a switch statement for strings.

- You assure that they are categorized correctly

```
public enum FilingStatus {SINGLE, MARRIED}
FilingStatus status = FilingStatus.SINGLE;
```

- Use the == to compare enumerated values

```
if (status==FilingStatus.SINGLE)…
```

Using Boolean Expressions

- True/False
- Assigned to an expression such as

```
<1000
double amount = 0;
System.out.println(<1000);
```

Output: true

Predicate Methods

- Method that returns a boolean value

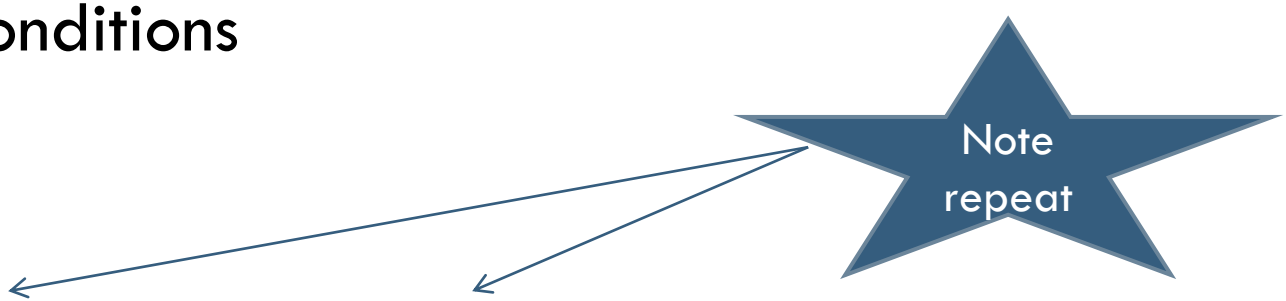
```
public class BankAccount
    {
        public boolean isOverdrawn()
        {
            return balance < 0;
        }
    }
```

Character Class Predicate Methods

- isDigit
- isLetter
- isUpperCase
- isLowerCase
- Scanner class
  - hasNext()
  - nextInt

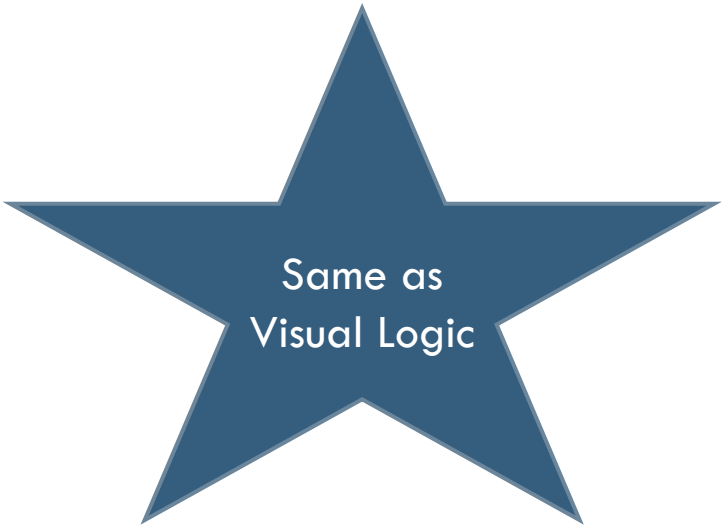
Boolean Operators

- Test two conditions
  - and &&
  - or ||



if (input.equals("S") || input.equals("M"))…..
If(input.equals("S") && input.equals("M")) ….

  - Can use ! – means not
  - Negates the answer



Boolean Variables

- Primitive type
- Must declare as boolean

```
private boolean married;
if (married)
        .....
```

- Don't use

```
        if (married == true)…
```