Chapter 3
Selection Statements

The `boolean` Type and Operators

Often in a program you need to compare two values, such as whether i is greater than j. Java provides six comparison operators (also known as relational operators) that can be used to compare two values. The result of the comparison is a Boolean value: true or false.

```
boolean b = (1 > 2);
```

Comparison Operators

Operator	Name
<	less than
<=	less than or equal to
>	greater than
>=	greater than or equal to
==	equal to
!=	not equal to

Logical Operators

Operator	Name
!	not
& &	and
| |	or
^	exclusive or

Truth Table for Operator !

p	!p
true	false
false	true

Example
!(1 > 2) is true, because (1 > 2) is false.
!(1 > 0) is false, because (1 > 0) is true.

Truth Table for Operator &&

p1	p2	p1 && p2
false	false	false
false	true	false
true	false	false
true	true	true

Example
(3 > 2) && (5 >= 5) is true, because (3 > 2) and (5 >= 5) are both true.
(3 > 2) && (5 > 5) is false, because (5 > 5) is false.

Truth Table for Operator ||

p1	p2	p1 || p2
false	false	false
false	true	true
true	false	true
true	true	true

Example
$(2 > 3) \| (5 > 5)$ is false, because $(2 > 3)$ and $(5 > 5)$ are both false. $(3 > 2) \| (5 > 5)$ is true, because $(3 > 2)$ is true.

Truth Table for Operator ^

p1	p2	p1 ^ p2
false	false	false
false	true	true
true	false	true
true	true	false

Example
(2 > 3) ^ (5 > 1) is true, because (2 > 3) is false and (5 > 1) is true.
(3 > 2) ^ (5 > 1) is false, because both (3 > 2) and (5 > 1) are true.

Example

```
int num = 9;
boolean ba = ((num % 2 == 0) && (num % 3 == 0));
System.out.println("Is " + num + " divisible by 2 and 3? " + ba);


boolean bb = ((num % 2 == 0) || (num % 3 == 0));
System.out.println("Is " + num + " divisible by 2 or 3? " + bb);


boolean bc = ((num % 2 == 0) ^ (num % 3 == 0));
System.out.println("Is " + num + " divisible by 2 or 3, but not both? " +
bc);
```

Example: Determining Leap Year?

Write a program that first prompts the user to enter a year as an <u>int</u> value and checks if it is a leap year.

A year is a leap year if it is divisible by 4 but not by 100, or it is divisible by 400.

(year % 4 == 0 && year % 100 != 0) || (year % 400 == 0)