Expressions, operators, conditional statement

Objectives:
After completing the following exercises, students will be able to:
- express logical statements as correct Java expressions
- use the Java *if-then* statement
- use the Java *if-else* statement
- rewrite *if-else* statements as two independent *if-then* statements

Exercise 1:
Convert each of the following phrases to a Java boolean expression as in the first example:

English expression	Java expression
1 whether x is positive	`x > 0`
2 whether x is a multiple of y	
3 whether x is between -2 and 13	
4 whether the difference between x and y is less than 5	
5 whether x is not between 5 and 27	
6 whether x has more than 4 digits	
7 whether x has exactly 6 digits	

Answers:

2
```
x % y == 0
```

3
```
x >= -2 && x <= 13
```

4
```
x - y < 5 || y - x < 5
```
or
```
x - y < 5 || x - y > -5
```
or
```
Math.abs(x - y) < 5
```

5
```
!(x >= 5 && x <= 27)
```
or
```
x < 5 || x > 27)
```

6
```
x >= 10000
```
or
```
Math.log10(x) >= 4
```

7
```
x>=100000 && x<1000000
```
or
```
Math.log10(x) == 6
```

Exercise 2:

Write a Java program that prompts the user to enter the width and the length for a rectangle, then to enter the width and the length for a second rectangle, and finally it displays a message stating which rectangle (the first or the second) has greater area. (Note: there are three cases)

Answer:

```
import java.util.Scanner;

class Ex2 {

 public static void main(String[] args) {

    Scanner KB = new Scanner(System.in);

    System.out.print("Enter length for rectangle 1: ");
    int length1 = KB.nextInt();

    System.out.print("Enter width for rectangle 1: ");
    int width1 = KB.nextInt();

    System.out.print("Enter length for rectangle 2: ");
    int length2 = KB.nextInt();

    System.out.print("Enter width for rectangle 2: ");
    int width2 = KB.nextInt();

    if (length1*width1 > length2*width2)
      System.out.println(Rectangle 1 has bigger area);

    if (length1*width1 < length2*width2)
      System.out.println(Rectangle 2 has bigger area);

    if (length1*width1 == length2*width2)
      System.out.println(Rectangles have same area);
 }

}
```

Exercise 3:

Write a Java program that prompts the user to enter two positive integers, then displays whether the first is a multiple of the second or not.

Answer:

```
import java.util.Scanner;

class Ex3 {

 public static void main(String[] args) {

    Scanner SC = new Scanner(System.in);

    System.out.print("Please enter the first number: );
    int num1 = SC.nextInt();

    System.out.print("Please enter the second number: );
    int num2 = SC.nextInt();

    if (num1 % num2 == 0)
      System.out.println(num1 + " is a multiple of " + num2);
    else
      System.out.println(num1 + " is not a multiple of " + num2);
 }

}
```

Exercise 4:
Rewrite the following Java program replacing *if-else* statement with *if-then* statements.

```java
import java.util.Scanner;

class Ex4 {

 public static void main(String[] args) {

   Scanner SC = new Scanner(System.in);

   System.out.print("Please enter your age: );
   int age = SC.nextInt();

   if (age >= 13 && age <= 60)
     System.out.println("You can proceed.");
   else
     System.out.println("Your age does not qualify you to procees");
 }

}
```

Answer:

```java
import java.util.Scanner;

class Ex4 {

 public static void main(String[] args) {

   Scanner SC = new Scanner(System.in);

   System.out.print("Please enter your age: );
   int age = SC.nextInt();

   if (age >= 13 && age <= 60)
     System.out.println("You can proceed.");

   If (age < 13 || age > 60)
     System.out.println("Your age does not qualify you to procees");
 }

}
```

Exercise 5:
Trace the following two code fragments for a = +3, a = 0, a = -5, then tell whether these fragments are equivalent or not.

```java
if (a < 0) {
  System.out.println("Negative");
  a = a * -1;
  System.out.println("Absolute
                value is: " + a);
}
else {
  System.out.println("Positive");
  System.out.println("Absolute
                value is: " + a);
}
```

```java
if (a < 0) {
 System.out.println("Negative");
 a = a * -1;
 System.out.println("Absolute
                    value is: " + a);
}
if (a >= 0) {
 System.out.println("Positive");
 System.out.println("Absolute
                    value is: " + a);
}
```

a = +3

       Positive   Positive
       Absolute value is: 3   Absolute value is: 3

a = 0

       Positive   Positive
       Absolute value is: 0   Absolute value is: 0

a = -5

       Negative   Negative
       Absolute value is: 5   Absolute value is: 5
                                               Positive
                                             Absolute value is: 5