AP Computer Science A — Conditions

1. **Boolean Comparators**

   ```
   <     >     ==     <=     >=     !=
   ```

2. **Compound Boolean Operators**

   ```
   &&          ||          !
   ```

3. **Basic `if` statement**

   ```
   if ( a condition is true )
   {
       // do these
       // statements
   }
   ```

   or

   ```
   if ( condition is true )
       // do this single statement
   ```

4. **Basic `if-else` statement to do one of two alternatives**

   ```
   if ( condition is true )
       // do this statement
   else
   {
       // do these
       // statements
   }
   ```

5. **"Switch-style" `if-else` statements to perform instructions based on a range of values in a single variable**

   ```
   if (condition1)
   {
       // do these
   }
   else if (condition2)
   {
       // do these
   }
   else if (condition3)
   {
       // do these
   }
   else
   {
       // do these if nothing else was done
   }
   ```

6. **Nested `if-else` statements to perform multi-step decision-making**

```
if (condition1)
{
    // statement
    if (condition2)
    {
        // statements
    }
    else
    {
        // statements
    }
    // statement
}
else
{
    // statement
    if (condition3)
    {
        // statements
    }
    else
    {
        // statements
    }
    // statement
}
```

EXERCISES

1. In a program, the number of days in a calendar year is already initialized as 365 in the `integer` variable `daysInYear`. Write a simple `if` statement that modifies that number appropriately if the boolean variable `leapYear` is true.

2. Write an `if-else` statement to print out the square root of a number, or print out a message that the square root is imaginary if the value of the `double aNumber` is negative.

3. Write an `if-else` statement that takes the `double` variables `a` and `b` and prints out the answer to `a / b`, but only if `b` is not `0`. Otherwise, the statement should `print` an error message.

4. Write a series of appropriate `if-else` statements (a "switch-style" statement) to `print` an appropriate `String` comment on the weather based on the temperature as given by the `double` variable `degreesFahrenheit` (or `degreesFahrenheit` if you prefer). Include at least 4 remarks, depending on the temperature, in your solution.

5. A program stores the lengths of the three sides of a triangle in the variables `a`, `b`, and `c`. Write if-else statements to to return a `String` identifying the type of triangle: *equilateral*, *isosceles*, or *scalene*.

6. You're trying to decide what to do this weekend. If you're `alone` and you `haveMoney` (both boolean variables), you'll go to the movies, but if you don't have money, you'll stay home and read. If you're *not* alone though, and you have money, you'll take your friends out to dinner, but if you don't have money, you'll all hang out together and play video games. Write a set of `if-else` statements to print out your weekend options based on the boolean variables `alone` and `haveMoney`.

EXERCISE SOLUTIONS

1. In a program, the number of days in a calendar year is already initialized as 365 in the `integer` variable `daysInYear`. Write a simple `if` statement that modifies that number appropriately if the boolean variable `leapYear` is true.

```
if (leapYear)
{
    daysInYear = 366;           // curly braces are optional here
}
```

2. Write an `if-else` statement to print out the square root of a `double` number stored in `aNumber`, or print out a message that the square root is imaginary if the value of `aNumber` is negative.

```
if (aNumber >= 0)
{
    System.out.println("Square root of " + aNumber + " is " +Math.sqrt(aNumber));
}
else
{
    System.out.println("The square root of a negative number is imaginary.");
}
```

3. Write an `if-else` statement that takes the `double` variables `a` and `b` and prints out the answer to `a / b`, but only if `b` is not `0`. Otherwise, the statement should print an error message.

   (Note that the following code, without the curly braces, is legal and works as it should. Which system of writing if-else statements do you prefer and find easier to read: the solution in #2 above or the solution for #3 given here?)

```
if (b != 0) System.out.println(a/b);
else System.out.println("Division by 0 is undefined.");
```

4. Write a series of appropriate `if-else` statements (a "switch-style" statement) to `print` an appropriate `String` comment on the weather based on the temperature as given by the `double` variable `degreesFahrenheit`. Include at least 4 remarks, depending on the temperature, in your solution.

```
if (degreesFahrenheit >= 100)
{
    System.out.println("It's a heatwave!");
}
else if (degreesFahrenheit >= 80)
{
    System.out.println("It's a little warm, eh?");
}
else if (degreesFahrenheit >= 60)
{
    System.out.println("Nice day for a picnic!");
}
else if (degreesFahrenheit >= 40)
{
    System.out.println("It's a little chilly, don't you think?");
}
else
    System.out.println("It's COLD out! Better bundle up!");
```

5. A program stores the lengths of the three sides of a triangle in the variables `a`, `b`, and `c`. Write if-else statements to to `return` a `String` identifying the type of triangle: *equilateral*, *isosceles*, or *scalene*.

```
if (a == b && b == c)
    return "equilateral";
else if (a == b || b == c || a == c)
    return "isosceles";
else
    return "scalene";
```

6. You're trying to decide what to do this weekend. If you're `alone` and you `haveMoney` (both `boolean` variables), you'll go to the movies, but if you're broke, you'll stay home and read. If you're *not* alone though, and you have money, you'll take your friends out to dinner, but if you don't have money, you'll all hang out and play video games. Write a set of `if-else` statements to print out your weekend options based on the `boolean` variables `alone` and `haveMoney`.

```
if (alone)
{
    if (haveMoney)
    {
        System.out.println("Going to movies alone");
    }
    else   // ie. we don't have money
    {
        System.out.println("Staying home to read");
    }
}
else    // this is the !alone part...
{
    if (haveMoney)
    {
        System.out.println("Taking friends out to dinner");
    }
    else
    {
        System.out.println("Playing videogames with friends");
    }
}
```

Because each statement is a single command, we can remove the curly braces to make it more readable:

```
if (alone)
    if (haveMoney)
        System.out.println("Going to movies alone");
    else
        System.out.println("Staying home to read");
else
    if (haveMoney)
        System.out.println("Taking friends out to dinner");
    else
        System.out.println("Playing videogames with friends");
```

Nesting statements as shown above is far preferable to trying to code everything with a series of complex, repetitive, and time-wasting `if-else` statements. Don't do it like this:

```
if (alone && haveMoney) System.out.println("Going to movies alone");
if (alone && !haveMoney) System.out.println("Staying home to read");
if (!alone && haveMoney) System.out.println("Taking friends out to dinner");
if (!alone && !haveMoney) System.out.println("Playing videogames with friends");
```