CSC120 2025S Lab No.4
Comparison

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This lab aims to write a program that compares **four people** using three quantities. The three quantities are the height, weight, and BMI. The user provides each person's name, height (in inches), and weight (in pounds). The program calculates each person's BMI. For each of the three quantities, the program reports the ranking in increasing order of the values in question.

A principal idea for computing the ranking is as follows:

- The program computes the maximum of the four and reports this value.
- The program computes the maximum of three values after removing the maximum of the four from consideration.
- The program computes the maximum and the minimum of the remaining two values.

We write three methods for these three selection processes, respectively.

- The method for computing the maximum of four is called `find1st`. The method receives four `double` values and four `String` values as parameters. We name the four `double` values `candidate_value1`, `candidate_value2`, `candidate_value3`, and `candidate_value4`. We name the four `String` values `candidate_name1`, `candidate_name2`, `candidate_name3`, and `candidate_name4`.

  The operation inside the method goes as follows:

  - We find the maximum of the four values using three applications of `Math.max()`. We need three applications because `Math.max()` can take only two values.
  - We divide the action into four cases once the maximum value has been computed: the case in which the maximum is equal to the first candidate value, the case in the maximum is equal to the second candidate value, the case in which the maximum is equal to the third candidate value, and the case in which the maximum is equal to the fourth candidate value.
  - In each of the four cases, the method reports the maximum and then calls the method for ranking the remaining three.

- The method for computing the maximum of three is called `find2nd`. The method receives three `double` values and three `String` values as parameters. We name the four `double` values `candidate_value1`, `candidate_value2`, and `candidate_value3`. We name the four `String` values `candidate_name1`, `candidate_name2`, and `candidate_name3`.

  The operation inside the method goes as follows:

  - We find the maximum of the three values using two applications of `Math.max()`. We need two applications because `Math.max()` can take only two values.
  - We divide the action into three cases once the maximum value has been computed: the case in which the maximum is equal to the first candidate value, the case in the maximum is equal to the second candidate value, and the case in which the maximum is equal to the third candidate value.
  - In each of the four cases, the method reports the maximum and then calls the method for ranking the remaining two.

- The method for reporting the ranking between the remaining two can be developed similarly.

The main method uses the following variables for storing the information:

`String name1, double height1, double weight1, double bmi1`
`String name2, double height2, double weight2, double bmi2`
`String name3, double height3, double weight3, double bmi3`
`String name4, double height4, double weight4, double bmi4.`

Reporting the rank, name, and value associated with the name can be done with the following method:

```
public static void report( int rank, String name, double value ) {
  System.out.printf(
      "Rank %d is %s, with a value of %.2f%n",
      rank, name, value );
}
```

The value for `rank` is 1 when reporting the maximum among four, 2 when reporting the maximum among three, and 3 and 4 at other times.

The formula for computing BMI is

$$bmi = 703.0 * weight/(height^2)$$

Here is an example of how the program works.

The first four lines collect information from the user. The program then ranks based on height, weight, and BMI.

```
1  Enter Name, Height, and Weight for Person 1: Joe 69.5 150.0
2  Enter Name, Height, and Weight for Person 2: Dirk 72.0 180.5
3  Enter Name, Height, and Weight for Person 3: Ernie 73.0 190.3
4  Enter Name, Height, and Weight for Person 4: Pio 74.0 176.0
5  ---- Ranking by Height
6  Rank 1 is Pio, with a value of 74.00
7  Rank 2 is Ernie, with a value of 73.00
8  Rank 3 is Dirk, with a value of 72.00
9  Rank 4 is Joe, with a value of 69.50
10 ---- Ranking by Weight
11 Rank 1 is Ernie, with a value of 190.30
```

```
Rank 2 is Dirk, with a value of 180.50
Rank 3 is Pio, with a value of 176.00
Rank 4 is Joe, with a value of 150.00
---- Ranking by BMI
Rank 1 is Ernie, with a value of 25.10
Rank 2 is Dirk, with a value of 24.48
Rank 3 is Pio, with a value of 22.59
Rank 4 is Joe, with the value of 21.83
```