```java
import java.util.Scanner;

/**
 * Person represents a single line from the file Experiment-Student.txt
 *   trait: the first column (0 or 1)
 *   without: the second column (without treatment)
 *   with: the third column (with treatment)
 *
 * @author Nick Jones
 * @version 12/3/2014
 */
public class Person {
    int index;
    Double without;
    Double with;
    int trait;

    /**
     * Constructor
     * @param index which line in the file is it?
     * @param without result without treatment
     * @param with result with treatment
     * @param trait trait of person
     */
    public Person(int index, Double without, Double with, int trait) {
        this.index = index;
        this.without = without;
        this.with = with;
        this.trait = trait;
    }


    /**
     * Get a string of this Person
     * @return index: trait without with
     */
    @Override
    public String toString() {
        return String.format("%4d:  %1d  %3.8f  %3.8f", index, trait, without, with);
    }


    /**
     * What is the mean of the values of the people in the array
     * @param ar  The array of people to find the mean of
     * @param control Is this the control group?
     * @return If control, the mean of without. Else, the mean of with.
     */
    public static Double mean(ArrayList<Person> ar, boolean control) {
        Double result = 0.0;

        if (control)
            for (Person p : ar)
                result += p.without;
        else
            for (Person p : ar)
                result += p.with;
```

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61
62          return result/ar.size();
63      }
64
65      /**
66       * What is the standard deviation of the values of the people in the array.
67       * @param ar The array of people
68       * @param control Is this the control group.
69       * @return If control, std(without). Else, std(with).
70       */
71      public static Double std(ArrayList<Person> ar, boolean control) {
72          Double result = 0.0;
73          Double mean = Person.mean(ar, control);
74
75          if (control)
76              for (Person p : ar)
77                  result += Math.pow(p.without - mean, 2);
78          else
79              for (Person p : ar)
80                  result += Math.pow(p.with - mean, 2);
81
82          return Math.sqrt(result/ar.size());
83      }
84
85      /**
86       * What percent of the Person have a trait of zero?
87       * @param ar The array of people
88       * @return What percent of people have zero as their trait. [0.0, 100.0]
89       */
90      public static Double percentZero(ArrayList<Person> ar) {
91          Double result = 0.0;
92
93          for(Person p : ar)
94              result += (p.trait + 1) % 2;
95
96          return result / ar.size() * 100;
97      }
98
99      /**
100      * Main Method
101      *
102      * Read in Experiment-Student.txt and perform statistical analysis on it.
103      *
104      * @param args UNUSED
105      */
106     public static void main(String[] args) {
107         int numControl = 20; // Number of people in control group
108         int numTest =  20; // Number of people in treatment group.
109
110         assert(numControl + numTest <= 1000);
111
112         try {
113             Scanner scnr = new Scanner(new File("Experiment-Student.txt"));
114
115             ArrayList<Person> ar = new ArrayList<Person>(); // All people in file
116             ArrayList<Person> control = new ArrayList<Person>(); // Control group
117             ArrayList<Person> test = new ArrayList<Person>(); // Treatment group
```

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118
119             int i = 1;
120
121             while(scnr.hasNextLine()) {
122                 String line = scnr.nextLine();
123                 Scanner lScnr = new Scanner(line); // scans the line
124
125                 // PARSE LINE FROM FILE
126                 int trait = lScnr.nextInt();
127                 Double without = lScnr.nextDouble();
128                 Double with = lScnr.nextDouble();
129                 Person p = new Person(i++, without, with, trait);
130
131                 // ADD TO ARRAY OF ALL PEOPLE
132                 ar.add(p);
133             }
134
135
136             // SELECT PEOPLE FOR CONTROL GROUP
137             for (i=0; i<numControl; i++) {
138                 int rand = (int)(ar.size() * Math.random());
139                 control.add(ar.get(rand));
140                 ar.remove(rand);
141             }
142
143             // SELECT PEOPLE FOR TREATMENT GROUP
144             for (i=0; i<numTest; i++) {
145                 int rand = (int)(ar.size() * Math.random());
146                 test.add(ar.get(rand));
147                 ar.remove(rand);
148             }
149
150             // DISPLAY CONTROL PEOPLE
151             System.out.println("\nControl:\n--------------------------");
152             i=1;
153             for(Person p : control)
154                 System.out.printf("%2d: %s\n", i++, p);
155
156             // DISPLAY TREATMENT PEOPLE
157             System.out.println("\nTest:\n--------------------------");
158             i=1;
159             for(Person p : test)
160                 System.out.printf("%2d: %s\n", i++, p);
161
162             // CALCULATE CONTROL STATS
163             Double controlMean = Person.mean(control, true);
164             Double controlSTD = Person.std(control, true);
165             Double controlZeroPercent = Person.percentZero(control);
166
167             // CALCULATE TREATMENT STATS
168             Double testMean = Person.mean(test, false);
169             Double testSTD = Person.std(test, false);
170             Double testZeroPercent = Person.percentZero(test);
171
172             // FIND TOTAL PERCENT ZERO
173             ArrayList<Person> all = new ArrayList<Person>(control);
174             all.addAll(test);
```

```
175             Double totalZeroPercent = Person.percentZero(all);
176
177             // DISPLAY CONTROL STATS
178             System.out.println("\nControl:\n--------------------------");
179             System.out.println("mean: " + controlMean);
180             System.out.println("std: " + controlSTD);
181             System.out.println("%0: " + controlZeroPercent);
182
183             // DISPLAY TREATMENT STATS
184             System.out.println("\nTest:\n--------------------------");
185             System.out.println("mean: " + testMean);
186             System.out.println("std: " + testSTD);
187             System.out.println("%0: " + testZeroPercent);
188
189             // DISPLAY TOTAL PERCENT ZERO
190             System.out.println("\nTotal %0:\n--------------------------");
191             System.out.println("" + totalZeroPercent);
192
193             // CALCULATE CONCLUSION
194             Double ts = (testMean - controlMean) /
195                     Math.sqrt(Math.pow(testSTD,2)/test.size() +
196                               Math.pow(controlSTD,2)/control.size());
197             Double cv = 1.96;
198             Boolean concl = Math.abs(ts) > cv;
199
200             // DISPLAY CONCLUSION
201             System.out.println("\nResult:\n--------------------------");
202             System.out.printf("|%f| %s %f => %s H0",
203                     ts,
204                     concl ? ">" : "<=",
205                     cv,
206                     concl ? "reject" : "fail to reject");
207
208             // CLOSE SCANNER
209             scnr.close();
210         }
211         catch (FileNotFoundException e) { System.out.println("File not found");
    System.exit(1); }
212     }
213 }
214
```