1. **(10 points) Chapter 7: Self-check problems #5, #7, #11, #13, #20.**

   For your benefit, I suggest you complete all of the self-check problems on your own. However, I will just collect the answers to the above five problems. Please type the answers into a document.

   a. NO NEED to copy original questions, just put down the question number and the answer.
   b. Name the file as "***LastnameFirstname7.doc***" (or ".docx" or ".pdf", where "Lastname" is your last name, and "Firstname" is your first name), submit it online.

2. **(40 points) Chapter 7: Programming Project #4 "Personality Test"**

   a. Download the attached "`PersonalityTest.java`", and "`personality.txt`" file.
   b. Background information about Personality Test:

   The Keirsey Temperament Sorter (keirsey.com) is a test that measures four independent dimensions of your personality:

   (1) *Extrovert* versus *Introvert* (**E** vs. **I**): what energizes you
   (2) *Sensation* versus *iNtuition* (**S** vs. **N**): what you focus on
   (3) *Thinking* versus *Feeling* (**T** vs. **F**): how you interpret what you focus on
   (4) *Judging* versus *Perceiving* (**J** vs. **P**): how you approach life

   The test involves answering a 70-question survey. Each question has two answer choices, which we'll call "A" and "B". The person taking the test can leave a question blank, in which case the answer will be recorded with a dash (**-**).

   Individuals are categorized as being on one side or the other for each dimension, and the corresponding letters are put together to form a personality type. For example, if you are an Extrovert, iNtuitive, Thinking, Perceiving person then you are referred to as an ENTP. The "A" answers correspond to the left-hand choices above: E, S, T, and J. The "B" answers correspond to the right-hand choices above: I, N, F, and P. For each dimension, we compute a percentage of B answers the user gave for that dimension between 0 and 100, to indicate whether the person is closer to the "A" or "B" side.

   Suppose that someone's answers are as follows:

Dimension	# of "A" answers	# of "B" answers	% of "B" answers	Result
Extrovert / Introvert	1	9	90%	I
Sensation / iNtuition	17	3	15%	S
Thinking / Feeling	18	2	10%	T
Judging / Perceiving	16	2	11%	J

We add up how many of each type of answer we got for each dimension. Then we compute the percentage of B answers for each dimension. Then we assign letters based on which side the person ends up on for each dimension. In the Extrovert/Introvert dimension, for example, the person above gave 9 "B" answers out of 10 total (90%), which means he is on the B side, which is "Introvert" or I. The overall percentages are (90, 15, 10, 11) which works out to a personality type of ISTJ.

c. Format of "`personality.txt`"

The personality data consists of line pairs, one per person. The first line has the person's name, and the second has the person's 70 answers ('A', 'B' or '-'). Notice that the A or B can be either upper or lowercase. A dash represents a question that was skipped by that person, as seen in Han Solo's data below.

Input file `personality.txt` (**partial**):

```
Betty Boop
BABAAAABAAAAAAABAAAABBAAAAAABAAAABABAABAAABABABAABAAAAAABAAAAAABAAAAAA
Bugs Bunny
aabaabbabbbaaaabaaaabaaaaababbbaabaaaabaabbbbabaaaabaabaaaaaabbaaaaabb
Luke Skywalker
bbbaaabbbbaaba-BAAAABBABBAAABBAABAAB-AAAAABBBABAABABA-ABBBABBABAA-AAAA
Han Solo
BA-ABABBB-bbbaababaaaabbaaabbaaabbabABBAAABABBAAABABAAAABBABAAABBABAAB
```

The questions are organized into 10 groups of 7 questions, with the following repeating pattern in each group:

(1) The first one question is an Extrovert/Introvert question (questions 1, 8, 15...).
(2) The next two questions are for Sensing/iNtuition (questions 2 and 3, 9 and 10...).
(3) The next two questions are for Thinking/Feeling (questions 4 and 5, 11 and 12...).
(4) The next two questions are for Judging/Perceiving (questions 6 and 7, 13 and 14...).

In other words, if we consider the E/I to be dimension 1, the S/N to be dimension 2, the T/F to be dimension 3, and the J/P to be dimension 4, the map of questions to their respective dimensions would look like this (spaces added for clarity):

```
dimension 1223344 1223344 1223344 1223344 1223344 1223344 1223344 1223344 1223344
1223344
char      BABAAAA BAAAAAA ABAAAAB BAAAAAA BAAAABA BAABAAA BABABAA BAAAAAA BAAAAAA
BAAAAAA
```

Notice that there are half as many Extrovert/Introvert questions as there are for each of the other three dimensions.

d. Modify the "`PersonalityTest.java`" so it will do the following:
   i. Your program begins with an introduction of the program, then it opens the input file and processes its data.
   ii. Each pair of lines from the input file is turned into a group of lines in the console output with the name, count of As and Bs for each dimension, % Bs for each dimension (rounded to the nearest percent), and personality type. Questions

left blank (indicated by a dash, '-') **do not contribute** to the count of As/Bs, nor to the percent Bs for that dimension. If the person has the same number of As and Bs for a dimension, give them an "**X**", as with Han Solo below. You are to reproduce this format **exactly**:

```
** This program reports the results for Keirsey Personality Test  **

Betty Boop:
answers: [1A-9B, 17A-3B, 18A-2B, 18A-2B]
percent B: [90, 15, 10, 10]
type: ISTJ

Bugs Bunny:
answers: [8A-2B, 11A-9B, 17A-3B, 9A-11B]
percent B: [20, 45, 15, 55]
type: ESTP

Luke Skywalker:
answers: [1A-8B, 7A-11B, 14A-5B, 15A-5B]
percent B: [89, 61, 26, 25]
type: INTJ

Han Solo:
answers: [2A-8B, 9A-9B, 11A-9B, 15A-5B]
percent B: [80, 50, 45, 25]
type: IXTJ
...
```

iii. You can assume that the input file has no errors or illegal data, and that nobody has skipped all questions for a dimension (otherwise, it would be impossible to determine a percentage of Bs).

iv. For this assignment, you are limited to the language features in Chapters 1 through 7 of the textbook.

v. Remember, your program will be graded both on "external correctness" and "internal design and style" (whether your source code follows the **style guide**)

e. Submit the final "**`PersonalityTest.java`**" file **(DO NOT change the file name)** online.

Implementation Hints:

A major purpose of this assignment is to test your understanding of arrays. You should use arrays to store the data for each of the four dimensions of the personality test, and to transform data from one form to another as follows:

- from the original 70 A/B answers to counts of As and Bs, grouped by dimension;
- from counts to percentages of Bs;
- from percentages to a four-letter personality type string.

These transformations are summarized by the following diagram using Han Solo's data:

```
Answers: "BA-ABABBB-bbbaababaaaabbaaabbaaabbabABBAAABABBAAABABAAAABBABAAABBABAAB"
          What is computed          Output
A counts:  {2, 9, 11, 15}
B counts:  {8, 9, 9, 5}                    answers: [2A-8B, 9A-9B, 11A-9B, 15A-5B]

B percent: {80, 50, 45, 25}                percent B: [80, 50, 45, 25]

Type:      "I" "X" "T" "J"                     type: IXTJ
```

To count As and Bs, read data from the input file one line at a time from your Scanner. Analyze each character within the overall line String as a char value using the line string's charAt method.
The process of converting the 70 answers into counts of As and Bs is one of the most challenging aspects of this program. Look at the lecture examples that perform tallying.
For debugging it can be helpful to print your arrays. Recall that the method Arrays.toString converts an array to a printable String. For example, to print the contents of an array named counts, you could write the following code:

```
System.out.println("My counts are " + Arrays.toString(counts));
```

You must display percentages of Bs as integers. Use Math.round or printf to round numbers to the nearest integer. If you use Math.round, you must cast its result to type int if you want to store the result in an int variable or array:

```
double d = 3.14;
int n = (int) Math.round(d);
```