Hands #1 - Getting Started with Input and Output

On the following pages, there are 9 sample problems. The dat files and solutions to these problems are provided in the Hands #1 folder.

The solutions are based on Java 5.0. I have used meaningful variable names to make the code more readable. Students in contest situations would certainly use shorter variable names and possibly more anonymous variables.

Problem	**Key Concepts**
pr11 - Gas Money	use `printf` to format output to 2 decimal places, uses `Math.abs`, `if` statements
pr12 - Paint My Room	`String` array with `String`s and `int`s; uses `Math.ceil`; cast to an `int`
pr13 - Operators	`String` to `char`; `switch` statements; escape characters(`\n \\`); cast to a `double`
pr14 - Attendance Average	finding averages; `++` operator; loop control variables not starting with `0`
pr15 - Swimming Pool	unit conversions; `Math.round` returns a `long`
pr16 - Discounts	`else if` ladder; round using `printf`
pr17 - Diver Scores	running total; average, `Math.max`; `Math.min` to find highest and lowest scores
pr18 - Round Numbers	rounding using `printf`; printing in columns using `printf`
pr19 - Character Counter	linear search on a string; printing in columns using `printf`; inequalities with chars

pr11 - Gas Money

Problem: Nick bought gas today. He wants to find out how much more, or less, it cost him today than it would have cost him yesterday.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains the number of gallons he bought followed by the price of gas today and the price of gas yesterday.

data file: `pr11`

Output: Output the label "`SAVED: `" or "`PAID MORE: `" followed by the amount he overpaid or saved compared how much he would have paid yesterday. If he would have paid the same, output "`PAID THE SAME`".

Assumptions: None.

Sample Input:

```
3
12 3.099 2.899
24 3.049 3.049
35.4 2.899 3.049
```

Sample Output:

```
PAID MORE: $2.40
PAID THE SAME
SAVED: $5.31
```

pr12 - Paint My Room

Problem: Nick is going to paint some walls in his school different colors. He knows that one-gallon of paint will cover 300 square feet. You need to calculate how many gallons of each color of paint he needs to buy.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains the color, length, and height of his room followed by the number of square feet that is taken up by windows and doors. All dimensions will be integers.

data file: `pr12`

Output: Output the color of the room followed by the numbers of gallons of paint he needs to buy followed by "`GALLON(S)`".

Assumptions: Paint only comes in one-gallon containers so if he needs 1.2 gallons, he must buy 2 gallons.

Sample Input:

```
3
RED 18 24 50
GREEN 21 18 35
BLUE 22 54 108
```

Sample Output:

```
RED 2 GALLON(S)
GREEN 2 GALLON(S)
BLUE 4 GALLON(S)
```

pr13 - Operators

Problem: Nick is learning his mathematical operators. Write a program to check his work.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains an operator as described below and two integers to use as operands.

+ means add **-** means subtract ***** means multiply
**** means integer division **/** means real division **%** means mod

data file: `pr13`

Output: Output the problem and the solution as shown below. Real division answers should be rounded to tenths.

Assumptions: None

Sample Input:

```
6
+ 10 3
- 10 3
* 10 3
\ 10 3
/ 10 3
% 10 3
```

Sample Output:

```
10 + 3 = 13
10 - 3 = 7
10 * 3 = 30
10 \ 3 = 3
10 / 3 = 3.3
10 % 3 = 1
```

pr14 - Average Daily Attendance

Problem: Nick is going find the average, by grade level, of the number of students who attended school today.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains 4 pairs integers. The first pair is the number of 9th graders enrolled followed by the number of 9th graders absent; the second pair is for 10th graders, the third pair for 11th graders and the fourth pair is for 12th graders.

data file: `pr14`

Output: Output the percent of students present by grade level in the format below. Round all percents to tenths. At least one blank line should be placed between sets of output.

Assumptions: None

Sample Input:

```
2
311 21 289 17 259 17 236 4
579 52 498 40 489 24 450 18
```

Sample Output:

```
93.2% PRESENT IN GRADE 9
94.1% PRESENT IN GRADE 10
93.4% PRESENT IN GRADE 11
98.3% PRESENT IN GRADE 12

91.0% PRESENT IN GRADE 9
92.0% PRESENT IN GRADE 10
95.1% PRESENT IN GRADE 11
96.0% PRESENT IN GRADE 12
```

pr15 - Swimming Pool

Problem: Write a program that Nick can use to determine the number of gallons of water his swimming pool holds.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contain length, width, and average depth of his pool in feet.

data file: `pr15`

Output: Output the number of gallons of water the pool will hold followed by the word "`GALLONS`". Round the answer to the nearest gallon.

Assumptions: There are 231 cubic inches in a gallon.

Sample Input:

```
3
40 20 5
20 10 3
75 65 7
```

Sample Output:

```
29922 GALLONS
4488 GALLONS
255273 GALLONS
```

pr16 - Discounts

Problem: Nick works for a company that does sales over the internet. For orders over $100, Nick's company gives a 10% discount and does not charge for shipping and handling. For orders $100 and under, his company charges 10% of the cost of the order with a minimum of $5 for shipping and handling.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains the cost of an order.

data file: `pr16`

Output: Output the total cost to the buyer. Output must be preceded by a `$` sign and rounded to the nearest penny.

Assumptions: None

Sample Input:

```
3
155.25
88.89
50
```

Sample Output:

```
$131.96
$97.78
$55.00
```

pr17 - Diver's Scores

Problem: Nick is a diver and needs a program to average his scores for a dive. There are 7 judges and the highest and lowest of the seven scores are discarded. The remaining five scores are averaged and then multiplied by the degree of difficulty of the dive to determine the final score for the dive. Each judge's score is in the range between 0 and 10, inclusive, and in increments of 0.5. The degree of difficulty is a decimal number between 1 and 8, inclusive.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains the seven scores followed by the degree of difficulty of the dive. The numbers on each line are separated by a single space.

data file: `pr17`

Output: Output the final score for each dive rounded to thousandths.

Assumptions: None

Sample Input:

```
3
7.5 7 7 7.5 6.5 6 8 2.3
5 5.5 6 6.5 5 5 4.5 3.2
3 3.5 4 4.5 3.5 4 4.5 4.8
```

Sample Output:

```
16.330
16.960
18.720
```

pr18 - Round Numbers

Problem: Write a program that will print the integers from 1 to a number read from the data file, their square roots rounded to tenths, and their cube roots rounded to hundredths.

Input: There is one line of input. The first integer represents the number of integers that follow. Each of following integers is the number of rows to print.

data file: `pr18`

Output: Output the heading "`ROUNDING IS FUN`" followed by the integers from 1 to the number of rows right justified in 3 columns, their square roots rounded to tenths and right justified in 6 columns, and their cube roots rounded to hundredths and right justified in 8 columns. Print at least one blank line between sets of output.

Assumptions: All input will be integers in the range 1 .. 25.

Sample Input: `2 20 6`

Sample Output:

```
ROUNDING IS FUN
  1   1.0    1.00
  2   1.4    1.26
  3   1.7    1.44
  4   2.0    1.59
  5   2.2    1.71
  6   2.4    1.82
  7   2.6    1.91
  8   2.8    2.00
  9   3.0    2.08
 10   3.2    2.15
 11   3.3    2.22
 12   3.5    2.29
 13   3.6    2.35
 14   3.7    2.41
 15   3.9    2.47
 16   4.0    2.52
 17   4.1    2.57
 18   4.2    2.62
 19   4.4    2.67
 20   4.5    2.71

ROUNDING IS FUN
  1   1.0    1.00
  2   1.4    1.26
  3   1.7    1.44
  4   2.0    1.59
  5   2.2    1.71
  6   2.4    1.82
```

pr19 - Character Counter

Problem: Write a program that will print the number of alphabetic characters, number of digits, and number of other characters in a string.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains less than 75 characters.

data file: `pr19`

Output: Output the number of alphabetic characters, number of digits, and number of other characters in each string. All output must be in the format below. The numbers following the colons are right justified in three columns.

Assumptions: There will be no additional white space at the end of a line. All alphabetic characters are upper case.

Sample Input:

```
2
TODAY IS 10/25/2055. EVERYTHING IS WONDERFUL:-) BUT I NEED $100.00.
I LIVE AT #2 DOWNING STREET. EMAIL ME AT ABC@1ABC4.
```

Sample Output:

```
LETTERS: 36 DIGITS: 13 OTHER: 18
LETTERS: 35 DIGITS:  3 OTHER: 13
```