CS100 **February 15, 2000**
Prelim 1 **7:30 PM – 9:00 PM**

_____ _____
(Print last name, first name, middle initial/name) (Student ID)

Statement of integrity: I did not, and will not, break the rules of academic integrity on this exam:

_____
(Signature)

Circle Your Section:

	Tuesday				Wednesday				Thursday
	PH 219	HO 401	HO 306	PH 403	PH 307	HO 401	HO 306	HO 320	HO 306
12:20				13 Yan					
1:25	1 Holland-Minkley	2 Yan	11 Artemov		6 Holland-Minkley	7 Rohde	10 Fan	14 Hande	12 Artemov
2:30	3 Holland-Minkley	5 Yan				8 Artemov			
3:35		4 Fan				9 Artemov			

Instructions:

- *Read all instructions carefully*!
- This test is closed book – no calculators, reference sheets, or any other material allowed.
- Initial or sign each page.
- Conciseness, clarity, and style all count. Show all work and comment code fragments to receive partial credit.
- Arrays are *not* allowed.
- For loops, you must use **`while`**. Do not use **`do-while`** and **`for`** loops.
- You may *not* alter the structures surrounding blanks and boxes.
- Use the backs of pages if you need more space or scrap. Ask a proctor if you need additional sheets.

Core Points:

1. _____ **(30 points)** _____

2. _____ **(20 points)** _____

3. _____ **(50 points)** _____

Total: _____ **/ (100 points)** _____

Bonus Points: _____ **/ (10 points)** _____

Problem 1 [30 points] *Definite Iteration & Arithmetic*

Assume you are modeling a collection of molecules with speeds measured in meters per second (m/s). Two measures of average speed for the collection are the ***mean speed*** v_{mean} and the ***root-mean-square*** (rms) speed v_{rms}:

$$v_{mean} = \frac{\text{sum of each speed}}{\text{number of molecules}} \quad \text{and} \quad v_{rms} = \sqrt{\frac{\text{sum of each speed squared}}{\text{number of molecules}}}$$

For example, the mean and rms speeds of 1 m/s and 3m/s are $v_{mean} = \frac{1+3}{2} = 2$ and $v_{rms} = \sqrt{\frac{1^2+3^2}{2}} = \sqrt{5}$.

Fill in the blanks below to write a program to:

- Read the integer number **n** of molecules. Assume **n** is non-negative.
- Read **n** floating-point speeds of molecules. Assume each speed is non-negative.
- Note: The program reads input without printing prompts.
- Print the *magnitude* of the percent error of v_{rms} ("estimated") from v_{mean} ("actual").

Hints: You might need **`Math.sqrt`** (square root), **`Math.pow`**, or **`Math.abs`**.

```
public class problem1 {
   public static void main(String[] args) {
      TokenReader in = new TokenReader(System.in);
      int n = _____________________________; // # of molecules
      double sum = ____________________________; // sum of speeds so far
      double squares = ________________________; // sum of squared speeds so far
      int k = _____________________________; // # of speeds already processed
      double speed;                          // speed of a molecule
      // Compute sum of speeds and sum of squared speeds

         while( ___________________________ ) {
            _____________________________; // Read next speed
            _____________________________; // Sum speeds
            _____________________________; // Sum squared speeds
            _____________________________; // Increment # of speeds processed
         }
      // Report if zero molecules, or report percent error of Vrms from Vmean

         if ( _______________ )
            System.out.println("No molecules!");
         else {
            double Vmean = ____________________________________; // mean speed
            double Vrms = _____________________________________; // rms speed
            System.out.println("Percent error: " +
               ____________________________________________________);
         }
   }
}
```

Problem 2 [20 points] *Conditionals & Boolean Expressions*

Write a program to compute the number of days in any given month of a non-leap year. Fill in the box below to assign the length in days of **`month`** to variable **`days`**. Assume **`month`** is between 1 and 12, inclusive.

The indices and lengths in an non-leap year of months are:

month:	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
index:	1	2	3	4	5	6	7	8	9	10	11	12
length:	31	28	31	30	31	30	31	31	30	31	30	31

Use the following rules to write the program:
Rule 1: Even-index months from `Jan` to `Jul` and odd-index months from `Aug` to `Dec` have 30 days.
Rule 2: Rule 1 does not apply to `Feb`.
Rule 3: When Rules 1 and 2 do not apply, the month has 31 days.
For full credit, use concise code to test whether the month index is even or odd.

```
public class problem2 {
   public static void main(String[] args) {
      TokenReader in = new TokenReader(System.in);
      int month = in.readInt(); // month index: assume from 1 to 12
      int days; // # of days in month
```

```
   }
}
```

Problem 3 [50 points] *Indefinite Iteration: Processing an input sequence with a stopping value*

Fill in the box below to write a program to:

- Read a sequence of integers between -10 and 10, inclusive. An out-of-bounds integer terminates the sequence. You do not need to prompt the user before the input.
- Account for boundary conditions – you might want to do this part last since it might be tricky.
- Declare named constants when appropriate.
- Print the largest *pair-sum.* A pair-sum is the sum of a pair of neighboring elements.

ex.) The input `-1 10 3 0 11` has pair-sums $9 = -1 + 10$, $13 = 10 + 3$, and $3 = 3 + 0$. The largest is 13.

```
public class problem3 {
   public static void main(String[] args) {
      TokenReader in = new TokenReader(System.in);
```

```
   }
}
```

Bonus: [10 Bonus Points] *CS100 Website & Newsgroup*

Bonus Questions:

- Do NOT work on these until you completely finish all core problems. Core determines your grade!!!
- Multiple choice. Circle the correct answer.
- You get +1/0/-1 bonus points for correct, blank, and wrong answers, respectively. Your lowest total bonus grade on this Prelim cannot drop below zero, though.

B1) Is 0 a multiple of 17?

```
a) yes    b) no    c) the question makes no sense
```

B2) What sign does 0 have?

```
a) negative     b) positive      c) both      d) neither
```

B3) What is the median of 2, 2, and 5?

```
a) 2    b) 3   c) 4   d) 5   e) there is no median   f) none of these
```

B4) Should you read newsgroups with mono-spaced/fixed-width/non-proportional fonts?

```
a) yes     b) no     c) doesn't matter
```

B5) Is it OK to put a comment for a group of statements off-to-the-side?

```
a) always OK    b) only OK with proper indentation     c) never OK
```

B6) Can a variable name include the dollar symbol $?

```
a) Java does, but we don't              b) Java does, and so do we
c) Java does not, and neither do we     d) Java does not, but we do
```

B7) What CS100 programming assignments are partners allowed for?

```
a) only exercises    b) only projects    c) both    d) neither
```

B8) Which letter is NOT a middle initial of Dave S., Thomas Y., Sergei A., Laurie B., or Amanda H.?

```
I)   J)    K)    L)    M)    N)
```

B9) Which of the following people is not on the CS100 staff this semester? (circle one)

```
a) Woong Yoon   d) David Welte   g) Po Chen
b) Daisy Fan    e) Andrew Lee    h) Prashanth Hande
c) Eric Hsieh   f) Yi Qun Liu    i) Raju Rohde
```

B10) Which weekday has the least total time allocated to office hours and tutoring?

```
a) Mon    b) Tue     c) Wed     d) Thu     e) Fri
```