
(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 307	HO 401	HO 306	HO 306
1:25	1 Holland-Minkley	2 Yan	11 Artemov	6 Holland-Minkley	7 Rohde	10 Fan	12 Artemov
2:30	3 Holland-Minkley	5 Yan			8 Artemov		
3:35		4 Yan			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