

## Exam I

Given: 24 September 2015

Due: End of session

This exam is closed-book, closed-notes, no electronic devices allowed. The exception is the “sage page” on which you may have notes to consult during the exam. Answer questions on the pages of the exam. Do not unstaple the pages of this exam, nor should you attach any other pages to the exam. You are welcome to use the blank space of the exam for any scratch work.

Your work must be legible. Work that is difficult to read will receive no credit. Do not dwell over punctuation or exact syntax in code; however, be sure to indent your code to show its structure.

You must sign the pledge below for your exam to count. Any cheating will cause the students involved to receive an F for this course. Other action may be taken. If you need to leave the room for any reason prior to turning in your exam, you must give your exam and any electronic devices with a proctor.

You must fill in your identifying information correctly. Failure to do so is grounds for a zero on this exam. When you reach this point in the instructions, please give the instructor or one of the proctors a meaningful glance.

<b>Print clearly</b> the following information:		
Name (print clearly):		
Student 6-digit ID (print <i>really</i> clearly):		
Your answers below tell us where to return your graded exam.		
What time do you actually attend studio/lab?		
What room (222, 218, 216, or 214)? your best guess		
Problem Number	Possible Points	Received Points
1	20	
2	30	
3	25	
4	25	
Total	100	

**Pledge:** On my honor, I have neither given nor received any unauthorized aid on this exam.

Signed: \_\_\_\_\_  
(Be sure you filled in your information in the box above!)

1. (20 points)

(a) (10 points) Circle the correct type for each expression in the table below, and state the result of evaluating the expression:

Expression	Type	Result
<code>247 &gt; 241</code>	double   int   boolean   String	_____
<code>3.0 + "0"</code>	double   int   boolean   String	_____
<code>"100" + (30+1)</code>	double   int   boolean   String	_____
<code>(7/8) + "nly"</code>	double   int   boolean   String	_____
<code>5 / 2</code>	double   int   boolean   String	_____
<code>5 / 2.0</code>	double   int   boolean   String	_____
<code>true &amp;&amp; false</code>	double   int   boolean   String	_____
<code>! ((1 &gt; 2)    false)</code>	double   int   boolean   String	_____
<code>3/2 &lt;= 1</code>	double   int   boolean   String	_____
<code>true    false</code>	double   int   boolean   String	_____

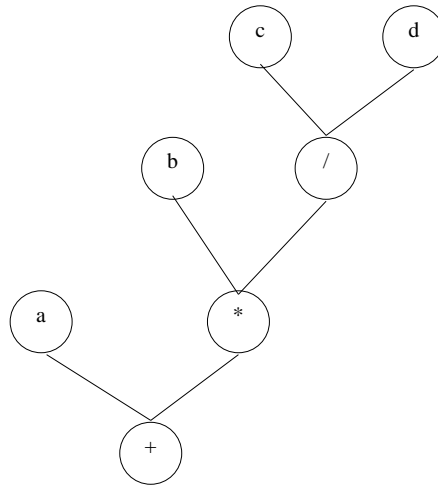
(b) (5 points) Below draw the expression tree<sup>1</sup> for the expression

$$1 * 2 + 3 + 4 * 5$$

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<sup>1</sup>Or, explain exactly the order in which the operations occur.

(c) (5 points)



Complete the blanks below regarding the tree shown above, which uses the arithmetic operators  $+$ ,  $*$ , and  $/$ :

- The \_\_\_\_\_ operator is the first operation to execute.
- The \_\_\_\_\_ operator is the last operation to execute.

2. (30 points)

(a) (10 points) Complete the code below so that it prints `true` if exactly two of the variables have the same value. Otherwise it should print `false`.

```
int a = ap.nextInt("Value for a?");  
int b = ap.nextInt("Value for b?");  
int c = ap.nextInt("Value for c?");
```

*Continued on next page...*

- (b) (20 points) Complete the code below so that it determines how many of  $N$  random numbers are less than 0.5, with each random number chosen by a call to `Math.random()`. Recall that each call to `Math.random()` returns a double `r` such that  $0 \leq r < 1$ . Do not use any arrays! Your code should produce output such as the following (in the example below, I typed 100 in response to the prompt):

```
You asked for 100 random numbers.  
Of those, 63 were less than 0.5.
```

Your output will depend on the value of  $N$  supplied when the program is run, as well as the results of the calls to `Math.random()`.

```
int N = ap.nextInt("How many random numbers?");
```

3. (25 points)

- (a) (20 points) We have studied 4 basic data types in the first part of our course: `int`, `double`, `boolean`, and `String`. Fill in the table below to supply the data type most appropriate for the specified scenario. Also give a brief explanation of why you made that choice and one simple example. Note that a given scenario may have more than one correct answer.

*Continued on next page...*

Scenario	Circle one type 1 point	Explanation & example 2 & 2 points
The number of courses you are taking this semester	double   int   boolean   String	
How much you are enjoying CSE131	double   int   boolean   String	
Whether you plan to continue your studies in computer science	double   int   boolean   String	
The title of your first novel, assuming you write one	double   int   boolean   String	

- (b) (5 points) Recall that in the Nutrition lab, you were asked to ensure that the results you printed had only two digits after the decimal point. For this problem, suppose `d` is a `double` with an unknown number of digits after its decimal point. For each of the following, provide a description or single line of code to explain how to achieve the result:
- i. (1 points) Assign `double r1` so that it is like `d`, but with the decimal moved two digits to the right.
  - ii. (1 points) Assign `double r2` so that it is like `d`, but with the decimal moved two digits to the left.
  - iii. (1 points) Assign `int k` so that it is like `d`, but with no digits after the decimal point.
  - iv. (2 points) Below assign `String s` so that it has the value of `d` but with just two digits of precision after the decimal point.

4. (25 points) An array `poll` has been created that contains polling data for an election. You may assume for all of this problem that the array contains only positive<sup>2</sup> numbers. An example of such an array follows:

poll array	[0]	[1]	[2]	[3]	[4]	[5]	[6]	[7]
contents	3	1	3	7	6	1	3	2

In this particular example, we can tell the following from the above array:

- `poll[0] = 3`, meaning that the first person who responded to this poll chose candidate 3.
- 8 people were polled, because the array has 8 elements.
- 7 candidates were running, because the largest value found in the array is 7.
- Candidate 2 received 1 vote. Candidates 4 and 5 received 0 votes. Candidate 3 received 3 votes.

The above is only an example of a `poll` array. Suppose you are given another `poll` array containing only positive integers. Answer the questions below by filling in the required code.

- (a) (5 points) Complete the code below so that it sets `N` to the size of the `poll` array:

```
int N = // How many people were polled?
```

- (b) (10 points) Complete the code below so that the printed line says how many candidates are running for this poll:

```
int M = 0; // initialize M, but its value will change below
// Complete the loop so that when the loop is over,
// M is set to the number of candidates that are running
// for this poll
for (int i=0; i < N; ++i) { // N is computed above

}
System.out.println("There are " + M + " people running");
```

*Continued on next page...*

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<sup>2</sup>An integer is positive if it is strictly greater than 0.

(c) (10 points) With  $N$  and  $M$  already computed above for some `poll` array with positive entries, you next determine how many votes each candidate received.

As an example, your output would resemble the following if you were given the `poll` array shown at the beginning of this question.

```
Candidate 1 received 2 votes
Candidate 2 received 1 vote
Candidate 3 received 3 votes
Candidate 4 received 0 votes
Candidate 5 received 0 votes
Candidate 6 received 1 vote
Candidate 7 received 1 vote
```

Complete the code below so that it prints the number of votes each candidate has received in the poll.

```
for (int c=0; c < M; ++c) { // for each candidate c
```

```
    //
    // your code above here computes and prints the number of
    // vote candidate c has in the poll array
    //
}
```

