

You only need to write your name and e-mail ID on the first page.

This exam is CLOSED text book, closed-notes, closed-calculator, closed-neighbor, etc. Questions are worth different amounts, so be sure to look over all the questions and plan your time accordingly. Please sign the honor pledge here:

---



---



---



---

Page 1	___ / 3
Page 2	___ / 17
Page 3	___ / 25
Page 4	___ / 20
Page 5	___ / 15
Page 6	___ / 20
<b>Total</b>	<b>___ / 100</b>

*Note: When an integer type is required use `int`, when a floating-point type is required use `double`. If we don't specify an aspect of the problem, you can choose it.*

**Note: If you are still writing on the exam after “pens down” is called – even if it is just to write your name – then you will receive a zero on this exam. No exceptions!**

1. [3 points] What lab section are you in?

\_\_\_ CS 101-E

\_\_\_ CS 101-2 (lab 8:00–9:15 a.m. Thu)

\_\_\_ CS 101-3 (lab 9:30–10:45 a.m. Thu)

\_\_\_ CS 101-4 (lab 11:00–12:15 p.m. Thu)

\_\_\_ CS 101-5 (lab 12:30–1:45 p.m. Thu)

\_\_\_ CS 101-6 (lab 2:00–3:15 p.m. Thu)

\_\_\_ CS 101-7 (lab 3:30–4:45 p.m. Thu)

\_\_\_ CS 101-8 (lab 5:00–6:15 p.m. Thu)

\_\_\_ CS 101-9 (lab 6:30–7:45 p.m. Thu)

2. [9 points] Consider the following statements in the Java language:

```
Scanner stdin = new Scanner(System.in);
double PI = 3.14159;
final double centimetersPerInch = 2.54;
String input = new String("Wahoos!");
int meaningOfLife = 42;
Rectangle square = new Rectangle(2, 2);
```

Answer the following as **true** or **false** (don't answer T or F – you need to write the **FULL** word to get credit).

- a. PI is a constant Answer: \_\_\_\_\_
- b. The word *stdin* is a Java reserved word. Answer: \_\_\_\_\_
- c. *centimetersPerInch* is an invalid identifier name. Answer: \_\_\_\_\_
- d. The word *Final* can be the name of a variable (notice the capitalization) Answer: \_\_\_\_\_
- e. *String* is an object Answer: \_\_\_\_\_
- f. *meaningOfLife* is a variable Answer: \_\_\_\_\_
- g. *double* is a class Answer: \_\_\_\_\_
- h. *square* is a variable Answer: \_\_\_\_\_
- i. *Rectangle* is a type Answer: \_\_\_\_\_

3. [8 points] Draw a memory diagram showing what memory looks like after the following four statements:

```
String s1;
String s2 = null;
String s3 = "";
String s4 = "CS101";
```

4. [5 points] In about 20 words or less, explain how references and objects differ.

5. [5 points] In about 20 words or less, explain how classes and objects differ.

6. [5 points] In about 20 words or less, explain the difference between a statement and an expression.

7. [5 points] In about 20 words or less, explain what garbage collection is.

8. [5 points] In about 20 words or less, explain the difference between = and ==.

9. [10 points] What are the value AND TYPE of each of the following Java *expressions*?

a. 3 / 4  
Value \_\_\_\_\_ Type \_\_\_\_\_

e. 17 % 7 % 5  
Value \_\_\_\_\_ Type \_\_\_\_\_

b. 2.0 / 3  
Value \_\_\_\_\_ Type \_\_\_\_\_

f. 17 % (7 % 5)  
Value \_\_\_\_\_ Type \_\_\_\_\_

c. 4.0 / 2.0  
Value \_\_\_\_\_ Type \_\_\_\_\_

g. !false && true  
Value \_\_\_\_\_ Type \_\_\_\_\_

d. 2 + 3 \* 4.0  
Value \_\_\_\_\_ Type \_\_\_\_\_

h. !false || false  
Value \_\_\_\_\_ Type \_\_\_\_\_

10. [6 points] List all of the primitive types (hint: there are 8 of them).

11. [4 points] Consider the following code sequence. What are the values of the variables *x*, *y* and *z* *after* this code runs?

```
int x;
x = 7;
int y;
y = 3;
int z;
z = 5;
y = z;
z = 4;
```

*x*'s value: \_\_\_\_\_

*y*'s value: \_\_\_\_\_

*z*'s value: \_\_\_\_\_

12. [15 points] Given the following String declaration and initialization:

```
String hexDigits = "0123456789abcdef";
```

What value does each of the following code segments evaluate to? If they result in a run-time or compile-time error, then state so (you can just write 'error'; you don't have to specify which is which). Don't worry about the lack of semi-colons, however.

a. `hexDigits.substring (3,4)`

b. `hexDigits.substring (6)`

c. `hexDigits.substring (12)`

d. `hexDigits.indexOf ("c")`

e. `hexDigits.indexOf ("6")`

f. `hexDigits.charAt(3)`

g. `hexDigits.length()`

13. [20 points] Consider a Java program that calculates the estimated airspeed velocity of an unladen European swallow. This is roughly 3 times the wingbeat frequency (in wingbeats per second) times the amplitude of the wingbeat (meters per beat – it’s a measure of the vertical distance the wings’ “span” while beating). It is described using the following formula:

$$\text{unladen airspeed velocity} = 3.0 * \text{frequency} * \text{amplitude in meters}$$

You will need to write the relevant parts of this program, in three parts. All the code that is written below is assumed to be in the `main()` method, so you don’t have to write that (or the ‘`public class Foo`’ part). You don’t have to worry about any of the “good programming practices” that are normally done in the homeworks. The code you write below, when put in a `main()` method in a class, and with the appropriate library import lines, should be fully working Java code.

a. Write the code that declares a `Scanner`, and reads in TWO doubles from the keyboard. These doubles represent the variables on the right side of the equation, above. Don’t worry about prompting the user for input.

b. Write the code that computes the unladen airspeed velocity.

c. Write the code that prints out both the user input and the computed result.