Name: _____

Solutions

CS 141: Introduction to (Java) Programming: Exam 2

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1.	(max 12)	4.	(max 18)
2.	(max 32)	5.	(max 23)
3.	(max 15)		
Total:			(max 100)

1. (12 pts total) 2-Dimensional Arrays:
   a. (4 pts) Write code that declares and creates a 2-dimensional array of integers called `myNums` with 6 rows and 4 columns:

```
int[][] myNums = new int[6][4];
```

   b. (2 pts each, 8 pts total) What is the value of each of the following
   (or state if the item doesn't make sense and, if so, why)

`myNums[0][4]` _____

Makes no sense – invalid index - can't have a column index of 4

`myNums.length` __6_____

`myNums[2].length` __4_____

`myNums[2][3].length` _____

Makes no sense – `myNums[2][3]` is an integer. It doesn't have a length.

2. (1 pt each, 32 pts total) **True and False:** Please circle T or F

1) **T or F:** Object parameters are passed by value.
2) **T or F:** Integer (`int`) parameters are passed by value.
3) **T or F:** Arrays parameters are passed by reference.
4) **T or F:** The keyword word `static` is used to indicate instance methods and variables.
5) **T or F:** If one changes the value of a class variable, the value is changed for all objects of that type.
6) **T or F:** A binary file can easily be read by any text editor.
7) **T or F:** A try-catch is used to handle exceptions.
8) **T or F:** If a program tries to open a file that doesn't exist, the program will throw an exception.
9) **T or F:** It is never ok for two methods in a class to have the same name.
10) **T or F:** An ascii file can *only* contain letters of the alphabet.
11) **T or F:** The `catch` part of a try-catch is used to indicate what to do if no errors are generated.
12) **T or F:** In general, instance member variables should be public.
13) **T or F:** The name of a constructor must be the name of the class.
14) **T or F:** A constructor should always have a `void` return value.
15) **T or F:** The process of hiding object data and providing methods for data access is called encapsulation.
16) **T or F:** An object's accessor method is called when the keyword `new` is used.
17) **T or F:** An object's *member* variable exists for as long as the object exists.
18) **T or F:** Once an object is garbage collected, it can still be retrieved if needed again.
19) **T or F:** It is possible for a method to have multiple return statements in its implementation.
20) **T or F:** Private *methods* can be called outside of the class by using setters and getters.
21) **T or F:** Private instance variables hide the implementation of a class from the class user.

22) **T or F:** The terms setters and accessors are used interchangeably.

23) **T or F:** A method with a `void` return type must never have a return statement.

24) **T or F:** A variable declared within a block of code can be accessed from outside of the block.

25) **T or F:** The `toString` method must always be declared as public.

26) **T or F:** The declaration:

```
Card c;
```

creates a new Card object.

27) **T or F:** Stepwise refinement is the process of breaking complex problems down into smaller, manageable steps.

28) **T or F:** Unit testing should always be done.

29) **T or F:** It is never ok for two different variables to have the same name in a class.

30) **T or F:** A stub is a method that acts as a placeholder and returns a simple value so another method can be tested.

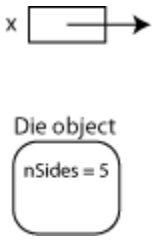
31) **T or F:** Suppose `setValue` is a method with one parameter of type int. When *calling* the method, you need to provide a *formal parameter*, e.g. `setValue(int x)`. And when *declaring* the method, you need to provide an *actual parameter*, e.g., `setValue(5)`.

32) **T or F:** Methods can have multiple arguments and can return multiple return values.

3. (5 pts each, 15 pts total) **Object Diagram:** Assume there exists a `Die` class containing an instance member variable which stores the number of sides. The `Die`'s `toString` method prints the word "`Die`" followed by the number of sides, e.g. "`Die 6`".

   Given the code below, ***draw the object diagram at the lines 3, 7, and 10.*** *Also indicate at each of these lines,* ***what is printed*** **and what, if anything, is garbage collected**.

   Follow the drawing style used in class, e.g. *use rectangular boxes to indicate object references; use rounded boxes to indicate objects as shown below on the right.*

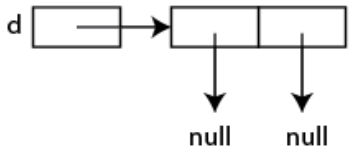



```
Line 1:    public static void main(String[] args) {
Line 2:       Die[] d = new Die[2];
Line 3:       System.out.println(d[0] + ", " + d[1]);
Line 4:       Die dd = new Die(10);
Line 5:       d[0] = new Die(6);
Line 6:       d[1] = dd;
Line 7:       System.out.println(d[0] + ", " + d[1] + ", " + dd);
Line 8:       d[0] = null;
Line 9:       dd = null;
Line 10:      System.out.println(d[0] + ", " + d[1] + ", " + dd);
Line 11:   }
```

Please use the space below as scratch paper. Once you have worked out the diagrams, please copy them as neatly as possible to the next page.

Line 3: output is _____null, null _____

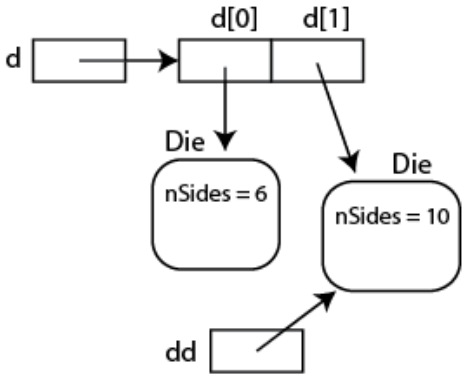
Object diagram:



What if anything is
garbage collected? None

Line 7: output is ___Die 6, Die 10, Die 10

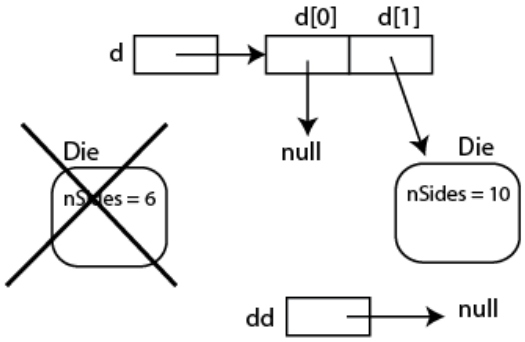
Object diagram:



What if anything is
garbage collected? none

Line 10: output is ____null, Die 10, null_

Object diagram:



What if anything is
garbage collected? Die 6

4. (18 pts) Create a `Person` class consisting of the following:
   - Two instance member variables for the person's name and age.
   - A constructor which sets the value of both instance variables.
   - A setter & getter for the age variable.
   - A `toString` method.
   - A method called `birthday` which increases age by 1 and *returns* the message "`Happy Birthday`".

```
public class Person {

    // Instance member variables for name and age:

    private String name = "";
    private int age = 0;

    // Constructor:
    public Person(String n, int a) {
        name = n;
        age = a;
    }

    // Getter and Setter for age
    public int getAge() {
        return age;
    }

    public void setAge(int age) {
        this.age = age;
    }

    // toString
    public String toString() {
        return name + " is " + age + " years old.";
    }

    // birthday
    public String birthday() {
        age = age + 1;
        return "Happy Birtday";
    }


}
```

5. (23 pts) For each variable name listed at top, indicate a "D" on the line where the variable is declared. Mark an x in boxes to indicate scope. Circle "P" at the top if the variable is formal parameter, "M" if it is a member variable and "L" if it is a local variable.

		args			result			n			b			y			p			i			t			c			n		
		P	M	L	P	M	L	P	M	L	P	M	L	P	M	L	P	M	L	P	M	L	P	M	L	P	M	L	P	M	L
1	public class DoSomething {																														
2	public static double result = 0;				D																										
3					x																										
4	public static void main(String[] args) {	D			x																										
5	int n = 3;	x			x			D																							
6	double b = 5.2;	x			x			x			D																				
7	result = big(n) + byTwo(b);	x			x			x			x																				
8	System.out.println("result="+result);	x			x			x			x																				
9	}	x			x			x			x																				
10					x																										
11	public static double byTwo(double y) {				x									D																	
12	double p = 2 * y;				x									x			D														
13	if (y > 5) {				x									x			x														
14	int i = 4;				x									x			x			D										
15	p = y * i;				x									x			x			x										
16	}				x									x			x			x										
17	return p;				x									x			x														
18	}				x									x			x														
19					x																										
20	public static double big(int t) {				x																			D							
21	double c = 1.0;				x																			x			D				
22	for (int n = 1; n < t; n++) {				x																			x			x			D	
23	c = c * n;				x																			x			x			x	
24	}				x																			x			x			x	
25	return byTwo(c);				x																			x			x				
26	}				x																			x			x				
27	}				x																										