Review for Second Exam

CMPS 111
Introduction to Computer Science I
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Review for Second Exam

The exam will cover chapters 3, 4, portions of 6 and 11, plus all material in the lectures and the labs. The most important topics covered are:

- methods (even though this was in chapter 2, methods occur so often in combination with the newer topics that it is worth reviewing them carefully)
- inheritance, overriding methods, the `extends` and `super` keywords, etc.
- interfaces, the `implements` keyword, etc.
- boolean variables, operators, and expressions; `if`, `else`, etc.
- loops, `while` and `do`, the `break` statement, etc.
- arithmetic, differences between `int` and `double`, etc.
- basic mouse actions, `mouseClicked`, `mouseDragged`, etc.

Here are some review questions that are based on the assumption that you have read the chapters:

1. Explain the difference between the keywords `extends` and `implements`.

2. Suppose `Person` is defined as follows:

```java
public class Person {
    protected String _name;
    protected int _age;

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

    public String getName() {
        return _name;
    }

    public int getAge() {
        return _age;
    }
}
```

Handed out on: ;lkjsf  Handout # sdaflkj
Create a subclass of Person named Student that has an additional attribute named _school of type String. The new class should have a three-parameter constructor that takes a name, an age, and a school (a String, an int, and a String). It should be possible to “get” any of the three values from a Student object.

3. In the preceding example, is it absolutely necessary to declare _name and _age as protected? Explain.

4. A question to the previous one: Suppose we have the following two classes:

```java
public class Parent {
    private int _x;
    public Parent() {
        _x = 1;
    }
}

public class Child extends Parent {
    public Child() {
        super();
        _x = 2;
    }
}
```

Will Child compile without error? Explain.

5. A question related to the previous two: Suppose we have the following two classes:

```java
public class Parent {
    protected int _x;
    public Parent() {
        _x = 1;
    }
}

public class Child extends Parent {
    public Child() {
        super();
        _x = 2;
    }
}
```

Will Child compile without error? Explain.

6. Some cell phones can serve as cameras. Suppose we have two unrelated classes named Camera and Phone. Is it possible to create a class named CameraPhone that inherits properties and methods from both the Camera and Phone classes? Explain.

7. Given the following two classes:

```java
public class Circle extends Ellipse {
    private int _radius;
    ... constructor missing ...
    public int getRadius() {
        return _radius;
    }
    ... other methods missing ...
}

public class Test extends Frame {
    private Circle _circ;
    public Test() {
        _circ = new Circle(33);
        _circ.setSize(50,75);
    }
    ... main not shown ...
}
```

Handout # sdaflkj
The intent of the Circle class is to have a subclass of ellipses that have all the default properties that ellipses have (e.g., default color is red, default location is in the middle of the frame, etc.). Circles are created with an integer radius specified in the constructor; There are no other ways to construct an object of class Circle. All the other behaviors are the same as those for the Ellipse class except that once a circle has been created, it cannot have its size changed. In other words, the call to 

\[ \_\text{circ}.\text{setSize}(50,75) \] 

\[ \text{should have no effect on} \] 

the shape of the object \_circ. Other methods, such as setXLocation, setColor, etc., will behave exactly as they do for the Ellipse class.

Supply the missing constructor for the Circle class. Supply any remaining methods needed to achieve the intent described above.

8. Suppose we wish to be able to drag Circles around in the frame (assume Circle is as described in the previous problem). Write a method for the Circle class that allows the circle to be dragged when the mouse is dragged.

9. Leap years are defined as years that are divisible by 4, unless they are also divisible by 100, in which case they must be divisible by 400 as well. For instance, 2008 is a leap year since 2008 is divisible by 4. 1900 is also divisible by 4, but it is not a leap year since it is divisible by 100 but is not divisible by 400. 2000 is a leap year since it is divisible by 400.

If year is an int containing a year, write a boolean expression that is true if and only if year is a leap year. (HINT: There is an int operator that computes remainders.)

10. Write an if statement that uses your boolean expression from the previous problem to print the words “leap year” or “not leap year” depending on whether or not year is a leap year.

11. What is wrong with the following statements:

```java
  double x = 10;
  int y = x;
```

12. Suppose we really want to do what is described in the preceding problem, that is, we want to be able to take a double value and assign that value to an int variable. How can it be done?

13. Write a method named tax that takes a double value named price as a parameter and returns the amount of sales tax for an item of that price; assume a 6.5% sales tax.

14. Write a method named total that takes two parameters: an int variable named quantity and a double variable named price. The method should return the total amount, including tax, for purchasing that quantity of an item at that price. Your method should call the tax method from the previous problem.

15. Write a method named isSmall that takes an integer parameter x and returns true if x is a single-digit number (either positive or negative) and returns false otherwise.

16. The area \( A \) of a triangle with side lengths equal to \( a, b, \) and \( c \) is given by the formula:

\[
A = \sqrt{s(s-a)(s-b)(s-c)}
\]
where $s$ is equal to:

$$s = \frac{a + b + c}{2}$$

Write a method named `area` that takes three `double` values `a`, `b`, and `c` and returns the area of a triangle having those as the side lengths. (This is called Heron’s formula.)

17. What do the following sequence of statements print?

```java
int n = 3;
while (n > 1) {
    System.out.println(n);
    if (n % 2 == 0) {
        n = n/2;
    } else {
        n = 3*n + 1;
    }
}
```

18. What do the following sequence of statements print?

```java
int x = 10;
int y = 20;
if (x > 0 && y <= 20) {
    System.out.println(1);
}
if (x > 10 || y <= 20) {
    System.out.println(2);
}
else if (x <= 10 && y > 0) {
    System.out.println(3);
}
else {
    System.out.println(4);
}
```

19. Given the following interface:

```java
public interface AnInterface {
    public void printSomething();
    public int returnSomething(double x);
}
```

Create a Java class that implements this interface. I don’t care what it does (keep it simple), just make sure it implements the interface.

20. Explain the difference between `while` and `do` loops.