

Show all of your work clearly in the space provided or on the additional page at the end of the exam. Be sure to **read each problem carefully**. Note that the exam is double sided.

1. (10 points) What is the value of `z` after the following statements are executed? For partial credit, explain your answer.

```
int x = 3;
int z = --x;
z += x--;
```

2. (5 points) Evaluate the following expression. Assume `flag` is a `boolean` set to `true` and `a` is an `int` set to `2`:

```
a < 3 || flag && !flag
```

3. (5 points) In a UML diagram, what does a solid diamond indicate?

4. (10 points) In a subclass's constructor, what do you have to do if you want to begin the constructor with a call to the superclass's zero-parameter constructor? Explain.

5. (15 points) Explain what makes a class an **abstract class** and what impact that has on how the class is used.

6. (15 points) Implement a class called `Child` that inherits from the `Parent` class (shown below) and overrides the `methodize()` method so that it displays “C: methodize.”

```
public class Parent {
    protected int number = 2;

    public Parent() {
        System.out.println("P: _constructor");
    }

    public void methodize() {
        System.out.println("P: _methodize");
    }

    public int getNumber() {
        System.out.println("P: _getNumber");
        return number;
    }
}
```

7. (10 points) Based on your implementation of the `Child` class and the provided `Parent`, indicate what the following program will display:

```
public static void main(String [] args) {  
    Parent p = new Parent ();  
    Child c = new Child ();  
    p.methodize ();  
    c.methodize ();  
    System.out.println (p.getNumber ());  
    p = new Parent ();  
}
```

8. (15 points) Draw the UML class diagram for the `Parent` class used in the previous two problems.

9. (15 points) Draw the sequence diagram for the program below:

```
public class Exam {  
    public static void main(String [] args)  
    {  
        String phrase = JOptionPane.showInputDialog("Enter a phrase");  
        int firstSpace = phrase.length()/2;  
        String word = phrase.substring(0, firstSpace);  
        JOptionPane.showMessageDialog(null, "First word: " + word);  
    }  
}
```



Additional space — identify which problem your work is associated with.