Foundations of Programming

(a) Distinguish between the terms *instance method* and *class method*. [4 marks]

(b) A newcomer to Java programming has written the following code:

```java
class Parent {
    public void test() {
        System.out.println("Parent");
    }
}

class Child extends Parent {
    public void test() {
        System.out.println("Child");
    }
}

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

The `javac` compiler complains about one statement. Which one and why? Correct the code by inserting an appropriate cast. [4 marks]

(c) With this correction the program will compile and run. Explain in outline what happens at run-time and show what output is printed. [5 marks]

(d) Small print in the Java documentation says that you “cannot override a *static* method but you can hide it”. If both `test()` methods are made *static* the program will again compile and run. Explain what happens this time and show what output is printed. [7 marks]