Set 11 Answers

1. What is a Java interface?

Typically, it is just a collection of method prototypes that are implemented by several related classes.

2. What is polymorphism?

Sometimes a single variable can refer to objects of different types. For example, if you have an interface called _CanFly_, then you can create a variable of type _CanFly_ which can refer to any kind of object that knows how to fly. (In other words, it can refer to an object of any class which implements the _CanFly_ interface.) This kind of variable is _polymorphic_.

3. Suppose you have an interface called `CanDance`, and three classes (`Student`, `Penguin`, and `Cow`) all of which implement the `CanDance` interface. Also assume that there is a method available with the following prototype:

```
public static doSquareDance(CanDance a)
```

Decide which of the following code fragments are reasonable:

```
a. CanDance x = new CanDance();  NO
b. CanDance y = new Student();   YES
c. Student z = new CanDance();   NO
d. Student z = new Penguin();    NO
e. CanDance a;
     a = new Student();            YES
     a = new Penguin();            YES
     a = new Cow();                YES
f. Penguin b = new Penguin();
     doSquareDance(b);             YES
g. Student c = new Student();
     doSquareDance(c);             YES
h. Cow d = new Cow();
     doSquareDance(d);             YES
i. CanDance e = new Student();
     doSquareDance(e);             YES
```

4. ANSWERS TO THIS QUESTION WILL VARY!

5. What is meant by the term _algorithm_?

A sequence of instructions or steps that can be followed in order to solve a relatively simple well-defined problem. Frequently there are many different known algorithms for solving a problem.

6. Name several problems that can be solved with just an algorithm.

Sorting an array of numbers; Finding the quickest route for going to the store; listing the first 1000 prime numbers; factoring an integer into it_s prime factors; combining many baskets of eggs into a single basket using a machine that takes two baskets as input and outputs one basket containing all of the eggs in the first two baskets combined; etc.

7. Name several problems that are too complicated to be solved with just a single algorithm.

Running a restaurant; a simulation of a submarine; scheduling the flights for a major airline company; predicting whether or not the economy will improve; etc.

8. What is a _use case_? Imagine that you are working on online banking program. Describe several _use cases_ that your program should be able to deal with. (Recall that there are three parts to the description of a _use case_: the pre-conditions, the actions, and the post-conditions.)

A use case is a typical scenario that a program may encounter _ it describes what factors are involved in the case, how the program handles the case, and what you can assume is true AFTER the program handles the case.

For a _banking program_, a typical _use case_ is:

(Withdrawing Money from an ATM)

Pre-conditions: Customer has an account with money in it and has a valid ATM card; ATM has money in it; ATM has paper in order to print receipts.

Actions: Customer puts card into machine; ATM reads card; Customer enters withdrawal transaction; ATM spits out money; ATM spits out receipt; ATM spits out card

Post-conditions: Customer has more money; ATM has less money and less paper