CS 100J Prelim 2 Spring 2007 Answers

Question 1. (a) A loop invariant is a true-false statement that is true before and after each iteration of the loop.

(b) **int** m= f(0);

   // invariant: m = maximum value of f(i) for

              i in the range 0..k–1

   for (**int** k= 1; k < n; k= k+1) {
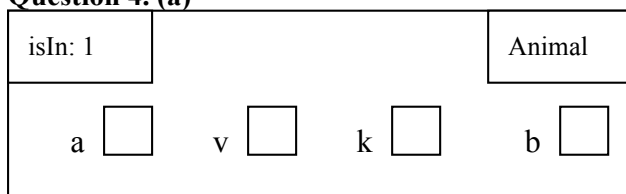
      m= Math.max(m, f(k));

   }

Question 2.

/** Pts in v[0..k-1] with negative x-y-coords
have been replaced by corres. pts
with positive x-y-coords. */

for (**int** k= 0; k < v.size(); k= k+1) {

   if (v.get(k).getX() < 0 && v.get(k).getY() < 0){

      int x= Math.abs(v.get(k).getX());

      int y= Math.abs(v.get(k).getY());

      v.set(k, new Point(x, y));

   }

}

/** Pts in v[0..v.size()-1] with negative x-y-coords
have been replaced by corres. pts with positive
x-y-coords. */

Question 3. **(a)** The apparent type of a variable is the type or class with which it is declared; its real type is the type or class of the object whose name it contains. Variable v has apparent class Animal and real class AsianElephant.

(c) (1) false,   (2) "Elephant",   (3) Runtime error: the Elephant cannot be cast to class AsianElephant.   (4) Compiletime (syntactic) error: The apparent type of f, Animal, does not have a getHeight() method.

Question 4. (a)

isIn: 1				Animal
a ☐	v ☐	k ☐	b ☐	

(b) /** = "obj is an Elephant with the same values
in its fields as this Elephant" */

public boolean equals(Object obj) {

   if (!(obj **instanceof** Elephant))

      return false;

   Elephant e= (Elephant) obj;

   return ht == e.ht &&

      getName().equals(e.getName()) &&

      getWeight() == e.getWeight();

}

Question 5.

/** = Rhino ra and rb are related */

public static boolean areRelated (

                 Rhino ra, Rhino rb) {

   if (ra == **null** || rb == **null**)

      return false;

   if (ra == rb)

      return true;

   // ra and rb are not null and are different

   return areRelated(ra, rb.mother) ||

      areRelated(ra, rb.father) ||

      areRelated(rb, ra.mother) ||

      areRelated(rb, ra.father);

}

Question 3. **(b)**

a0		
	name	null	Animal
	Animal(…, …) weight	0	
	getName() getWeight()		
	AnimalType() isIn(…, …)		
	ht	0	Elephant
	Elephant(…, …, …) getHeight()		
	AnimalType()		
			AsianElephant
	AsianElephant(…, …, …)		
	AnimalType()		