CSE 341 — General Programming Language Concepts — Mini Exercises — Answers

1. Consider the following example in Ruby.

```ruby
def test k
  k = k+5
  print k
end

n = 0
test n
print n
```

(a) What is the output in normal Ruby?

```
5
0
```

(b) What would the output be if k were passed by reference?

```
5
5
```

2. Here is a Racket example.

```racket
(define a 3)

(define (test x)
  (printf "starting test - x = \a\n\nx)"
  (set! a (+ a 1)))
  (printf "after first set! - x = \a\n\nx)"
  (set! a (+ a 1)))
  (printf "leaving test - x = \a\n\nx)"

(test (+ a 10))
```

(a) What is the output in normal Racket?

```
starting test - x = 13
after first set! - x = 13
leaving test - x = 13
```

(b) What would the output be if x were passed by reference? The same!

(c) What would the output be if x were passed by name?

```
starting test - x = 13
after first set! - x = 14
leaving test - x = 15
```

(d) Rewrite the example to simulate call by name by passing a lambda.
(define a 3)
(define (test x)
  (printf "starting test - x evaluated = \"a\n\" (x))
  (set! a (+ a 1))
  (printf "after first set! - x evaluated = \"a\n\" (x))
  (set! a (+ a 1))
  (printf "leaving test - x evaluated = \"a\n\" (x)))
(t (lambda () (+ a 10)))

3. True or false?
   (a) Haskell is statically typed if the programmer includes a type declaration for all functions; otherwise it is dynamically typed. **False.**
   (b) Java is type safe. **True.**
   (c) Each of the following Haskell expression gives a compile-time type error, since `tail` is being provided a value of the incorrect type:

   `tail []`
   `tail (1,2,3)`

   **False.** (Only the second gives a type error; the first one gives a runtime error.)

4. What happens when you try the following Haskell program?

   ```haskell
   x :: Float
   y :: Double
   x = 3
   y = 4
   z = x+y
   ```

   You get a type error, since + doesn’t work with two different types (Double and Float). No coercion in Haskell, not even Float to Double. But note that Haskell isn’t troubled by `x = 3`. That’s ok because 3 has type `(Num t) => t`. 

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