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CS 4450

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Chapter 18 Homework Problems #3, 6

3. Make an experiment with the ML language system that demonstrates that ML does not pass parameters by name. Show the results of your experiment, and explain what results by-name parameter passing would have given.

Experiment:

```
1. datatype 'a stream = Nil |
        Cons of 'a * (unit → 'a stream);
2. fun thunk Nil = raise Empty |
        thunk (Cons(_,t)) = t;
3. fun divBy0 k = Cons(k, fn() => divBy0(k div 0));
4. val Cons(_, f) = nums;
5. val rest = f();
```

Step 5 results in a uncaught exception error: Div[divide by zero].

6. Arrays in Java:

```
Int[] A = new int[2];
A[0] = 0, A[1] = 2;
f (A[0], A[A[0]]);
Function f:  void f(int x, int y) {x = 1; y = 3;}
```

Values of A for each Parameter Passing Method:

a. By value: then x and y is initialized by A[0] and A[A[0]] (which is A[0]), A[0] = 0, x and y are both 0. x = 1 and y = 3 but passing by value does not change the array A. **A[0] = 0 and A[1] = 2.**

b. By reference: Then x and y are aliases to memory locations for A[0]. Change to x or y will change

A[0]. Thus x = 1 changes A[0] = 1 and then the assignment y = 3 sets A[0] = 3. **A[0] = 3 and A[1] = 2.**

c. By value-result: x and why are first initialized by value of A[0], both givin 0. X is then set to 1 and y to 3. When the function finishes x and y are set to A[0] and A[A[0]] respectively. **A[0] = 1 and A[1] = 3.**

e, By name: Accesses actual parameter each time formal parameter is accessed. With assignment x = 1, A[0] = 1. With assignment y = 3 we access A[A[0]] which is A[1] = 2 and set to 3. **A[0] = 1 and A[1] = 3.**