CIS 5520
Advanced Programming

Fall 2023

* Introduce yourself to your new
  homework partner
* Questions about quickcheck at
  PollEv.com/cis5520

Today: Monday, Oct 2nd

- HW #3 available, due Thursday, Oct 19th
  - SAT - this week   (Read QuickCheck module first)
  - Queue – next week (Read QuickCheck module first)
  - AVL – next week or week of Oct 16th (Read RedBlack module first)
- You are responsible for every part of the assignment
- Fall Break Oct 12th-15th
  - Watch video before class Monday Oct 9th (link in RedBlack module)
  - Optional class Wednesday (Oct 11th), HW workday

QuickCheck discussion

- Quickcheck library overview
- Quiz questions:
  - prop_insert_ordered
  - genMaybe
- Generating trees: genTree variants
- Open Q&A

QuickCheck and the Testable Typeclass

quickCheck :: Testable prop => prop -> IO ()

- to quickCheck (f :: **a -> Bool**) generate 100 random "a"s
- check if each "f a" returns true or false
- if ever false, shrink counterexample
- print smallest failing value

Testable Bool

(Arbitrary a, Show a, Testable prop) => **Testable** (a -> prop)

QuickCheck and the Arbitrary Typeclass

```haskell
class Arbitrary a where
    arbitrary :: Gen a    -- generator for arbitrary elements of a
    shrink :: a -> [a]    -- produce "smaller" variants of argument


type Gen a                         -- generator type
sample' :: Gen a -> IO [a]         -- generate some random values
instance Functor Gen               -- fmap :: (a -> b) -> Gen a -> Gen b
instance Monad Gen                 -- return :: a -> Gen a
                                   -- (>>=) :: Gen a -> (a -> Gen b) -> Gen b
```

Property type: controlling QuickCheck

Abstract type: "Property"

    -- | can turn any testable type into a property

    property :: Testable prop => prop -> Property

    -- | can test with any Property

    instance Testable Property

Property combinators

    (==>) :: Testable prop => Bool -> prop -> Property

    label :: String -> Property -> Property

    (and others!)