

ALLOY SCOPE
SELECTION, EXAMPLES

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SCOPE SELECTION



[HTTP://WWW.AMAZON.COM/BEYOND-FAR-SIDE-GARY-LARSON/DP/0751502340/](http://www.amazon.com/Beyond-Far-Side-Gary-Larson/dp/0751502340/)

SCOPE SELECTION-1/3

- **START WITH THE DEFAULT SCOPE**
- **COUNTEREXAMPLE TOO COMPLEX TO GROK?**
 - **REDUCE SCOPE TO GET SMALLER EXAMPLE**
- **NO COUNTEREXAMPLE FOUND?**
 - **INCREASE SCOPE TO INCREASE CONFIDENCE**

SCOPE SELECTION-2/3

- MAKE BOUND BIG ENOUGH FOR CONSTRAINTS

- **some disj** start, end: Node | ... ← NEED AT LEAST 2 NODES

- USE SIGNATURE MULTIPLICITIES WHEN APPROPRIATE

// BAD!

```
abstract sig Color {}  
sig Red, Green, Blue  
    extends Color {}
```

```
fact {  
    one Red  
    one Green  
    one Blue  
}
```

```
pred show[] {}  
run show for 2
```

← NO ERROR, BUT NO
INSTANCE FOUND

// Good!

```
abstract sig Color {}  
one sig Red, Green, Blue  
    extends Color {}
```

```
pred show[] {}  
run show for 2
```

↑ SIG. MULTIPLICITY
OVERRIDES SCOPE

CONT. Q1

SCOPE SELECTION-3/3

- DON'T SET SCOPE LARGER THAN NEEDED IF ALL RELEVANT VALUES ARE NAMED

```
sig Name, Address { }  
sig Book { addr: Name -> Address }  
pred add[b,b': Book, n: Name, a: Address] {  
    b'.addr = b.addr + n->a  
}  
run add for 3 but 2 Book
```

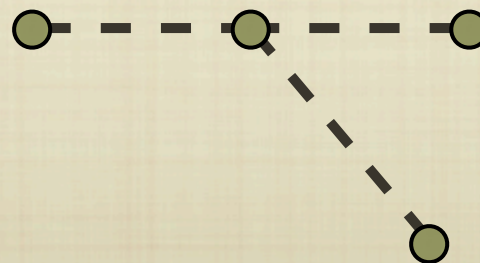
WHY 2?

```
sig Node { adj: Node }  
fact { all n, n': Node | n' in n.*adj }  
pred show[] { some Node }  
run show for 3
```

WHY NOT 2?

- LET KNOWN SHAPES SUGGEST CONSTRAINTS

```
sig Point { }  
sig Segment { from, to: Point }  
...  
run show for 4 Point, 3 Segment
```



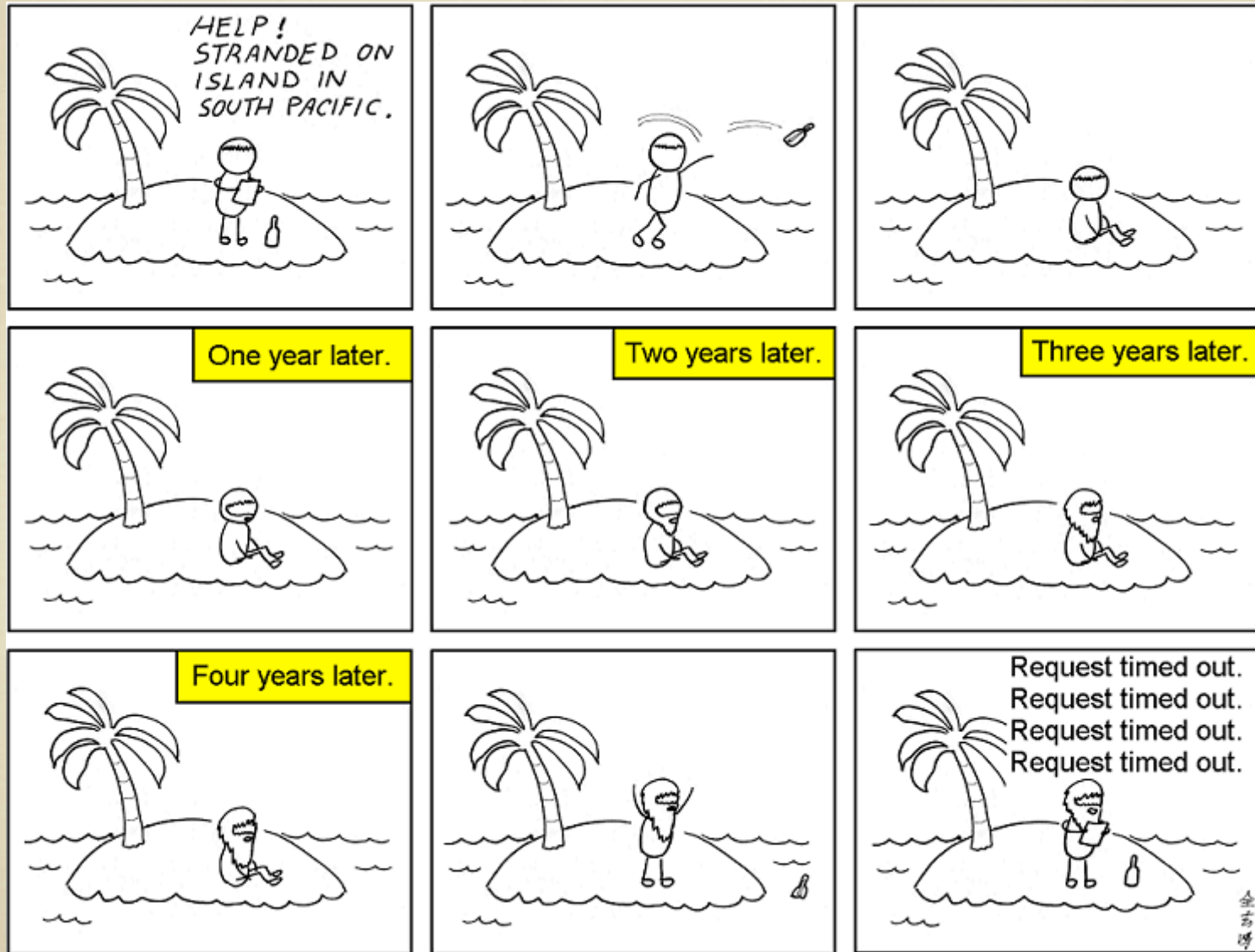
END Q1

CAREFUL!

- **exactly** LETS YOU SPECIFY AN EXACT SCOPE BOUND
- WILL OMIT **SMALLER** COUNTEREXAMPLES!
- USE **exactly** FOR GENERATING SAMPLE INSTANCES
- DON'T USE IT FOR CHECKING ASSERTIONS

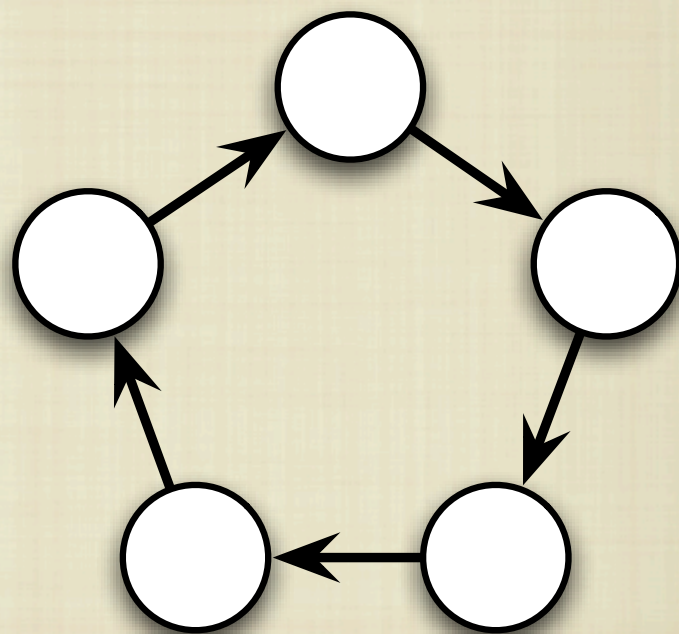
EXAMPLE:
LEADER ELECTION

CARTOON OF THE DAY



LEADER ELECTION IN RING

- **PROBLEM: CONCURRENT PROCESSES RUNNING SAME CODE MUST COLLABORATE TO IDENTIFY A “LEADER”**
- **SOLUTION:**
 - **ASSUME UNIQUE PIDS AND MAKE HIGHEST THE LEADER**
 - **PASS TOKENS CONTAINING PIDS (START WITH OWN)**
 - **RECEIVE TOKEN:**
 - **< OWN PID?, DISCARD**
 - **> OWN PID?, PASS ALONG**
 - **= OWN PID?, DECLARE SELF ELECTED**



SEE FILE → OPEN SAMPLE MODELS...,
book/chapter6/ringElection2.als