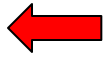
Types in Asteroid

- Asteroid is dynamically type checked
  - Infers types of variables at runtime
  - No type hierarchy, explicit type conversions!
  - Be careful, incorrect type conversions can lead to information loss!

```
ast> let i = 1.
ast> gettype(i)
integer
ast> let i = 1.0.
ast> gettype(i)
real
ast>
```

```
ast> let i = 1 + 2.5.
error: found 'integer + real' expected 'real + real'
ast> let i = toreal(1) + 2.5.
ast> gettype(i)
real
ast> i
3.5
ast>
```

```
ast> let i = 1 + tointeger(2.5).
ast> gettype(i)
integer
ast> i
3
ast>
```



Types in Asteroid

- Lists:
  - Lists in Asteroid are polymorphic in the sense that they do not enforce any kind of type restrictions on their elements.
  - This is similar to Python and very different from languages like C++ where this kind of polymorphism can only be achieved via class inheritance.
  - The following is legal in Asteroid,

```
ast> let l = [1,2.5,"three"].
ast> gettype(l)
list
ast> l
[1,2.5,three]
ast>
```

Types in Asteroid

- Tuples:
  - One way to think about tuples is as “fixed length lists” that are immutable, i.e.
    - Once you have decided on the number of components of a tuple you cannot change it.
    - Tuples with different number of components are incompatible.
    - You cannot change the contents of a tuple.

```
ast> let (x,y) = (1,2,3).
error: pattern match failed: term and pattern lists/tuples are not the same length
ast>
```

```
ast> let t@0 = 2.
error: term '(1,2)' is not a mutable structure
ast>
```

Types in Asteroid

- Structures
  - Asteroid uses name equivalence when computing the compatibility of two constructed types

```
ast> structure Type1 with
....   data a.
....   data b.
.... end
ast> structure Type2 with
....   data a.
....   data b.
.... end
ast> let q:%Type2 = Type1(1,2).
error: pattern match failed: conditional pattern match failed
ast> let q:%Type1 = Type1(1,2).
ast>
```