

## **Double Dispatch/ Inheritance:** Rock, Paper, Scissors

Write three classes, `Rock`, `Paper` and `Scissors`. They could all add a `RPSObject` mixin or be subclasses of some superclass, but that isn't necessary for this example. We want to calculate the result of two RPS objects fighting each other. We will have a "fights" method that returns the string "wins", "ties" or "loses" to indicate if some object "a" won/tied/lost to object "b".

Less OOP Approach: Recall Ruby can use `is_a? <class type>` to test if the variable is the given type or not. Implement it using this technique.

OOP Approach: Implement this functionality using double dispatch. The client code should be able to call "a.fights(b)" for some arbitrary R/P/S objects a and b (without necessarily knowing whether the objects a and b are rocks, papers or scissors).

- a. Add the headers for the `fights(other)` method to each of the three classes.. when the client calls "a.fights(b)", the fights message will be sent to the correct class of a, due to dynamic dispatch.
- b. Within the `fights` method, we know the type of this first "a" object is the class we are in. We don't know the type of the parameter `other`. To take advantage of dynamic dispatching again, we should call some method on the other object.
- c. To implement this, add three methods "fightsPaper()", "fightsRock()" and "fightsScissors()" to each of the three classes (9 methods total).
- d. Now, complete the `fights(other)` method to each of the three classes.

## **Class and Mixins and Coerce:**

Please see the other handout for the code of class PosRational and answer following questions:

First, we want to make this class Comparable:

1. How would you make a class Comparable in Java?

2. In Ruby what are the things we need to add to PosRational class?

3. Write the definition of the function that we needed to add.

Then we want to make this class Enumerable (despite its meaning less for this class):

1. What does it means to be Enumerable?

2. How do we call it in Java? How would you make a class "Enumerable" in Java?

3. In Ruby what are the things we need to add to PosRational class?

4. Write the definition of the function that we needed to add.

(The first element will be numerator and second element will be denominator. Note that Enumerable is totally useless for this class, and is only here for instructive purposes.)

Lastly, we want to make addition between numbers (Fixnums) and PosRational objects:  
For example we would like both  $2 + \text{PosRational}(3, 2)$  and  $\text{PosRational}(3, 2) + 2$  to work and return the same result.

1. What's coerce?

2. Write the coerce method for PosRational class that allows addition between Fixnum and PosRational Objects.

3. What are the constraints of coerce? Can we use it with a dot(.) to call a function?

**EXTRA:** We can't really write a coerce in Java. However, how would you write a coerce-like method for a class in Java? **Why can't we write coerce in Java?**

## Extra practice questions:

Recall how map can be implemented in Enumerable:

```
def map
  arr = []
  each {|x| arr.push (yield x) }
  arr
end
```

1. In the same manner, write a min method for the Enumerable mixin. Assume the min of an empty list is 0.

How many local variables do we need? What should be the initial value of it?

Write your implementation below:

2. We would like to change min method to return the second smallest element. Assume there are at least 2 elements in the list.

How many local variables do we need? What should be the initial value of it?

Write your implementation below: