README

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prep$_{\textbf{ruby challenges}}$

The Ruby challenge problems from the Markup and Coding course of the Viking Code School Prep Work

`https://www.vikingcodeschool.com`

1 Ruby Calisthenics

1.1 Power

Write a method *power* which takes two integers (*base* and *exponent*) and returns the *base* raised to the power of *exponent*. Do not use Ruby's "**" operator for this!

```
> power(3,4)
=> 81 # (3*3*3*3)
```

```
def power(base,exponent)
  # returns base raised to the power of exponent without the use of ** operator

  a = base
  b = exponent
  c = []

  b.times do
    c.push a
  end

  p c.inject(1) {|product, n| product * n}
end

power(3,4)
```

1.2 Factorial

Write a method *factorial* which takes a number and returns the product of every number up to the current number multiplied together.

```
> factorial(5)
=> 120 # from 1*2*3*4*5

def factorial(n)
  # Int => Int
  # Takes a number and returns the product of every number up to
  # the current number multiplied together

  a = []

  n.downto(1).each do |i|
    a.push i
  end

  p a.inject(1) {|product, n| product * n}

end

factorial(5)
```

1.3 Uniques

Write a method *uniques* which takes an array of items and returns the array without any duplicates. Don't use Ruby's *uniq* method.

```
uniques([1,5,"frog",2,1,3,"frog"])
=> [1,5,"frog",2,3]

def uniques(array)
  # Array of Items => Array of Items
  # Takes an array, returns array with duplicate items removed.
  # Write without uniq

  no_dupes = []
  couples = array.combination(2)
  groups = array.group_by{|e| e}
```

```
  groups.each do |g|
    no_dupes.push(g[0])
  end

  p no_dupes
end

uniques([1,5,"frog",2,1,3,"frog"])
```

1.4 Combinations

Write a method *combinations* which takes two arrays of strings and returns an array with all of the combinations of the items in them, listing the first items first.

```
> combinations(["on","in"],["to","rope"])
=> ["onto","onrope","into","inrope"]

def combinations(ary1,ary2)
  # Ary(Str), Ary(Str) => Ary(Str)
  # Takes two arrays of strings, returns an array with all of the combinations
  # of the items in them, listing the first item first.

  a = ary1
  b = ary2

  c = []

  a.each do |s|
    b.each do |x|
      c.push "#{s}#{x}"
    end
  end

  p c
end

combinations(["on","in"],["to","rope"])
```

1.5 Primes

Write a method is_{prime}*?* which takes in a number and returns *true* if it is a prime number.

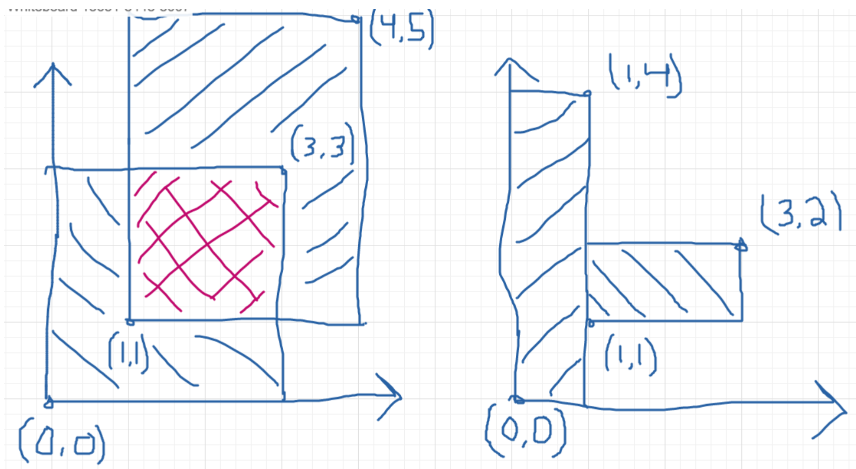
```
> is_prime?(7)
=> true
> is_prime?(14)
=> false

def is_prime?(i)
  range = (i-1).downto(2)

  range.each do |a|
    #p i%a == 0
  end

  p range.any? {|a| i%a == 0}
end

is_prime?(7)
```

1.6 Rectangle Overlap

Write a method *overlap* which takes two rectangles defined by the coordinates of their corners, e.g. *[[0,0],[3,3]]* and *[[1,1],[4,6]]*, and determines whether they overlap. You can assume all coordinates are positive integers.

```
> overlap( [ [0,0],[3,3] ], [ [1,1],[4,5] ] )
=> true
> overlap( [ [0,0],[1,4] ], [ [1,1],[3,2] ] )
=> false
```

It doesn't count as overlapping if their edges touch but they do not otherwise overwrite each other. As expressed by a sixth grade student:




```
def overlap(a,b)
  # Array(Coordinates), Array(Coordinates) => Boolean

  # a = [[0,0],[3,3]]
  ax1 = a[0][0]
  ay1 = a[0][1]
  ax2 = a[1][0]
  ay2 = a[1][1]

  awidth = ax2-ax1
  aheight = ay2-ay1
  aarea = awidth*aheight

  # b = [[1,1],[4,5]]
  bx1 = b[0][0]
  by1 = b[0][1]
  bx2 = b[1][0]
  by2 = b[1][1]

  bwidth = bx2-bx1
  bheight = by2-by1
  barea = bwidth*bheight

  #( [ [0  , 0  ],[3  , 3  ] ], [ [1  , 1  ],[4  , 5  ] ] )
  #( [ [ax1, ay1],[ax2, ay2] ], [ [bx1, by1],[bx2, by2] ] )
```

```
  case a
  when bx1 < ax2 && by1 < ay2
    true
  when bx1 < ax2 && by2 > ay1
    true
  when bx2 > ax1 && by2 > ay1
    true
  when ax1 < bx2 && ay2 > by1
    true
  else
    false
  end
end

p overlap( [ [0,0],[3,3] ], [ [1,1],[4,5] ] )
p overlap( [ [0,0],[1,4] ], [ [1,1],[3,2] ] )

# further development needed to explore every case
```

2 A Bigger Challenge: The Counting Game

10 friends are sitting in a circle around a table and decide to play a new game. In it, they count up through the numbers from 1 to 100. The first person says "1", the second says "2" and so on... but with a few catches:

- Whenever the number is divisible by 7, they switch directions. So person 6 will say "6", person 7 will say "7", then person 6 again will say "8".

  ```
  when x%y == 0 # reverse
  ```

- Whenever the number is divisible by 11, they skip the next person for the following number. For instance, if person 3 says "33", person 5 will say "34" instead (person 4 gets skipped).

  ```
  friends = []
  10.times do
    friends.push 0
  end
  ```

```
# Produces each number and which person said it
# Hash {Person(Int)=>List of Numbers(Array of Integers)}

# Example Return Steps
# { 1 => 1, 2 => 2, 3 => 3, 4 => 4, 5 => 5, 6 => 6, 7 => 7, 8 => nil, 9 => nil, 10
# { 1 => [1,12], 2 => 2, 3 => [3,11], 4 => [4,10], 5 => [5,9], 6 => [6,8], 7 => 7,
# { 1 => [1,12], 2 => 2, 3 => [3,11], 4 => [4,10], 5 => [5,9], 6 => [6,8], 7 => 7,
# { 1 => [1,12,16,25], 2 => [2,17,24], 3 => [3,11,18,23], 4 => [4,10,19], 5 => [5,

friends = 10
persons = []

friends.times do
  persons.push []
end

count = 1

until count > 100
  persons.each_with_index do |person,index|
    id = index+1

    if count%7 > 0
      person.push count
    else
      person.push "#{count}, reverse"
    end

    p id
    p person
    count = count+1
  end

end
```

Your job is to code a program which outputs each number and which person said it. Use it to show that player 1 will say the number "100".

2.1 The Elevator

You live in a 25 story building with one elevator. The central microcontroller got eaten by rats and the building manager has asked you to code up the elevator's operating procedure until he can get a new one. You figure you'll have to learn to actually code soon but you first want to think things through and pseudocode your design.

2.1.1 Elevator Details

The basic elevator machinery is completely dumb (it doesn't do anything it's not told to do) but is capable of interpreting and executing the commands:

- "open elevator door"
- "close elevator door"
- "go up full speed"
- "go down full speed"
- "slow down"
- "stop"

...and it accepts user input in the form of:

- floor buttons inside the elevator
- door open and close buttons inside the elevator
- up and down call buttons on each floor

...and it has sensors for:

- if a human is in the door closing path
- if it is currently at a floor (instead of in-between floors)

...and it has a few quirky requirements:

- it must "slow down" at least 1 floor before it stops.
- there is a small chance that it actually stops between floors by accident (it's an old elevator)

2.1.2 The Task

Your job is to design a properly working elevator. It should stop on each floor it is physically able to during a given trip to pick up whoever is going the same direction. Additionally, make sure that no one is:

1. smashed into the ground
2. pushed through the roof
3. squished by the doors
4. let off in between floors
5. stuck going the wrong direction (unless they choose not to exit)

This will be good practice thinking about all the edge cases and scenarios that a user can do.

The point isn't to follow any strict guidelines of syntax but rather to focus on getting the logic of the problem figured out and then organizing it into modules that accomplish the sub-tasks that are required.

2.2 NB: Software Engineering

`https://www.vikingcodeschool.com/software-engineering-basics`

- "logic" way through problems
  - pseudocoding ("whiteboarding")
    - software design
      - solve problem first THEN code the solution
      - break Problem apart into individual sub-processes called "Modules"
      - Modules Interface
      - keep modules as independent as practically possible (aim for low "Coupling")
      - make sure modules are all working towards the same goal (are highly "Cohesive")
      - try to keep modules insulated from how other modules actually do their job (keep them highly "Encapsulated")
      - SOLID principles

- modular design and engineering best practices
- 4-step engineering problem solving approach
  1. Understand the problem
  2. Plan a solution
  3. Carry out that plan
  4. Examine your results for accuracy
- Agile development
  * project management technique / development philosophy
  * teams commonly work in short (1-2 week) sprints
  * XP and SCRUM, Agile techniques
    · short cycle times
    · frequent client/user interaction
    · keeps project focused on relevant tasks
    · XP
    · pair programming
    · pairing developers together at workstations
  * keep software user-driven
  * TDD