47MapReduce and PageRank

Question 1:

Suppose our input data to a map-reduce operation consists of integer values (the keys are not important). The map function takes an integer *i* and produces the list of pairs (*p*,*i*) such that *p* is a prime divisor of *i*. For example, map(12) = [(2,12),(3,12)].

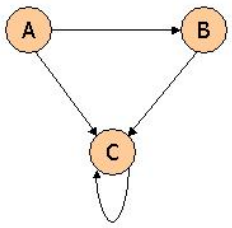
The reduce function is addition. That is, reduce(p,[i_1,i_2,...,i_k]) is (p,i_1+i_2+...+i_k).

Compute the output, if the input is the set of integers 15, 21, 24, 30, 49.

prime no:2,3,5,7,11,.....
15:[3,15],[5,15]
21:[3,21],[7,21]
24:[2,24],[3,24]
30:[2,30],[3,30],[5,30]
49:[7,49]
by combining all common elements part i.e compare left element and add rightmost element of that to get the solution.
[2,(24+30)],[3,(15+21+24+30)],[5,(15+30)],[7,(21+49)]
so, Output is ([2,54],[3,90],[5,45],[7,70])

Question 2:

Consider three Web pages with the following links:

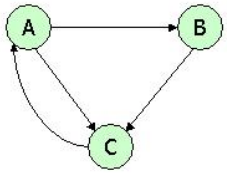


Suppose we compute PageRank with a β of 0.7, and we introduce the additional constraint that the sum of the PageRanks of the three pages must be 3, to handle the problem that otherwise any multiple of a solution will also be a solution. Compute the PageRanks *a*, *b*, and *c* of the three pages A, B, and C, respectively.

Value of a, b, or c as we iterate are: a
All PageRank is multiplied by .7 before distribution, and .3 is then added to each new PageRank.
a = β(0) + (1-β) → .3

b = β(a/2) + (1 - β) → .7(a/2) + .3
c = β(a/2 + b + c) + (1 - β) → .7(a/2 + b + c) + .3
That immediately tells us a = .3. We can then use the second equation to discover b = .7(.3/2) + .3 = .405. Finally, the third equation simplifies to c = .7(.555 + c) + .3, or .3c = .6885. From this equation we get c = 2.295
To compute the subs of each two of the variables:
a + b = .705, a + c = 2.595, and b + c = 2.7

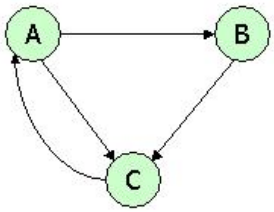
Question 3:



Suppose we compute PageRank with β=0.85. Write the equations for the PageRanks *a*, *b*, and *c* of the three pages A, B, and C, respectively.

We Know,
a = β * c + (1 - β) 1/3
b = β * a/2 + (1 - β) 1/3
c = β * (a/2 + b) + (1 − β)1/3
Here,
a = 0.85*c + (1 - 0.85) 1/3, a = 0.85c + 0.05
b = 0.85*0.5*a + 0.05, b = 0.425a + 0.05
c = 0.85*[0.5*a + b] + 0.05, c = 0.425a + 0.85b +0.05

Question 4:



Assuming no "taxation," compute the PageRanks *a*, *b*, and *c* of the three pages A, B, and C, using iteration, starting with the "0th" iteration where all three pages have rank $a = b = c = 1$. Compute as far as the 5th iteration, and also determine what the PageRanks are in the limit

a = c
b = a/2
c = a/2 + b
At 0th iteration: a = 1; b = 1; c = 1
At 1st iteration: a = c = 1; b = 1/2; c = 1/2 + 1 = 3/2
At 2nd iteration: a = c = 3/2; b = a/2 = 1/2; c = 1/2 +1/2 = 1
At 3rd iteration: a = c = 1; b = a/2 = (3/2)/2; c = 3/4 + 1/2 = 5/4
At 4th iteration: a = c = 5/4; b = a/2 = 1/2; c = 5/4
At 5th iteration: a = 5/4; b = 5/8; c = 9/8
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