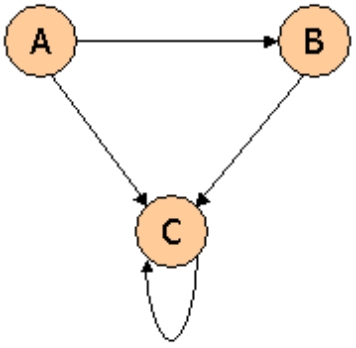
Feedback — Week 1 (Basic)

Help Center

You submitted this quiz on **Thu 5 Feb 2015 10:10 PM PST**. You got a score of **4.00** out of **4.00**.

Question 1

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. Then, identify from the list below, the true statement.

Your Answer		Score	Explanation
a + b = 0.705	✔	1.00	
b + c = 2.735			
a + b = 0.655			
b + c = 2.5			
Total		1.00 / 1.00	

Question Explanation

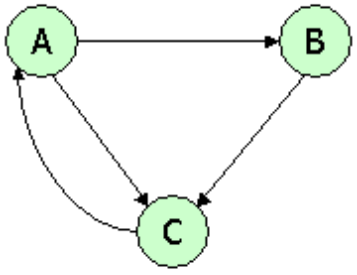
The rules for computing the next value of a, b, or c as we iterate are:
a <- .3
b <- .7(a/2) + .3
c <- .7(a/2+b+c) + .3

The reason is that a splits its PageRank between b and c, while b gives all of its to c, and c keeps all its own. However, all PageRank is multiplied by .7 before distribution (the "tax"), and .3 is then added to each new PageRank.

In the limit, the assignments become equalities. 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. It is now a simple matter to compute the subs of each two of the variables: a+b = .705, a+c = 2.595, and b+c = 2.7.

Question 2

Consider three Web pages with the following links:



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. Then, identify in the list below, one of the equations.

Your Answer		Score	Explanation
(•) .95a = .9c + .05b	✔	1.00	
( ) 85b = .575a + .15c			
( ) a = .9c + .05b			
( ) .85a = c + .15b			
Total		1.00 / 1.00	

Question Explanation

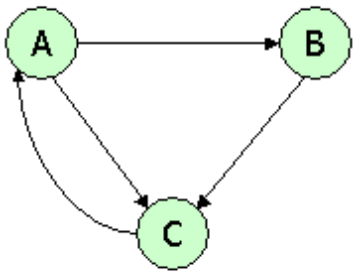
Here are the equations in the general form, where the PageRank of a node is set equal to β times the fair share of the PageRank of each predecessor of that node, plus (1-β) divided by the number of nodes (3), times the sum of the PageRanks.
a = .85c + .05a + .05b + 0.05c
b = .425a + .05a + .05b + 0.05c
c = .85b + .425a + .05a + .05b + 0.05c

If we simplify so there is only one term for each variable, we get:

.95a = .9c + .05b
.95b = .475a + .05c
.95c = .9b + .475a

Question 3

Consider three Web pages with the following links:



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. Then, identify the true statement from the list below.

Your Answer		Score	Explanation
○ In the limit, b = 1/2			
◉ In the limit, a = 6/5	✔	1.00	
○ After iteration 5, c = 7/4			
○ After iteration 4, a = 3/2			
Total		1.00 / 1.00	

Question Explanation

The rules for how PageRank passes around the graph can be expressed as:
a <- c
b <- a/2
c <- a/2 + b

Here is the table of the effect of applying these rules for 5 interations:

Iteration	0	1	2	3	4	5
a	1	1	3/2	1	5/4	5/4
b	1	1/2	1/2	3/4	1/2	5/8
c	1	3/2	1	5/4	5/4	9/8

The above table gives you the values for the 4th and 5th iterations, which are some of the values asked for. The other options involve the values in the limit. For this simple graph, the solution, where the arrow is replaced by equality in the rules, is easy to calculate. The first rule tells us a=c, and the second rule says b is half a (and therefore half c). That is, a:b:c is 2:1:2. Since the sum of the three values is 3, it must be that a = c = 6/5, and b = 3/5.

Question 4

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. Then, identify, in the list below, one of the pairs in the output.

Your Answer		Score	Explanation
(7,48)			
(2,54)	✔	1.00	
(3,107)			
(7,119)			
Total		1.00 / 1.00	

Question Explanation

Map does the following: 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) We then group by keys, giving: (2, [24, 30]) (3, [15, 21, 24, 30]) (5, [15, 30]) (7, [21, 49]) Finally, we add the elements of each list, giving the result (2,54), (3,90), (5,45), (7,70).