Feedback — Quiz 6: Sections 13-14

You submitted this quiz on **Sat 17 Nov 2012 8:08 PM PST**. You got a score of **10.00** out of **10.00**.

Section 13 covers Path Dependent outcomes. Some key concept are Urn Models, PATH vs. PHAT dependence, public works and externalities, and increasing returns. Be ready to do some math on urn processes such as Polya and Balancing.

Section 14 covers Networks. There are a few questions that require you to calculate path length, degree, and so on, and some that require you to think about the meanings of these numbers.

There fewer multiple choice questions on this quiz than usual, and more that ask you to input numbers. When asked for a numeric answer, please write as "12" for example, instead of "twelve". And don't include any punctuation.

Good luck!

Question 1

In the Polya Process, what is the probability of drawing a blue ball on each of your first two draws? (Assume that you start with one blue ball and one red ball in the urn.)

Your Answer		Score	Explanation
◉ $\frac{1}{3}$	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

The odds of drawing a blue ball in the first round are $\frac{1}{2}$. Since you add a blue ball after the first round, the odds are $\frac{2}{3}$ on the second draw.

The total probability is $\frac{1}{2} * \frac{2}{3} = \frac{1}{3}$

[See 13.2, "Urn Models"]

Question 2

In the Balancing Process, what is the probability of drawing a red ball on each of your first two draws? (Assume you start with one red ball and one blue ball in the urn.)

Your Answer		Score	Explanation
◉ $\frac{1}{6}$	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

The odds of drawing a red ball first are $\frac{1}{2}$.

You then add a blue ball, so the odds of drawing a second red are $\frac{1}{3}$.

So the total probability is $\frac{1}{2} * \frac{1}{3} = \frac{1}{6}$.

[See 13.2, "Urn Models"]

Question 3

In the Polya Process, what are the odds of picking twenty red balls in a row? (Assume you start with one red ball and one blue ball in the urn.)

Your Answer		Score	Explanation
◉ $\frac{1}{21}$	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

You can solve this in two ways:

You can realize that with 20 draws there are 21 possible combinations -- from 0 red balls to 20 -- and each is equally likely, making the odds $\frac{1}{21}$

Or you can multiply $\frac{1}{2} * \frac{2}{3} * \frac{3}{4} \ldots \frac{20}{21}$ and cancel out terms to get $\frac{1}{21}$.

[See 13.3, "Mathematics on Urn Models"]

Question 4

What is the primary reason that the number and combination of public projects in existence might be a path dependent outcome? Please answer in one word, no period.

You entered:

Externalities

Your Answer		Score	Explanation
Externalities	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

Externalities. Investment in public projects might yield some calculated benefit, but the choice to invest in an additional public works project may yield costs or benefits beyond that of each of the individual projects - these are a type of externality which may affect the decision to invest in additional public projects, and the order of that investment decision can thus greatly affect whether a road gets built, or an airport and a road, or a landfill and a road and an airport.

[See 13.5, "Path Dependence and Increasing Returns"]

Question 5

Using the Polya Process, you pick 10 balls from an urn. What is the diversity index of the distribution of possible outcomes? Please give a numeric answer.

You entered:

11

Your Answer		Score	Explanation
11	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

There are 11 potential outcomes - between 0 and 10 of the balls can be of a given color.

Since we know that each equilibrium is equally likely, each has a probability of $\frac{1}{11}$.

The diversity index is equal to the inverse of the sum of the square of each probability:

$$\frac{1}{\frac{1}{121}*11}$$

This simplifies to $\frac{1}{\frac{1}{11}}$, which equals 11.

[See 13.6, "Path Dependent or Tipping Point"]

Question 6

What is the average degree of a network with six nodes and fifteen edges? Please give a numeric answer.

You entered:

5

Your Answer		Score	Explanation
5	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

Average degree = $\frac{2*edges}{nodes}$

$\frac{2*15}{6} = 5$

[See 14.2, "The Structure of Networks"]

Question 7

A train system connects Detroit to Chicago; Chicago to Minneapolis; Minneapolis to Milwaukee; and Milwaukee to Chicago. What's the average path length between all pairs of cities?

Your Answer		Score	Explanation
◉ $\frac{8}{6}$ or $1\frac{1}{3}$	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

Average path length = sum of all path lengths / total paths.

Path lengths: Detroit to Chicago =1, Detroit to Minneapolis =2, Detroit to Milwaukee = 2, Milwaukee to Minneapolis =1, Minneapolis to Chicago =1, and Chicago to Minneapolis = 1.

Sum of path lengths = $1 + 2 + 2 + 1 + 1 + 1 = 8$.

There are 6 paths, so the average path length is $\frac{8}{6}$ or $1\frac{1}{3}$.

[See 14.2, "The Structure of Networks"]

Question 8

What is the clustering coefficient of a family tree network that covers four generations? Assume every person marries and that each couple has exactly two children. Assume that the family tree in this question connects only spouses and mothers to their offspring.

If you've never seen a family tree, here is a link:

http://www.yangfamilytaichi.com/yang/tree/images/familytree.jpg

You entered:

0

Your Answer		Score	Explanation
0	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

Zero! This Family Tree has no triangles. Edges run only from spouse to spouse and from mothers to their offspring. If fathers were also connected by an edge to their offspring, there would be triangles. But here, we have none.

[See 14.2, "The Structure of Networks"]

Question 9

Suppose that we have a random clique network in which each person has 20 random friends and 100 clique friends. How many 2-friends does each person have?

You entered:

4400

Your Answer		Score	Explanation
4400	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

2-friends = clique friends' random friends, random friends' clique friends, and

random random.

In simpler terms, 2-friends = CR + RC + RR.

C=100, R=20.

$$(100)(20) + (20)(100) + (20)(20) = 4400.$$

Each person has 4,400 2-friends.

[See 14.3, "The Logic of Network Function"]

Question 10

Which of the following measures of a network might you use to capture social capital, if we take social capital to indicate something like the productive capacity of a group? You may select more than one answer.

Your Answer		Score	Explanation
☑ Average Degree	✓	0.33	
☑ Clustering Coefficient	✓	0.33	
☑ Average Path Length	✓	0.33	
Total		1.00 / 1.00	

Question Explanation

They could all be used. The clustering coefficient, path length, and average degree, each, in some way, capture the cost and speed of mobilization (conveying messages, information, delegation).

A high clustering coefficient would indicate a degree of centrality, a low path length would mean communication/delegation would only have to travel a short distance, and a high average degree would mean that on average, each individual in the group was connected to many of the other members.

[See 14.4, "Network Function"]