Feedback — Final Exam: Sections 11-20

You submitted this exam on **Fri 23 Nov 2012 11:00 PM PST**. You got a score of **9.00** out of **11.00**. You can attempt again in 10 minutes.

Question 1

People learn from others about which policies to support. Three policies are currently proposed: raising taxes, lowering taxes, and keeping taxes the same.

In October, 10% prefer cutting taxes, 30% prefer raising taxes, and 60% prefer keeping taxes the same.

In November, 25% prefer cutting taxes, 0% prefer raising taxes, and 75% prefer keeping taxes the same.

Darwin Charles, a political commentator, argues using replicator dynamics that this data proves that everyone will soon want tax cuts. Imagine a replicator model that supports his conclusions by giving each policy a fitness. Which one of the following set of fitness levels supports Charles' argument? While calculating, round all calculations to the nearest hundredths place (i.e. if your calculator shows 0.346, round to 0.35).

Your Answer		Score	Explanation
◉ Fitness for cutting taxes = 2; Fitness for same taxes = 1; Fitness for raising taxes = 0.	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

Remember our replicator equation: $Pr_{t+1}(i) = \frac{Pr_t(i)\pi(i)}{\sum_{j=1}^{N} Pr_t(j)\pi(j)}$

In words, this means that the probability of being type i at time $t+1$ is equal to the weight of type i at time t divided by the total weight of all types at time t.

Make an educated guess of the fitness levels (given the options) and see if they fit. We'll just demonstrate the correct answer. Multiply the proportions in October by the fitness levels to find weights:

Weight (cutting taxes): $0.10 * 2 = 0.20$

Weight (raising taxes): $0.30 * 0 = 0$

Weight (same taxes): $0.60 * 1 = 0.60$

So the total weight for all policies is $0.20 + 0 + 0.60 = 0.80$

The proportion in favor of cutting taxes at $t+1$ will be $\frac{0.20}{0.80} = 0.25$

The proportion in favor of raising taxes at $t+1$ will be $\frac{0}{0.80} = 0$

The proportion in favor of keeping taxes the same will be $\frac{0.60}{0.80} = 0.75$

These proportions match those given for November. If we run this operation several times, we find that the proportion of people in favor of cutting taxes continues to increase. After about 10 time periods, effectively 100% of people will be in favor of cutting taxes.

In each of the incorrect options, the fitness for raising taxes is greater than the fitness of cutting taxes. In such a scenario, we would never reach a time at which all people favor cutting taxes.

[See 19.2, "The Replicator Equation"]

Question 2

The City of Ann Arbor opened a new dog park. If D equals the number of dogs that are at the park, then happiness per dog (at the park) equals 30 - D. This holds so long as there are more than 10 dogs at the park. If there are 10 dogs or fewer in the park, happiness per dog equals 9. Any dogs not at the park have a happiness of 4 in either scenario. Assume there are 90 dogs in Ann Arbor. If there are 12 dogs at the park, what is the total happiness?

Your Answer		Score	Explanation
◉ 528	✓	1.00	

Total	1.00 / 1.00

Question Explanation

Consider this a public access or common pool resource problem.

Simply do the math:

$12(30-12)+(78*4)=216+312=528$. So the total happiness of all the dogs in Ann Arbor is 528.

[See 17.4, "Collective Action and Common Pool Resource Problems"]

Question 3

True or False:

Coordination tends to be a measurable difference - in which no one is better off not coordinating - whereas Standing Ovation tends to be more psychological - in which there may be some personal reason not to do what most others are doing.

Your Answer		Score	Explanation
◉ True	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

True.

In a Pure Coordination Game, all players are better off when they are all doing the same action.

In a Standing Ovation, however, there might be a threshold or a percentage of people standing required before an individual adopts an action. If the threshold or required percentage isn't met, the individual prefers not to stand even if a majority of people are standing.

[See 12.3, "Pure Coordination Game"]

Question 4

Imagine a nation facing off against a multinational terrorist organization. The nation has far more resources and money than the terrorists have. Which model best explains why - as the nation invests more money and resources into fighting the terrorists - the terrorists expand into more countries?

Your Answer		Score	Explanation
◉ Blotto	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

This is an application of Colonel Blotto.

Recall that the less resource-rich player increases its chance of winning by increasing the number of fronts.

For example, 75 troops cannot defeat 100 troops on four fronts, but they can on five fronts.

[See 16.4, "Blotto: Troop Advantages"]

Question 5

Natalie is bidding in a second price auction. If she and her opponents are rational, what should she bid?

Your Answer		Score	Explanation
◉ She should bid half her value.	✗	0.00	
Total		0.00 / 1.00	

Question Explanation

Since in a second price auction the winner pays the next highest bid, bidding below valuation just decreases one's chance of winning.

Bidding above valuation might seem okay, but if someone bids above your valuation but below your bid, you end up with a negative payoff (you pay more than your value).

So the optimal strategy in a second price auction amongst rational bidders is to

simply bid your value.

[See 18.3, "Auctions"]

Question 6

There are three predictions: 105, 125, 190. The actual value is 145. Which of the following values is closest to the crowd (squared) error?

Your Answer		Score	Explanation
◉ 25	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

$Step\ 1$: Calculate the average prediction:

$\frac{105+125+190}{3} = 140;$

$Step\ 2$: Calculate each individual squared error and then the average error:

$(105-145)^2 = 1,600; (125-145)^2 = 400; (190-145)^2 = 2,025.$

Average error = $\frac{1,600+400+2,025}{3} = 1,341.67$

$Step\ 3$: Calculate each individual diversity and then the crowd diversity:

$(105-140)^2 = 1,225; (125-140)^2 = 225; (190-140)^2 = 2,500.$

Crowd Diversity = $\frac{1,225+225+2,500}{3} = 1,316.67.$

$Step\ 4$: Calculate crowd error:

Crowd Error = Average Error - Diversity

$1,341.67 - 1,316.67 = 25$

So the crowd (squared) error is 25.

[See 20.3, "Diversity Prediction Theorem"]

Question 7

At Ohio University, students get randomly assigned to dorm rooms for a one-week orientation period. At the end of the week, two students can switch rooms with one another so long as both of them approve the switch. These are single rooms, meaning there is only one student per room. Assume a small cost of switching and no major externalities. Will this process of switching stop?

Your Answer		Score	Explanation
◉ Yes	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

This is a Lyapunov Process.

Remember our 'chairs and offices' example from the Lyapunov video? There, we found that it would be effective for workers in an office to trade chairs until some limit was reached such that happiness could no longer increase with more trades.

The same assumptions hold for this dorm room example. Roommates will switch until some maximum happiness is reached such that any further improvement in happiness is not worth the cost of switching. So switching stops. Of course, there may be externalities (can you think of any?) but we're assuming here that they're not so great so as to prevent this Lyapunov function from reaching its limit.

[See 11.5, "Lyapunov: Fun and Deep"]

Question 8

A law firm has favorable outcomes in 92% of cases that go to court. They have repeated this feat for many, many years. They recruit the top talent and have some of the top lawyers in the country as partners. If we were to use the Skill vs. Luck Model to determine how much of the law firm's success derives from skill, and how much derives from luck, would we expect the variable a to be closer to 0 or to 1?

Your Answer		Score	Explanation
◉ 0	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

The model tells us that Outcome = $a * Luck + (1 - a) * Skill$.

If a is close to 1, it means that outcomes are heavily influenced by luck.

If a is close to 0, it means that luck does not play a great role, indicating the influence of skill.

In this case, we expect a to be close to 0, because the question tells us that the law firm's success derives mostly from skill. There are several hints that tell us this: the law firm is successful over a sustained period of time ("many, many years"), and they have some of the "top lawyers" in the country. [See 15.3, "Skill and Luck"]

Question 9

You are given the following information about a network:

It has an average path length of about 2,

An average degree of about 20,

And a very low clustering coefficient.

Which one of the following scenarios best fits this network structure?

For this question, use your reasoning instead of trying to set up each network and do all of the math.

Your Answer		Score	Explanation
◉ Lending network of adults (people who've loaned money to one another)	✗	0.00	
Total		0.00 / 1.00	

Question Explanation

Let's use a process of elimination for this one:

Path length from node A to node B denotes the minimal number of edges that must be traversed to get from node A to node B. The average path length of a network is the average path length between all pairs of nodes. So which of the options could have an average path length of about 2? Airline network and

friendship network can both work because it's reasonable in both cases that to get from node A to node B, you have to traverse an average of roughly 2 edges. For example, with flights, this suggests it takes an average of two flights to get from any airport to any other airport. This path length doesn't work with loans or EU countries, however. In both cases, it will take more than an average of 2 edges to get from node to node. So loan network and country network are eliminated. Next is degree. Degree is the number of edges connected to a node. The degree of a network is the average degree across all nodes. A high degree network is one in which nodes are very interconnected, and a low degree network is one in which there are few connections between nodes.Which of the two remaining options are likely to have an average degree of about 20? Airline network works, since each airport is likely to have flights to and from an average of roughly 20 other airports. Friendship network can work as well: despite the fact that we don't know a lot about what kind of friendship network this is, 20 is a reasonable number of average friend connections.

Finally, Clustering Coefficient is the percentage of triples of nodes that have edges between all three nodes. In other words, it's the percentage of all possible triangles in a network that are realized. An airline network is likely to have a clustering coefficient of close to zero. This is because an airline network will have a few "hubs" - in other words, nodes with many edges going outward to smaller airports. These smaller airports are usually only connected to each other through the hub (which explains the average path length of two), but not directly to one another, meaning potential triangles miss one edge. For a friendship network, on the other hand, the clustering coefficient is likely to be higher, since friends of friends are likely to end up as friends on occasion, which will create triangles of friends.

The airline network is the only one that can exhibit all three properties.

[See 14.2, "The Structure of Networks"]

Question 10

What is the primary reason that the number and combination of public projects in existence might be a path dependent outcome?

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 11

What are the three classes of outcomes - other than equilibrium - that a model can produce?

Your Answer		Score	Explanation
◉ Complex, periodic, chaotic	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

We have discussed four possible classes of outcomes in this class: equilibrium, complexity, periodic (cyclic), and chaos.