Feedback — Midterm Exam: Sections 1-10

You submitted this exam on **Mon 19 Nov 2012 5:57 AM PST**. You got a score of **13.00** out of **15.00**.

This quiz covers the first ten sections of Model Thinking. The questions are both conceptual - i.e., they ask which model best applies - and technical - i.e., involving calculations.

There are two variations to every question, so when you retake the quiz, you will see fresh versions. These will deal with similar concepts, but will differ within those concepts.

You have the usual 5 attempts on this exam. Please attempt it as many times as best suits you within that limit. It may take one or two more attempts than you are used to, given the variations. The exam is intended as a slightly more rigorous test of your skills than the section quizzes. You will be asked 15 questions instead of 10.

Please be prepared to use any concepts discussed in the first ten sections of the course. If you have watched all of the videos and studied a bit, you should be in great shape.

Best of luck.

Question 1

Which model would be best able to explain why at some parties, you find that all of the men are in one room and all of the women are in another, even though no one really wanted this to happen?

Your Answer		Score	Explanation
◉ Schelling's Model	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

Schelling's model of segregation explains how you get segregation even with tolerant preferences. Like residential segregation, this problem represents a situation in which micro-level behavior produces a counterintuitive macro-level pattern.

[See 2.2, "Schelling's Segregation Model" - under "Segregation and Peer Effects"]

Question 2

Choose two applications of the Standing Ovation Model. Please select two of the four possible answers.

Your Answer		Score	Explanation
☐ Classifying various types of tipping points.	✓	0.25	
☐ Accounting for the psychological biases of human agents when creating a model.	✓	0.25	
☑ Measuring the probability of a riot or uprising.	✓	0.25	The Standing Ovation Model can take into account such variable as average level of discontent in a populace, diversity of levels of discontent, and variance in thresholds for citizens to join riots.
☑ Estimating the number of students that will sign up for an online course.	✓	0.25	We can use the Standing Ovation Model to estimate how many students will sign up for an online course based on the quality of the course, the threshold in quality level for various people to join, and so on.
Total		1.00 / 1.00	

Question Explanation

[See 2.5, "The Standing Ovation Model" - under "Segregation and Peer Effects"]

Question 3

Identical twins Janelle and Jamie leave their hometown in Michigan to attend college. When they leave home, they're the same in every way – down to their friends and their independent political beliefs. Janelle goes to Olivet College and becomes a Republican. Jamie goes to Alma College and becomes a Democrat. Which concept that we've studied thus far $best$ explains how this might occur?

Your Answer		Score	Explanation
◉ Peer Effects	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

"Peer Effects" predicts that in some dimensions, people will tend to change to match people around them. If Janelle goes to a campus that's a little more conservative, and Jamie goes to a college that's a little more liberal, or if they fall into cliques that differ along that dimension, they may change their ideologies.

[See 2.6 "Identification Problem" - under "Segregation and Peer Effects"]

Question 4

Suppose that a production process creates gaskets with an average diameter of 3 inches and a standard deviation of $\frac{1}{200}$ of an inch. What's the six sigma range of this production process?

Your Answer		Score	Explanation
◉ $[2.97, 3.03]$	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

Multiply the standard deviation by 6; then subtract the result from 3 for your low

point, and add it to 3 for your high point.

Low point: $20 - (6 * .005) = 2.97$.

High point: $20 + (6 * .005) = 3.03$.

So the range is $[2.97, 3.03]$.

[See 3.3, "Six Sigma" - under "Aggregation"]

Question 5

For which of the following attributes would people be likely to have spatial preferences? Ignore external factors; just decide whether these particular attributes are likely to be spatial.

Your Answer		Score	Explanation
☑ Temperature of coffee	✓	0.25	
☑ Level of spice in Thai food	✓	0.25	
☑ Size of a couch for the living room	✓	0.25	
☐ Hourly pay	✓	0.25	
Total		1.00 / 1.00	

Question Explanation

We can think of spatial preferences as those for which we have some ideal - for which more is not necessarily better.

Your ideal couch would be some particular size -- say 72 inches. You wouldn't want an infinitely big couch, so the couch is spatial.

The level of spice for most people would be spatial -- you would have an ideal point that may be higher or lower than others' ideal points.

The same goes for coffee temperature. Most people have an ideal temperature, so it too is spatial. Of course, there are bounds on either side; at some point, coffee would be too hot (or cold) for anyone to want to drink. But within these bounds, temperature is a spatial attribute

Hourly pay, on the other hand, is not a spatial preference. You would probably choose more pay - as would most people, because in this case, more is better.

[See 4.3, "Spatial Choice Models" - under "Decision Models"]

Question 6

In regards to the Rational Actor Model, which of the following would make you MORE likely to assume that individuals act rationally?

Your Answer		Score	Explanation
☐ Emotional Decision	✓	0.33	
☑ High Stakes Choice	✓	0.33	
☐ Repeated Choice	✗	0.00	
Total		0.67 / 1.00	

Question Explanation

People are more like to be rational when the stakes are large and when the choice is repeated as they continue to learn. When a decision is particularly emotional, on the other hand, people may be prone to psychological biases.

[See 5.2, "Rational Actor Models" - under "Thinking Electrons: Modeling People"]

Question 7

Dave owns a spice store. He hires a consultant to construct a linear model that predicts the sales of a spice as a function of its cost. The consultant's model states that sales in pounds per week, S, equals $20 - 4P$, where P = the price per pound in dollars. Prices of the spices range from five to ten dollars. Should Dave rely on the consultant's model?

Your Answer		Score	Explanation
◉ No. The model cannot be correct.	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

No, because in the model the sales of spices will all be zero or negative. If P=10, then sales will equal negative twenty pounds.

We discussed linear models in Section 6. To review, watch the videos under "Categorical and Linear Models".

This question is also a good example of why models can be useful - even when they fail. To review some reasons why we model, check the videos in Section 1, under "Introduction: Why Model".

Question 8

Which of the following are linear? You may choose more than one answer.

Your Answer		Score	Explanation
☐ A graph of the function $Y = X^2$	✓	0.25	This is an example of an exponential function.
☐ World population as a function of time.	✓	0.25	World population increases by an increasing ratio of people to time. Therefore, it's not a linear function. It's difficult to predict how and when this will change, but we don't mean to get into that here.
☑ Square footage of a house as a function of its width.	✓	0.25	In this case, the square footage is increasing by a constant ratio. Therefore, it's a linear function.
☑ A graph of the function $Y = X + 1$	✓	0.25	To see how this is linear, draw a simple graph. When X is equal to 1, Y will equal 2. When X is equal to 2, Y will equal 3. So the graph will be linear.
Total		1.00 / 1.00	

Question Explanation

[See 6.3, "Linear Models" - under "Categorical and Linear Models"]

Question 9

Choose one of the options below to fill in the two blanks:

A (1) _____ tip occurs when a gradual change in the value of a variable leads to a large, i.e. discontinuous, jump in that same variable in the future.

A (2) _____ tip occurs when a gradual change in the value of one variable leads to a discontinuous jump in some other variable of interest.

Your Answer		Score	Explanation
◉ (1) Direct (2) Contextual	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

A direct tip occurs when a gradual change in the value of a variable leads to a large, i.e. discontinuous, jump in that same variable in the future. A good example is "the straw that broke the camels back". At some point, the addition of straw, which has been occurring gradually, leads to the camel suddenly falling, and all of the straw with it.

A contextual tip occurs when a gradual change in the value of one variable leads to a discontinuous jump in some other variable of interest. An example is the forest fire percolation model. We can gradually increase the density of trees without much change in the likelihood of a forest fire occurring until some point, at which a slight increase in tree density causes a discontinuous jump in the probability of a forest fire occurring.

While scholars and writers often focus on direct tips, contextual tips often make direct tips possible, such as when human rights conditions in a state deteriorate, creating the potential for an uprising.

[See 7.5, "Classifying Tipping Points" - under "Tipping Points"]

Question 10

What is the irony of the Basic Growth Model?

Your Answer		Score	Explanation
◉ Growth stops at some point.	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

Both of the options are true: in the Basic Growth Model, investment is one key to growth, and growth will stop at some point. But here we're looking for the "irony" of the growth model, and that irony is that the model shows us that growth eventually stops.

[See 8.3,"Basic Growth Model" - under "Economic Growth"]

Question 11

Using the Solow Growth model, suppose that an economy was in a long-run equilibrium and that a technological innovation makes the entire society 20% more productive, i.e. we multiply the output function by 1.2. How much larger, in percentage terms, is output in the new long-run equilibrium?

Assume that the initial production function is $10K^{0.5}$ and that people invested at 10% and that depreciation was also 10%.

Please give your answer as an integer, and do not include a percentage sign.

You entered:

90

Your Answer		Score	Explanation
90	✗	0.00	
Total		0.00 / 1.00	

Question Explanation

Recall that in the Solow Growth Model, we get a doubling of any increase, so a 20% increase in productivity will produce a 40% increase in the long run.

In this example, initially investment equals $K^{0.5}$ and depreciation equals $0.1K$.

Therefore, in equilibrium, we have $10K^{0.5} = K$, so that $K = 100$, and output equals 100 as well.

After the innovation, investment equals $1.2K^{0.5}$ and depreciation equals $0.1K$.

Therefore, in equilibrium, we have $12K^{0.5} = K$, so $K = 144$, and so does output.

Previously, output was 100. Now it's 144. So output has increased 44%

[See 8.4, "Solow Growth Model" - under "Economic Growth"]

Question 12

Which of the following explains why groups outperform individuals when solving problems?

Your Answer		Score	Explanation
☐ Diverse Local Optima	✗	0.00	
☑ Diverse Heuristics	✓	0.33	
☐ Diverse Perspectives	✗	0.00	
Total		0.33 / 1.00	

Question Explanation

Diverse heuristics and diverse perspectives both lead to diverse local optima.

Diverse local optima, in turn, enable groups to not get stuck where individuals would get stuck.

Therefore, all three answers are correct.

[See 9.4, "Teams and Problem Solving" - under "Diversity and Innovation"]

Question 13

Each member of a five person team has one unique idea for how to approach a

problem. If ideas can be applied individually and in pairs to create approaches to the problem, how many total approaches does the team have? (Hint: think of this as recombination). Please input your answer as a whole number with no punctuation.

You entered:

15

Your Answer		Score	Explanation
15	✓	1.00	
Total		1.00 / 1.00	

Question Explanation

They have 5 individual ideas: A, B, C, D, and E

They have 10 pairs of ideas: AB, AC, AD, AE, BC, BD, BE, CD, CE, and DE.

$5 + 10 = 15$, so they have a total of 15 approaches.

[See 9.5, "Recombination" - under "Diversity and Innovation"]

Question 14

An analysis of consumer data claims that Americans' color preferences for cars satisfy a Markov Process. This model assumes that each individual follows the same Markov Process. In the model, the states are the colors of cars. Which of the following must be true?

Your Answer		Score	Explanation
☐ Someone's previous car color choice has no effect on their current choice.	✓	0.50	
☑ The market shares of each color car should be relatively constant.	✓	0.50	
Total		1.00 / 1.00	

Question Explanation

The model averages over lots of people.

This means that car sales of each color should approximate the Markov equilibrium, so the market shares should be constant.

However, this does not mean that one's previous color choice does not effect one's current choice. The transition probabilities could be such that a person who buys a white car is more likely to buy a silver car than a black car.

[See 10.5, "Exapting the Markov Model" - under "Markov Processes"]

Question 15

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. These outcomes have been discussed in a number of sections.