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Philosophy 666: Rational Choice Theory
March 31, 2017

test 2 – answer key

Instructions:

1. Answer all of the following questions on the answer sheets provided. You can write on this list of questions, but credit will be awarded only for answers written on answer sheets.
2. Do not access any book, notebook, newspaper, calculator, computer, cell phone, or other possible source of inappropriate aid during the test, do not leave the room before you are finished taking the test, and be sure to finish the test within this 50-minute testing period. No credit will be given for any work done after you access any possible source of inappropriate aid, after you leave the room for any reason, or after the end of the testing period.
3. When you are finished, be sure your name is written on each of your answer sheets, and turn them in. Also, turn in this list of questions. If you write your name on it, it will be returned with your graded answer sheets.

Questions:

For questions 1 and 2, let L be a lottery that provides a 1/4 chance of winning a car and a 3/4 chance of winning nothing. Also, assume that a bike is a separate possible prize. And assume the following:

u(bike) = u(nothing) + x

u(car) = u(bike) + y

$x > 0$

$y > 0$

1. Suppose Shannon prefers L to the bike. What constraint concerning x and y (in addition to the constraints just stated) implies utility assignments for the three prizes (nothing, bike, and car) that make the principle of maximizing expected utility agree with Shannon's preference? Show your work.

   answer:

$$\mathrm{EU(L)} > \mathrm{EU(bike)}$$

$$\left(\frac{1}{4}\right)u(\mathrm{car}) + \left(\frac{3}{4}\right)u(\mathrm{nothing}) > u(\mathrm{bike})$$

$$\left(\frac{1}{4}\right)[u(\mathrm{nothing}) + x + y] + \left(\frac{3}{4}\right)u(\mathrm{nothing}) > u(\mathrm{nothing}) + x$$

$$u(\mathrm{nothing}) + x + y + 3u(\mathrm{nothing}) > 4u(\mathrm{nothing}) + 4x$$

$$4u(\mathrm{nothing}) + x + y > 4u(\mathrm{nothing}) + 4x$$

$$x + y > 4x$$

$$y > 3x$$

2. What are some utility assignments for the three prizes that make the principle of maximizing expected utility agree with Shannon's preference? Write your answer as a series of three equations, like this:

   u(nothing) = __

   u(bike) = __

   u(car) = __

   (Of course, in each equation, instead of a blank ('__'), you will have a number.)

   answer: the following, or many other possibilities:

   u(nothing) = 0

   u(bike) = 1

   u(car) = 10

3. Suppose S is the following information:

   > Devin believes that a particular risky option offers him a 60-percent chance at $1,000 and a 40-percent chance at $0. Given a choice between $500 and the risky option just described, Devin prefers the risky option.

   Which of the following is true?

   (a) S implies that Devin is risk-averse.

   (b) S implies that Devin is risk-neutral.

   (c) S implies that Devin is risk-seeking.

   (d) none of the above (i.e., Devin might be risk-averse or risk-neutral or risk-seeking, but none of those is implied by S)

   answer: d

4. What is the main difference between the Allais paradox and the Ellsberg paradox?

   (a) The Allais paradox is based on two hypothetical choices, while the Ellsberg paradox is based on one hypothetical choice.

   (b) The Allais paradox is generally accepted as a refutation of expected-utility theory, while opinion is sharply divided as to the force of the Ellsberg paradox.

   (c) Attempting to reconcile the Allais-paradox preferences with the principle of maximizing expected utility leads to inconsistent attributions of utilities, while attempting to reconcile the Ellsberg-paradox preferences with the principle of maximizing expected utility leads to inconsistent attributions of probability beliefs.

   (d) The Allais paradox requires the assumption that more money is always preferred to less, and although that assumption is considered fairly innocuous, the Ellsberg paradox is more powerful because it provides essentially the same kind of counterexample to expected-utility theory as the Allais paradox, but without requiring that assumption.

   answer: c

5. Let Lottery L comprise the following:
   - a 60-percent chance at a lottery comprising an 80-percent chance of winning a dog and a 20-percent chance of winning a cat
   - a 30-percent chance at a lottery comprising a 50-percent chance of winning a dog and a 50-percent chance of winning a cat
   - a 10-percent chance of winning a cat

   What non-compound lottery does Lottery L reduce to? Show your work.

   answer:

   possible prizes: dog, cat

   dog probability $= \left(\frac{6}{10}\right)\left(\frac{8}{10}\right) + \left(\frac{3}{10}\right)\left(\frac{5}{10}\right) + \left(\frac{1}{10}\right)(0) = \frac{48}{100} + \frac{15}{100} + 0 = \frac{63}{100}$

   cat probability $= \left(\frac{6}{10}\right)\left(\frac{2}{10}\right) + \left(\frac{3}{10}\right)\left(\frac{5}{10}\right) + \left(\frac{1}{10}\right)(1) = \frac{12}{100} + \frac{15}{100} + \frac{10}{100} = \frac{37}{100}$

   So, Lottery L reduces to the non-compound lottery comprising a 63-percent chance of winning a dog and a 37-percent chance of winning a cat, which can be written L(63/100, dog, cat).

6. What is the role of the continuity condition in the proof of the representation theorem?

   answer:

   It facilitates the prediction of the chooser's preference regarding any two options by identifying, for any prize comprised by the options being compared, an equally desirable lottery involving only the chooser's most-preferred prize and least-preferred prize.

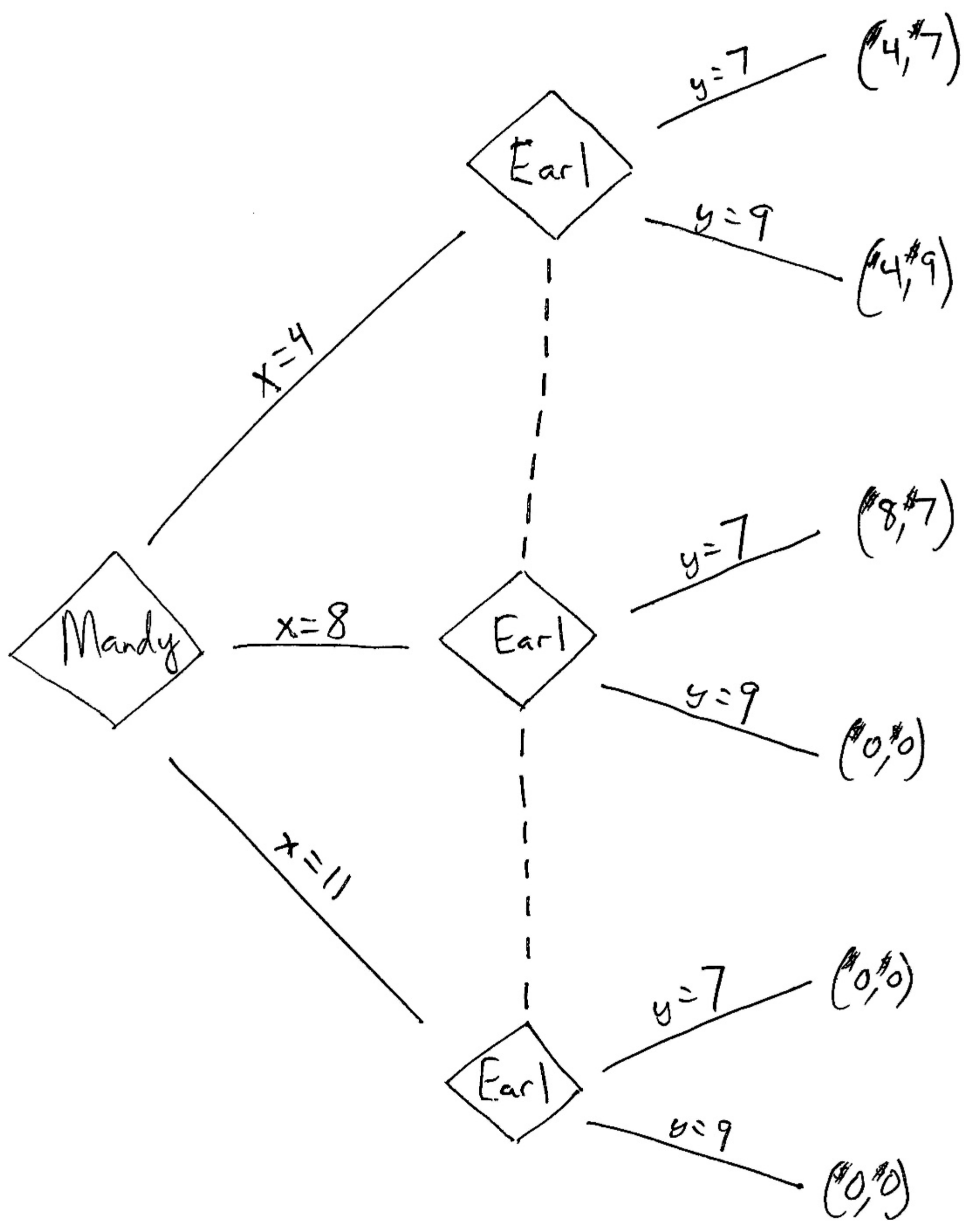
For questions 7 and 8, assume the following:

> Mandy can choose either $x = 4$ or $x = 8$ or $x = 11$. Then Earl, not knowing Mandy's choice, can choose either $y = 7$ or $y = 9$. If $x + y > 16$, each player gets \$0; otherwise, Mandy gets \$$x$ and Earl gets \$$y$.

Also, when answering questions 7 and 8, when stating the outcomes, you do not have to write the players' names – you can just write ordered pairs of payoffs where the first payoff is Mandy's and the second is Earl's.

7. Draw a tree for this game.

   answer:



8. Draw a matrix (or matrices, if necessary) for this game.

answer:

		Earl	
		y = 7	y = 9
	x = 4	(\$4, \$7)	(\$4, \$9)
Mandy	*x* = 8	(\$8, \$7)	(\$0, \$0)
	x = 11	(\$0, \$0)	(\$0, \$0)

9. Analyze the following game using dominance considerations and state the strategy pair that results from that analysis.

	C_1	C_2	C_3	C_4
R_1	4, −4	8, −8	5, −5	1, −1
R_2	6, −6	7, −7	5, −5	6, −6
R_3	4, −4	3, −3	3, −3	5, −5

answer:

First, eliminate R_3 and C_2:

	C_1	C_2	C_3	C_4
R_1	4, −4	8, −8	5, −5	1, −1
R_2	6, −6	7, −7	5, −5	6, −6
R_3	4, −4	3, −3	3, −3	5, −5

Second, eliminate R_1 and C_1:

	C_1	C_2	C_3	C_4
R_1	4, −4	8, −8	5, −5	1, −1
R_2	6, −6	7, −7	5, −5	6, −6
R_3	4, −4	3, −3	3, −3	5, −5

Third, eliminate C_4:

	C_1	C_2	C_3	C_4
R_1	4, −4	8, −8	5, −5	1, −1
R_2	6, −6	7, −7	5, −5	6, −6
R_3	4, −4	3, −3	3, −3	5, −5

The remaining strategy pair is (R_2, C_3).

10. The following is a zero-sum game written using condensed notation. Analyze it using dominance considerations and state the strategy pair that results from that analysis.

	C_1	C_2	C_3
R_1	2	3	9
R_2	6	5	8

answer:

First, eliminate C_3:

	C_1	C_2	C_3
R_1	2	3	9
R_2	6	5	8

Second, eliminate R_1:

	C_1	C_2	C_3
R_1	2	3	9
R_2	6	5	8

Third, eliminate C_1:

	C_1	C_2	C_3
R_1	2	3	9
R_2	6	5	8

The remaining strategy pair is (R_2, C_2).

Instructions, revisited:

As stated in item 3 of the instructions, turn in this list of questions along with your answer sheets.