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University of Kansas, Fall 2021
Philosophy 666: Rational Choice Theory
October 1, 2021

test 1 – 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:

1. Suppose there are four items – a, b, c, and d – and Nithon has the preferences a P d, b P d, and c P d (and no other preferences). Are Nithon's preferences complete? Why or why not?

   answer:

   No, because Nithon's preferences do not address any of the following pairs of items: {a, b}, {a, c}, {b, c}.

2. Which of the following is the purpose of the small-improvement argument?

   (a) to defend the completeness condition against the objection that some incompleteness in a person's preferences is not necessarily irrational

   (b) to defend the completeness condition against objections based on small differences between some items' levels of desirability

   (c) to oppose the completeness condition on the grounds that when two items differ in a sufficiently small way, they are equally desirable

   (d) to oppose the completeness condition by rebutting the claim that if a person does not prefer one item to another, and does not prefer the second item to the first, then they must be indifferent between the two items

   answer: d

3a. Suppose there are three items – a, b, and c – and Luke has the preferences a P c and b P c. Does the transitivity condition require that Luke have any additional preference? If so, what is that additional preference?

   answer:

   No, it does not. The two preferences given do not suggest any preference between a and b that the transitivity condition would require that Luke hold.

3b. Suppose there are three items – *a*, *b*, and *c* – and Ilar has the preferences *a* P *b* and *b* I c. Does the transitivity condition require that Ilar have any additional preference? If so, what is that additional preference?

answer:

Yes – *a* P *c*.

4. Suppose Tina has the preferences *a* P *b*, *b* P *c*, and *c* P *a*, and she has item *a*. What is an offer that you could make to her that would be strong evidence that you intended to use her as a money pump?

answer:

"I see that you have item *a*. If you give me that and 5 cents, I will give you item *c*."

5a. Suppose Ilsa's preferences are accurately represented by the following interval utility function:

x	*u*(*x*)
a	18
b	15
c	9
d	4

What is another interval utility function that accurately represents Ilsa's preferences?

answer: the following, or any positive linear transformation of the utilities given above:

x	*u*(*x*)
a	180
b	150
c	90
d	40

5b. What is the general rule for determining whether two different interval utility functions both represent the same preferences, or convey the same information about a set of preferences? (In other words, what is the general rule for determining whether an answer to question 5a is correct?)

answer:

The two different interval utility functions must be positive linear transformations of each other. That is, each must be derivable from the other by a transformation of the form $u'(x) = au(x) + b$, where $a > 0$ (and b can be positive, negative, or 0).

6. Suppose Kent is choosing between tennis and bowling, for an afternoon activity. The outcome if he chooses tennis depends on whether the puddles on the tennis courts from the recent rain have evaporated. The outcome if he chooses bowling depends on whether the bowling alley has good air conditioning. If you were to set up a standard choice matrix for this situation, with the row headings corresponding to Kent's options and the column headings corresponding to the possible states of the world, which of the following would be the heading for one of the columns in your matrix?

   (a) 'puddles have evaporated'

   (b) 'puddles have evaporated and there is good air conditioning'

   (c) 'go bowling'

   (d) 'go bowling and good air conditioning'

   answer: b

7. What objection to the maximin rule do you find most compelling? Be sure to clearly describe the aspect of the maximin rule that makes it vulnerable to the objection that you mention.

   answer: There are many possible correct answers, but here is one:

   A compelling objection is that the maximin rule disregards all information about the options' possible outcomes except for the information about each option's worst possible outcome. This can lead to questionable recommendations. For example, an option with possible utilities 100, 200, 300 would be recommended as superior to an option with possible utilities 99, 400, 500.

The following choice matrix is for questions 8–10.

	S_1	S_2	S_3
A_1	5	8	4
A_2	6	3	1
A_3	9	2	7

8. Which option(s) would be recommended by the optimism-pessimism rule, with an optimism index of 2/3? Show your calculations of the α-indexes of the options. (You do not have to reduce any fractions.)

   answer:

   $$\alpha\text{-index for } A_1 = \left(\frac{2}{3}\right)(max) + \left(1 - \frac{2}{3}\right)(min) = \left(\frac{2}{3}\right)(8) + \left(\frac{1}{3}\right)(4) = \frac{16}{3} + \frac{4}{3} = \frac{20}{3}$$

   $$\alpha\text{-index for } A_2 = \left(\frac{2}{3}\right)(max) + \left(1 - \frac{2}{3}\right)(min) = \left(\frac{2}{3}\right)(6) + \left(\frac{1}{3}\right)(1) = \frac{12}{3} + \frac{1}{3} = \frac{13}{3}$$

   $$\alpha\text{-index for } A_3 = \left(\frac{2}{3}\right)(max) + \left(1 - \frac{2}{3}\right)(min) = \left(\frac{2}{3}\right)(9) + \left(\frac{1}{3}\right)(2) = \frac{18}{3} + \frac{2}{3} = \frac{20}{3}$$

   A_1 and A_3 have the highest α-index, so the optimism-pessimism rule would recommend both of those options equally.

9. Which option(s) would be recommended by the minimax regret rule? Show the regret matrix and how you can use it to identify the option(s) that would be recommended by the minimax regret rule.

   answer:

   regret matrix (with an additional column):

	S_1	S_2	S_3	maximum regret for each option:
A_1	4	0	3	(4)
A_2	3	5	6	6
A_3	0	6	0	6

   The smallest maximum regret is circled. Because it is in the row for A_1, that is the option that the rule would recommend.

10. Which option(s) would be recommended by the rule of maximizing expected utility using the principle of insufficient reason? Show your calculations of the expected utilities of the options, or mathematically equivalent calculations that you may choose to use instead. (Either way, you do not have to reduce any fractions.)

    answer:

$$\mathrm{EU}(A_1) = \left(\frac{1}{3}\right)(5) + \left(\frac{1}{3}\right)(8) + \left(\frac{1}{3}\right)(4) = \frac{5}{3} + \frac{8}{3} + \frac{4}{3} = \frac{17}{3}$$

$$\mathrm{EU}(A_2) = \left(\frac{1}{3}\right)(6) + \left(\frac{1}{3}\right)(3) + \left(\frac{1}{3}\right)(1) = \frac{6}{3} + \frac{3}{3} + \frac{1}{3} = \frac{10}{3}$$

$$\mathrm{EU}(A_3) = \left(\frac{1}{3}\right)(9) + \left(\frac{1}{3}\right)(2) + \left(\frac{1}{3}\right)(7) = \frac{9}{3} + \frac{2}{3} + \frac{7}{3} = \frac{18}{3}$$

   A_3 has the highest expected utility, so it is the option that the rule of maximizing expected utility using the principle of insufficient reason would recommend.

Instructions, revisited:

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