University of California, Davis -- Department of Economics

**ECON 106 : DECISION MAKING** Professor Giacomo Bonanno

**SPRING 2025 - FIRST MIDTERM EXAM** **Version 1**

Answer all questions. **If you don't explain (= show your work for) your answers you will get no credit.**

**NAME:_____ University ID:_____**

**CIRCLE THE NAME OF YOUR TA:**

Zander Memon or Alec Navori or Laurin Curschellas

**or** write your Discussion Section number: _____

- **By writing your name on this exam you certify that you have not violated the University's Code of Academic Contact** (for example, you have not copied from the work of another student and you have not knowingly facilitated cheating by another student).

- **If you submit the exam without writing your name and ID, you will get a score of 0 for this exam.**

- **If you do not stop writing when told so (at the end), a penalty of 10 points will be deducted from your score.**

**1.** [19 points] Seth is facing the following decision problem:

| state → | $s_1$ | $s_2$ |
|---|---|---|
| act ↓ | | |
| *a* | $z_1$ | $z_2$ |
| *b* | $z_3$ | $z_4$ |

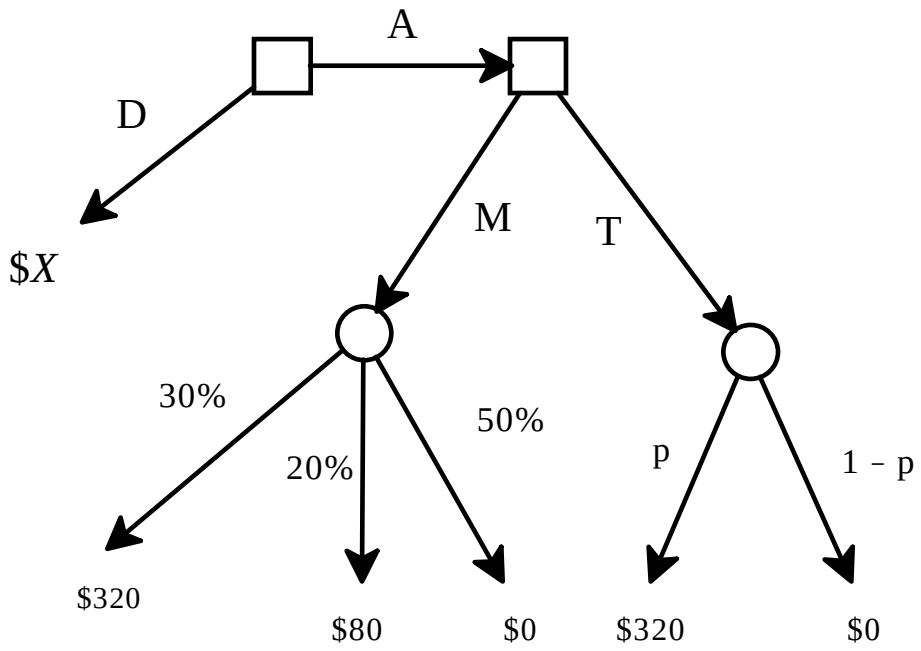
He says that **act *a* weakly (but not strictly) dominates act *b***.

**(a)** [9 points] Below is a list of complete and transitive rankings of the set of outcomes $\{z_1, z_2, z_3, z_4\}$. Circle all those (and only those) that are compatible with the information given above.

1. $z_1 \succ z_2 \succ z_3 \succ z_4$
2. $z_1 \succ z_3 \succ z_2 \succ z_4$
3. $z_1 \succ z_4 \succ z_3 \sim z_2$
4. $z_1 \sim z_2 \succ z_3 \sim z_4$
5. $z_4 \succ z_1 \sim z_2 \succ z_3$
6. $z_2 \succ z_1 \succ z_3 \sim z_4$
7. $z_1 \sim z_3 \succ z_2 \succ z_4$
8. $z_2 \succ z_1 \sim z_3 \succ z_4$
9. $z_2 \succ z_1 \sim z_3 \sim z_4$

**(b)** [10 points] Suppose that Seth adds the following information: if he knew that the state were $s_1$ then he would *strictly* prefer choosing act *a* rather than act *b*. Find all the possible complete and transitive rankings of the set of outcomes that are compatible with this additional information. [Do **not** restrict attention to the rankings listed in Part (a).]

**2.** [30 points] Julia faces the decision problem represented by the following tree. Julia prefers more money to less and is risk neutral.




**(a)** [8 points] If Julia told you that if she decided to choose *A* then she would follow with *T*, what would you be able to infer about the value of *p*?

**(b)** [8 points] If Julia told you that if $p = 40\%$, then she would choose *D*, what would you be able to infer about the value of *X*?

**(c)** [8 points] Suppose that $X = 120$. Find Julia's optimal decision for every possible value of $p$.

**(d)** [6 points] Suppose that $p = 20\%$. Find Julia's optimal decision for every possible value of $X$.

**3.** [35 points] Consider the following decision problem:

| states → / acts ↓ | $s_1$ | $s_2$ | $s_3$ |
|---|---|---|---|
| $a_1$ | $z_1$ | $z_2$ | $z_3$ |
| $a_2$ | $z_4$ | $z_5$ | $z_6$ |
| $a_3$ | $z_7$ | $z_8$ | $z_9$ |
| $a_4$ | $z_{10}$ | $z_{11}$ | $z_{12}$ |

The agent's ranking of the outcomes is as follows (where $\succ$ means 'better than' and $\sim$ means 'just as good as'):

$$z_6 \succ z_{12} \succ z_9 \succ z_4 \succ z_3 \succ z_8 \succ z_2 \sim z_{11} \succ z_5 \sim z_{10} \succ z_7 \succ z_1$$

**(a)** [10 points] Find two actions such that one strictly dominates the other. State which one dominates the other. [Write your answer below]

**(b)** [10 points] Find two actions such that one weakly (but not strictly) dominates the other. State which one dominates the other. [Write your answer below]

**(c)** [8 points] Find the Maximin solution. [Write your answer below]

**(d)** [7 points] Find the Leximin solution. [Write your answer below]

**4.** [16 points] Bob's von Neumann-Morgenstern utility function is $U(\$x) = \sqrt{x}$. He faces the following decision problem:

| probability | $\frac{1}{6}$ | $\frac{3}{6}$ | $\frac{2}{6}$ |
|---|---|---|---|
| state $\rightarrow$ | $s_1$ | $s_2$ | $s_3$ |
| act $\downarrow$ | | | |
| $A$ | \$25 | \$100 | \$16 |
| $B$ | \$64 | \$81 | \$9 |
| $C$ | \$4 | \$36 | \$49 |

**(a)** [9 points] What act will **Bob** choose? Explain your answer. [Write your answer below.]

**(b)** [7 points] Find Bob's **normalized** utility function for the sums of money in the above table. [Write your answer below.]