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: Jou-Chun Lin or Denis Sosinskiy

If you don’t know the name of your TA, then circle your Section:

A01, Tuesday 5-6    A02, Tuesday 6-7    A03, Tuesday 7-8    A04, Tuesday 8-9

- 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.

Answer all questions. If you don’t explain your answers you will get no credit.
1. [50 points] Consider the following decision problem, where \( a, b, c \) and \( d \) are acts and \( s_1, s_2, s_3 \) and \( s_4 \) are states. The outcomes, as you see, are sums of money. Consider an individual who prefers more money to less.

<table>
<thead>
<tr>
<th></th>
<th>( s_1 )</th>
<th>( s_2 )</th>
<th>( s_3 )</th>
<th>( s_4 )</th>
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<tbody>
<tr>
<td>( a )</td>
<td>$9</td>
<td>$5</td>
<td>$8</td>
<td>$3</td>
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<tr>
<td>( b )</td>
<td>$10</td>
<td>$5</td>
<td>$9</td>
<td>$4</td>
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<tr>
<td>( c )</td>
<td>$12</td>
<td>$2</td>
<td>$8</td>
<td>$3</td>
</tr>
<tr>
<td>( d )</td>
<td>$10</td>
<td>$6</td>
<td>$9</td>
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(a) [24 points] In the expressions below of the form \( x \) \( \boxdot \) \( y \) inside the box write either the symbol \( \succ \) if act \( x \) strictly dominates act \( y \), or the symbol \( \succeq \) if act \( x \) weakly dominates act \( y \), or the symbol \( \times \) if act \( x \) does not dominate act \( y \):

\[
\begin{array}{cccc}
  a & b & a & c \\
  a & d & b & c \\
  b & a & c & a \\
  c & b & d & a \\
  d & b & d & c \\
\end{array}
\]

(b) [2 points] Is there an act which is weakly dominant? If your answer is Yes name the act.

(c) [2 points] Is there an act which is strictly dominant? If your answer is Yes name the act.

(d) [2 points] Find the MaxiMin solution.

(e) [3 points] Find the LexiMin solution.

(f) [12 points] Suppose that the individual is risk neutral and attaches the following probabilities to the states: \( P(s_1) = \frac{3}{16}, P(s_2) = \frac{1}{16}, P(s_3) = \frac{7}{16}, P(s_4) = \frac{5}{16} \). What act will she choose? Justify your answer.

\[
\begin{array}{cccc}
  s_1 & s_2 & s_3 & s_4 \\
  e & $11 & $1 & $7 & $2 \\
\end{array}
\]

(g) [5 points] Suppose that we added one more act, namely the following: \( e \) \( \$11, \$1, \$7, \$2 \). Which of the answers to parts (b), (c), (d), (e) and (f) would change? [You don’t need to explain how they would change, just state if they would change.]
2. [20 points] Corey faces the decision problem represented by the following decision tree. Corey prefers more money to less money and is risk neutral.

![Decision Tree Diagram]

(a) [8 points] Suppose that \( p = \frac{1}{2} \) and \( q = \frac{1}{2} \). If Corey says that he is taking action R, what can you infer about the value of \( X \)?

(b) [8 points] Suppose that \( X = 35 \) and \( p = \frac{1}{3} \). For what values of \( q \) would Corey choose action R?

(c) [4 points] If \( X = 35 \) and \( p = q = \frac{1}{3} \) what will Corey do?
3. [30 points] The set of alternatives is \( Z = \{A, B, C, D, E, F\} \). It has been observed that, when the available alternatives were B, C and F Amy chose C. We express this by saying that the observation was \( \{B, C, F\}, C \). The following is a list of observations concerning Barbara:

\[

Barbara tells us that during the observation period her preferences did not change and that she is not indifferent between any two alternatives (she always prefers one alternative to another).

(a) [18 points] Find a complete and transitive preference relation that rationalizes the above observations (one is enough: no need to find them all). Justify your answer.

(b) [6 points] Write a utility function that represents Barbara's preferences, using consecutive positive integers, starting from 1.

(c) [6 points] Assuming that Barbara is rational, if she had been faced with a choice from the set \( \{A, B, E\} \), what would she have chosen?