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Department of Statistics
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Theory and Methodology of Statistical Science

WRITTEN EXAMINATION
Thursday June 1, 2023

Allowed tools: Calculator.

There are seven questions worth 40 points in total.

For the maximum number of points on each problem detailed, well motivated and clear solutions are required.

1. (5p) The concept of objectivity is highly related to science. How would you define objectivity in this context and, further, intersubjectivity?

2. (5p) Describe shortly inductive reasoning in science and its shortcomings. What is the connection with abduction?

3. (6p) The classical inference theory has been criticized on several accounts. Describe shortly three of them.

4. (6p) What is the Fundamental Problem of Causality? Use appropriate notation. Also, mention three issues that are important to take into account in order to support a hypothesis of a causal relationship.

5. (6p) Describe the Infinite Lottery Example in detail and stress what deFinetti wanted to show with it.

6. (6p) In one envelope there is an amount of b monetary units and in another $2b$ monetary units. You draw one envelope at random and find 64 monetary units. If you were allowed, would you take the other envelope instead? (You cannot have both.)

7. (6p) Suppose the parameter of interest is the probability $0 < p < 1$, where p denotes the probability that a particular coin will land "heads" when it is flipped. One possible experiment consists of flipping the coin 20 times and recording the number of heads. Another experiment consists of flipping the coin until the seventh head occurs and recording the number of tails before the seventh head. Now suppose the experimenter uses a random number table to choose between these two experiments, happens to choose the second one and collects data consisting of the seventh head occuring on trial 20.

   Comment on this situation using the different principles of statistical inference.