

Questions for Exam 1

Scientific Thought II

Spring 2010

Exam 1 will consist of a selection of these questions.

1. According to Hume: (a) what are beliefs about the future based on? (b) which part of this basis can't be justified and why can't it be justified? (c) why are all beliefs about the future unjustified?
2. Did Hume think we should stop having beliefs about the future? Support your answer with a quotation from Hume.
3. According to Hume, what is the principle of human nature that causes us to have beliefs about the future? Give an example of how this cause can produce a belief about the future.
4. Explain what it means for a statement to be analytic or synthetic and give an example of each kind of statement.
5. State one similarity and two differences between Popper and Hume on induction.
6. Compare and contrast Popper's view of scientific method with the method of hypothesis (as advocated, for example, by Descartes).
7. What are Popper's requirements for an acceptable theory in empirical science? Explain what each requirement means.
8. Why can't theories be falsified deductively? What is the methodological rule that Popper introduced to ensure that theories can be falsified?
9. Can Popper's scientific method ever require a true theory to be regarded as false? Explain.
10. On Popper's account of science, is there any justification for believing that the theories accepted in science are true or that the theories rejected by science are false? Explain.
11. Do good scientists behave in accordance with Popper's rules of scientific method? Support your answer with an example.
12. What must happen in order for scientists to give up a paradigm, according to Kuhn?
13. Can the following claims of Kuhn be explained in terms of what is probable given the evidence? Justify your answers.
 - (a) Anomalies normally don't cause a paradigm to be abandoned.
 - (b) Severe and prolonged anomalies cause a sense of crisis.
 - (c) Paradigms aren't abandoned without a better alternative.

14. How would Laplace determine the possibility of a coin landing heads (a) a priori, (b) a posteriori, and (c) by considering reasons we have? What kind of possibility is determined by each method?
15. Why are absolute possibilities not always 0 or 1, according to Laplace? Why do relative possibilities often differ from absolute possibilities?
16. A die will be tossed twice. What is the probability that it will land six each time given (a) the die is fair, (b) the die is biased but the direction of the bias is unknown? Justify your answers.
17. Laplace said “there is only probability relative to us.” Is that correct? Justify your answer.
18. According to Keynes:
 - (a) What does it mean to say that the probability of a given h is α ?
 - (b) In what sense is it true that probability is subjective? In what sense is this not true?
19. Does Keynes think probability theory is part of logic? What is his reason?
20. Give an example of probabilities that Keynes would say are comparable but not measurable.
21. Give two reasons why, according to Keynes, the probability that you will live to be 70 years old cannot be measured by collecting statistical data.
22. Give an example of probabilities that Keynes would say are not comparable.
23. What is the Principle of Indifference?
24. The Principle of Indifference has sometimes been used to argue that if a is a proposition about which we have no relevant external evidence then the probability of a is $1/2$. Is this conclusion correct? Justify your answer.
25. Suppose we are given that an urn contains two balls, each of which may be either black or white. Describe two different ways that the Principle of Indifference can be applied to this situation. What is the probability of the following propositions according to these two ways?
 - (a) Both balls are white.
 - (b) One ball is white and one is black.
 - (c) Both balls are black.
 - (d) The second ball is white.
 - (e) The second ball is white given that the first is white.
26. What is “relevant evidence”? According to Keynes, if you have relevant evidence for one alternative, what must be true in order to legitimately apply the Principle of Indifference?
27. In which of the following cases would Keynes allow that the Principle of Indifference can be used to infer that the probability that a book is red is $1/2$? Explain.
 - (a) You have no relevant external evidence.
 - (b) You know that the book is either red or blue and nothing else.

28. If you have no relevant external evidence about the color of a book, is the probability the book is red greater than, equal to, or less than $1/3$? Justify your answer.
29. For problems involving balls that may be either black or white, did Keynes believe that the Principle of Indifference can be applied to ratios or constitutions? How did he argue for his view? Is his argument cogent? Explain.
30. Describe a situation in which the inductive probability of a die landing six, given the available evidence, is (a) the same as its physical probability, (b) different to its physical probability.
31. “Probability measures the confidence that a particular individual has in the truth of a particular proposition” (Leonard J. Savage, *The Foundations of Statistics*, p. 3). Is this a correct account of inductive probability? Justify your answer.
32. Give an example of an elementary sentence for inductive probability in which the hypothesis is that it will rain tomorrow.
33. What does it mean for a function to be logical? Is inductive probability logical? Justify your answer to the latter question.
34. Suppose you were to reason as follows: “Only a small proportion of people live to be 100 years old, so I will probably not live to be 100 years old.”
 - (a) How would your inference be represented in the standard model of inductive inference? State a criticism of this representation.
 - (b) How would your inference be represented in the probabilistic model of inductive inference?
35. Hume and Popper claimed that inductive inferences are based on a synthetic assumption that hasn’t been observed to be true. Were they right? Justify your answer.
36. Explain the difference between an experiment token and an experiment type; illustrate your answer with an example.
37. What is determinism? If determinism is true, does it follow that all pps are 0 or 1? Explain why, or why not.
38. State SP and its corollary.
39. Let X = tossing a fair coin, O = the coin lands heads. (a) Prove that $pp_X(O)$ doesn’t exist, if nothing further is assumed about X . (b) Describe what could be added to X to make it true that $pp_X(O) = 1/2$.
40. If X = placing a die on a table in whatever way one wants and O = the die is placed with six facing up, does $pp_X(O)$ exist? Explain why, or why not.
41. State the definition of favoring and the law of likelihood.
42. For each of the following, say which (if either) of H_1 and H_2 is favored by E . Justify your answers using either the definition of favoring or the law of likelihood.
 - (a) $p(H_1|E) = 0.7$, $p(H_2|E) = 0.2$, $p(H_1) = 0.5$, $p(H_2) = 0.1$.
 - (b) $p(E|H_1) = 0.7$, $p(E|H_2) = 0.2$, $p(H_1) = 0.5$, $p(H_2) = 0.1$.

- (c) A ball is drawn from an urn. $H_1 = 10\%$ of the balls in the urn are black, $H_2 = 20\%$ of them are black, $E =$ the ball drawn is black.
- (d) A die is tossed. $H_1 =$ it came up 4 or 6, $H_2 =$ it came up 2, $E =$ it came up even.
43. Let $T =$ Ptolemy's claim that the sun and planets orbit the earth on epicycles, $C =$ Copernicus's claim that the earth and other planets orbit the sun. Which of these is favored by the following pieces of evidence? Justify your answer using the law of likelihood; draw diagrams as appropriate.

E_1 : Mercury and Venus always appear close to the sun.

E_2 : The superior planets are closest to the earth when in opposition to the sun.