Problem Set 1: Basics

Answer in complete sentences. Due by February 7th at 8pm.

1. Define each of the following terms as accurately as you can. Use your own words if possible, and give examples where helpful.

    a. **Proposition**
    b. **Disjunction**
    c. **Validity**
    d. **Argument**
    e. **Intersection**
    f. **Soundness**
    g. **Premise**
    h. **Inductive Reasoning**
    i. **Additivity**

2. For each of the arguments below, assess whether or not they are ***valid***. For the invalid arguments, describe a possible state of affairs in which all the premises would be true, but the conclusion false.

    a. P1. All bears are brown or black.
    P2. Joe is not brown.
    C. So, either Joe is black or he is not a bear.

    b. P. Everybody loves their mother.
    C. So, there is somebody that everybody loves.

    c. P1. Either Joe owns a red hat and a red coat or he owns a blue hat and a blue coat.
    P2. Joe owns a red hat.
    C. So, Joe owns a red coat.

    d. P1. Anybody who loves somebody is loved by everyone.
    P2. Romeo loves Juliet
    C. So, everyone loves Juliet.

    e. P1. If Agnes is thoughtless, then she does mischief.
    P2. But Agnes does mischief only if she is bored.
    P3. Agnes is thoughtless but not bored.
    C. So, Agnes is a thoughtless hippo.

3. This is a question about ***probabilisitic independence***.

   a. Write down the mathematical definition of probabilistic independence.

   b. Three normal six-sided dice A, B, and C are about to be thrown. Which of the following pairs of events have independent ***chances*** of being realised? Explain, in each case, why these chances are or aren't independent. Do **not** assume the dice are fair.

      i. *Die A and C land on a 5* and *Die B lands on a 5*
      ii. *Die A beats die B* and *Die B beats die C*
      iii. *Die B beats die A* and *Die A lands on an even number*

   c. Assuming the dice *are* fair, check that your answers in (b) conform to the mathematical definition of independence, by calculating the probability of each of the six events and each of the three conjunctions of events.

   d. A coin is about to be tossed ten times. Which of these pairs of events should you have independent ***credences*** about? Explain your answers. Do **not** assume the coin is fair.

      i. *Five out of ten tosses land Heads* and *The first toss lands Heads*
      ii. *The first six tosses land Heads* and *The seventh toss lands Heads*
      iii. *Three Heads in the first six tosses* and *Two Heads in the final four*

   e. Give an intuitive, non-mathematical characterisation of what it takes for two events to be probabilistically independent. Would you characterise independent *chances* differently from independent *credences*? Explain.

4. [Do this exercise ***before*** you do next week's reading.] Most of our beliefs about the world are not formed on the basis of direct experience, but through ***testimony***: they are based on information that has been communicated to us by other people, either in conversation, books, newspapers, the internet etc. In *On Miracles*, David Hume gave an informal, probability-based argument that you should not believe in miracles on the basis of testimony:

   P1. It is rational to believe *p* on the basis of testimony only if the proposition that *p* is *more probable* than the proposition that the testimony in is either mistaken or fabricated.
   P2. A miracle is by definition an extremely improbable event.
   P3. Given that miracle reports are quite often fabricated, and given people's known propensity to believe in supernatural things, it is never extremely improbable that a report of a miraculous appearance is in some way mistaken or fabricated.
   C1. So, it is never rational to believe in miracles on the basis of testimony.

   a. Is this a ***valid*** argument?
   b. Is the argument ***sound***? Give reasons.

c. Hume's contemporary Richard Price raised the following sort of objection against the first premise of Hume's argument:

P4. It is rational to believe, based on a report printed in a 99.9% reliable newspaper, that the winning lotto numbers are 18-23-38.
P5. In this case, the probability that the newspaper made a mistake is 1/1,000, whereas the probability of the event reported is only 1/1,000,000
C2. So, it is sometimes rational to believe p on the basis of testimony, even if the proposition that p is less probable than the proposition that the testimony in question is either mistaken or fabricated.

Do you find Price's objection persuasive? If not, explain why not. If you do find it persuasive, can you think of any way in which Hume's first premise may be restated to avoid this objection?