Some Probability

Coin Tosses

1. In a study on how people perceive probability, Kahneman and Tversky asked subjects: "Which of the following two sequences is more likely: 'HTHTTH' or 'HHHTTT'?" Most people will say the first sequence. Why do you think they say this?

2. If a fair coin is tossed three times there will be 0, 1, 2, or 3 heads. How likely is each of these four possibilities?

Beyond a reasonable doubt

A judge's charge to a jury might by like the following issued by Judge Weinstein:

> "If you entertain a reasonable doubt as to any fact or element necessary to constitute the defendant's guilt, it is your duty to give him the benefit of that doubt and return a verdict of not guilty. Even where the evidence demonstrates a probability of guilt, if it does not establish such guilt beyond a reasonable doubt, you must acquit the accused. This doubt, however, must be a reasonable one; that is one that is founded upon a real tangible substantial basis and not upon mere caprice and conjecture. It must be such doubt as would give rise to a grave uncertainty, raised in your mind by reasons of the unsatisfactory character of the evidence or lack thereof. A reasonable doubt is not a mere possible doubt. It is an actual substantial doubt. It is a doubt that a reasonable man can seriously entertain. What is required is

not an absolute or mathematical certainty, but a moral certainty."
State v. Cage, 554 So.2d 39, 41 (La. 1989)

1. Do you feel a moral certainty that if you roll three dice, you will not roll three 6's?

2. Does it make sense to assign an actual probability to the notion of a reasonable doubt? If so, what probability would you assign?

3. Do you suppose that juries are ever really told what probability to associate to the phrase 'reasonable doubt'?

4. What percent of the people on death row do you think are innocent?

5. In an article about the trial of John Bertsch and Jeffrey Hronis accused of a 1985 kidnap, rape and murder case we read:

   > "The FBI's DNA tests in 1989 showed that the chances of a match were 1 in 12 million for Bertsch and 1 in 8 million for Hronis. In a re-testing in 1992 the FBI came up with 1 in 16,000 for Hronis and 1 in 200 for Bertsch."

   Would the 1989 tests have satisfied "beyond a reasonable doubt"? What about the 1992 tests?