Conditional probability

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- How is the conditional probability that $X = 1$ given $Y = 2$ calculated?

- In introducing this definition I said we needed two functions. Explain in your own words why two functions are required in order to understand conditional probability. What purposes do these functions serve?

- Explain what we mean when we say that a set of subsets are disjoint. Explain why the set of outcomes for which the random variable, X, equals one must be disjoint from the set of outcomes for the set of outcomes for which the random variable X equals 2. Hint: what is the conditional probability $P(X = 1|X = 2)$ equal to?

- The inclusion exclusion principle is an important result in probability theory. It states $P(X = 1 \vee Y = 2) = P(X = 1) + P(Y = 2) - P(X = 1 \wedge Y = 2)$. Explain why this equation holds by drawing a Venn diagram or by considering a finite set.