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We denote the event

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We denote the event that there are 3 sixes

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We denote the event that there are 3 sixes in 8 rolls by A ,

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We denote the event that there are 3 sixes in 8 rolls by A , the event that there are 2 sixes in the first 5 rolls by B .

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We denote the event that there are 3 sixes in 8 rolls by A , the event that there are 2 sixes in the first 5 rolls by B . The probability in question is

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We denote the event that there are 3 sixes in 8 rolls by A , the event that there are 2 sixes in the first 5 rolls by B . The probability in question is $P(B|A)$.

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We denote the event that there are 3 sixes in 8 rolls by A , the event that there are 2 sixes in the first 5 rolls by B . The probability in question is $P(B|A)$. Using the general formula for conditional probabilities

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$$P(B|A)$$

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$$P(B|A) = \frac{P(B \cap A)}{P(A)}$$

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By the multiplication rule we get

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Now the probability of $P(A)$ is given by

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$$P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{P(A|B)P(B)}{P(A)}$$

Now the probability of $P(A)$ is given by the binomial distribution

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Now the probability of $P(A)$ is given by the binomial distribution page 81,

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Now the probability of $P(A)$ is given by the binomial distribution page 81, as is $P(B)$

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Now the probability of $P(A)$ is given by the binomial distribution page 81, as is $P(B)$ and $P(A|B)$ (the latter is the probability of getting 1 six in 3 rolls).

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$$P(B|A) = \frac{P(2 \text{ sixes in } 5 \text{ rolls})P(1 \text{ six in } 3 \text{ rolls})}{P(3 \text{ sixes in } 8 \text{ rolls})}$$

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a hypergeometric probability. The result generalizes. If we have x successes in n trials then the probability of having $y \leq x$ successes in $m \leq n$ trials is given by

$$\frac{\binom{m}{y} \binom{n-m}{x-y}}{\binom{n}{x}}$$

The probabilities do not depend on p .