Assignment 1

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1) Probability that A speaks truth is $\frac{4}{5}$. A coin is tossed. A reports that a head appears. The probability that actually there was head is
   a) $\frac{4}{5}$
   b) $\frac{1}{2}$
   c) $\frac{1}{5}$
   d) $\frac{2}{5}$

   Solution: Let E denote the event that person A speaks truth, then we have

$$\Pr(E) = \frac{4}{5} \tag{0.0.1}$$

   Let X denote the event of occuring a head when a coin is tossed. The probability of getting head is $\frac{1}{2}$, whether A speaks truth or not

$$\Pr(X \mid E) = \frac{1}{2} \tag{0.0.2}$$

   The probability that actually there was head, when A reports that a head appears is,

$$\Pr(E \mid X) = \frac{\Pr(EX)}{\Pr(X)} \tag{0.0.3}$$

$$= \frac{\Pr(E)\Pr(X \mid E)}{\Pr(X)} \tag{0.0.4}$$

$$= \frac{\frac{4}{5} \times \frac{1}{2}}{\frac{1}{2}} \tag{0.0.5}$$

$$= \frac{4}{5} \tag{0.0.6}$$