Father of lies

Question: A father claims about snowfall last night. First daughter tells that the probability of snowfall on a particular night is 1/8. Second daughter tells that **5 out of 6 times the father is lying**! What is the probability that there actually was a snowfall?

Solution: Let S = there was a snowfall and C = father claims about a snowfall.

Note that 5 out 6 times the father is lying **is a conditional probability**: $P(C|S) = 1/6$ and $P(C|\text{not } S) = 5/6$.

$$\begin{aligned} P(S|C) &= \frac{P(S,C)}{P(C)} \\ &= \frac{P(C|S) \times P(S)}{P(C|S) \times P(S) + P(C|\text{not } S) \times P(\text{not } S)} \\ &= \frac{1/6 \times 1/8}{1/6 \times 1/8 + 5/6 \times 7/8} \\ &= 1/36 \end{aligned}$$