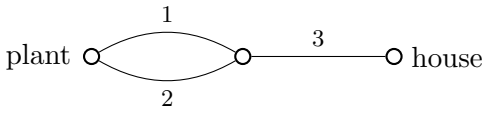
An electric plant is connected to a house through three power lines as in the diagram. A typhoon destroys each power line independently with probability 30%. What is the probability that the house loses power?



Solution: Let S_i be the event that line i survives the typhoon, and S be the event that the house remains powered. Then $S = (S_1 \cup S_2) \cap S_3$. By independence

$$\begin{aligned}
\mathrm{P}(S) &= \mathrm{P}(S_1 \cup S_2)\,\mathrm{P}(S_3) \\
&= (1 - \mathrm{P}(S_1^c \cap S_2^c))\,\mathrm{P}(S_3) \\
&= (1 - \mathrm{P}(S_1^c)\,\mathrm{P}(S_2^c))\,\mathrm{P}(S_3) \\
&= (1 - 0.3)^2 \cdot 0.7 \\
&= 0.637.
\end{aligned}$$

Therefore the house loses power with probability $\mathrm{P}(S^c) = 1 - \mathrm{P}(S) = 0.363$.