

$$\begin{aligned}
& \text{(a) } P(R) \\
&= P(R,S) + P(R,\neg S) \\
&= P(R|S)P(S) + P(R|\neg S)P(\neg S) \\
&= 0.7 * 0.25 + 0.3 * (1 - 0.25) \\
&= 0.4
\end{aligned}$$

$$\begin{aligned}
& \text{(b) } P(We) \\
&= P(We,R,Wo) + P(We,R,\neg Wo) + P(We,\neg R,Wo) + P(We,\neg R,\neg Wo) \\
&= P(We|R,Wo)P(R,Wo) + P(We|R,\neg Wo)P(R,\neg Wo) + P(We|\neg R,Wo)P(\neg R,Wo) \\
&\quad + P(We|\neg R,\neg Wo)P(\neg R,\neg Wo) \\
&= P(We|R,Wo)P(Wo|R)P(R) + P(We|R,\neg Wo)P(\neg Wo|R)P(R) \\
&\quad + P(We|\neg R,Wo)P(Wo|\neg R)P(\neg R) + P(We|\neg R,\neg Wo)P(\neg Wo|\neg R)P(\neg R) \\
&= 0.12 * 0.7 * 0.4 + 0.25 * 0.3 * 0.4 + 0.1 * 0.2 * 0.6 + 0.08 * 0.8 * 0.6 \\
&= 0.114
\end{aligned}$$

$$\begin{aligned}
& \text{(c) } P(M | S) \\
&= P(M,S) / P(S) \\
&= (P(M,S,R,Wo,We) + P(M,S,R,Wo,\neg We) + P(M,S,R,\neg Wo,We) + P(M,S,R,\neg Wo,\neg We) + \\
&\quad P(M,S,\neg R,Wo,We) + P(M,S,\neg R,\neg Wo,We) + P(M,S,\neg R,Wo,\neg We) + P(M,S,\neg R,\neg Wo,\neg We)) / \\
&\quad P(S) \\
&= P(R|S)P(Wo|R)P(We|Wo,R)P(M|We) + P(R|S)P(Wo|R)P(\neg We|Wo,R)P(M|\neg We) + \\
&\quad P(R|S)P(\neg Wo|R)P(We|\neg Wo,R)P(M|We) + P(R|S)P(\neg Wo|R)P(\neg We|\neg Wo,R)P(M|\neg We) + \\
&\quad P(\neg R|S)P(Wo|\neg R)P(We|Wo,\neg R)P(M|We) + P(\neg R|S)P(Wo|\neg R)P(\neg We|Wo,\neg R)P(M|\neg We) + \\
&\quad P(\neg R|S)P(\neg Wo|\neg R)P(We|\neg Wo,\neg R)P(M|We) + P(\neg R|S)P(\neg Wo|\neg R)P(\neg We|\neg Wo,\neg R)P(M|\neg We) \\
&= 0.7 * 0.7 * 0.12 * 0.02 + 0.7 * 0.7 * 0.88 * 0.42 + 0.7 * 0.3 * 0.25 * 0.02 + 0.3 * 0.8 * 0.08 * \\
&\quad 0.02 + 0.3 * 0.2 * 0.1 * 0.02 + 0.7 * 0.3 * 0.75 * 0.42 + 0.3 * 0.2 * 0.9 * 0.42 + 0.3 * 0.8 * 0.92 \\
&\quad * 0.42 \\
&= 0.3654
\end{aligned}$$

$$\begin{aligned}
& \text{(d) } P(B | S) \\
&= P(B,S) / P(S) \\
&= (P(B,S,Wo,R) + P(B,S,\neg Wo,R) + P(B,S,Wo,\neg R) + P(B,S,\neg Wo,\neg R)) / P(S) \\
&= P(B|Wo,S)P(Wo|R)P(R|S) + P(B|Wo,S)P(Wo|\neg R)P(\neg R|S) + P(B|\neg Wo,S)P(\neg Wo|R)P(R|S) + \\
&\quad P(B|\neg Wo,S)P(\neg Wo|\neg R)P(\neg R|S) \\
&= 0.8 * 0.7 * 0.7 + 0.8 * 0.2 * 0.3 + 0.4 * 0.3 * 0.7 + 0.4 * 0.8 * 0.3 \\
&= 0.62
\end{aligned}$$

$$\begin{aligned}
& \text{(e) } P(S | B, \neg Wo) \\
&= P(S,B,\neg Wo) / P(B,\neg Wo) \\
&= (P(S,B,\neg Wo,R) + P(S,B,\neg Wo,\neg R)) / (P(B,\neg Wo,S,R) + P(B,\neg Wo,S,\neg R) + P(B,\neg Wo,\neg S,R) + P(B,\neg Wo,\neg S,\neg R)) \\
&= (P(B|S,\neg Wo)P(\neg Wo|R)P(R|S)P(S) + P(B|S,\neg Wo)P(\neg Wo|\neg R)P(\neg R|S)P(S)) / \\
&\quad (P(B|S,\neg Wo)P(\neg Wo|R)P(R|S)P(S) + P(B|S,\neg Wo)P(\neg Wo|\neg R)P(\neg R|S)P(S) + \\
&\quad P(B|\neg S,\neg Wo)P(\neg Wo|R)P(R|\neg S)P(\neg S) + P(B|\neg S,\neg Wo)P(\neg Wo|\neg R)P(\neg R|\neg S)P(\neg S)) \\
&= (0.4 * 0.3 * 0.7 * 0.25 + 0.4 * 0.8 * 0.3 * 0.25) / (0.4 * 0.3 * 0.7 * 0.25 + 0.4 * 0.8 * 0.3 * 0.25 \\
&\quad + 0.4 * 0.3 * 0.3 * 0.75 + 0.4 * 0.8 * 0.7 * 0.75)
\end{aligned}$$

$$= 0.1875$$