

$$\begin{aligned}
r_{1,3}^2 &= r_{1,2}^1 (r_{2,2}^1)^* r_{2,3}^1 + r_{1,3}^1 \\
&= 0(\epsilon + 00)^*(1 + 01) + 1 \\
&= 0(00)^*(1 + 01) + 1 \\
&= 0(00)^*1 + 0(00)^*01 + 1 \\
&= 0 * 1
\end{aligned}$$