

$$\begin{aligned}
 c_a) P(\text{Word}=\text{great}) &= P(\text{word}=\text{great} | \text{Document}=1) \times P(\text{Document}=1) + P(\text{word}=\text{great} | \text{Document}=2) \times P(\text{Document}=2) + P(\text{word}=\text{great} | \text{Document}=3) \times P(\text{Document}=3) \\
 &= \frac{13}{12+12+1+1+13} \times \frac{1}{3} + \frac{17}{17+17+17} \times \frac{1}{3} + \frac{15}{14+14+2+2+15} \times \frac{1}{3} \\
 &= 0.3286
 \end{aligned}$$

$$\begin{aligned}
 c_b) P(\text{Document}=1 | \text{Word}=\text{we}) &= P(\text{Word}=\text{we} | \text{Document}=1) P(\text{Document}=1) / P(\text{Word}=\text{we}) \\
 &= \left( \frac{1}{12+12+1+1+13} \times \frac{1}{3} \right) \div \left( \frac{1}{12+12+1+1+13} \times \frac{1}{3} + \frac{2}{14+14+2+2+15} \times \frac{1}{3} \right) \\
 &= 0.3760
 \end{aligned}$$

$$\begin{aligned}
 c_c) P(\text{Document}=2 | \text{Word}=\text{am} \text{ or } \text{Word}=\text{are}) &= P(\text{Word}=\text{am or are} | \text{Document}=2) P(\text{Document}=2) / P(\text{Word}=\text{am or Word}=\text{are}) \\
 &= \left( \frac{17}{17+17+17} \times \frac{1}{3} \right) \div \left( \frac{12+1}{12+12+1+1+13} \times \frac{1}{3} + \frac{17}{17+17+17} \times \frac{1}{3} + \frac{14+2}{14+14+2+2+15} \times \frac{1}{3} \right) \\
 &= 0.3310
 \end{aligned}$$

$$\begin{aligned}
 c_d) P(\text{Word}=\text{great}) &= P(\text{word}=\text{great} | \text{Document}=1) \times P(\text{Document}=1) + P(\text{word}=\text{great} | \text{Document}=2) \times P(\text{Document}=2) + P(\text{word}=\text{great} | \text{Document}=3) \times P(\text{Document}=3) \\
 &= \frac{13}{12+12+1+1+13} \times \frac{1}{6} + \frac{17}{17+17+17} \times \frac{1}{3} + \frac{15}{14+14+2+2+15} \times \frac{1}{2} \\
 &= 0.3262
 \end{aligned}$$

$$\begin{aligned}
 c_e) P(\text{Document}=1 | \text{Word}=\text{we}) &= P(\text{Word}=\text{we} | \text{Document}=1) P(\text{Document}=1) / P(\text{Word}=\text{we}) \\
 &= \left( \frac{1}{12+12+1+1+13} \times \frac{1}{6} \right) \div \left( \frac{1}{12+12+1+1+13} \times \frac{1}{6} + \frac{2}{14+14+2+2+15} \times \frac{1}{2} \right) \\
 &= 0.1673
 \end{aligned}$$

$$\begin{aligned}
 c_f) P(\text{Document}=2 | \text{Word}=\text{am} \text{ or } \text{Word}=\text{are}) &= P(\text{Word}=\text{am or are} | \text{Document}=2) P(\text{Document}=2) / P(\text{Word}=\text{am or Word}=\text{are}) \\
 &= \left( \frac{17}{17+17+17} \times \frac{1}{3} \right) \div \left( \frac{12+1}{12+12+1+1+13} \times \frac{1}{6} + \frac{17}{17+17+17} \times \frac{1}{3} + \frac{14+2}{14+14+2+2+15} \times \frac{1}{2} \right) \\
 &= 0.3298
 \end{aligned}$$