$$\text{Let } qf_w := count(\textbf{word } w \textbf{ in query log})$$

$$p(w|q, \mu = 2) = \frac{tf_{w,q} + 2 \times \frac{qf_w}{\sum_w qf_w}}{|q| + 2}$$

$$p(w|d, \mu = 2000) = \frac{tf_{w,d} + 2,000 \times \frac{cf_w}{\sum_w cf_w}}{|d| + 2,000}$$

$$D_{KL}(p(w|q)\|p(w|d)) \overset{rank}{=} -\sum_w p(w|q) \log p(w|d)$$

$$= -\sum_w \frac{tf_{w,q} + 2 \times \frac{qf_w}{\sum_w qf_w}}{|q| + 2} \log \frac{tf_{w,d} + 2,000 \times \frac{cf_w}{\sum_w cf_w}}{|d| + 2,000}$$