Answer: In the trigram model we take $P(T_1, T_2, T_3 \mid E_1, E_2, E_3)$ to be proportional to
$$\frac{P(T_1 \mid E_1)}{P(T_1)} \cdot \frac{P(T_2 \mid E_2, T_1)}{P(T_2)} \cdot \frac{P(T_3 \mid E_3, T_1, T_2)}{P(T_3)}$$
These probabilities are computed from their frequencies in the corpus except for $P(T_3 \mid T_1, T_2)$, which is computed using the specified smoothing formula.

We wish to compare $P(N, O, O \mid \text{fish,can,swim})$ with $P(O, O, O \mid \text{fish,can,swim})$. We are given

Freq$_C$(N|fish) = 0.7
Freq$_C$(O|fish) = 0.3
Freq$_C$(T$_I$ = O) = 0.429. (There are 1500 O’s in the corpus and 2000 N’s).
Freq$_C$(T$_I$ = N) = 0.571.
Freq$_C$(T$_I$ = O $\mid$ T$_I$−1 = N) = 1. (N is always followed by O in the corpus).
Freq$_C$(T$_I$ = O $\mid$ T$_I$−1 = O) = 0.2. (There are 1200 instances of ON and 300 instances of OO.)
Freq$_C$(T$_I$ = O $\mid$ T$_I$−2 = O, T$_I$−1 = O) = 0. (There are no instances of OOO.)
Freq$_C$(T$_I$ = O $\mid$ T$_I$−2 = N, T$_I$−1 = O) = 0.3 (There are 300 instances of NOO and 700 of NON.)

Hence

Prob($T_I$ = O $\mid$ T$_I$−2 = O, T$_I$−1 = O) = 0.6 · 0 + 0.3 · 0.2 + 0.1 · 0.429 = 0.1029.
Prob($T_I$ = O $\mid$ T$_I$−2 = N, T$_I$−1 = O) = 0.6 · 0.3 + 0.3 · 0.2 + 0.1 · 0.521 = 0.1921.

Therefore Prob(N,O,O $\mid$ fish,can,swim) / Prob(O,O,O $\mid$ fish,can,swim) =

\[
\frac{[\text{Prob}(N \mid \text{fish}) \cdot \text{Prob}(O \mid N) \cdot \text{Prob}(O \mid N,O)]}{[\text{Prob}(O \mid \text{fish}) \cdot \text{Prob}(O \mid O) \cdot \text{Prob}(O \mid O,O)]}
\]
(the other factors cancel out) =

\[
(0.7 \cdot 0.1921)/(0.3 \cdot 0.2 \cdot 0.1029) = 21.78.
\]

So the tagging N,O,O is about 22 times as large as O,O,O.