1. Tokunaga’s law is statistical but we can consider a rigid version. Take $T_1 = 2$ and $R_T = 2$ and draw an example network of order $\Omega = 4$ with these parameters.

2. Tokunaga’s law implies Horton’s laws:
   
   In lectures, we establish the following:
   
   $$n_\omega = \frac{2}{n_{\omega+1}} + \sum_{\omega'=\omega+1}^{\Omega} T_{\omega'-\omega} n_{\omega'}$$
   
   From here, derive Horton’s law for stream numbers: $n_\omega/n_{\omega+1} = R_n$, where $R_n > 1$ and is independent of $\omega$, and find $R_n$ in terms of Tokunaga’s two parameters $T_1$ and $R_T$.

3. Show $R_s = R_\ell$. In other words show that Horton’s law of stream segments matches that of main stream lengths.

4. Show $R_n = R_a$ by using Tokunaga’s law to find the average area of an order $\omega$ basin, $\bar{a}_\omega$, in terms of the average area of basins of order 1 to $\omega - 1$.
   
   (In lectures, we use Horton’s laws to roughly demonstrate this result.)

5. For river networks, basin areas are distributed according to $P(a) \propto a^{-\tau}$. Determine the exponent $\tau$ in terms of the Horton ratios $R_n$ and $R_a$.