Data Structures – HW 6

$n_1 = 400000 \; n_2 = 800000$

$f(n_1), f(n_2) = ?$

1. a. $\frac{f(n_1)}{f(n_2)} = \frac{dcn_1 \log n_1}{dcn_2 \log n_2} = \frac{1}{2}\frac{\log 400000}{\log 800000} = 0.4745$

   b. $\frac{f(n_1)}{f(n_2)} = \frac{0.2479670875}{0.4792572107} = 0.5173$

   c. The relative error between the theoretical estimation and calculated estimation is:

   $\frac{|0.5173 - 0.4745|}{0.4745} = 0.09$

2. a. $\frac{f(n_1)}{f(n_2)} = \frac{dcn_1 \log n_1}{dcn_2 \log n_2} = \frac{1}{2}\frac{\log 400000}{\log 800000} = 0.4745$

   b. $\frac{f(n_1)}{f(n_2)} = \frac{0.3605507205}{0.8757996888} = 0.4117$

   c. $\frac{|0.4117 - 0.4745|}{0.4117} = 0.152$

3. a. $\frac{f(n_1)}{f(n_2)} = \frac{dcn_1}{dcn_2} = \frac{400000}{800000} = 0.5$

   b. $\frac{f(n_1)}{f(n_2)} = \frac{0.5625947381}{1.0776972655} = 0.522$

   c. $\frac{|0.522 - 0.5|}{0.5} = 0.044$

4. a. $\frac{f(n_1)}{f(n_2)} = \frac{dcn_1}{dcn_2} = \frac{400000}{800000} = 0.5$

   b. $\frac{f(n_1)}{f(n_2)} = \frac{0.0247555724}{0.0440683538} = 0.562$

   c. $\frac{|0.562 - 0.5|}{0.5} = 0.124$

5. No. Since quick sort has different time complexity in the worst case, we have to take several tries in order to assure we're getting the right estimation for the sort.

6. Yes, running time in merge-sort depends on the array size (n) and therefor it's enough to test it one time with the wanted array size.