# hw1

1. (a) 2Mbps>1Mbps>500Kbps, throughput = 500Kbps
   (b) 1Mbps>500Kbps>200Kbps, throughput = 200Kbps
2. a. 2Mbps/100Kbps = 20 people
   b. 20%
   c. $(40n) * 0.2^n * (1-0.8)^{40-n}$
   d. $\sum_{i=21}^{40}((40i) * 0.2^i * (1-0.8)^{40-i})$
3. $(\sum_{i=0}^{N-1}(i))LRN$

   $=(N-1)2 * N * LRN$

   $=(N-1) * L2R$
4. ◦ $LR_1 + d_1s_1 + LR_2 + d_2s_2$

   ◦ $1000byte2Mbps + 4000km2 * 10^8 m/s + 1msec + 1000byte2Mbps + 1000km$

   $2 * 10^8 m/s$

   $=(1000 * 82000000 * 2)s + (4000+1000) * 10002 * 10^8 s + 1msec$

   $=0.033s + 1msec = 0.034s$
5. ◦ Physical Layer
     - rincipal responsibilities: bits “on the wire”
   ◦ Data-Link Layer
     - rincipal responsibilities: data transfer between neighboring network elements
   ◦ Network Layer
     - rincipal responsibilities: routing of datagrams from source to destination
   ◦ Transport Layer
     - rincipal responsibilities: process-process data transfer
   ◦ Application Layer
     - rincipal responsibilities: supporting network applications