```
2.
The network is saturated if there are 10 or more people sending. The cumulative
probability is obtained by computing the probability that EXACTLY i nodes are
transmitting, and then summing them up over all i >= 10
                                            n
So Pr[exactly i of the n nodes transmit] = ( )*(p^i)*(1-p)^(n-i)
                                            i
where p = probability that a node transmits

-------------------------------------------------------------------------------

3. Book Questions

1.5

(a) total_time = (handshake) + (propagation delay) + (transfer time)
                                          (1000*(10^3)*8) bits
               = (2*100)ms + (100/2)ms + --------------------  = 5.583 sec
                                            1.5 * (10^6) bps

(b) The total time will be the same as above, except that we wait for an extra
    999 RTTs, while sending the 1000 packets.

                So, total_time = 5.583 + 999*(0.1) = 105.483 sec

(c) We send 20 pkts in 1 RTT => 1000 pkts can be sent in 50 RTTs
    total_time = (handshake) + 50*RTT
               = 52*RTT = 5.2 sec

(d) Num pkts sent out till kth RTT = (2^k) - 1
    So, num RTTs required for 1000 pkts = ceil(log2(1000+1)) = 10 RTTs
    total_time = (handshake) + 10*RTT
               = 12*RTT = 1.2 sec


Note: The answer for (c) and (d) may be different depending on the way in which
the propagation delay is considered.


1.6
(a) total_time = (handshake) + (propagation delay) + (transfer time)

                                       (1500*(10^3)*8) bits
               = (2*80)ms + (80/2)ms + --------------------  = 1.4 sec
                                          10 * (10^6) bps

(b) The total time will be the same as above, except that we wait for an extra
    1499 RTTs, while sending the 1500 packets.

                So, total_time = 1.4 + 1499*(0.08) = 121.32 sec

(c) We send 20 pkts in 1 RTT => 1500 pkts can be sent in 75 RTTs
                total_time = (handshake) + 75*RTT
                           = 77*RTT = 6.16 sec

(d) Num pkts sent out till kth RTT = (2^k) - 1
    So, num RTTs required for 1500 pkts = ceil(log2(1000+1)) = 11 RTTs
                total_time = (handshake) + 11*RTT
                           = 13*RTT = 1.04 sec


1.7
                         2*(10^3)km
    Propagation delay = ------------    =  10 microseconds
                        2*(10^8)km/sec

                100 byte packets:  10*(-5) = (100*8 bits)/(B bps)
                                   => B = 8*(10^7)bps = 80 Mbps

                512 byte packets:  10*(-5) = (512*8 bits)/(B bps)
                                   => B = 4096*(10^5)bps = 409.6 Mbps


1.13
    Width of a bit = (1 bit) / (10^-9 bps) = 10^(-9) sec = 1 ns
                Length of the bit = 2.3*(10^8) m/sec * 1 ns = 0.23 m


2.16
    To find the new checksum:
                   Complement the old checksum,
                         Subtract 1 or 256 (depending on lower or higher order byte decerement)
                         Complement the result

                Or equivalently: Take the old checksum, and add 1 or 256 : this gives
                the new checksum :)
```