1. E(p) = Np(1-p)^(N-1)

= N(1-p)^2(N-1) - Np2(N-1)(1-p)^2(N-2)

= N(1-p)^2(N-2)((1-p)-p(2(N-1)))

=> (1-p) - 2p(N-1) = 0

= 1 - p = 2p(N-1)

= p = 1/2N-1

E(p) = N(1/2N-1)(1-(1/2N-1))^(N-1)

= (1-1/N) = 1

= (1-1/N)^N = 1/e

= (N/2N-1)(1/e)

= E(p) = (1/2)(1/e)

= 1/2e

1. 1. 1. Ave throughput = pA(1-pB)
      2. Total efficiency = pA(1-pB) + pB(1-pA)
   2. No it is not.

A => pA(1-pB) = 2pB(1-pB) = 2pB-2(pB)^2

B => pB(1-pA) = pB(1-2pB) = pB-2(pB)^2

pA needs to = 2-(pA/pB)

* 1. 1. A = 2p(1-p)^(N-1)
     2. Other = p(1-p)^(N-2)(1-2p)

1. = = =
2. 1. IP Addresses, b. MAC

| Name | IP | MAC |
| --- | --- | --- |
| A | 192.168.1.001 | 00-00-00-00-00-00 |
| Router 1 | 192.168.1.002 | 11-11-11-11-11-11 |
| B | 192.168.1.003 | 22-22-22-22-22-22 |
| C | 192.168.2.001 | 33-33-33-33-33-33 |
| Router 1 | 192.168.2.002 | 44-44-44-44-44-44 |
| Router 2 | 192.168.2.003 | 55-55-55-55-55-55 |
| D | 192.168.2.004 | 66-66-66-66-66-66 |
| E | 192.168.3.001 | 77-77-77-77-77-77 |
| Router 2 | 192.168.3.002 | 88-88-88-88-88-88 |
| F | 192.168.3.003 | 99-99-99-99-99-99 |

c.

1. Send from E to subnet adaptor IP (192.168.3.002)
2. From IP to MAC (88-88-88-88-88-88)
3. From subnet 3 to subnet 2 (198.162.2.002)
4. Check packet for receiving IP
5. Reroute to subnet 1 (33-33-33-33-33-33) from subnet 2 (192.168.2.003)
6. Subnet 1 routes to B (192.168.1.003)

d. E sends an ARP query to the router and it responds with E’s MAC address. Then continue from part C.

1. 1. X = E[X] = E[Y]-1 ; E = efficiency formula => =>
   2. p = 1/N
   3. β = Np(1-p)^N-1 => (1-1/N)^N-1 => x = => =>
   4. => => 1
2. 1. A to left router:
      1. Source: 00-00-00-00-00-00 : 111.111.111.001
      2. Destination: 22-22-22-22-22-22: 111.111.111.002
   2. Left router to right router
      1. Source: 33-33-33-33-33-33 : 122.222.222.002
      2. Destination: 55-55-55-55-55-55 : 122.222.222.003
   3. Right router to F
      1. Source: 88-88-88-88-88-88 : 133.333.333.002
      2. Destination: 99-99-99-99-99-99 : 133.333.333.003
3. 1. >= 2dprop-1
   2. 2(3000/(1.8\*10^8))(10000000) => 333.3
4. 1. 1000/(2\*10^8) + 20/(100\*10^6) => 5.2\*10^-6 = 5.2sec
   2. 5.2: A reports collision

10.4: B abort arrives at A; A retransmit

10.4+5.2 = 15.6: A arrives at B

t = 15.6 + (1500/(100\*10^6))

= 115.6

* 1. 1500\*4 + 20\*4 = 6080 bit time = 608

608 + 150 + 4.5

= 762.5