CS 9868 Internet Algorithmics
Solution for assignment 1

The answers for questions 1-4 and 6 will vary. We show a sample answer for questions 1, 3, and 6 but your answers will probably be different from the ones given here.

1. Symbolic name: www.csd.uwo.ca
   IP address: 129.100.16.66
   Class of IP addresses: B, as the binary representation of the first byte of the IP address is 10000001.
   Network prefix: 000001 01100100 (or 1.100 in dotted decimal notation).
   Maximum number of computers in this network: $2^{16} = 65536$.

3. 129.100.20.114/23
   Network number: 10000001 01100100 0001010
   Computer number: 0 01110010
   Maximum number of computers that belong to subnetwork: $2^9 = 512$.

5. *What is the probability that there will not be a second collision?*

   There will be a second collision if A and B choose the same waiting time. If A chooses waiting time t_1 the probability that B chooses the same waiting time is 1/3. Hence, the probability that there will not be a second collision is $1 - 1/3 = 2/3$.

   What is the probability that exactly k rounds of the above procedure are needed before one of the computers can transmit? **Hint.** *During $k-1$ rounds there will be collisions and in the k round the computers choose different random waiting times.*

   As stated above, the probability that A and B choose the same waiting time during a round of the above algorithm is 1/3. The probability that A and B choose the same waiting times for $k-1$ rounds is then $(1/3)^{k-1}$. The probability that in the k-th round A and B choose different waiting times is

   1 - Probability that A and B choose same waiting time = 1 - 1/3 = 2/3.

   Hence, the probability that A and B need k rounds for one of them to be able to transmit is $(1/3)^{k-1} \times 2/3 = 2/3^k$.

6. First 34 bytes of the package in hexadecimal notation.

   4c 72 b9 f9 3d 6f d8 24 bd 91 5d 00 08 00 45 00
   00 c4 2a ba 40 00 3f 06 e8 f9 81 64 10 42 81 64
   14 76

   MAC destination address: 4c 72 b9 f9 3d 6f
   MAC source address: d8 24 bd 91 5d 00

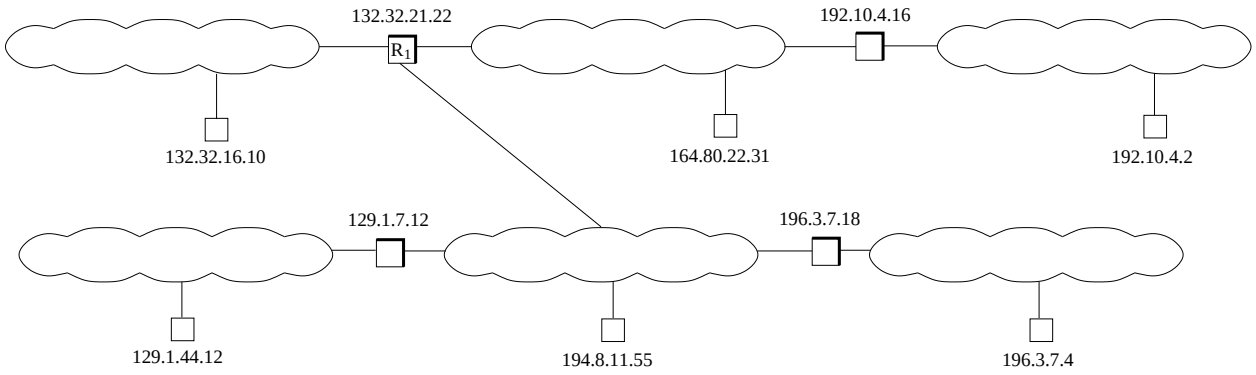
   For the datagram contained in this network packet:

   - Protocol version number: 4
   - Header length: 20 bytes
   - Total length of datagram: 196 bytes
   - Time to live: 63
   - Source IP address: 129.100.16.66

- Destination IP address: 129.100.20.118

7. Show the routing table for router R_1 in the following internet.

Destination	Next hop
132.32	deliver direct
164.80	deliver direct
194.8.11	deliver direct
192.10.4	192.10.4.16
129.1	129.1.7.12
196.3.7	196.3.7.18



8. Network 1 packet(s):

[**Packet header**: MAC address of A, MAC address of R_1, control bits of Network 1;
Packet data: {**Datagram header**: IP address of A, IP address of B, rest of header;
Datagram data: 500}]

Network 2 packet(s):

[**Packet header**: MAC address of R_1, MAC address of R_2, control bits of Network 2;
Packet data: {**Datagram header**: IP address of A, IP address of B, rest of header;
Datagram data: 350}]

[**Packet header**: MAC address of R_1, MAC address of R_2, control bits of Network 2;
Packet data: {**Datagram header**: IP address of A, IP address of B, rest of header;
Datagram data: 150}]

Network 3 packet(s):

[**Packet header**: MAC address of R_2, MAC address of B, control bits of Network 3;
Packet data: {**Datagram header**: IP address of A, IP address of B, rest of header;
Datagram data: 350}]

[**Packet header**: MAC address of R_2, MAC address of B, control bits of Network 3;
Packet data: {**Datagram header**: IP address of A, IP address of B, rest of header;
Datagram data: 150}]