P10. Consider a datagram network using 8-bit host addresses. Suppose a router uses longest prefix matching and has the following forwarding table:

Prefix Match	Interface
1	0
10	1
111	2
otherwise	3

For each of the four interfaces, give the associated range of destination host addresses and the number of addresses in the range.

Interface 0
Range: 10000000 through 10111111
Number of addresses: 64
Interface 1
Range: 11000000 through 11011111
Number of addresses: 32
Interface 2
Range: 11100000 through 11111111
Number of addresses: 32
Interface 3
Range: 00000000 through 01111111
Number of addresses: 128

P14. Consider a subnet with prefix 128.119.40.128/26. Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. Suppose an ISP owns the block of addresses of the form 128.119.40.64/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

128.119.40.0/28
128.119.40.16/28
128.119.40.32/28
128.119.40.64/28

P17. Suppose datagrams are limited to 1,500 bytes (including header) between source Host A and destination Host B. Assuming a 20-byte IP header, how many datagrams would be required to send an MP3 consisting of 5 million bytes? Explain how you computed your answer.

MP3 file size = 5 million bytes.

each datagram can carry 1500-40=1460 bytes of the MP3 file.
Number of datagram = 5 * 10^6 / 1460 = 3425

P21. Consider the SDN OpenFlow network shown in Figure 4.30. Suppose that the desired forwarding behavior for datagrams arriving at s2 is as follows:

- **any datagrams arriving on input port 1 from hosts h5 or h6 that are destined to hosts h1 or h2 should be forwarded over output port 2;**
- **any datagrams arriving on input port 2 from hosts h1 or h2 that are destined to hosts h5 or h6 should be forwarded over output port 1;**
- **any arriving datagrams on input ports 1 or 2 and destined to hosts h3 or h4 should be delivered to the host specified;**
- **hosts h3 and h4 should be able to send datagrams to each other.**

Specify the flow table entries in s2 that implement this forwarding behavior.

s2 flow table

Match	Action
Ingress Port: 1; IP Src: 10.3.*.*; IP Dst: 10.1.*.*	Forward(2)
Ingress Port: 2; IP Src: 10.1.*.*; IP Dst: 10.3.*.*	Forward(1)
Ingress Port: 1; IP Dst: 10.2.0.3	Forward(3)
Ingress Port: 2; IP Dst: 10.2.0.3	Forward(3)
Ingress Port: 4; IP Src=10.2.0.4; IP Dst: 10.2.0.3	Forward(3)
Ingress Port: 1; IP Dst: 10.2.0.4	Forward(4)
Ingress Port: 2; IP Dst: 10.2.0.4	Forward(4)
Ingress Port: 3; IP Src=10.2.0.3; IP Dst: 10.2.0.4	Forward(4)

P23. Consider again the scenario from P21 above. Give the flow tables entries at packet switches s1 and s3, such that any arriving datagrams with a source address of h3 or h4 are routed to the destination hosts specified in the destination address field in the IP datagram. (Hint: Your forwarding table rules should include the cases that an arriving datagram is destined for a directly attached host or should be forwarded to a neighboring router for eventual host delivery there.)

S1 flow table

Match	Action
IP Src = 10.2.*.*; IP Dst = 10.1.0.1	Forward (2)
IP Src = 10.2.*.*; IP Dst = 10.1.0.2	Forward (3)
IP Src = 10.2.*.*; IP Dst = 10.3.*.*	Forward (1)

S3 flow table

Match	Action
IP Src = 10.2.*.*; IP Dst = 10.3.0.6	Forward (1)
IP Src = 10.2.*.*; IP Dst = 10.3.0.5	Forward (2)
IP Src = 10.2.*.*; IP Dst = 10.1.*.*	Forward (3)