

1. Data plane - One of its main function is that it forwards traffic to the next hop along the path to the selected destination network. While the control plane functions include the system configuration, management, and exchange of routing table information and the packets are processed so the routing table information can be updated.
2. That would be the value of how long a packet can survive so it would be the Time to live field.
3. No common bytes are only used to find the checksum in the IP datagram, and only the IP header is used to find the checksum at the network layer.
4. (Bytes)/TOTAL $\Rightarrow (20+20+60) = 100 \Rightarrow 60/100 = 60\%$ for application data and 40% for overhead.
5.

$$\begin{array}{r}
 00110111 \\
 + 00101110 \\
 \hline
 01100101 \\
 + 01010101 \\
 \hline
 10111010 \\
 = 01000101
 \end{array}$$

The 1's complement of the sum of the bytes gives the checksum which is then used to find errors yet if any the results is zero then it will detect errors in the data but on the other hand if the result is 1 then it will not find errors. No, 1 bit errors will not go undetected when using the 1's complement of the sum. But 2 but 2 bit error can go undetected as any two bits being different but sum and checksum will be the same so it will have no impact thus becoming undetected.

6. Datagrams are reassembled at the destination and the reassemble is not done at each router as It only takes place at destination and not at routers since packets take independent paths which can't be done using routers.

7. $(1780/480) = 4$ fragments

Each fragment will contain $480 + 20 = 500$ bytes

The fourth fragment will contain $1780 - (480)(3) = 340$ bytes of data and 20 bytes of IP giving a total length of 360 bytes.

The offset value is expressed in units of 8-byte chunks. The offsets increment by amount of data in fragment / 8 = floor($480 / 8$) = 60. The offsets of the 4 fragments will be 0, 60, 120, and 180.

8. Your router assigns local IP addresses to the connected devices in our home. This allows them to communicate amongst each other behind the router in the home network. These IP addresses are never routed over the Internet, so they are able to be used on the home network.

9.

WAN	LAN
128.36.21.72, 2800	192.10.0.0.56, 4300

- 1)S: 192.10.0.0.56, 4300
D: 172.217.14.69, 25
- 2)S: 128.36.21.72, 2800
D: 172.217.14.69, 25
- 3)S: 172.217.14.69, 25
D: 128.36.21.72, 2800
- 4)S: 172.217.14.69, 25
D: 192.10.0.0.56, 4300

10. IPv6 packets can only travel over an IPv6 network. However by using the process tunnel, two routers that have both IPv4 and IPv6 can tunnel traffic between them by putting the IPv6 packets inside IPv4 packets and sending them to each other over IPv4.