1. An Internet Service Provider (ISP) is granted a block of addresses starting with 145.75.0.0/16. The ISP needs to distribute these addresses to three groups of customers as follows:

(a) The first group has 128 customers; each needs 256 addresses.
(b) The second group has 128 customers; each needs 64 addresses.
(c) The third group has 64 customers; each needs 128 addresses.

Find the first address of the 128th customer of the 2nd group and how many addresses are still available with ISP after these allocations.

(A) 145.75.127.128/24, 32768
(B) 145.75.159.192/26, 16384
(C) 145.75.159.192/26, 32768
(D) 145.75.191.128/25, 16384

Answer: Option B
Explanation :

Given 145.75.0.0/16 is the starting address. So, we have 2^{16} = 65,536 addresses with the ISP initially.

For the 1st group, each customer needs 256 addresses. So, 8 bits are needed to define each host. The prefix length is 32 – 8 = 24. Therefore the addresses of 1st group are:

1st customer => 145.75.0.0/24 to 145.75.0.255/24
2nd customer => 145.75.1.0/24 to 145.75.1.255/24
3rd customer => 145.75.2.0/24 to 145.75.1.255/24
……...
128th customer => 145.75.127.0/24 to 145.75.127.255/24

So, for the 1st group, the ISP has allocated 128*256 = 32768 addresses

For the 2nd group, each customer needs 64 addresses. So, 6 bits are needed to define each host. The prefix length is 32 – 6 = 26. Therefore the addresses of 2nd group are:

1st customer => 145.75.128.0/26 to 145.75.128.63/26
2nd customer => 145.75.128.64/26 to 145.75.128.127/26
3rd customer => 145.75.128.128/26 to 145.75.128.191/26
4th customer => 145.75.128.192/26 to 145.75.128.255/26
……..
128th customer 145.75.159.192/26 to 145.75.159.255/26

So, for the 2nd group, the ISP has allocated 128*64 = 8192 addresses

For the 3rd group, each customer needs 128 addresses. So, 7 bits are needed to define each host. The prefix length is 32 – 7 = 25. Therefore the addresses of the 3rd group are:

1st customer => 145.75.160.0/25 to 145.75.160.127/25

2nd customer => 145.75.160.128/25 to 145.75.160.255/25
3rd customer => 145.75.161.0/25 to 145.75.161.127/25
4th customer => 145.75.161.128/25 to 145.75.161.255/25
……..
64th customer => 145.75.191.128/25 to 145.75.191.255/25

So, for the 3rd group, the ISP has allocated 64*128 = 8192 addresses.

Hence the total no.of addresses available after allocating is
65536 – (32768 + 8192 + 8192) = 16384 addresses

Common Data Questions: Q. 2 and Q. 3

An organization is granted the block 150.36.0.0/16. The administrator wants to create 512 subnets.

2. What is the subnet mask?

(A) 255.255.255.128/25 (B) 255.255.255.192/26
(C) 255.255.255.224/27 (D) 255.255.255.240/28

Answer: Option A
Explanation:

From the Question, 16 bits are for the NID part and 16 bits are for the HID part.
We need to create 512 subnets. So we require 9 bits to be borrowed from HID, i.e., 8 bits from the 3rd octet and 1 bit from the 4th octet.
Therefore, the total number of 1's in the subnet mask will be 16 (because of the network id part) + 9 (because of the subnet part) = 25

Hence the subnet mask will be 255.255.255.128/25

3. Find the number of hosts in each subnet. Find the first and last host in the first subnet.

(A) 128, 150.36.0.1 and 150.36.0.127 (B) 128, 150.36.0.129 and 150.36.0.255
(C) 126, 150.36.0.1 and 150.36.0.126 (D) 126, 150.36.0.129 and 150.36.0.254.

Answer: Option C
Explanation:

Given 150.36.0.0/16 we need to create 512 subnets. So we require 9 bits to be borrowed from the host id, and we are left with 7 bits in the host part. So, practically, we have 2^7- 2 = 126 hosts per subnet.

The first subnet is 150.36.0.0. So the first host in subnet 1 is 150.36.0.1, and the last host is 150.36.0.126.

4. What could be the network mask if the direct broadcast address of a network is 168.17.07.255?

(A) 255.255.248.0
(B) 255.255.252.0
(C) 255.255.254.0
(D) **All the above**

Answer: Option D
Explanation:

Given IP address 168.17.07.255 is DBA and its class B.
In DBA, the HID part is all 1s
Therefore, 168.17.00000111.11111111
NID HID

For Netmask, the NID part is all 1's and the HID part is all 0's

Since the number of bits in NID or HID is not given, we can take any length for NID.
So last 11 bits can be HID (bcz DBA contains all 1's in HID).
Similarly last 10 bits can be HID, or 9 bits or 8 bits.
Depending on the number of bits, the Subnet Mask will vary.

The range of Netmask can be 255.255.248.0 to 255.255.255.0

5. The subnet mask for a particular network is 255.255.252.0. Which of the following pairs of IP addresses could belong to this network?

(A) 172.57.88.62 and 172.57.87.233 **(B) 10.35.24.2 and 10.35.29.4**
(C) 191.203.31.87 and 191.234.31.88 (D) 128.8.129.43 and 128.8.131.42

Answer: Option B
Explanation:

Take each option and do bitwise And with the given subnet mask. If you get the same network for both IPs given in an option, that is the answer.

6. An organisation has a class-B network and wishes to form subnets for 24 departments. The subnet mask would be:

(A) 255.255.224.0
(B) 255.255.240.0
(C) 255.255.248.0
(D) 255.255.252.0

Answer: Option C
Explanation:

We require 24 subnets. Therefore, we need 5 bits from HID.
Since it is class B, 16 bits are in NID, and we have to 5 bits for subnets.
As we know, in the Subnet mask NID+SID will be all 1's.
Therefore, the SM is 255.255.248.0

7. The routing table of a router is shown below:

Destination	Subnet Mask	Interface
128.75.43.0	255.255.255.0	Eth0
128.75.43.0	255.255.255.128	Eth1
192.12.17.5	255.255.255.255	Eth2
Default		Eth3

(A) Eth1 and Eth3
(B) Eth0 and Eth3
(C) Eth0 and Eth2
(D) Eth1 and Eth2

On which interface will the router forward packets addressed to destinations 128.75.43.16 and 192.12.17.10 respectively?

Answer: Option A
Explanation:

Take each option and do it bitwise And with the SM. If you get the same network ID for both Destinations IP'S that option that is the answer.
If more than two options come to the same NID, choose which has the highest no of 1's present

in the subnet mask.

8. In IP4 addressing format, the number of networks allowed under Class-C address is:

(A) 2^{24} **(B) 2^{21}**
(C) 2^{8} (D) $2^{8} - 2$

Answer: Option B
Explanation:

For class C address, 8 bits are reserved for Host Id, and 24 bits are reserved for Network Id. But out of 24 bits, the first 3 bits are fixed as 110; hence, the total number of networks possible is 2^{21}.

9. Suppose a subnet 'X' has a subnet mask 255.255.192.0 and a system A has IP 157.106.46.234. Which of the following IPs belongs to the same network A?

(A) 157.106.65.03 (B) 157.106.142.77
(C) Both (A) and (B) **(D) None of these**

Answer: Option D
Explanation:

Take the Given IP and given SM, DO AND WITH both, you will get NID
Now, take each option and do bitwise AND with the given subnet mask. If you get the SAME NID for IP'S given in an option, that is the answer.

Here, No IP address belongs to the Subnet X.

10. A company has a Class-C address of 204.204.204.0. It wishes to have three subnets, one with 100 hosts and two with 50 hosts each. Which one of the following options represents a feasible set of subnet mask/ subnet address pairs?

(A) 255.255.255.192/ 204.204.204.128
255.255.255.128/ 204.204.204.0
255.255.255.128/ 204.204.204.64

(B) 255.255.255.192/ 204.204.204.0
255.255.255.128/ 204.204.204.192

255.255.255.128/ 204.204.204.64

(C) 255.255.255.128/ 204.204.204.128
255.255.255.192/ 204.204.204.192
255.255.255.192/ 204.204.204.224

(D) 255.255.255.128/ 204.204.204.128
255.255.255.192/ 204.204.204.64
255.255.255.192/ 204.204.204.0

Answer: Option D
Explanation:

Subnet Address: First IP in the subnet.
Subnet Mask: all the net bits + subnet bits will be 1, and host bits will be 0.
DBA: Last IP in the subnet.

For class C, the subnet mask is 255.255.255.0
As it is a class C address, we have to take two bits from the last octet.

Therefore, Possible subnet bits would be 00,01,10,11

Subnet address of (100 hosts) = **255.255.255.128**
Subnet address of (50 hosts) = **255.255.255.192**
Subnet address of (50 hosts) = **255.255.255.192**

MSB in last 8 bits helps us to get two subnets

10000000 →→ subnet1

00000000 →→ subnet2

subnet2 is divided into two more subnets using 7th bit

00000000 →→ subnet2(0)

01000000 →→ subnet2(1)

11. Two computers, A and B are configured as follows. A has IP address of 203.197.17.157 and netmask 255.255.128.0. B has the IP address of 203.192.192.201 and netmask 255.255.192.0. Which one of the following statements is true?

(a) A and B both assume they are on the same network.

(b) B assumes A is on the same network, but A assumes B is on a different network.
(c) A assumes B is on the same network, and B assumes A is on a different network.
(d) A and B both assume they are on different networks.

Solution: Option D

12. A router uses the following routing table:

Destination	Mask	Interface
144.72.0.0	255.255.0.0	Eth0
144.72.64.0	255.255.224.0	Eth1
144.72.68.0	255.255.255.0	Eth2
144.72.68.64	255.255.255.224	Eth3

A packet bearing a destination address 144.72.68.117 arrives at the router on which interface will it be forwarded?

(a) Eth0
(b) Eth1
(c) Eth2
(d) Eth3

Solution: Option C
Explanation:

Do Bitwise ANDING with the given IP address and each Mask from the table. Results match with the destination IP which will be the correct interface.
if it matches with more than one destination IP, then takes the highest no. of 1's present in the Mask interface.

13. 127.0.127.195 is a:

(a) Limited Broadcast Address
(b) Direct Broadcast Address
(c) Multicast Address
(d) Loopback Address

Solution: Option D

14. Let computers A and B have IP addresses 72.195.126.113 and 72.195.126.91, respectively, and both use subnet mask 'N'. Then what is the value of 'N' that should not be used out of the following if both belong to the same network?

(A) 255.255.255.0
(B) 255.255.255.128
(C) 255.255.255.192
(D) 255.255.255.224

Answer: Option D
Explanation:

Do Bitwise AND with SM (from option) and given IP
the correct answer will be which give same NID for both IP

Common Data Questions: Q. 15, Q. 16 and Q.17

Consider three IP networks A, B and C. Host H_A in networks 'A' sends the message each containing 180 B of application data to a host H_C in network HC. The TCP layer prefixes 20 Bytes header to the message. This passes through an intermediate network, 'B'. The maximum packet size, including 20B IP headers in each network, is:
A. 500 Bytes
B. 100 Bytes
C.1000 Bytes

The network A and B are connected through a 512 Kbps link, while B and C are connected by a 256 Kbps link.

15. Assuming that the packets are correctly delivered, how many Bytes including headers, are delivered to the IP layer at the destination for one application message in the best case? Consider only data packets.

(A) 220 (B) 240
(C) 260 (D) 280

Answer: Option C

16. What is the rate at which application data is transferred to host H? Ignore errors, acknowledgements and other overheads.

(A) 196 Kbps (B) 177.23 Kbps
(C) 354.5 Kbps (D) 325.5 Kbps

Answer: Option A
17. What is the extra overhead caused by fragmentation?

(A) 40 Bytes (B) 20 Bytes
(C) 0 Bytes (D) 60 Bytes

Answer: Option A

18. How many networks of class B are possible

(A) 2^{32} (B) 2^{16} **(C) 2^{14}** (D) 2^{7}

Answer: **Option B**
Explanation:

In class B, 16 bits are chosen for network ID and from these 16 bits, two leading bits are fixed, i.e. "10", so 14 bits are remaining to use for Host.

19. In which of the following strategies, bits from HID are chosen in an IP address. (HID means Host ID).

(A) subnetting (B) supernetting (C) NAT (D) None of these

Answer: Option A
Explanation:

In subnetting, bits from HID are chosen and used as subnet ID.

20. In a subnet mask, the number of 0's indicated

(A) NID **(B) HID** (C) Both (D) None of these

Answer: Option B
Explanation:

In Subnet mask, no. of 0's indicate HID and no. of 1's indicate (NID + SID) part.