1. Identify the class of IP address 10.0.0.1.

Solution:

- IP classes are defined by the first octet:

Class	First Octet Range
A	1 to 126
B	128 to 191
C	192 to 223
D	224 to 239 (Multicast)
E	240 to 254 (Experimental)

- First octet of 10.0.0.1 is **10**, which lies between **1-126 → Class A**

Answer: Class A

---

2. What is the default subnet mask of Class C?

Solution:

- Class C default subnet mask is always **255.255.255.0**
- This means first 3 octets (24 bits) are network bits, last octet (8 bits) are host bits.

Answer: 255.255.255.0

---

3. Calculate the network address of 192.168.1.45/24.

Solution:

- IP: 192.168.1.45
- Prefix /24 → subnet mask = 255.255.255.0
- Network address is calculated by bitwise AND between IP and subnet mask:

IP Octets	192	168	1	45
Mask Octets	255	255	255	0
Network Addr.	192	168	1	0

- So, Network Address: **192.168.1.0**

Answer: 192.168.1.0

---

4. Find the broadcast address for 172.16.10.0/20.

Solution:

- IP: 172.16.10.0
- Prefix: /20 → subnet mask = 255.255.240.0
- /20 means 20 bits network, 12 bits host.
- Calculate block size for the third octet:
    - Third octet mask: 240 (binary 11110000)
    - Block size = 256 - 240 = 16
- Network address third octet is 16 (from 172.16.10.0, third octet is 10 but masked to network range)
- Find the network block:
    - Blocks of size 16: 0, 16, 32, ...
    - 10 lies between 0 and 15, so network third octet is **0**
- Network address is 172.16.0.0
- Broadcast address is:
    - Third octet: network + block size -1 = 0 + 16 -1 = 15
    - Fourth octet: 255
- So broadcast address: **172.16.15.255**

Answer: 172.16.15.255

---

5. How many hosts are possible in a /26 network?

Solution:

- /26 means 26 bits network, 6 bits host.
- Number of hosts = 2^(number_of_host_bits) - 2
- Here, hosts = 2^6 - 2 = 64 - 2 = **62**

Answer: 62 hosts

---

6. Convert IP address 192.168.5.10 to binary.

Solution:

Convert each octet to 8-bit binary:

Octet	Decimal	Binary
1	192	11000000
2	168	10101000
3	5	00000101
4	10	00001010

Answer: 11000000.10101000.00000101.00001010

---

7. What is the first usable IP address in the subnet 10.10.0.0/16?

Solution:

- Network address: 10.10.0.0
- Subnet mask: 255.255.0.0 (/16)
- First usable IP = Network address + 1
- So first usable IP: 10.10.0.1

Answer: 10.10.0.1

---

8. Calculate the number of subnets created when borrowing 4 bits in Class B.

Solution:

- Default Class B subnet mask: /16
- Borrow 4 bits → new prefix: /16 + 4 = /20
- Number of subnets = 2^(number_of_borrowed_bits) = 2^4 = 16

Answer: 16 subnets

---

9. Find the last usable IP address in subnet 192.168.1.0/27.

Solution:

- /27 → subnet mask 255.255.255.224
- Number of hosts = 2^(32-27) - 2 = 2^5 - 2 = 30 hosts
- Block size = 256 - 224 = 32 (in the fourth octet)
- Subnet ranges (fourth octet):
    - o   0-31, 32-63, 64-95, ...
- Network: 192.168.1.0 - 192.168.1.31
- Usable IPs: 192.168.1.1 to 192.168.1.30
- Last usable IP = 192.168.1.30

Answer: 192.168.1.30

---

10. What is the CIDR prefix for subnet mask 255.255.255.192?

Solution:

- Convert subnet mask to binary:
    - o   255 = 11111111 (8 bits)
    - o   192 = 11000000 (2 bits set)
- Count total 1 bits:
    - o   8 + 8 + 8 + 2 = 26 bits
- So CIDR prefix is **/26**

Answer: /26

11. Calculate subnet mask for 500 hosts.

Solution:

- Number of hosts needed = 500
- Formula for hosts: 2^h - 2 ≥ number_of_hosts
- Find smallest h such that 2^h - 2 ≥ 500
- Try h=9: 2^9 - 2 = 512 - 2 = 510 ≥ 500 ✓
- So host bits = 9
- Total bits in IPv4 = 32
- Network bits = 32 - 9 = 23
- Subnet mask = /23
- Convert /23 to dotted decimal:
    - o   8 bits: 255.255.255.0 → /24
    - o   For /23, 23 bits network = 255.255.254.0

Answer: 255.255.254.0 (/23)

---

12. What is the host range of 172.31.0.0/16?

Solution:

- Network address: 172.31.0.0
- Prefix: /16 → subnet mask: 255.255.0.0
- Host bits = 32 - 16 = 16 bits
- Number of hosts: 2^16 - 2 = 65534 hosts
- First usable IP = Network + 1 = 172.31.0.1
- Last usable IP = Broadcast - 1
- Broadcast address: 172.31.255.255
- Last usable IP = 172.31.255.254

Answer:
Range: 172.31.0.1 to 172.31.255.254

---

13. How many subnets are there in Class C by default?

Solution:

- Default subnet mask for Class C: 255.255.255.0 (/24)
- Default means no bits borrowed → only one subnet.
- Number of subnets = 1

Answer: 1 subnet

---

14. Convert subnet mask 255.255.254.0 to CIDR.

Solution:

- Convert each octet to binary:
  - 255 → 11111111 (8 bits)
  - 255 → 11111111 (8 bits)
  - 254 → 11111110 (7 bits)
  - 0 → 00000000 (0 bits)
- Total network bits = 8 + 8 + 7 + 0 = 23
- CIDR notation: /23

Answer: /23

---

15. Find network address of 192.168.100.25 with subnet mask 255.255.255.240.

Solution:

- IP: 192.168.100.25
- Mask: 255.255.255.240 (/28)
- Block size = 256 - 240 = 16 (in fourth octet)
- Identify the subnet block for fourth octet (25):
  - Blocks: 0-15, 16-31, 32-47, ...
  - 25 is in block 16-31
- Network address: 192.168.100.16

Answer: 192.168.100.16

---

16. Calculate broadcast address for IP 10.0.4.5/22.

Solution:

- Prefix /22 → subnet mask: 255.255.252.0
- Block size in third octet: 256 - 252 = 4
- Third octet of IP = 4
- Identify block:
  - Blocks: 0-3, 4-7, 8-11, ...
  - 4 is in 4-7 block
- Network address: 10.0.4.0
- Broadcast address third octet = 7
- Broadcast address fourth octet = 255
- Broadcast address = 10.0.7.255

Answer: 10.0.7.255

17. How many hosts are available in a /30 subnet?

Solution:

- /30 means 30 bits network, 2 bits host
- Number of hosts = 2^2 - 2 = 4 - 2 = 2 hosts

Answer: 2 hosts

---

18. Find network address of 172.16.5.6 with mask 255.255.255.0.

Solution:

- Mask: 255.255.255.0 (/24)
- Network address is IP AND mask

IP Octets	172 16 5 6
Mask Octets	255 255 255 0
Network Addr.	172 16 5 0

- Network address: 172.16.5.0

Answer: 172.16.5.0

---

19. How many bits are borrowed for subnet mask 255.255.248.0?

Solution:

- Default Class B mask: 255.255.0.0 (/16)
- Given mask: 255.255.248.0
- Convert third octet (248) to binary: 11111000
- Count number of 1 bits in third octet: 5
- Borrowed bits = 5 (since default was 0 bits in third octet)
- So, borrowed bits = 5

Answer: 5 bits borrowed

---

20. Calculate the subnet mask for 64 subnets in Class A.

Solution:

- Default Class A mask: /8
- Number of subnets = $2^n = 64 \rightarrow n = 6$ bits
- Add borrowed bits: $8 + 6 = 14$ bits network
- Subnet mask = /14
- Convert /14 to decimal:
  - 8 bits: 255
  - 6 bits in second octet = binary 11111100 → decimal 252
  - So mask: 255.252.0.0

Answer: 255.252.0.0 (/14)

---

21. Find the number of hosts in a subnet with mask 255.255.255.224.

Solution:

- Mask: 255.255.255.224
- Convert last octet to binary: 224 → 11100000
- Number of host bits = number of 0s in mask = 3 bits
- Number of hosts = $2^3 - 2 = 8 - 2 = 6$ hosts

Answer: 6 hosts

---

22. What is the subnet mask for a /21 prefix?

Solution:

- /21 means 21 bits network, 11 bits host
- Mask in decimal:
  - First octet: 255 (8 bits)
  - Second octet: 255 (8 bits)
  - Third octet: 11100000 (5 bits set) → 224
  - Fourth octet: 0
- Subnet mask: 255.255.224.0

Answer: 255.255.224.0

---

23. Calculate the broadcast address for IP 192.168.2.130/25.

Solution:

- /25 → subnet mask 255.255.255.128
- Block size in last octet: 256 - 128 = 128
- IP fourth octet: 130
- Block ranges: 0-127, 128-255
- 130 falls in block 128-255
- Network address: 192.168.2.128
- Broadcast address: 192.168.2.255

Answer: 192.168.2.255

---

24. Find the first usable IP in subnet 10.10.32.0/19.

Solution:

- /19 subnet mask: 255.255.224.0
- Network address: 10.10.32.0
- First usable IP = network address + 1 → 10.10.32.1

Answer: 10.10.32.1

---

25. How many subnets can be created with 3 borrowed bits?

Solution:

- Number of subnets = 2^(borrowed bits) = 2^3 = 8

Answer: 8 subnets

---

26. Calculate the network address of 172.20.10.100 with subnet mask 255.255.252.0.

Solution:

- Subnet mask: 255.255.252.0
- Block size in third octet: 256 - 252 = 4
- Third octet in IP: 10
- Find network block: blocks of 4 → 0-3, 4-7, 8-11
- 10 is in 8-11 block
- Network address: 172.20.8.0

Answer: 172.20.8.0

---

27. What is the CIDR notation for subnet mask 255.255.255.128?

Solution:

- Convert to binary:
  - 255 = 8 bits
  - 255 = 8 bits
  - 255 = 8 bits
  - 128 = 10000000 → 1 bit
- Total bits set: 8 + 8 + 8 + 1 = 25

Answer: /25

---

28. Calculate number of hosts in 192.168.10.0/28 subnet.

Solution:

- /28 → 28 bits network, 4 bits host
- Number of hosts = 2^4 - 2 = 16 - 2 = 14 hosts

Answer: 14 hosts

---

29. Find broadcast address for IP 172.16.33.10/27.

Solution:

- /27 → subnet mask 255.255.255.224
- Block size = 256 - 224 = 32 (in fourth octet)
- IP fourth octet: 10
- Blocks: 0-31, 32-63, ...
- 10 is in 0-31 block
- Broadcast address: network address + block size -1 = 172.16.33.31

Answer: 172.16.33.31

---

30. How many hosts per subnet in 10.0.0.0/12 network?

Solution:

- /12 means 12 bits network, 20 bits host
- Hosts = 2^20 - 2 = 1,048,576 - 2 = 1,048,574 hosts

Answer: 1,048,574 hosts

---

31. Find the network address of 192.168.50.75/26.

Solution:

- /26 → subnet mask 255.255.255.192
- Block size in fourth octet: 256 - 192 = 64
- Fourth octet of IP = 75
- Blocks: 0-63, 64-127, 128-191, ...
- 75 is in 64-127 block
- Network address: 192.168.50.64

Answer: 192.168.50.64

32. What is the first usable IP address in 172.16.20.0/22?

Solution:

- /22 → subnet mask 255.255.252.0
- Network address: 172.16.20.0
- First usable IP = network + 1 → 172.16.20.1

Answer: 172.16.20.1

---

33. How many subnets are created by borrowing 5 bits in Class C?

Solution:

- Default mask Class C: /24
- Borrow 5 bits → new prefix: /24 + 5 = /29
- Number of subnets = 2^5 = 32

Answer: 32 subnets

---

34. Calculate the broadcast address of 192.168.1.0/26.

Solution:

- /26 → subnet mask 255.255.255.192
- Block size in last octet: 256 - 192 = 64
- Network address fourth octet: 0
- Broadcast address: network + block size -1 = 0 + 64 -1 = 63
- Broadcast: 192.168.1.63

Answer: 192.168.1.63

---

35. What is the subnet mask for a /17 prefix?

Solution:

- /17 → 17 bits network, 15 bits host
- Mask:
  - 8 bits → 255
  - 8 bits → 255
  - 1 bit → 128
  - 0 bits → 0
- So, 255.255.128.0

Answer: 255.255.128.0

---

36. How many hosts can a /29 subnet support?

Solution:

- /29 → 29 bits network, 3 bits host
- Hosts = 2^3 - 2 = 8 - 2 = 6

Answer: 6 hosts

---

37. Convert IP 10.0.5.15 to binary.

Solution:

Octet	Decimal	Binary
10	10	00001010
0	0	00000000
5	5	00000101
15	15	00001111

Answer: 00001010.00000000.00000101.00001111

---

38. What is the number of hosts in 172.16.0.0/19?

Solution:

- /19 → 19 bits network, 13 bits host
- Hosts = 2^13 - 2 = 8192 - 2 = 8190

Answer: 8190 hosts

---

39. Find the first usable IP in 192.168.100.128/25.

Solution:

- /25 → subnet mask 255.255.255.128
- Network address: 192.168.100.128
- First usable IP: network + 1 → 192.168.100.129

Answer: 192.168.100.129

---

40. Calculate the number of subnets created with a /20 mask in Class B.

Solution:

- Default Class B mask: /16
- Borrowed bits: 20 - 16 = 4 bits
- Number of subnets = 2^4 = 16

Answer: 16 subnets

---

41. Find the broadcast address for IP 10.1.15.100/20.

Solution:

- /20 → subnet mask 255.255.240.0
- Block size in third octet = 256 - 240 = 16
- Third octet in IP: 15
- Blocks: 0-15, 16-31, ...
- 15 is in 0-15 block
- Network address: 10.1.0.0
- Broadcast address third octet = 15

- Broadcast address = 10.1.15.255

Answer: 10.1.15.255

---

42. How many usable IPs in a /30 subnet?

Solution:

- /30 → 2 bits for host
- Usable hosts = 2^2 - 2 = 2 hosts

Answer: 2 hosts

---

43. What is the network address of 192.168.200.100 with mask 255.255.255.192?

Solution:

- Mask: 255.255.255.192 (/26)
- Block size in last octet: 256 - 192 = 64
- Last octet in IP: 100
- Blocks: 0-63, 64-127
- 100 is in 64-127 block
- Network address: 192.168.200.64

Answer: 192.168.200.64

---

44. Calculate the subnet mask for 2000 hosts.

Solution:

- Hosts needed: 2000
- Formula: 2^h - 2 ≥ 2000
- Try h=11: 2^11 - 2 = 2046 ≥ 2000 ✔
- Network bits: 32 - 11 = 21
- Subnet mask: /21
- Convert to decimal:
    - 255.255.248.0

Answer: 255.255.248.0 (/21)

45. Find first usable IP in 192.168.1.128/25.

Solution:

- /25 → mask 255.255.255.128
- Network address: 192.168.1.128
- First usable IP: 192.168.1.129

Answer: 192.168.1.129

46. How many subnets are possible with subnet mask 255.255.255.224 in Class C?

Solution:

- Default Class C mask: 255.255.255.0 (/24)
- New mask: 255.255.255.224 (/27)
- Borrowed bits = 27 - 24 = 3
- Number of subnets = 2^3 = 8

Answer: 8 subnets

47. Calculate broadcast address of 172.16.100.10/23.

Solution:

- /23 → mask 255.255.254.0
- Block size in third octet: 256 - 254 = 2
- Third octet in IP: 100
- Blocks: 100-101, 102-103, etc.
- 100 is in 100-101 block
- Network address: 172.16.100.0
- Broadcast address third octet = 101
- Broadcast address: 172.16.101.255

Answer: 172.16.101.255

48. Convert subnet mask 255.255.255.252 to CIDR.

Solution:

- 255.255.255.252
- Last octet in binary: 252 = 11111100 → 6 bits set
- Total bits set = 8 + 8 + 8 + 6 = 30

Answer: /30

---

49. How many hosts are there in 192.168.10.0/26?

Solution:

- /26 → 6 bits host
- Hosts = 2^6 - 2 = 64 - 2 = 62 hosts

Answer: 62 hosts

---

50. Find network address for IP 10.0.3.128/22.

Solution:

- /22 → mask 255.255.252.0
- Block size in third octet: 256 - 252 = 4
- Third octet: 3
- Blocks: 0-3, 4-7, ...
- 3 is in 0-3 block
- Network address: 10.0.0.0

Answer: 10.0.0.0

51. Calculate the broadcast address for 192.168.5.10/28.

Solution:

- /28 → subnet mask 255.255.255.240
- Block size in last octet: 256 - 240 = 16
- Last octet in IP: 10
- Blocks: 0-15, 16-31, ...
- 10 is in 0-15 block
- Network address: 192.168.5.0
- Broadcast address: network + block size - 1 = 0 + 16 - 1 = 15
- Broadcast: 192.168.5.15

Answer: 192.168.5.15

---

52. How many hosts can be assigned in a /24 subnet?

Solution:

- /24 → 8 bits host
- Hosts = 2^8 - 2 = 256 - 2 = 254

Answer: 254 hosts

---

53. Find the first usable IP in subnet 10.0.128.0/17.

Solution:

- /17 → subnet mask 255.255.128.0
- Network address: 10.0.128.0
- First usable IP: 10.0.128.1

Answer: 10.0.128.1

---

54. How many subnets can be created by borrowing 4 bits in Class B?

Solution:

- Default Class B: /16
- Borrowed bits = 4
- Number of subnets = 2^4 = 16

Answer: 16 subnets

---

55. What is the subnet mask for /19 prefix?

Solution:

- /19 → 255.255.224.0

Answer: 255.255.224.0

---

56. Calculate the network address for IP 172.16.72.130/21.

Solution:

- /21 → mask 255.255.248.0
- Block size in third octet: 256 - 248 = 8
- Third octet in IP: 72
- Blocks: 64-71, 72-79, ...
- 72 is in 72-79 block
- Network address: 172.16.72.0

Answer: 172.16.72.0

---

57. Calculate the broadcast address of 192.168.0.0/22.

Solution:

- /22 → mask 255.255.252.0
- Block size in third octet: 256 - 252 = 4
- Network address third octet: 0
- Broadcast address third octet: 0 + 4 -1 = 3
- Broadcast address: 192.168.3.255

Answer: 192.168.3.255

---

58. How many hosts are available in a /30 subnet?

Solution:

- /30 → 2 bits host
- Hosts = 2^2 - 2 = 2

Answer: 2 hosts

---

59. What is the prefix length for subnet mask 255.255.255.248?

Solution:

- Last octet: 248 = 11111000 (5 bits)
- Total bits: 8 + 8 + 8 + 5 = 29

Answer: /29

---

60. Calculate number of hosts in 172.16.0.0/18.

Solution:

- /18 → 14 bits host
- Hosts = 2^14 - 2 = 16384 - 2 = 16382

Answer: 16,382 hosts

61. Find the network address of 192.168.25.130/27.

Solution:

- /27 → mask 255.255.255.224
- Block size in last octet: 256 - 224 = 32
- Last octet in IP: 130
- Blocks: 128-159, 160-191, ...
- 130 is in 128-159 block
- Network address: 192.168.25.128

Answer: 192.168.25.128

---

62. Calculate broadcast address of 10.10.5.25/30.

Solution:

- /30 → mask 255.255.255.252
- Block size in last octet: 256 - 252 = 4
- Last octet in IP: 25
- Blocks: 24-27, 28-31, ...
- 25 is in 24-27 block
- Network address: 10.10.5.24
- Broadcast address: 10.10.5.27

Answer: 10.10.5.27

---

63. How many hosts are available in a /23 subnet?

Solution:

- /23 → 9 bits host
- Hosts = 2^9 - 2 = 512 - 2 = 510

Answer: 510 hosts

64. What is the first usable IP in 172.16.5.64/26?

Solution:

- /26 → mask 255.255.255.192
- Network address: 172.16.5.64
- First usable IP: 172.16.5.65

Answer: 172.16.5.65

---

65. Calculate subnet mask for prefix length /22.

Solution:

- /22 → mask 255.255.252.0

Answer: 255.255.252.0

---

66. Find network address of 192.168.100.200/24.

Solution:

- /24 → mask 255.255.255.0
- Network address: 192.168.100.0

Answer: 192.168.100.0

---

67. Calculate number of subnets by borrowing 6 bits in Class C.

Solution:

- Default mask Class C: /24
- Borrow 6 bits → new prefix: /30
- Number of subnets = 2^6 = 64

Answer: 64 subnets

68. Calculate broadcast address for 10.0.7.9/21.

Solution:

- /21 → mask 255.255.248.0
- Block size in third octet: 256 - 248 = 8
- Third octet in IP: 7
- Blocks: 0-7, 8-15, ...
- 7 in 0-7 block
- Network address: 10.0.0.0
- Broadcast address third octet: 7
- Broadcast address: 10.0.7.255

Answer: 10.0.7.255

---

69. How many hosts in a subnet with mask 255.255.255.240?

Solution:

- 255.255.255.240 → /28
- Host bits = 4
- Hosts = 2^4 - 2 = 14 hosts

Answer: 14 hosts

---

70. Find the first usable IP in subnet 192.168.45.0/26.

Solution:

- /26 → mask 255.255.255.192
- Network address: 192.168.45.0
- First usable IP: 192.168.45.1

Answer: 192.168.45.1

71. Calculate the network address of 172.31.50.75/20.

Solution:

- /20 → subnet mask 255.255.240.0
- Block size in third octet = 256 - 240 = 16
- Third octet in IP: 50
- Blocks: 48-63, 32-47, etc.
- 50 falls in 48-63 block
- Network address: 172.31.48.0

Answer: 172.31.48.0

---

72. How many usable hosts are there in 192.168.1.0/26?

Solution:

- /26 → 6 bits host
- Usable hosts = 2^6 - 2 = 64 - 2 = 62

Answer: 62 hosts

---

73. Find the broadcast address of 10.0.8.5/21.

Solution:

- /21 → subnet mask 255.255.248.0
- Block size in third octet: 256 - 248 = 8
- Third octet in IP: 8
- Blocks: 8-15, 0-7, etc.
- 8 is in 8-15 block
- Network address: 10.0.8.0
- Broadcast address: 10.0.15.255

Answer: 10.0.15.255

---

74. What is the subnet mask for prefix /26?

Solution:

- /26 → 255.255.255.192

Answer: 255.255.255.192

---

75. How many subnets can be created borrowing 2 bits in Class B?

Solution:

- Default Class B mask: /16
- Borrow 2 bits → new prefix: /18
- Number of subnets = 2^2 = 4

Answer: 4 subnets

---

76. Find first usable IP address in 192.168.100.64/26.

Solution:

- /26 → mask 255.255.255.192
- Network address: 192.168.100.64
- First usable IP: 192.168.100.65

Answer: 192.168.100.65

---

77. Calculate number of hosts in 10.10.0.0/20 subnet.

Solution:

- /20 → 12 bits host
- Hosts = 2^12 - 2 = 4096 - 2 = 4094

Answer: 4094 hosts

78. Calculate broadcast address of 172.16.40.100/22.

Solution:

- /22 → subnet mask 255.255.252.0
- Block size in third octet = 256 - 252 = 4
- Third octet in IP: 40
- Blocks: 40-43, 44-47, etc.
- 40 is in 40-43 block
- Network address: 172.16.40.0
- Broadcast address: 172.16.43.255

Answer: 172.16.43.255

---

79. What is the CIDR notation for 255.255.254.0?

Solution:

- 255.255.254.0
- 254 in binary: 11111110 (7 bits set)
- Total bits: 8 + 8 + 7 + 0 = 23

Answer: /23

---

80. How many hosts are available in /30 subnet?

Solution:

- /30 → 2 bits host
- Hosts = 2^2 - 2 = 2

Answer: 2 hosts

81. Calculate network address of 192.168.10.130/25.

Solution:

- /25 → mask 255.255.255.128
- Block size in last octet = 256 - 128 = 128
- Last octet in IP: 130
- Blocks: 0-127, 128-255
- 130 is in 128-255 block
- Network address: 192.168.10.128

Answer: 192.168.10.128

---

82. Find the broadcast address for 172.16.0.0/19.

Solution:

- /19 → mask 255.255.224.0
- Block size in third octet: 256 - 224 = 32
- Network address third octet: 0
- Broadcast third octet = 0 + 32 - 1 = 31
- Broadcast address: 172.16.31.255

Answer: 172.16.31.255

---

83. How many subnets can you create by borrowing 3 bits from Class C?

Solution:

- Default Class C mask: /24
- Borrow 3 bits → new prefix /27
- Number of subnets = 2^3 = 8

Answer: 8 subnets

---

84. Calculate usable hosts in 10.10.10.0/29 subnet.

Solution:

- /29 → 3 bits host

- Usable hosts = 2^3 - 2 = 6

Answer: 6 hosts

---

85. What is the subnet mask for prefix /21?

Solution:

- /21 → mask 255.255.248.0

Answer: 255.255.248.0

---

86. Find first usable IP in 192.168.50.64/26.

Solution:

- /26 → mask 255.255.255.192
- Network address: 192.168.50.64
- First usable IP: 192.168.50.65

Answer: 192.168.50.65

---

87. Calculate broadcast address of 10.0.4.5/22.

Solution:

- /22 → mask 255.255.252.0
- Block size in third octet: 256 - 252 = 4
- Third octet in IP: 4
- Blocks: 4-7, 0-3, etc.
- 4 in 4-7 block
- Network address: 10.0.4.0
- Broadcast address: 10.0.7.255

Answer: 10.0.7.255

---

88. How many hosts are available in /24 subnet?

Solution:

- /24 → 8 bits host
- Hosts = 2^8 - 2 = 254

Answer: 254 hosts

---

89. What is the CIDR notation for subnet mask 255.255.255.252?

Solution:

- 252 in binary: 11111100 → 6 bits set
- Total bits = 8 + 8 + 8 + 6 = 30

Answer: /30

---

90. Find network address of 172.31.16.35/20.

Solution:

- /20 → mask 255.255.240.0
- Block size in third octet: 256 - 240 = 16
- Third octet in IP: 16
- Blocks: 16-31, 0-15, etc.
- 16 is in 16-31 block
- Network address: 172.31.16.0

Answer: 172.31.16.0

---

91. Calculate broadcast address for 192.168.1.64/26.

Solution:

- /26 → mask 255.255.255.192
- Block size in last octet = 256 - 192 = 64
- Network address last octet: 64
- Broadcast address last octet = 64 + 64 - 1 = 127
- Broadcast address: 192.168.1.127

Answer: 192.168.1.127

---

92. How many hosts are in subnet 10.1.1.0/23?

Solution:

- /23 → 9 bits for hosts
- Hosts = 2^9 - 2 = 512 - 2 = 510

Answer: 510 hosts

---

93. Find first usable IP in 172.16.10.0/24.

Solution:

- /24 → mask 255.255.255.0
- Network address: 172.16.10.0
- First usable IP: 172.16.10.1

Answer: 172.16.10.1

---

94. Calculate subnet mask for prefix length /18.

Solution:

- /18 → mask 255.255.192.0

Answer: 255.255.192.0

---

95. Find network address of IP 192.168.200.123/25.

Solution:

- /25 → mask 255.255.255.128
- Block size in last octet: 256 - 128 = 128
- Last octet in IP: 123
- Blocks: 0-127, 128-255
- 123 is in 0-127 block

- Network address: 192.168.200.0

Answer: 192.168.200.0

---

96. Calculate number of subnets by borrowing 5 bits in Class C.

Solution:

- Default Class C mask: /24
- Borrow 5 bits → new prefix: /29
- Number of subnets = 2^5 = 32

Answer: 32 subnets

---

97. How many usable hosts are in /29 subnet?

Solution:

- /29 → 3 bits host
- Usable hosts = 2^3 - 2 = 6

Answer: 6 hosts

---

98. Find broadcast address of 172.16.40.5/21.

Solution:

- /21 → mask 255.255.248.0
- Block size in third octet = 256 - 248 = 8
- Third octet in IP: 40
- Blocks: 40-47, 32-39, etc.
- 40 in 40-47 block
- Network address: 172.16.40.0
- Broadcast address: 172.16.47.255

Answer: 172.16.47.255

---

99. What is the CIDR prefix for subnet mask 255.255.255.224?

Solution:

- 224 in binary: 11100000 → 3 bits set
- Total bits: $8 + 8 + 8 + 3 = 27$

Answer: /27

---

100. Calculate number of hosts in subnet 10.0.0.0/16.

Solution:

- /16 → 16 bits host
- Hosts = 2^16 - 2 = 65534

Answer: 65,534 hosts