Set 5 — Answer key

Mark your paper first, then read the working for anything you missed. Every answer was generated from subnet maths and checked independently.

1. How many usable hosts in a /20?

   Answer: 4,094

   - 12 host bits: 2^12 = 4,096 addresses − 2 = 4,094.

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2. Which network is 198.51.100.187/25 in?

   Answer: 198.51.100.128/25

   - /25 = 255.255.255.128: interesting octet is the 4th (128). Block = 256 − 128 = 128.
   - 187 ÷ 128 = 1 r59 → block starts at 128, next block at 256.
   - Network 198.51.100.128, broadcast 198.51.100.255.

   `Check it: https://subnetcalculator.dev/?ip=198.51.100.187&cidr=25`

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3. Which network is 192.168.110.228/19 in?

   Answer: 192.168.96.0/19

   - /19 = 255.255.224.0: interesting octet is the 3rd (224). Block = 256 − 224 = 32.
   - 110 ÷ 32 = 3 r14 → block starts at 96, next block at 128.
   - Network 192.168.96.0, broadcast 192.168.127.255 (octets to the right: 0 on the network, 255 on the broadcast).

   `Check it: https://subnetcalculator.dev/?ip=192.168.110.228&cidr=19`

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4. Which network is 10.249.218.11/21 in?

   Answer: 10.249.216.0/21

   - /21 = 255.255.248.0: interesting octet is the 3rd (248). Block = 256 − 248 = 8.
   - 218 ÷ 8 = 27 r2 → block starts at 216, next block at 224.
   - Network 10.249.216.0, broadcast 10.249.223.255 (octets to the right: 0 on the network, 255 on the broadcast).

   `Check it: https://subnetcalculator.dev/?ip=10.249.218.11&cidr=21`

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5. 10.247.34.191/22: find the network, broadcast and usable range.

   Answer: Network 10.247.32.0 · broadcast 10.247.35.255 · usable 10.247.32.1–10.247.35.254

   - /22 = 255.255.252.0: interesting octet is the 3rd (252). Block = 256 − 252 = 4.
   - 34 ÷ 4 = 8 r2 → block starts at 32, next block at 36.
   - Network 10.247.32.0, broadcast 10.247.35.255 (octets to the right: 0 on the network, 255 on the broadcast).
   - Usable 10.247.32.1–10.247.35.254 (1,022 hosts).

   `Check it: https://subnetcalculator.dev/?ip=10.247.34.191&cidr=22`

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6. Which network is 192.168.223.49/26 in?

   Answer: 192.168.223.0/26

   - /26 = 255.255.255.192: interesting octet is the 4th (192). Block = 256 − 192 = 64.
   - 49 ÷ 64 = 0 r49 → block starts at 0, next block at 64.
   - Network 192.168.223.0, broadcast 192.168.223.63.

   `Check it: https://subnetcalculator.dev/?ip=192.168.223.49&cidr=26`

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7. 10.186.52.83/29: find the network, broadcast and usable range.

   Answer: Network 10.186.52.80 · broadcast 10.186.52.87 · usable 10.186.52.81–10.186.52.86

   - /29 = 255.255.255.248: interesting octet is the 4th (248). Block = 256 − 248 = 8.
   - 83 ÷ 8 = 10 r3 → block starts at 80, next block at 88.
   - Network 10.186.52.80, broadcast 10.186.52.87.
   - Usable 10.186.52.81–10.186.52.86 (6 hosts).

   `Check it: https://subnetcalculator.dev/?ip=10.186.52.83&cidr=29`

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8. Last usable host in the subnet of 10.118.209.113/25?

   Answer: 10.118.209.126

   - /25 = 255.255.255.128: interesting octet is the 4th (128). Block = 256 − 128 = 128.
   - 113 ÷ 128 = 0 r113 → block starts at 0, next block at 128.
   - Network 10.118.209.0, broadcast 10.118.209.127.
   - Last usable = broadcast − 1 = 10.118.209.126 (not 10.118.209.127).

   `Check it: https://subnetcalculator.dev/?ip=10.118.209.113&cidr=25`

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9. 192.168.123.237/22: find the network, broadcast and usable range.

   Answer: Network 192.168.120.0 · broadcast 192.168.123.255 · usable 192.168.120.1–192.168.123.254

   - /22 = 255.255.252.0: interesting octet is the 3rd (252). Block = 256 − 252 = 4.
   - 123 ÷ 4 = 30 r3 → block starts at 120, next block at 124.
   - Network 192.168.120.0, broadcast 192.168.123.255 (octets to the right: 0 on the network, 255 on the broadcast).
   - Usable 192.168.120.1–192.168.123.254 (1,022 hosts).

   `Check it: https://subnetcalculator.dev/?ip=192.168.123.237&cidr=22`

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10. Smallest prefix that fits 500 hosts?

    Answer: /23 (255.255.254.0, 510 usable)

    - 500 hosts + 2 (network and broadcast) = 502 addresses.
    - Next power of two: 512 = 9 host bits → /23 (510 usable).

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11. 172.22.6.226/30: find the network, broadcast and usable range.

    Answer: Network 172.22.6.224 · broadcast 172.22.6.227 · usable 172.22.6.225–172.22.6.226

    - /30 = 255.255.255.252: interesting octet is the 4th (252). Block = 256 − 252 = 4.
    - 226 ÷ 4 = 56 r2 → block starts at 224, next block at 228.
    - Network 172.22.6.224, broadcast 172.22.6.227.
    - Usable 172.22.6.225–172.22.6.226 (2 hosts).

    `Check it: https://subnetcalculator.dev/?ip=172.22.6.226&cidr=30`

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12. Broadcast address for 192.168.89.89/20?

    Answer: 192.168.95.255

    - /20 = 255.255.240.0: interesting octet is the 3rd (240). Block = 256 − 240 = 16.
    - 89 ÷ 16 = 5 r9 → block starts at 80, next block at 96.
    - Network 192.168.80.0, broadcast 192.168.95.255 (octets to the right: 0 on the network, 255 on the broadcast).
    - Trap: the 4th octet of the broadcast is 255, not the block edge.

    `Check it: https://subnetcalculator.dev/?ip=192.168.89.89&cidr=20`

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13. Smallest prefix that fits 50 hosts?

    Answer: /26 (255.255.255.192, 62 usable)

    - 50 hosts + 2 (network and broadcast) = 52 addresses.
    - Next power of two: 64 = 6 host bits → /26 (62 usable).

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14. VLSM: split 192.168.13.0/24 for 11, 2, 27 hosts, largest first. Which subnet does the 11-host LAN get?

    Answer: 192.168.13.32/28

    - Largest first: 27, 11, 2.
    - 27 → /27 (block 32); 11 → /28 (block 16); 2 → /30 (block 4).
    - Place each on the next free aligned address in 192.168.13.0/24: 192.168.13.0/27, 192.168.13.32/28, 192.168.13.48/30.

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15. VLSM: split 172.31.186.0/23 for 37, 166, 6, 2 hosts, largest first. Which subnet does the 2-host LAN get?

    Answer: 172.31.187.72/30

    - Largest first: 166, 37, 6, 2.
    - 166 → /24 (block 256); 37 → /26 (block 64); 6 → /29 (block 8); 2 → /30 (block 4).
    - Place each on the next free aligned address in 172.31.186.0/23: 172.31.186.0/24, 172.31.187.0/26, 172.31.187.64/29, 172.31.187.72/30.

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16. VLSM: split 192.168.116.0/22 for 21, 105, 43 hosts, largest first. Which subnet does the 43-host LAN get?

    Answer: 192.168.116.128/26

    - Largest first: 105, 43, 21.
    - 105 → /25 (block 128); 43 → /26 (block 64); 21 → /27 (block 32).
    - Place each on the next free aligned address in 192.168.116.0/22: 192.168.116.0/25, 192.168.116.128/26, 192.168.116.192/27.

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17. VLSM: 10.150.200.0/24 already has 10.150.200.0/26, 10.150.200.64/27. Next subnet for 4 hosts?

    Answer: 10.150.200.96/29

    - 4 hosts + 2 → /29 (block 8).
    - The used blocks end at 10.150.200.95, so the next free address is 10.150.200.96.
    - 10.150.200.96 is a multiple of 8 in its octet, so it is aligned: 10.150.200.96/29.

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18. VLSM: 172.23.236.0/22 already has 172.23.236.0/23, 172.23.238.0/25, 172.23.238.128/28. Next subnet for 5 hosts?

    Answer: 172.23.238.144/29

    - 5 hosts + 2 → /29 (block 8).
    - The used blocks end at 172.23.238.143, so the next free address is 172.23.238.144.
    - 172.23.238.144 is a multiple of 8 in its octet, so it is aligned: 172.23.238.144/29.

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19. VLSM: 172.27.81.0/24 already has 172.27.81.0/28, 172.27.81.16/29, 172.27.81.24/30. Does a subnet for 20 hosts still fit?

    Answer: Yes (172.27.81.32/27)

    - 20 hosts + 2 → /27 (block 32).
    - Free space: 172.27.81.28–172.27.81.255 (228 addresses).
    - Yes: 172.27.81.32/27 is free and aligned.

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20. VLSM: 10.64.167.0/24 already has 10.64.167.0/25, 10.64.167.128/26, 10.64.167.192/28. Does a subnet for 40 hosts still fit?

    Answer: No

    - 40 hosts + 2 → /26 (block 64).
    - Free space: 10.64.167.208–10.64.167.255 (48 addresses).
    - No: there is no free, aligned block of 64 left.

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