1. IP: 172.30.4.0/22

* Lan 1: 60
* Lan 2: 10
* Lan 3: 250
* Lan 4: 100

Solve:

Lan 3: Bit needed: 8 as 1111 1111 = 255 hosts > 250 hosts

* Subnet mask: 32 – 8 = 24
* Number of hosts: 2^8 = 256
* Number of usable hosts: 256 – 2 = 254
* Subnet address range: 172.30.4.0 - 172.30.4.255
* Usable address range: 172.30.4.1 - 172.30.4.254

Lan 4: Bit needed: 7 as 011 1111 = 127 hosts > 100 hosts

* Subnet mask: 32 – 7 = 25
* Number of hosts: 2^7 = 128
* Number of usable hosts: 128 – 2 = 126
* Subnet address range: 172.30.5.0 – 172.30.5.127
* Usable address range: 172.30.5.1 – 172.30.5.126

Lan 1: Bit needed: 6 as 0011 1111 = 63 hosts > 60 hosts

* Subnet mask: 32 – 6 = 26
* Number of hosts: 2^6 = 64
* Number of usable hosts: 64 – 2 = 62
* Subnet address range: 172.30.5.128 - 172.30.5.191
* Usable address range: 172.30.5.129 - 172.30.5.190

Lan 2: Bit needed: 4 as 0000 1111 = 15 hosts > 10 hosts

* Subnet mask: 32 – 4 = 28
* Number of hosts: 2^4 = 16
* Number of usable hosts: 16 – 2 = 14
* Subnet address range: 172.30.5.192 - 172.30.5.207
* Usable address range: 172.30.5.193 - 172.30.5.206

2. IP: 123.116.128.0/17

* Lan A: 1500
* Lan B: 80
* Lan C: 50
* Lan D: 700
* Lan E: 20

Solve:

Lan A: Bit needed: 11 as 0111 1111 1111 = 2047 hosts > 1500 hosts

* Subnet mask: 32 – 11 = 21
* Number of hosts: 2^11 = 2048
* Number of usable hosts: 2048 – 2 = 2046
* Network portion calculations:

128.0: 1000 0000 0000 0000

0111 1111 1111

* 1000 0111 xxxx xxxx = 135.0
* Subnet address range: 123.116.128.0 - 123.116.135.255
* Usable address range: 123.116.128.1 - 123.116.135.254

Lan D: Bit needed: 10 as 0011 1111 1111 = 1023 hosts > 700 hosts

* Subnet mask: 32 – 10 = 22
* Number of hosts: 2^10 = 1024
* Number of usable hosts: 1024 – 2 = 1022
* Network portion calculations:

136.0: 1000 1000 0000 0000

0011 1111 1111

* 1000 1011 xxxx xxxx = 139.0
* Subnet address range: 123.116.136.0 - 123.116.139.255
* Usable address range: 123.116.136.1 - 123.116.139.254

Lan B: Bit needed: 7 as 0111 1111 = 127 hosts > 80 hosts

* Subnet mask: 32 – 7 = 25
* Number of hosts: 2^7 = 128
* Number of usable hosts: 128 – 2 = 126
* Subnet address range: 123.116.140.0 - 123.116.140.127
* Usable address range: 123.116.140.1 - 123.116.140.126

Lan C: Bit needed: 6 as 0011 1111 = 63 hosts > 50 hosts

* Subnet mask: 32 – 6 = 26
* Number of hosts: 2^6 = 64
* Number of usable hosts: 64 – 2 = 62
* Subnet address range: 123.116.140.128 - 123.116.140.191
* Usable address range: 123.116.140.129 - 123.116.140.190

Lan E: Bit needed: 5 as 0001 1111 = 31 hosts > 20 hosts

* Subnet mask: 32 – 5 = 27
* Number of hosts: 2^5 = 32
* Number of usable hosts: 32 – 2 = 30
* Subnet address range: 123.116.140.192 - 123.116.140.223
* Usable address range: 123.116.140.193 - 123.116.140.222

Serial 1: Bit needed: 2 as 0000 0011 = 3 hosts > 2 hosts

* Subnet mask: 32 – 2 = 30
* Number of hosts: 2^2 = 4
* Number of usable hosts: 4 – 2 = 2
* Subnet address range: 123.116.140.224 - 123.116.140.227
* Usable address range: 123.116.140.225 - 123.116.140.226

Serial 2: Bit needed: 2 as 0000 0011 = 3 hosts > 2 hosts

* Subnet mask: 32 – 2 = 30
* Number of hosts: 2^2 = 4
* Number of usable hosts: 4 – 2 = 2
* Subnet address range: 123.116.140.228 - 123.116.140.231
* Usable address range: 123.116.140.229 - 123.116.140.230

3. IP: 192.168.1.0/24

* Lan 1: 29
* Lan 2: 21
* Lan 3: 12
* Lan 4: 8

Solve:

Lan 1: Bit needed: 5 as 0001 1111 = 31 hosts > 29 hosts

* Subnet mask: 32 – 5 = 27
* Number of hosts: 2^5 = 32
* Number of usable hosts: 32 – 2 = 30
* Subnet address range: 192.168.1.0 - 192.168.1.31
* Usable address range: 192.168.1.1 - 192.168.1.30

Lan 2: Bit needed: 5 as 0001 1111 = 31 hosts > 21 hosts

* Subnet mask: 32 – 5 = 27
* Number of hosts: 2^5 = 32
* Number of usable hosts: 32 – 2 = 30
* Subnet address range: 192.168.1.32 - 192.168.1.63
* Usable address range: 192.168.1.33 - 192.168.1.62

Lan 3: Bit needed: 4 as 0000 1111 = 15 hosts > 12 hosts

* Subnet mask: 32 – 4 = 28
* Number of hosts: 2^4 = 16
* Number of usable hosts: 16 – 2 = 14
* Subnet address range: 192.168.1.64 - 192.168.1.79
* Usable address range: 192.168.1.65 - 192.168.1.78

Lan 4: Bit needed: 4 as 0000 1111 = 15 hosts > 10 hosts

* Subnet mask: 32 – 4 = 28
* Number of hosts: 2^4 = 16
* Number of usable hosts: 16 – 2 = 14
* Subnet address range: 192.168.1.80 - 192.168.1.95
* Usable address range: 192.168.1.81 - 192.168.1.94