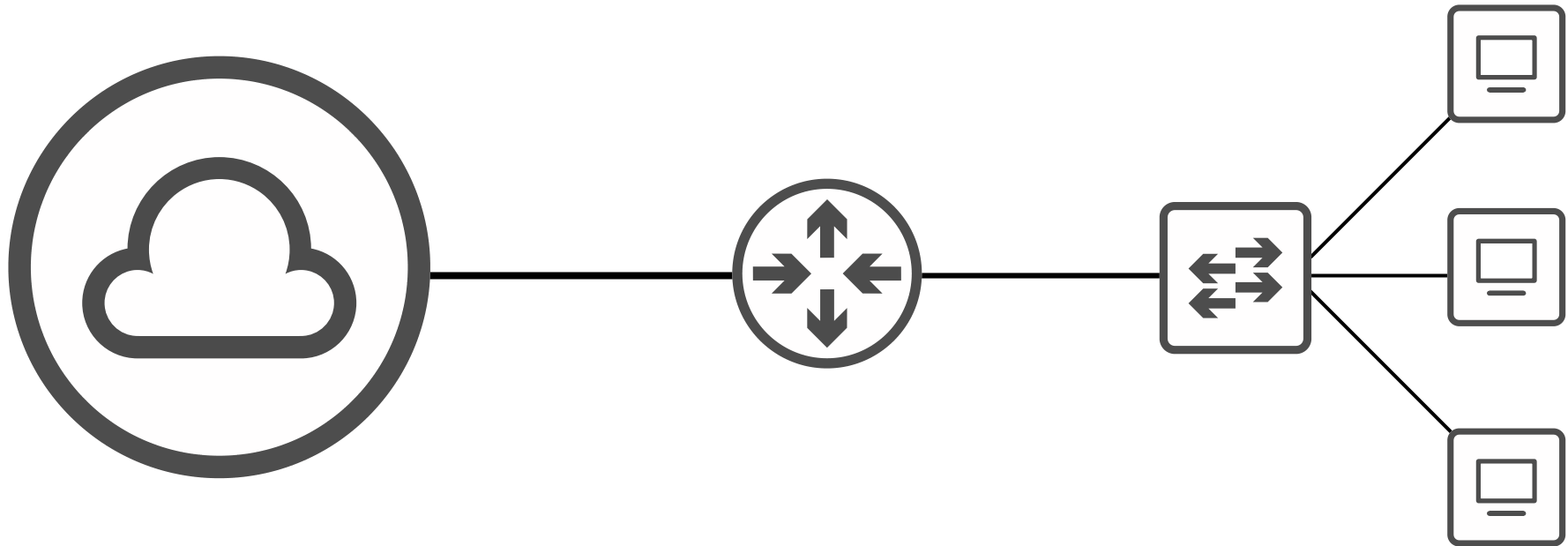


CCNA 200-301 Day 14

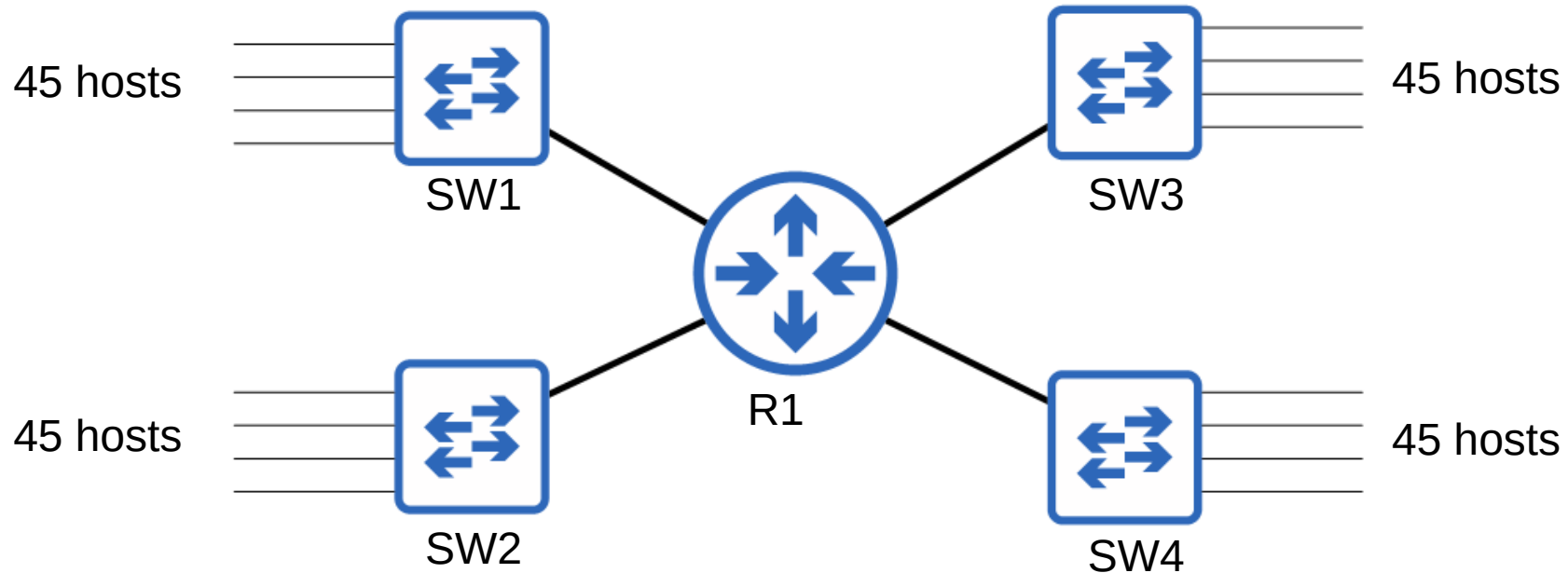
Subnetting (Part 2)



Things we'll cover

- Subnetting practice questions (Class C networks)
- Subnetting Class B networks

Subnetting



192.168.1.0/24

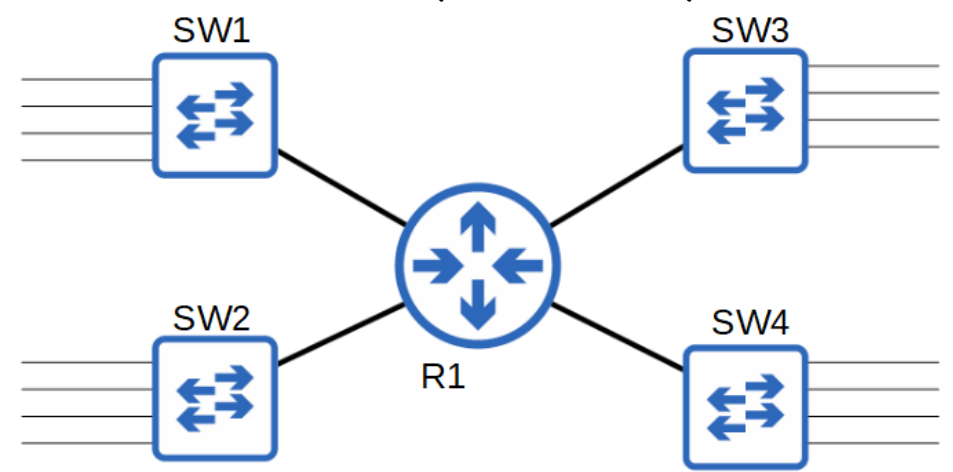
Divide the 192.168.1.0/24 network into four subnets that can accommodate the number of hosts required.

QUIZ

The first subnet (Subnet 1) is 192.168.1.0/26. What are the remaining subnets?

HINT: Find the broadcast address of Subnet 1. The next address is the network address of Subnet 2. Repeat the process for Subnets 3 and 4.

Subnet 1:
192.168.1.0/26



Subnet 3:
()/26

Subnet 2:
()/26

Subnet 4:
()/26

192.168.1.0/24

Subnet 1

Subnet 1: 192.168.1.0/26

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 0 0 1 . 0 0 0 0 0 0 0 0
192 . 168 . 1 . 0

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 0 0 1 . 0 0 1 1 1 1 1 1
192 . 168 . 1 . 63

192.168.1.0 – 192.168.1.63

Subnet 2

Subnet 2: 192.168.1.64/26

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 0 0 1 . 0 1 0 0 0 0 0 0
192 . 168 . 1 . 64

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 0 0 1 . 0 1 1 1 1 1 1 1
192 . 168 . 1 . 127

192.168.1.64 – 192.168.1.127

Subnet 3

Subnet 3: 192.168.1.128/26

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 0 0 1 . 1 0 0 0 0 0 0 0

192 . 168 . 1 . 128

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 0 0 1 . 1 0 1 1 1 1 1 1

192 . 168 . 1 . 191

192.168.1.128 – 192.168.1.191

Subnet 4

Subnet 4: 192.168.1.192/26

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 0 0 1 . 1 1 0 0 0 0 0 0
192 . 168 . 1 . 192

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 0 0 1 . 1 1 1 1 1 1 1 1
192 . 168 . 1 . 255

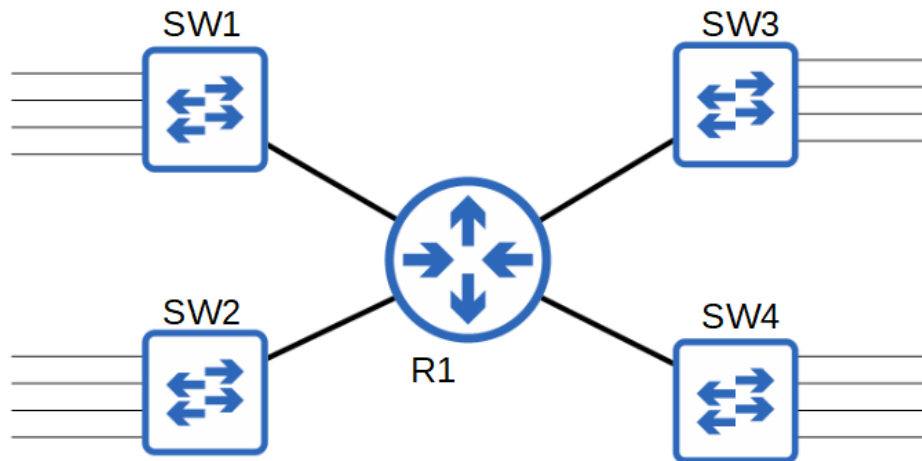
192.168.1.192 – 192.168.1.255

QUIZ

The first subnet (Subnet 1) is 192.168.1.0/26. What are the remaining subnets?

HINT: Find the broadcast address of Subnet 1. The next address is the network address of Subnet 2. Repeat the process for Subnets 3 and 4.

Subnet 1:
192.168.1.0/26



Subnet 3:
192.168.1.128/26

Subnet 2:
192.168.1.64/26

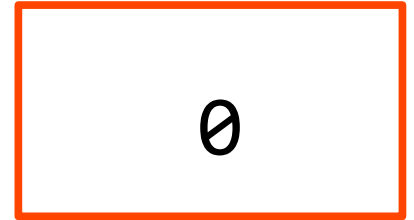
Subnet 4:
192.168.1.192/26

192.168.1.0/24

Subnetting Trick

192.168.1.0/26

192 . 168 . 1 . 0



128 64 32 16 8 4 2 1



0

0

0

0

0

0

0

0

NETWORK
PORTION

HOST
PORTION



Subnetting Trick

192.168.1.64/26

192 . 168 . 1 . 64

128 64 32 16 8 4 2 1

0 1 0 0 0 0 0 0

NETWORK
PORTION

HOST
PORTION

Subnetting Trick

192.168.1.128/26

192 . 168 . 1 . 128

128 64 32 16 8 4 2 1

1 0 0 0 0 0 0 0

NETWORK
PORTION

HOST
PORTION

Subnetting Trick

192.168.1.192/26

192 . 168 . 1 . 192

128 64 32 16 8 4 2 1

1 1 0 0 0 0 0 0

NETWORK
PORTION

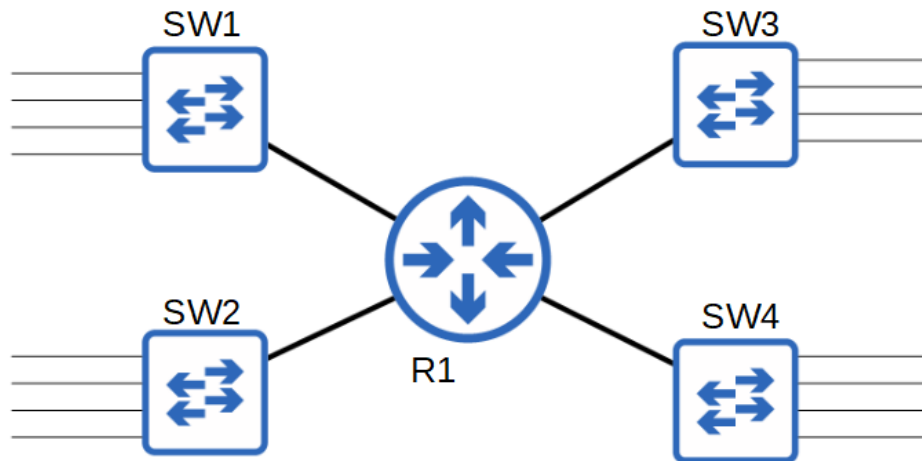
HOST
PORTION

QUIZ

The first subnet (Subnet 1) is 192.168.1.0/26. What are the remaining subnets?

HINT: Find the broadcast address of Subnet 1. The next address is the network address of Subnet 2. Repeat the process for Subnets 3 and 4.

Subnet 1:
192.168.1.0/26



Subnet 3:
192.168.1.128/26

Subnet 2:
192.168.1.64/26

Subnet 4:
192.168.1.192/26

192.168.1.0/24

Subnetting

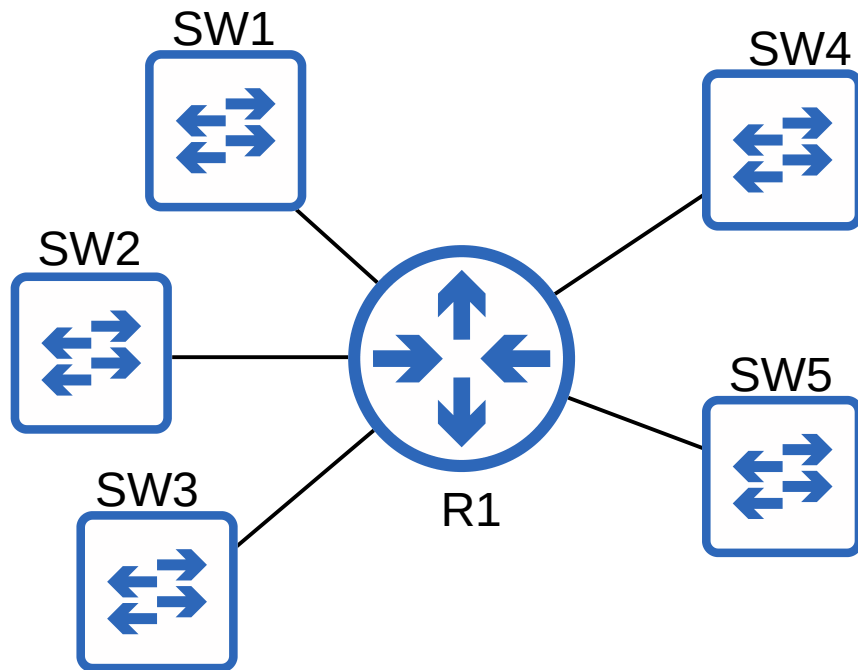
Subnet 1:

Subnet 2:

Subnet 3:

Subnet 4:

Subnet 5:



192.168.255.0/24

Divide the **192.168.255.0/24** network into five subnets of equal size. Identify the five subnets.

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 1 1 1 1 1 1 1 1 . 0 0 0 0 0 0 0 0
192 . 168 . 255 . 0

Borrowing 0 bits = can't make any subnets

1 1 0 0 0.0.0.0	.	1 0 1 0 1 0 0 0	.	1 1 1 1 1 1 1 1	.	0 0 0 0 0 0 0 0
192	.	168	.	255	.	0
1 1 0 0 0.0.0.0	.	1 0 1 0 1 0 0 0	.	1 1 1 1 1 1 1 1	.	1 0 0 0 0 0 0 0
192	.	168	.	255	.	128

Borrowing 1 bit = can make 2 subnets

$2^x =$ number of subnets
(x = number of 'borrowed' bits)

$2^n - 2 =$ number of hosts
(n = number of host bits)

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 1 1 1 1 1 1 1 1 . 0 0 0 0 0 0 0 0
192 . 168 . 255 . 0

Borrowing 2 bits = can make 4 subnets

1 1 0 0 0 . 0 . 0 . 0 . 1 0 1 0 1 0 0 0 . 1 1 1 1 1 1 1 1 . 0 0 0 0 0 0 0 0
192 . 168 . 255 . 0

Borrowing 3 bits = can make 8 subnets

Subnetting Trick

192.168.255.0/27

										NETWORK				HOST																									
										PORTION				PORTION																									
1	1	0	0	0	0	0	0	.	1	0	1	0	1	0	0	0	.	1	1	1	1	1	1	1	1	.	0	0	0		0	0	0	0	0				
										192	.											168	.											255	.				0

Subnetting Trick

192.168.255.0/27

192 . 168 . 255 . 0

128 64 32 16 8 4 2 1

0

0

0

0

0

0

0

0

NETWORK
PORTION

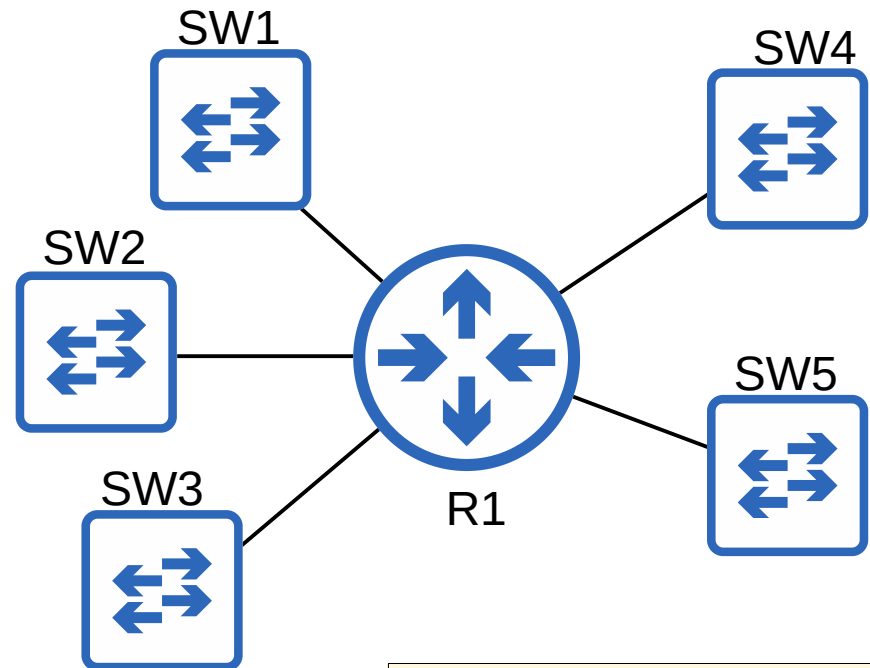
HOST
PORTION

Subnetting

Subnet 1:
192.168.255.0/27

Subnet 2:
192.168.255.32/27

Subnet 3:
192.168.255.64/27



Subnet 4:
192.168.255.96/27

Subnet 5:
192.168.255.128/27

192.168.255.160/27

Subnet 6: 192.168.255.160/27
Subnet 7: 192.168.255.192/27
Subnet 8: 192.168.255.224/27

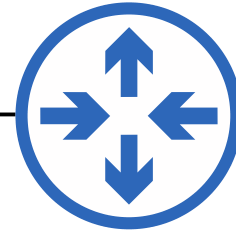
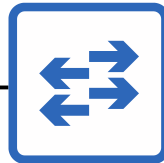
Divide the 192.168.255.0/27 into five subnets of equal size. Identify the five subnets.

Identify the subnet

What subnet does host **192.168.5.57/27** belong to?

Subnet ID: _____/27

192.168.5.57



Identify the subnet

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 1 0 1 . 0 0 1 1 1 0 0 1
192 . 168 . 5 . 57

Identify the subnet

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 1 0 1 . 0 0 1 1 1 0 0 1
192 . 168 . 5 . 57



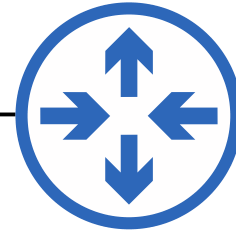
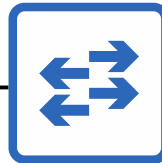
1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 0 0 1 0 1 . 0 0 1 0 0 0 0 0
192 . 168 . 5 . 32

Identify the subnet

What subnet does host **192.168.5.57/27** belong to?

Subnet ID: 192.168.5.32 /27

192.168.5.57

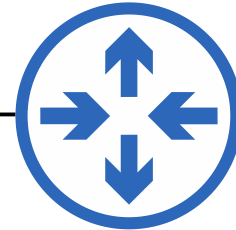
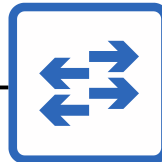


Identify the subnet

What subnet does host **192.168.29.219/29** belong to?

Subnet ID: _____/29

192.168.29.219



Identify the subnet

1 1 0 0 0 0 0 0 . 1 0 1 0 1 0 0 0 . 0 0 0 1 1 1 0 1 . 1 1 0 1 1 0 1 1
192 . 168 . 29 . 219

Identify the subnet

1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 1 1 1 0 1 . 1 1 0 1 1 0 1 1
192 . 168 . 29 . 219



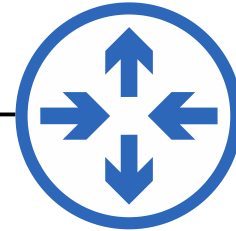
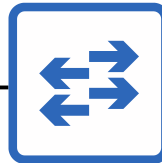
1 1 0 0 0.0.0.0 . 1 0 1 0 1 0 0 0 . 0 0 0 1 1 1 0 1 . 1 1 0 1 1 0 0 0
192 . 168 . 29 . 216

Identify the subnet

What subnet does host **192.168.29.219/29** belong to?

Subnet ID: 192.168.29.216/29

192.168.29.219



Subnets/Hosts (Class C)

Prefix Length	Number of Subnets	Number of Hosts
/25	2	126
/26	4	62
/27	8	30
/28	16	14
/29	32	6
/30	64	2
/31	128	0 (2)
/32	256	0 (1)

Subnetting Class B Networks

Class	Leading bits	Size of <i>network number</i> bit field	Size of <i>rest bit</i> field	Number of networks	Addresses per network
Class A	0	8	24	128 (2^7)	16,777,216 (2^{24})
Class B	10	16	16	16,384 (2^{14})	65,536 (2^{16})
Class C	110	24	8	2,097,152 (2^{21})	256 (2^8)

The process of subnetting Class A, Class B, and Class C networks is
EXACTLY THE SAME!

Subnetting Class B Networks

You have been given the 172.16.0.0/16 network. You are asked to create 80 subnets for your company's various LANs. What prefix length should you use?

172.16.0.0/16

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
172 . 16 . 0 . 0

Borrowing 0 bits = can't make any subnets

$2^x = \text{number of subnets}$
($x = \text{number of 'borrowed' bits}$)

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
 172 . 16 . 0 . 0

Borrowing 1 bit = 2 subnets

Subnet mask:

1 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 1 . 1 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
 255 . 255 . 128 . 0

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
 172 . 16 . 0 . 0

Borrowing 2 bits = 4 subnets

Subnet mask:

1 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 1 . 1 1 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
 255 . 255 . 192 . 0

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
 172 . 16 . 0 . 0

Borrowing 3 bits = 8 subnets

Subnet mask:

1 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 1 . 1 1 1 0 0 0 0 0 . 0 0 0 0 0 0 0 0
 255 . 255 . 224 . 0

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
 172 . 16 . 0 . 0

Borrowing 4 bits = 16 subnets

Subnet mask:

1 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 1 . 1 1 1 1 0 0 0 0 . 0 0 0 0 0 0 0 0
 255 . 255 . 240 . 0

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
 172 . 16 . 0 . 0

Borrowing 5 bits = 32 subnets

Subnet mask:

1 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 1 . 1 1 1 1 1 0 0 0 . 0 0 0 0 0 0 0 0
 255 . 255 . 248 . 0

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
 172 . 16 . 0 . 0

Borrowing 6 bits = 64 subnets

Subnet mask:

1 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 1 . 1 1 1 1 1 1 0 0 . 0 0 0 0 0 0 0 0
 255 . 255 . 252 . 0

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
 172 . 16 . 0 . 0

Borrowing 7 bits = 128 subnets

Subnet mask:

1 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 1 . 1 1 1 1 1 1 1 0 . 0 0 0 0 0 0 0 0
 255 . 255 . 254 . 0

Subnetting Class B Networks

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0

172 . **16** . **0** . **0**

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 0 1 0 . 0 0 0 0 0 0 0 0

172 . **16** . **2** . **0**

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 1 0 0 . 0 0 0 0 0 0 0 0

172 . **16** . **4** . **0**

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 0 1 1 0 . 0 0 0 0 0 0 0 0

172 . **16** . **6** . **0**

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 0 0 . 0 0 0 0 1 0 0 0 . 0 0 0 0 0 0 0 0

172 . **16** . **8** . **0**

Subnetting Class B Networks

You have been given the 172.22.0.0/16 network. You are required to divide the network into 500 separate subnets. What prefix length should you use?

172.22.0.0/16

1 0 1 0 1 1 0 0 . 0 0 0 1 0 1 1 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
172 . 22 . 0 . 0

Borrowing 9 bits = 512 subnets

Subnetting Class B Networks

You have been given the 172.18.0.0/16 network. Your company requires 250 subnets with the same number of hosts per subnet. What prefix length should you use?

172.18.0.0/16

1 0 1 0 1 1 0 0 . 0 0 0 1 0 0 1 0 . 0 0 0 0 0 0 0 0 . 0 0 0 0 0 0 0 0
172 . 18 . 0 . 0

Borrowing 8 bits = 256 subnets

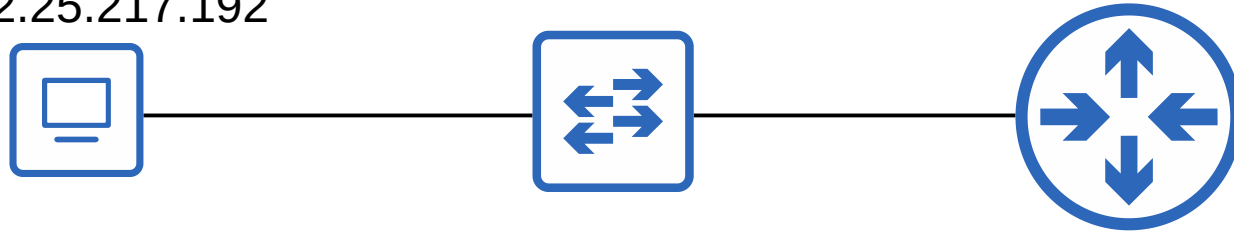
8 host bits = 254 hosts per subnet

Identify the subnet

What subnet does host **172.25.217.192/21** belong to?

Subnet ID: _____/21

172.25.217.192



Identify the subnet

1 0 1 0 1 1 0 0 . 0 0 0 1 1 0 0 1 . 1 1 0 1 1 0 0 1 . 1 1 0 0 0 0 0 0
172 . 25 . 217 . 192



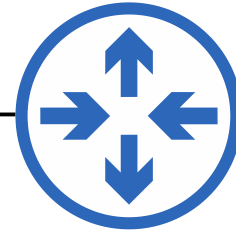
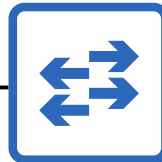
1 0 1 0 1 1 0 0 . 0 0 0 1 1 0 0 1 . 1 1 0 1 1 0 0 0 . 0 0 0 0 0 0 0 0
172 . 25 . 216 . 0

Identify the subnet

What subnet does host **172.25.217.192/21** belong to?

Subnet ID: 172.25.216.0 /21

172.25.217.192



Subnets/Hosts (Class B)

Prefix Length	Number of Subnets	Number of Hosts
/17	2	32766
/18	4	16382
/19	8	8190
/20	16	4094
/21	32	2046
/22	64	1022
/23	128	510
/24	256	254

Prefix Length	Number of Subnets	Number of Hosts
/25	512	126
/26	1024	62
/27	2048	30
/28	4096	14
/29	8192	6
/30	16384	2
/31	32768	0 (2)
/32	65536	0 (1)

QUIZ

QUIZ QUESTION 1

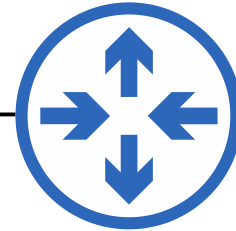
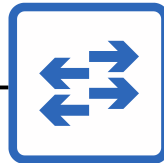
You have been given the 172.30.0.0/16 network. Your company requires 100 subnets with at least 500 hosts per subnet. What prefix length should you use?

QUIZ QUESTION 2

What subnet does host **172.21.111.201/20** belong to?

Subnet ID: _____/20

172.21.111.201

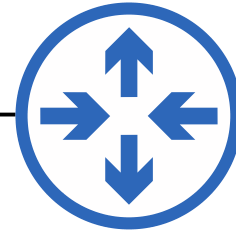
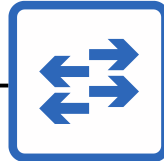


QUIZ QUESTION 3

What is the **broadcast address** of the network **192.168.91.78/26** belongs to?

Broadcast address: _____/26

192.168.91.78



QUIZ QUESTION 4

You divide the 172.16.0.0/16 network into 4 subnets of equal size.
Identify the **network** and **broadcast** addresses of the second subnet.

QUIZ QUESTION 5

You divide the 172.30.0.0/16 network into subnets of 1000 hosts each. How many subnets are you able to make?